

Editors: Ingo Mose, Janne Liburd, Cormac Walsh,  
Elen-Maarja Trell, Frans J. Sijsma

# Crossing Borders, Blending Perspectives

*Trilateral Wadden Sea Explorations*

Series of the Rudolf Agricola School for Sustainable Development of the University of Groningen  
University of Groningen Press



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# Table of Contents

Acknowledgements	9
Dedication	11
<b>Chapter 1 Introduction:</b>	
Crossing borders and blending perspectives at the Wadden Sea	13
Cormac Walsh, Ingo Mose, Janne Liburd, Elen-Maarja Trell and Frans Sijtsma	
<b>Section 1: Teaching and Learning</b>	<b>35</b>
<b>Chapter 2</b>	
Transformative learning in higher education institutions to sustain the Wadden Sea	37
Christian Wittlich, Marie Fujitani, Tanja Behrendt, Michael Thiele and Michael Fink	
<b>Chapter 3 Group go-alongs:</b>	
Participatory teacher/student engagements with others and nature	59
Annet Kempenaar and Bodil Blichfeldt	
<b>Chapter 4 Crossing borders and blending perspectives in designing long-term futures for the Dutch Wadden coast: Results from the 2023 Summer School</b>	<b>75</b>
Annet Kempenaar and Eric Luiten	
<b>Chapter 5 Crossing borders:</b>	
Student reflections on the TriWadWalk experience	99
Sarah Siebel and Christin Schellworth	

**Section 2: Scientific Explorations** \_\_\_\_\_ **109**

Chapter 6 Crossing scales:

Migratory birds and the relationship between the local and the global at the Wadden Sea \_\_\_\_\_ **111**

Cormac Walsh

Chapter 7 Blue carbon and the Wadden Sea –

Controversies in managing coastal vegetated ecosystems as carbon sinks \_\_\_\_\_ **135**

Michael Fink and Beate Ratter

Chapter 8 Dynamic dune management on Sylt:

A modelling approach \_\_\_\_\_ **155**

Anne Orth and Roberta Schütte

Chapter 9 Young people in the Wadden “hinterlands”:

Reflections on liveability and the future for youth in Eemsdelta municipality,  
North-East Groningen \_\_\_\_\_ **169**

Elen-Maarja Trel, Henk Hofstede and Gwenda van der Vaart

Chapter 10 Sustainable tourism in the trilateral Wadden area:

A pondering exploration of complexities and – perhaps – a glimpse of a more sustainable society  
\_\_\_\_\_ **201**

Frans Sijtsma

<b>Section 3: Voices from the Region</b>	<b>223</b>
Chapter 11 Challenges of climate change for land drainage on the Wadden Sea coast – Results of the KLEVER-Risk project	225
Jan Spiekermann and Peter Schaal	
Chapter 12 Biolandhof Agena & Dreyer – Regional organic farming in and for the East Frisia region	243
Heiko Dreyer	
Chapter 13 Rethinking tourism – Regenerative tourism development in the Wadden Sea National Park	253
Jannik Lorenzen	
Chapter 14 Lower Saxony Wadden Sea Biosphere Region – Emergence and prospects of a model region for sustainable development	275
Jürgen Rahmel, Astrid Martin and Peter Südbeck	
<b>Conclusion</b>	<b>289</b>
Chapter 15 Conclusion: Collaborative Wadden Sea futures	291
Janne Liburd, Cormac Walsh, Elen-Maarja Trell, Ingo Mose and Frans Sijtsma	
About the editors	307
About the authors	309





## Acknowledgements

In the summer of 2017, Dominik Siegrist, a retired professor of nature tourism and protected areas in Switzerland, together with colleagues and friends crossed the Alps on foot from Vienna to Nice. Their ambitious walking project “Whatsalp” sought to explore the current state of the Alps against the background of contemporary transformation processes. They engaged in discussions with residents, environmental activists, tourism experts, fellow researchers and other stakeholders along the way (Siegrist 2019). This endeavour inspired Ingo Mose, a long-standing colleague and friend of Dominik Siegrist, to attempt to organise something similar at the Wadden Sea, perhaps in the form of a walking tour from Den Helder to Esbjerg. However, this idea quickly gave way to the more realistic prospect of two shorter walks at the coast, crossing the German-Dutch and German-Danish border areas, respectively that became known as TriWadWalks. It was also agreed not to set off exclusively on foot, even though, in retrospect, the experience of walking was undoubtedly one of the most impressive aspects of the whole venture. Various stages were also covered by bicycle. The use of a ferry was essential for visiting two islands, and the train was used twice to shorten longer distances. In the end, this resulted in two one-week hikes, one of which led from Norddeich in Germany to Groningen in the Netherlands in spring of 2022, and the other from Klanxbüll in Germany to Tonder in Denmark in the autumn of 2022.

As editors, we would like to thank everyone who contributed to the TriWadWalks project and this book publication, including all who participated as students and researchers and all those who we met along the way. We thank each of the authors for taking the time to write informed,

insightful and thought-provoking chapters, and for their constructive engagement with the review and editing process. The TriWadWalks and this book have received generous financial support from the Common Wadden Sea Secretariat, the Faculty of Spatial Sciences, University of Groningen, the Wadden Academy, the Faculty of Humanities, University of Southern Denmark, and the European Union Erasmus Programme, without which neither could have materialised. Further thanks go to Rebekka Ernst, Ilse van Dijk and Astrid Bakker for assistance in many respects. We would also like to thank the Rudolf Agricola School at the University of Groningen for accepting our book as the first volume in a newly founded publication series. Finally, as you read this book, we trust you will find it both enjoyable and inspirational. We hope it will motivate you to take a walk at the Wadden, explore its complex wonders, and actively contribute to the well-being of the UNESCO World Heritage Wadden Sea for present and future generations.

## *Dedication*

This book is dedicated to the memory of Jeanne Meldon-Walsh (1953-2024): environmentalist, planner, researcher and passionate advocate for sustainable coastal landscapes.





# Chapter 1

## *Introduction: Crossing borders and blending perspectives at the Wadden Sea*

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<sup>a</sup>Carl von Ossietzky University of Oldenburg, <sup>b</sup>University of Southern Denmark, <sup>c</sup>University of Groningen.<sup>1</sup>

“To walk is to step out of the safe and familiar. It’s taking the first step towards the unknown and rising above our limitations. By walking, we broaden our horizons and create space for personal growth and development.”

Søren Kierkegaard (1813-1855)

### 1. A transdisciplinary collaborative endeavour

This book emerged from a unique collaborative endeavour. In the spring and autumn of 2022, an international group of university staff and students came together to explore the Wadden Sea coast, inspired by a shared curiosity and care for the Wadden Sea and its hinterlands in Denmark, Germany and the

<sup>1</sup> Corresponding author: [cormac.walsh@uni-oldenburg.de](mailto:cormac.walsh@uni-oldenburg.de)

Netherlands (Figure 1). The group included eleven university lecturers and seventeen students from Rijksuniversiteit Groningen, Carl von Ossietzky University of Oldenburg, the University of Bremen, the University of Hamburg, Leuphana University of Lüneburg, and the University of Southern Denmark, represented a wide range of social and environmental science disciplines including geography, spatial planning, environmental sciences, landscape ecology, tourism studies, regional design, economics and sustainability studies. The inter-university cooperation at the core of *TriWadWalks* dates back to 2007, when the first teaching and research workshop was held at the University of Groningen, Faculty of Spatial Sciences. Since then, the partnership has grown to include six partners in all three Wadden Sea countries. Workshops have taken place on an annual basis, rotating among partner institutions. Over time, the need arose to experiment with a new format of exchange and to tap into latent opportunities for exploration.

The overarching aim of our *TriWadWalks* project was to cross borders and blend perspectives from different scientific fields, age groups, and cultural backgrounds and from a range of different stakeholders to better understand and appreciate the nuances, opportunities and struggles of this multifaceted region<sup>2</sup> (see also Menke et al 2022, Kempenaar et al 2024). In this endeavour, we were inspired by Swiss geographer Dominik Siegrist's and friends' walk across the Alps from Vienna to Nice (Siegrist, 2019). Our physical journeys across the Wadden Sea region provided a foundation for collaborative journeys of the mind, characterised by inter- and transdisciplinary learning and reflection. From the outset, our *TriWadWalk* endeavours have thus occupied an unusual and perhaps privileged position, providing a space for learning in the field, incorporating elements of both teaching and research practice coupled with critical reflection and engagement with external perspectives from beyond the academy (see also Kempenaar et al., 2024).

<sup>2</sup> Note we use the term “Wadden Sea region” to refer to the regional context of the Wadden Sea, without implying set geographical boundaries. This is distinguished from the term “Wadden Sea Region” which denotes an area of cooperation within defined boundaries.



Figure 1: The Wadden Sea at the coast of Denmark, Germany and the Netherlands (Source: © Common Wadden Sea Secretariat, Satellite image: albedo39 Satellitenbildwerkstatt e.K. (image processing), Brockmann Consult GmbH (scientific consulting), raw data: U.S. Geological Survey).

Initially planned as “walks,” we sought to travel by foot and bike as much as possible, with some connections made via boat, bus and train as necessary. The first week-long TriWadWalk (May 2022) took the group on a journey through the Wadden area of the German-Dutch border region, while the second (September 2022) crossed the German-Danish border (Figures 2 and 3). The two border regions were deliberately selected as localities where we anticipated that the imprint of distinct ways of living, working and engaging with the Wadden Sea would be more clearly visible in the landscape. Although it is not helpful to

speak of distinct national cultures or nationally defined cultural relationships with the Wadden Sea, differences in management regimes, governance cultures and institutional arrangements are considerable. Both border regions represent areas of continuity and discontinuity where territorial borders have been superimposed on a common, shared landscape. In each case, we were also keen to include both the mainland coast and islands on our travels, providing an opportunity for reflection on how the relationship between the coast and islands has changed over time. Today, the Wadden Sea islands occupy a prominent position in the public imagination, whether as holiday destinations or associated with an idealistic perception of island life, whereas nearby rural areas on the coast often experience an increasing sense of peripherality. Both journeys took us through captivating landscapes, rich in both natural and cultural heritage. The places visited included a wide range of landscape types, each with their own entangled histories of human-nature relations. These included drained and reclaimed dike-landscapes on the coast, protected marshlands, fresh- and saltwater lagoons, an artificial lake formerly used for trapping ducks, mudflats, saltmarshes, coastal dunes, beaches and the raised *Geest* landscape of moraine sediments on the mainland coast, in addition to rural villages and towns (see also Walsh, 2022). Our journeys through these varied landscapes provided inspiration for lively discussions during the days and in the evenings on the nature of Wadden Sea nature, the values underlying conservation and the relationships between tourism, nature education and nature conservation.

The German-Dutch border region can be characterised as a liminal, in-between space with no agreed definition of the precise location of the international border in the Ems estuary and Dollart Bay. The invisibility of the border became quite apparent when travelling on the ferry to Borkum, where no indication was given for the border at all. Despite long-lasting controversies about the “true course” of the border going back as far as the 15th century, the Netherlands and Germany have expressed their will to act in the region in the sense of “good neighbourliness” as confirmed in the Ems-Dollart Treaty of 1960. Since both countries have managed to establish different formats of active cross-border collaboration, such as the Ems-

Dollart Region established in 1977, a special purpose association acting in the fields of spatial planning, infrastructure, regional development and culture (see Knottnerus, 1992). Financial resources for the various projects conducted by the association are allocated to a greater extent through the European INTERREG programme, targeting particularly activities in the cross-border regions of the European Union. As such, the Ems-Dollart Region has gradually developed into a “meeting space” where joint ideas, initiatives and projects are conducted, thereby creating an impressive picture of “unity in diversity.” The long experience of cross-border collaboration, however, does not rule out occasional political disputes, such as the recent controversy about further gas drilling by the Dutch company One-Dyas in the area between the islands of Schiermonnikoog and Borkum.

At the Danish-German border, we encountered a metal fence cutting across the landscape erected to prevent the spread of swine flu into Denmark. On either side of the border, we encountered lagoons located behind the dikes, which provide protected habitats for a wide range of flora and fauna. We quickly discovered, however, that whereas the lake on the German side is freshwater, the Danish lake remains connected to the sea beyond the dikes and consequently has a higher salt content and a very different ecology. Following a referendum in 1920, the territorial border between Denmark and what was then known as Prussia shifted southward, and formerly German lands became Danish. As a consequence, the island of Sylt lost its ferry connection to the Hoyer on the (now) Danish coast and an alternative needed to be found. This, in turn, prompted the building of the Hindenburg dam, connecting Sylt to the German mainland, with significant consequences for tidal flows and patterns of sedimentation at the island’s coastline (see Tubridy et al., 2022). In another example of cross-border history, the Verein Jordsand, established in 1907, remains to this day one of the most prominent conservation NGOs at the German Wadden Sea. The association, however, takes its name from *Hallig Jordsand*, a formerly inhabited marsh island, where, in its early years, members went on camping and birdwatching trips. This low-lying island, located northeast of

Sylt, became Danish following the 1920 referendum and gradually declined in size over subsequent decades. Its remains are now visible as a sandbank, uncovered at low tide.



Figure 2: Map of TriWadWalk 1 route: May 2022, Dutch-German Border (Source: map produced by Geodienst, University of Groningen).



Figure 3: Map of TriWadWalk 2 route: September 2022, Danish-German Border  
(Source: map produced by Geodienst, University of Groningen).

The total journey lasted ten full days across 570 kilometres (see Figure 2 and 3 for the routes and Table 1 for the modalities and distances) and engaged with 30 different stakeholders. Overall, 11 staff members and 17 students from the six universities participated.

Table 1: Selected statistics of the TriWadWalk (Source: authors).

	Distance travelled (km)					Actors met
	Train / Bus	Ferry	Bike	Walk	Total	
<b>Part 1: German-Dutch border</b>	13	127	212	27	379	20
Average per Day	13	127	212	27	379	20
<b>Part 2: German-Danish border</b>	74	13	52	53	192	10
Average per Day	15	3	10	11	38	2
<b>Total (both parts)</b>	87	140	264	80	571	30
Average per Day	9	14	26	8	57	3

In university courses, especially in landscape-, geography- and tourism-related domains, field trips with students are common (see Krakowka, 2012). The usual practice at the universities involved in the TriWadWalks would be one or two staff members and 20-50 students. Our TriWadWalk encounters were very different. The group size was deliberately kept small so everyone would get to know each other. The number of students and staff was relatively balanced, which helped ensure that both the young and the more senior perspectives were listened to. The experience of living and travelling together as a group provided ample opportunities for conversation and reflection, contributing to a sense of shared endeavour and collective while allowing space for individual reflection (see also Kempenaar et al., 2024; Kempenaar & Blichfeldt in Chapter 3 and Sijtsma in Chapter 10 of this volume).

## 2 • The Wadden Sea: A cultural and natural landscape

The Wadden Sea is an intertidal coastal landscape that extends over a length of more than 450 km from Den Helder in the Netherlands, along the full length of the German North Sea Coast to Blåvandshuk in southwest Denmark, covering an area of approximately 11,500 km<sup>2</sup>. The Wadden Sea is a highly dynamic habitat where the alternation of high and low tide twice a day creates unique living conditions for a wide range of species (Reise et al., 2010). For example, numerous salt-tolerant plants have been able to adapt to the extreme conditions and are part of this highly sensitive ecosystem. It is an area full of life. The Wadden Sea ecosystem has one of the highest rates of primary production (in simple terms, biomass growth) in the world and provides food for numerous species. The Wadden Sea is also the nursery of many fish and marine mammals. In addition to numerous breeding birds, huge flocks of migratory birds use the area in spring and fall as a resting place to replenish their food reserves. This makes it an important resting area for millions of migratory birds on the East Atlantic Flyway, a migration route of global significance (Reise, 2021; Südbeck & Bairlein, 2018).

The Wadden Sea coast is, however, also a cultural landscape and one that has been transformed by human activity over a period of thousands of years (Egberts & Schroor, 2018; Reise, 2013). The geomorphology of the coastal landscape has been massively transformed by dike construction, land reclamation and drainage, as well as catastrophic storm floods (Meier et al., 2013). Memories of catastrophic storm surges and their impacts on coastal and island communities and the struggle against the sea are furthermore integral to a common historical imaginary of the North Sea as hazardous, unpredictable and unforgiving (Ratter & Walsh, 2024; Ritson, 2018). It is only in recent times, since coastal communities began to feel secure behind modern dikes and other hard defences, that a fundamental shift has been possible: from the protection of the people from the wild nature of the North Sea to the protection of the vulnerable nature of the Wadden Sea ecosystem from the destructive influence of human society (Striegnitz, 2006). Thus, the Wadden Sea coast has been subject to both radical

material transformations and substantial changes in meaning and perception over a relatively short period of time (Ratter & Walsh, 2024). Karsten Reise, one of the foremost experts on the ecology of the Wadden Sea, has argued that given the extent and complexity of contingent society-environment interactions throughout the ten-thousand-year history of the landscape, it is not possible to know what the Wadden Sea ecosystem would be like today had there been no human intervention (Reise, 2013). Recognising the inherent dynamism and long history of society-environment interaction makes any notion of the Wadden Sea as a pristine natural landscape or ‘pure’ wilderness redundant (Walsh, 2020). It follows that the Wadden Sea is better understood in relational terms, explicitly recognising the intertwined natural and cultural heritage of the landscape and the need to approach current and future challenges from a cross-disciplinary socio-ecological perspective (Döring et al, 2021; Liburd & Walsh, 2022).

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### 3• Transboundary cooperation for a shared ecosystem

For more than 40 years, the governments and Wadden Sea stakeholders of Denmark, Germany and the Netherlands have been actively engaged in protecting the Wadden Sea, evidenced in fourteen trilateral Governmental Declarations on sustainable protected area management. The tidal landscape in front of the dikes is recognised as a unique, ecologically rich ecosystem of outstanding natural value. Following decades of international cooperation and conservation efforts, the Dutch and German sectors of the Wadden Sea were designated as a UNESCO World Heritage Site in 2009, with Denmark joining in 2014 (Enemark, 2021; Reise et al., 2010). Additionally, large parts of the Wadden Sea are designated as national parks, UNESCO biosphere reserves, nature reserves, and Natura 2000 sites (see also Walsh in Chapter 6 of this volume, and Rahmel et al. in Chapter 14). The Wadden Sea thus constitutes a transboundary area of conservation with a long history of cooperation and knowledge

exchange among scientists, policymakers and practitioners (Enemark, 2021). Indeed, at the trilateral level, the Wadden Sea is deliberately framed as a single ecosystem transcending national borders, as “one Wadden Sea.” Following its inscription as a transboundary site on UNESCO’s World Heritage List, the three Wadden Sea countries hold a collective responsibility to preserve its Outstanding Universal Value (OUV). The current management framework, encapsulated in the Single Integrated Management Plan (Common Wadden Sea Secretariat, 2023a), is designed to enhance the ongoing coordination of transboundary efforts, ensuring the effective protection and maintenance of the OUV.

The close cooperation at the trilateral level notwithstanding, it is evident that the Wadden Sea is embedded in diverse nationally and regionally-specific social, cultural and policy contexts. Management practices and ways of working at the Wadden Sea reflect a plurality of distinct and, at times, divergent understandings of nature, landscape and nature-culture relations (Döring et al., 2021; Walsh, 2021). For many thousands of people, whether local residents or visitors, the Wadden Sea is a special place (Sijtsma et al., 2012, 2019), a site of emotional attachments grounded in landscape and memory (Döring & Ratter, 2021). Individual experiences of the Wadden Sea are situated in specific places and are built on associative meanings, memories and personal perceptions of the landscape, its history and possible futures (Döring et al., 2022; Liburd et al., 2021).

In this book, we move beyond the trilateral narrative of “one Wadden Sea” to explore the nuances of place and complexity of nature-culture relations at the local scale. The front cover image reflects this tension between international and local perspectives. The map provides a birds-eye view of the Wadden Sea, a view where national borders are not visible, and the unity of the coastal landscape is emphasised. As with all maps, it is an abstraction, a simplification of reality. In this case, the map shows low tide across the whole Wadden Sea, a physical impossibility, as low tide does not occur simultaneously across this large geographical area. The map in the cover image is laid out on the ground on the Danish island of Rømø. It

provides a useful reminder of the wider context of our travels following our crossing from Sylt to Rømø at the German-Danish border. It does not, however, provide much guidance in navigating the local landscape nor in understanding how nature conservation at the Wadden Sea is embedded in the local societal contexts of northern Friesland and southern Jutland.

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### 4 • The Wadden Sea in an industrialised world

It is widely recognised that large-scale protected areas have the potential to act as model regions for transformation to a more sustainable society (e.g., Hammer et al., 2016; Liburd & Walsh, 2022) and there are positive examples to be found at the Wadden Sea. Yet the Wadden Sea is also a region of contradictions and conflicting trends. Large-scale industrial agriculture is a prominent feature of the lowland landscapes of Groningen, Eastern Friesland and southern Denmark, and the ports of Hamburg, Bremerhaven, Wilhelmshaven, Esbjerg, and Eemshaven continue to raise concerns in relation to water, noise, light and air pollution.

The Wadden Sea faces increased pressures and risks due to the ongoing industrialisation of the southern North Sea (Emeis et al., 2015). The range of maritime activities placing pressure on the Wadden Sea ecosystem is diverse and includes commercial fisheries and shipping, offshore renewable energy, aquaculture, oil and gas extraction and military activity. The extent of the risks to this fragile ecosystem posed by commercial shipping was, not for the first time, brought into sharp relief in the summer of 2023 with the narrowly avoided disaster of the foundering of *mv Fremantle Highway* (Common Wadden Sea Secretariat, 2023b). Indeed, the future status of the Wadden Sea as a World Heritage Site is uncertain and cannot be taken for granted as concerns for the integrity of, and degree of protection afforded to the Wadden Sea ecosystem in the face of ongoing oil and gas extraction have promoted close scrutiny from UNESCO (UNESCO, 2024).

Along the Wadden coast, a fine balance must be sought between coastal defence, necessary for ensuring the safety of local inhabitants, the economic and social structures necessary to support local livelihoods and the nature conservation measures required to protect the ecosystem itself. The protection and, indeed, restoration of the Wadden Sea must go hand-in-hand with a fundamental socio-ecological transformation of the Wadden Sea region (Liburd & Walsh, 2022). The support and engagement to collectively contribute to safeguarding the Wadden Sea's outstanding universal values rely not only on the efforts of national and regional governments but also on local stakeholders' everyday practice and innovative solutions stemming from local communities. The islands of Juist, Ameland and Borkum are taking a leading role in progressing towards carbon neutrality, as is the development of innovative approaches to saline agriculture at the Ems Delta and Texel, and the explicit incorporation of the UN 2030 Sustainable Development Goals within the management framework of the Danish Wadden Sea National Park. Whereas the Wadden Sea is an ecosystem of global importance, the lived meaning and transformative potential of the Wadden Sea region is found in local places, given meaning by a multitude of everyday practices, and diverse ways of knowing, working, and being with the coastal landscape.

The economy of the Wadden Sea region is dependent on its capacity to host large numbers of tourists across the summer season, yet large numbers of visitors also present a risk to the fragile Wadden Sea ecosystem, and to local residents' quality of life. Indeed, the Wadden Sea Region (WSR<sup>3</sup>) ranks among the most popular tourist destinations in Northern Europe, with tourism serving as a cornerstone of the rural economy. In 2019, the WSR recorded over 46 million overnight stays, including 11.3 million in the Dutch part, 27.2 million in the German part, and 7.9 million in the Danish part of the WSR (Hartman et al., 2022). However, the actual numbers are likely significantly higher, as official statistics exclude overnight stays in smaller and private accommodations. Tourism revenue in the WSR has shown growth in

<sup>3</sup> The Wadden Sea Region (WSR) is defined to include the Dutch provinces, German regional districts and Danish municipalities bordering the Wadden on both the mainland coast and the islands (Hartmann et al. 2022).

recent years, reaching an estimated EUR 6.7 billion. Of this total, EUR 3.3 billion (50.6%) was generated in the German part, EUR 2.2 billion (32.5%) in the Dutch part, and EUR 1.2 billion (17.6%) in the Danish part. The sector supports approximately 89,000 full-time jobs across the region, with the Dutch part accounting for 47.7% of employment, the German part for 40.1%, and the Danish section for 12.2% (Hartman et al., 2022). Research on visitor motivations for travelling to the Wadden Sea (summer and autumn 2020, spring 2021) highlights that tourists were primarily drawn by the recreational opportunities offered by the unique nature and landscape. Reflecting this, nearly all respondents identified protected nature (91%) and the experience of pristine, intact nature (90%) as highly significant factors (Yarar et al., 2022).

For many visitors, the Wadden Sea and its islands are places of relative peace and quiet, open horizons and picturesque land- and seascapes, away from the stresses of metropolitan life and perhaps associated with more harmonious or simpler ways of living with nature (Egberts & Hundstad, 2019; Freriks, 2015). Yet this idealistic view hides the reality of the Wadden Sea as a fragile ecosystem at risk from multiple human pressures and contradictions inherent in human uses of the coastal landscape. For us as researchers and lecturers, the Wadden Sea region serves not only as a living laboratory, but it is also home to many of us, and temporary residence to numerous human and non-human visitors. It is a place where the aforementioned tensions and contradictions of contemporary society are vividly highlighted by the presence of the Wadden Sea UNESCO World Heritage site, which embodies both the potential and the responsibility we owe to future generations.

## 5 • The Wadden Sea as a space for critical social scientific engagement

As social science researchers and educators, the contradictions and potentials underlying society-environment relations at the Wadden Sea are both of great interest and highly relevant. Through our TriWadWalks experiment, we engaged with the many faces of the Wadden Sea region, exploring and making sense of different contradictions, everyday practices, inspiring solutions and potential, listening to and learning from diverse stakeholders. One can see the Wadden Sea region as a living laboratory, one where many of the tensions and contradictions of contemporary society are placed in sharp contrast to the presence of the Wadden Sea World Heritage and the potential it represents. The Wadden Sea, with the complex characteristics outlined above, offers a wide range of opportunities for (academic) research and teaching. A decades-long tradition of Wadden Sea research in the natural, social and spatial sciences in all three countries of the Wadden Sea bears witness to the diverse scientific issues associated with the Wadden Sea. The Wadden Sea has also always offered a wide range of topics for teaching in various courses of study in all universities involved in TriWadWalks and beyond. Yet, too often, Wadden Sea research and teaching have been characterised by a number of blindspots. In particular, the research on the nature and ecology of the Wadden Sea nature has long been the preserve of natural scientists, whereas social scientists were primarily concerned with issues of landscape, cultural heritage and the sustainable development of the Wadden Sea region (see e.g., Kabat et al., 2012). Furthermore, a strategic desire to emphasise the coherence of the Wadden as a single transboundary ecosystem has led to a tendency to focus on commonalities and the trilateral dimension rather than differences in governance approaches or ways of engaging with the Wadden Sea found at lower spatial scales. In recent years, these old divisions have increasingly been challenged with a renewed explicit emphasis on inter- and transdisciplinary research and a call for integrated perspectives (see Döring et al., 2021; Enemark et al., 2018).

All university lecturers involved in the TriWadWalks have gained experience in research and teaching in and with the Wadden Sea over the course of their careers. By deciding to set off on the TriWadWalks, however, we opened a new chapter in our relationships with the Wadden Sea coast. The challenges to sustainable and regenerative development are manifestly visible in the Wadden area: global climate change and sea-level rise threaten precious and vulnerable habitats and species; wind turbines constitute new landmarks on the horizon; maritime transportation routes pose environmental risks to sea life; industrial fishing presents an existential threat to the Wadden Sea's unique ecology and undermines natural carbon sinks; large numbers of tourists may lead to ecological degradation and local resistance; the agricultural sector is confronted with multifaceted socio-environmental challenges from saltwater intrusion to the need to reduce nitrogen pollution; industrial activities in the harbours impact on the natural richness and integrity of estuary environments; rural liveability is at stake due to outmigration and the related loss of services, as well as the risks posed by earthquakes caused by natural gas extraction. Against this background, it is increasingly recognised that effective practice in coastal management, spatial planning and nature conservation requires explicit attention to place-based society-environment relations at the coast (Goncalves and Pinho, 2024; Walsh, 2019). Extensive and in-depth engagement with coastal communities and stakeholders is, furthermore, required to ensure the legitimacy and acceptance of management interventions with direct implications for the effectiveness of specific measures. Indeed, the core challenges of climate change, sea-level rise, and sustainable and regenerative development are societal rather than primarily technical tasks, requiring a broad knowledge basis, including natural science, social science, and lay perspectives, and consideration of the plurality of sociocultural values and perspectives (Walsh and Döring, 2018).

## 6 • Book chapters and online supplementary materials

The chapters below are organised in three sections. We begin with four chapters under the rubric of *Teaching and Learning*, followed by five research-based scientific explorations, and four chapters providing practitioner perspectives under the heading *Voices from the Region*. All chapters took their inspiration from the TriWadWalk experience and reflect the diverse roles of the authors, whether as university lecturers and professors, researchers, students or practitioners. Given the centrality of the teaching and learning experience to our TriWadWalks endeavour, we begin with a set of chapters that explore the role of innovative approaches (transformative learning – Chapter 2, Wittlich et al) and methods (Go-alongs – Chapter 3, Kempenaar & Blichfeldt; collaborative regional design – Chapter 4, Kempenaar et al.) in higher education in fostering future sustainability at the Wadden Sea. The final chapter of this first section, written by two student participants, focuses on the TriWadWalks themselves as a border-crossing, blended learning experience (Chapter 5, Siebel & Schellworth).

The second section on scientific explorations opens with a chapter on migratory birds at the Wadden Sea and the relationship between local and global perspectives in Wadden Sea nature conservation (Chapter 6, Walsh). For Fink and Ratter (Chapter 7) the focus lies on “blue carbon” and current controversies concerning the management of coastal ecosystems as carbon sinks. In a second student contribution, Orth and Schütte (Chapter 8) apply an agent-based modelling approach to the question of dynamic dune management on the island of Sylt. In Chapter 9, the focus shifts to young people and a discussion of liveability in the coastal hinterland of the Wadden Sea (Trell et al.). It is followed by an essay on the role of soft and hard values in sustainable development at the Wadden Sea (Chapter 10, Sijtsma). Our third section begins with the challenges posed by climate change to inland drainage schemes in the marshlands of East Friesland (Chapter 11, Spiekerman & Schaal). In Chapter 12, we turn to the perspective of an organic farmer, also in East Friesland and his understanding of

sustainability in the context of the Wadden Sea region (Dreyer). Subsequently, a young tourism business owner at the Danish Wadden Sea examines current practice and future potentials for sustainable and regenerative tourism based on co-design perspectives (Chapter 13, Lorenzen). The final contribution offers a policy perspective in a discussion of the Lower Saxony Biosphere Region as a model for sustainable development at the Wadden Sea coast (Chapter 14, Rahmel et al.). In Chapter 15, we draw some key conclusions and lessons learnt based on the individual book chapters and the totality of the TriWadWalk experience with propositions for collaborative Wadden Sea futures.

In summary, this book presents new perspectives that can inform research, teaching, and everyday practices in and beyond the Wadden Sea region. It advocates for the pivotal importance of learning from one another, across differences, to respect diverse experiences and identify challenges present across the Wadden Sea region's borders. Supplementing this publication, TriWadWalks partner universities have developed place-based educational materials to support and complement future university courses and field excursions, ensuring that students from multiple disciplines have access to insights, perspectives and reflection, representing the multifaceted nature of the Wadden Sea region (TriWadWalks, 2022). Whereas the TriWadWalks foregrounded the immediacy of in-person engagement with individual actors, local communities and the landscape itself, our methods embraced digital tools to provide for enhanced blended learning environments for future visitors to the Wadden Sea, both virtual and physical. The online lecture series draws on the expertise of each of the participating partner universities. They complement existing teaching materials on Wadden Sea literature produced by environmental humanities scholars at the Rachel Carson Centre for Environment and Society, Ludwig-Maximilians-University Munich (deSmalen and Ritson, 2023).

The TriWadWalks lectures combine international perspectives on protected area management, sustainability, tourism and regional development with contributions based on theoretically

informed empirical research at the Wadden Sea. Following in the spirit of our TriWadWalk objectives, the lectures raise topical issues and seek answers to difficult questions concerning the relationships between nature conservation, sustainable tourism, coastal management and climate change adaptation at the Wadden Sea. They encourage critical reflection and emphasise the need for multi-disciplinary thinking that recognises the horizontal linkages across specialist topic areas. In this sense, they showcase the benefits of a place-based embedded understanding of the Wadden Sea, informed by and complementing the TriWadWalks. The open access online lecture series is hosted by the University of Groningen.

In addition to the recorded lectures, a bibliography of Wadden Sea literature from the social sciences and humanities has been collated, focused in particular on the work of the partner universities but also moving beyond this to include, for example, historical and literary perspectives. The bibliography is sorted by theme and provides an easily accessible overview of the breadth and depth of current and recent research efforts in this field.

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# **Section 1:** **Teaching and Learning**





## Chapter 2

# *Transformative learning in higher education institutions to sustain the Wadden Sea*

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### 1. Introduction

The Wadden Sea is the world's largest coastal ecosystem of intertidal mudflats, stretching along the North Sea coasts of the Netherlands, Germany, and Denmark. The Wadden Sea is a sensitive ecosystem as well, facing a variety of challenges that threaten its ecological integrity, biodiversity, and ultimately people (Strempel et al., 2017). More generally, the challenges of the Wadden Sea can be perceived as sustainability issues. Managing and balancing the interplay of nature, state, market, and society on and between different scales seems crucial to deal with serious threats to the integrity of the Wadden Sea, like pollution, overfishing, tourism, and climate change. In terms of political administration, the versatile social, ecological, economic, and cultural interests in the Wadden Sea area are

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## Section 1: Teaching and Learning

coordinated by local, regional, national and supranational authorities. The transboundary nature of both the resources and the collective action problems complicate the need for tailored governance solutions (Ostrom, 1990). To maintain the Wadden Sea's uniqueness, coordination efforts and political agreements across scales to promote sustainable collective action and to manage conflicts seem necessary. Responses to increase sustainability are usually highly interdisciplinary, context dependent, temporary, and controversial (UNESCO, 2006; WBGU, 2011).

Education plays a key role in producing and cultivating knowledge, shaping values, promoting action and fostering acceptance of pathways towards sustainability (Goldberg et al., 2020; Lathan et al., 2024; Pettig, 2021). Within institutes of education, academia can take a crucial part in facilitating transformative processes by generating new insights and transferring them to society. A major task of Higher Education Institutions (HEIs) is to teach and train future generations of decision-makers. Focussing on transitions of societies towards sustainability, education should “give a depth in the disciplinary knowledge while also providing opportunities for interdisciplinary thinking and action” (Svanström et al., 2008, p. 342). In this regard, teaching and learning would not only encompass theoretical approaches but also incorporate the practical application of solutions. It is an advantage, if context specific learning and action takes place in the field (Goldberg et al., 2020), and students can embody interactions within vital place-based socio-material assemblages (Latour, 1993). Students should thereby come into contact with and be exposed to existing interest groups to understand their values, interests, and actions. The interaction between stakeholders reveals commonalities and conflicts. Such stakeholder groups include not only key players in state, market, and society as well as the general public for a broad input base (Kooiman, 2020), but also the more-than-human world and the cultural landscape of the Wadden Sea (Döring et al., 2021; Liburd et al., 2021; Whatmore, 2006). Therefore, another major task of HEIs to teach and train future generations requires establishing networks among actual decision-makers to let students participate in real-world settings. Through lived experience of

place-based challenges, students reflect in real time on their own values and biases. Independent from teaching and training alone, HEIS could also use their exchange platforms to transfer the latest research findings to the public and to facilitate dialogue and informed decision-making processes among the stakeholders. This would avoid the situation that “graduates have the proper skills to address complex sustainability problems, but societies and economies are not yet prepared to absorb them” (Wiek et al., 2010, p. 212). Yet the main foci of the HEIS do not necessarily seem to be on solving these issues. On the contrary, there are also internal tendencies to distract HEIS from realities outside, presenting themselves as “ivory towers.” According to Liburd (2013, p. 48):

[...] in a university context, the ivory tower is applied to intellectuals wilfully engaged in pursuits that are disconnected from practical concerns of everyday life. [...] The closed institutional system has fortified the myth of the ivory tower university as both a self-directed entity and a signifier of the elitist university. The implied separation of the university from the world represents disengaged academics as isolated and unresponsive in their pondering on irrelevant matters to society.

Meeting these sustainability requirements, challenges, and expectations for teaching, research, and transfer presents the HEIS with great difficulties. The Wadden Sea, with its supra-regional significance and intertwined challenges and stakeholders, helps to highlight the difficulties of the HEIS and suggest potential solutions. This chapter highlights the role of academic teaching in sustaining the Wadden Sea as a template for how HEIS can foster sustainability by grounding theory in place. To understand the potentials and limitations of academic teaching, we first emphasise the importance of field learning from the theoretical perspective on how to overcome a Knowledge-Action Gap (KAG) via transformative education. Secondly, we examine how HEIS address these challenges and explore constraints that exist within academia. We focus on the disciplinary logics of academia and exemplify its strengths and shortcomings. In a next step, we outline ways for academia to address the shortcomings and constraints raised in this

chapter, in service of transformative education in HEIs. Based on the experiences of the authors, we examine the development of some inter- and transdisciplinary studies at the Universities of Bremen, Hamburg and Oldenburg. In addition, we discuss the potential of field trips as a method to integrate transdisciplinarity within current teaching. Our contribution concludes with implications on how to foster place-based transformative education in the Wadden Sea and beyond.

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## 2. Transformative education to overcome a Knowledge-Action Gap

A variety of crises and threats such as climate change, biodiversity loss, scarcity of raw materials, political conflicts and social disparities are increasingly calling established social, political and economic structures into question. The need for a sustainability transformation is therefore largely undisputed. For successful transformation, not only an understanding of the specific problems and their connections is needed. First, action is required to leave unsustainable pathways. Then, there must be a critical mass adopting behaviours, norms, or cultural changes in order for system-wide transformation to occur (Heal and Kunreuther, 2010; Polanyi, 1944). When it comes to the question of what exactly motivates transformation, or what transformation means in substance and what specific steps are necessary, there is considerable disagreement amidst the myriad of possibilities. Though these questions are diverse and contested, the social science literature on transformations (and transitions) share themes of regime shifts, complexity, interconnectedness and overcoming boundaries between disciplines, science and society (Alff and Hornidge, 2019; Grin et al., 2010; Hölscher et al., 2018). In addition, although changes and crises are largely global in nature, the concrete threats and necessary measures have elements that are regionally or spatially bound. This is also linked to the realisation that transformation processes can only succeed if they are

accepted by civil society and are co-designed in a participatory and collaborative manner (Renn et al., 1993). Learning, knowledge exchange, and education must therefore be a central component of transformation (Pahl-Wostl, 2009). Transformative learning (Pahl-Wostl, 2009) is learning that moves learners to positive (environmental/social) action at the psychological level of behaviour by challenging underlying beliefs and worldviews. Thus, it is important to note that in learning settings the path from knowledge to action is not automatic. Static rational models suggest linear correlations where action inevitably follows knowledge (Bogner, 1998; Kaiser et al., 1999). Accordingly, Butler (1993, p. 215) states that:

The assumption underlying interpretation is that awareness leads to knowledge and knowledge leads to understanding. Once people begin to understand the environment, their appreciation deepens, and they begin to respect and even love the environment. Action follows.

Yet such linear assumptions leading from an increase in factual knowledge to pro-environmental change in behaviour have long been criticised as too simple, excluding other important dimensions. For example, studies on behaviour have shown that even with knowledge and general pro-environmental attitudes of environmental appreciation and respect, people still vote against specific pro-environmental policies and fail to take specific pro-environmental actions (Dermont, 2018; Kollmuss & Agyeman, 2002). As a result, more complex models have been introduced (Kollmuss and Agyeman, 2002; Lee and Moscardo, 2005; Siegel et al., 2018) to illustrate the so-called Knowledge-Action-Gap (KAG). In this respect, barriers to behavioural change encompass social and psychological dimensions such as values, attitudes, norms, and emotions, which establish certain behavioural patterns that knowledge alone might not be able to change (Kinzig et al., 2013). In addition, personal behaviour is deeply influenced by social, cultural, and economic factors (Kollmuss & Agyeman, 2002).

## Section 1: Teaching and Learning

The previous paragraphs have provided the broad theoretical base of the KAG, and motivated the need for education that can bridge this gap and move beyond knowledge transmission. However, the question arises as to what education related to transformation processes can look like (Lathan et al., 2024; Pettig, 2021). For example, when used in the context of action research and other forms of participatory knowledge creation, “learning” is criticised when initiated for others and not with others, and without reflection on positionality, subjectivity, and power imbalances between all involved (Cornish et al., 2023; Heape & Liburd, 2018; McKay & Marshall, 2001). Centring co-creation in educational settings is essential to negotiate meaning through transformative social interactions – as opposed to seeing education as a linear process of transmission (Heape & Liburd, 2018; Liburd, 2013).

For some years, transformative education has been experiencing a veritable renaissance to foster transformative action, especially in school geography (Pettig, 2021; Nöthen & Schreiber, 2023). The German Advisory Council on Global Change (WBGU, 2011, p. 352) indicates:

Transformative education (tE) generates an understanding of different options for action and solution approaches. This includes, for example, encouraging informed low-carbon mobility behaviour, sustainability-conscious eating habits, or an awareness of cross-generational responsibilities. Related educational content would, for example, be innovations that are likely to have transformative impact, or which have already had one.

The concept of transformative learning (Mezirow, 1997) involves much more than the cumulative acquisition of factual knowledge. Rather, it is about changing self-perceptions and worldviews, thereby centring around the affective dimension and aiming to alter patterns of previous feelings, thoughts and actions. In terms of content, it is about empowering people to help shape a global transformation towards a sustainable future for all, while articulating their own visions of individual life and living together (Pettig, 2021). In this context, positive self-experiences of learners who are affected by alternating states of cognitive dissonance and

consonance also appear to be important: “One of the most powerful tools for fostering transformative learning is providing students with learning experiences that are direct, personally engaging and stimulate reflection upon experience” (Taylor, 2007, p. 182).

Transformative education should make it possible to reflect on one’s own disposition towards a wide range of sustainability-related topics and issues in their complex, sometimes contradictory ecological, social, economic or political interactions, which are also often characterised by a high degree of uncertainty. In the sense of critical education, it initiates emancipation processes. It encourages people to think beyond the normative, promotes their own actions, deconstructs existing conditions and narratives and fosters confidence and maturity in order to be able to stand up for one’s own convictions. The latter can be realised, for example, through participation in democratic negotiation processes (Pettig, 2021).

For transformative education to stimulate action, teaching has to take place not only within formal learning facilities. If the goal is to not only explain issues of interest but also to facilitate action, teaching and learning is to be connected to specific places (Glassner & Eran-Zoran, 2016). The application of knowledge requires place-specific adaptation and interpretation to bridge the gap between knowledge and its application in a particular setting. Such valuable learning experiences can be offered by open, place-based teaching methods such as field trips (Wittlich, 2021). In addition to many publications that originate predominantly from environmental psychology, which attempt to bridge the KAG and move from knowledge to action, transformative education and transformative learning still appear to be promising (Pettig, 2021; Nöthen & Schreiber, 2023).

### 3• Challenges of higher education institutes in transition

As previously mentioned, HEIS have an important role in addressing topics such as pollution, ecosystem degradation and biodiversity loss as well as adaptation to climate change in such a highly vulnerable region as the Wadden Sea. Thereby, the HEIS are critically reflecting their role and setting structural changes in motion to meet the expectations. Although first efforts and trends might be visible, the implementation of changes is usually very slow in the university context. Various reasons can be identified and mentioned, often related to the organisational structure. According to Singer-Brodowski et al. (2019, p. 4):

[...] The higher education landscape in Germany is diverse. The profiling of the universities is a consequence of the ongoing differentiation of universities according to their performance and quality. Other characteristics of HEIS are the historically grown structuring into disciplines, self-government, and the Humboldtian principle of autonomy in research and teaching.

Furthermore, the criteria by which universities, their faculties and departments are primarily assessed, and which are central to their funding, lie in international visibility, which is achieved through research, associated publications and third-party funded projects. The once central element of teaching is in danger of withering away (Charkley & Sterling, 2011).

Besides personal and financial constraints, we identify the mismatch of inter- and transdisciplinary problems and a disciplinary order within HEIS as a root cause for limitations. The challenges in the Wadden Sea and as well as likely solutions concern the interface between nature, state, market, and society. Disciplinary perspectives are important, but in cross-scale social-ecological systems, they can only individually address aspects of a complex whole (Bammer, 2017; Steffen et al., 2015). There is a risk of consequential costs from missing important aspects and unintended side effects. The inter- and transdisciplinarity of problems and solutions are not unique to the Wadden Sea.

Despite the recognised importance of interdisciplinarity to address global challenges, there are persistent hurdles to integrate interdisciplinary science into the mainstream disciplinary landscape (Bammer, 2017). Disciplinary focus is not without value; there is general consensus that “a prerequisite for the ability to understand other perspectives is to have a strong enough identity in (one’s) own profession” (Svanström et al., 2008, p. 342). Disciplinarity has the advantage that the production of new statements and empirical realities follow a well-defined and established commitment to theoretical assumptions, beliefs, values, and techniques. On the other hand, there is the tendency of resisting and rejecting insights from conflicting theories and assumptions that do not share the disciplinary commitments so that disciplinarity not only regulates but can also restrict knowledge cultivation (Corry, 2022; Ng & Litzenberg, 2019). Increasingly specialised degree courses contradict a development to more permeability between disciplinary degree courses (Singer-Brodowski et al., 2019). Thus, the challenge moving forward is to support a foundation of profound disciplinary knowledge integrated into programs that foster permeability and connectivity.

New – often international – degree programmes at the bachelor level like Natural Sciences for Sustainability at the University of Bremen, Sustainability Economics at the University of Oldenburg, or new interdisciplinary joint programmes offered by European network universities<sup>5</sup> still anchor in disciplinary approaches as the teaching is still offered by disciplinary organised faculties. Even within interdisciplinary study programmes like Environmental Science (in Oldenburg) or Natural Sciences for Sustainability (in Bremen) individual modules taught are often still based on each disciplinary background as the professors involved are still representatives of their subdiscipline. Interdisciplinarity within the modules taught is not a given. Meanwhile Geography as a traditional academic science has a long and rich history of interdisciplinarity by its definition as a spatial science that includes a wide range of subdisciplines from natural to social sciences and the interdependencies and

<sup>5</sup> Bremen’s Yufe network will be offering a bachelor on Urban Sustainability soon, and Groningen is part of an ‘Island’-master consortium.

## Section 1: Teaching and Learning

relations among them. Despite that, the division between human geography and physical geography is huge and topics like regional or integrative geography are not very popular among leading scholars. Hamburg's section of Integrative Geography can be seen as a rare exception. Bremen's geography department, however, just broke up the Regional Geography module for future teachers from a field trip preparing seminar to individual seminars offered by human and physical geographers separately. As the disciplines (re-)produce their own young talents, staff being able to cover various disciplines and to generate knowledge acknowledged by the individual disciplines is generally hard to find. On an informal level, creating transdisciplinary (and interdisciplinary) learning and teaching settings is usually realised through the efforts of dedicated students and lecturers. As these settings lack institutionalisation, the frequency, quality, and persistence of knowledge and action generated in these contexts is heavily dependent on chance. In terms of how the institutions see themselves and what is expected of them, this framework is unsuitable for addressing the present challenges.

Financial and personnel decisions also reflect disciplinarity. In Germany's public universities new professorships are established after negotiations between the faculty's representatives (deans), the rectorate of the university, and the political decision makers on the level of the ministry of (higher) education. Each existing department or discipline has the agenda to defend an existing chair/professorship after the retirement of the predecessor, which impedes structural changes.

In sum, extending disciplinary teaching to transdisciplinary scenarios often encounters obstacles due to the structural framework of HEIs. The integration of inter- and transdisciplinary courses into the predominantly disciplinary curricula is rarely considered, which results in restrictive examination regulations and a lack of resources (time, financial, personnel).

## 4 • Opportunities for interdisciplinarity via general studies and internationalisation

Within the interdisciplinary learning opportunities, heterogeneous groups of students from different disciplines (and cultures) can work with a broader perspective on sustainability topics. One aspect that presents opportunities for finding resources and space for interdisciplinary teaching can be seen in so called General Studies, which constitute electives that range from languages, IT-courses, professional preparation, or courses that can be chosen from other disciplines. If a study programme offers such free electives, the options to get credit for international and transdisciplinary courses that do not belong to a set curriculum are expanded. At the same time, an open structure where General Studies are situated within several bachelor's programmes, allows the specific General Studies module to be detached from other modules within these programmes, waiving off expected prerequisites. Care must be taken to avoid fragmented learning or a lack of progression given disconnected modules, and thus special attention is given to the specific teaching and learning setting, letting the students profit from their different expertise instead (Behrendt et al., 2022). Increasing interactivity and collaboration in these course settings could be the key. Different learning approaches such as research and problem-based learning are proposed within literature (e.g., Allen et al., 2011, Koltay & Karvalics, 2023). We used the TriWad Workshops and TriWadWalks to serve as examples for implementation.

The first seven workshops of this series were organised by the Spatial Sciences from Groningen, the Environmental Sciences from Oldenburg, and the section of Economic Geography from Bremen. Being tri-national and interdisciplinary by definition, the facilitators tried to find topics that could relate to students from all disciplines, which resulted in new ideas on teaching and training like joint student projects. The experience showed that methodology played an important role both as a way to disseminate and create knowledge as well as a topic to study. Focusing on the creation of a joint questionnaire to use in several theses or the

## Section 1: Teaching and Learning

establishment of a common database across sites during such occasions, for example, proved that these learning approaches can bridge the diversity of academic backgrounds of the participants (Mossig & Thiele, 2015) and create interdisciplinary and international learning environments within disciplinary boundaries.

Not only students but also staff were inspired by these gatherings. Skills like organising the teaching module, giving academic input, scoring the budget, or gaining access to third parties proved to be split between the universities and departments. A major help in this case was the focus on the Wadden Sea and the National Parks for which funds could be made available due to extensive prior research involvement. While transfer and outreach activities are increasingly being recognised and funded in research projects, the targeted recipients are by definition outside the university. Embedding students is not subsidised, so in our view a key opportunity for transformative education remains mostly untouched. These reflections also gave rise to the TriWadWalks as a field trip format with the intention of staff and students leaving the universities and becoming more transdisciplinary and action oriented.

While further developments of inter- and transdisciplinary studies take place, but often suffer from institutional framings, we see largely untapped potential in other existing structures of our home universities. The International Module Social Sciences of the University of Bremen is such a General Studies module focusing on professionalisation and internationalisation. Its aim is to include degree and guest students in international projects like Blended Intensive Programmes (BIP). Its resources were also used for a joint learning platform which included learning videos, presentations and web meetings.

## 5 • Reflections on the added transdisciplinary value of the TriWadWalks

From the students' perspective, field trips are cherished as a welcome alternative to regular learning facilities such as classrooms (Brovelli et al., 2012; Kimmel, 1999). Compared to conventional teaching-learning settings, and building on the concept of experiential learning (Kolb, 1984), there is a general consensus on the added value of “going out” in theory and practice (Fujitani et al., 2017; Wittlich, 2021). According to Brühne (2011), it is particularly important to enable primary experiences through outdoor learning in a world where young people are heavily influenced by the media. However, less formal places of learning are also considered important, as they counteract alienation from nature, offer interesting, place-based insights and at the same time promote environmental awareness towards various sustainability topics (Bartsch-Herzog & Opp, 2011). We reflect on TriWadWalks and their added value towards transdisciplinarity, transformational learning, and transformative action.

Throughout field trips such as our TriWadWalks, the chosen sites are often novel and exciting, and participants expect to learn in an enjoyable manner (Kempenaar et al., 2024). Thus, learning is imbued with positive affect, whilst students are confronted with controversial situations in a “space of possibilities” for critical inquiry (Heape & Liburd, 2018, p. 238) and can examine different transformation paths towards sustainability throughout their journey. In transformational learning theory (Mezirow, 1991), a “disorienting dilemma” is the trigger to a process of self-reflection and challenging one's own assumptions, which leads to transformation. Further theory on transformational experiences points to “peak” experiences of authenticity where “one is more acutely and penetratingly perceptive to the outside world, able to attend to the experience in a non-evaluative manner” (Maslow, 1959, p. 44). Such disorienting or peak episodes are often to be found outside one's usual routines, and are designed into the fabric of the TriWadWalks. For instance, riding bicycles through wetlands in Dutch coastal areas and discussing different approaches to flood protection in vulnerable

## Section 1: Teaching and Learning

places on-site, has a different quality than learning about such issues second-hand from papers and books. Talking to different stakeholders who are building a sustainable school using novel building materials, might be a first-time-experience for students as well as for academic staff. Riding a bicycle out at night to visit a professor and his students in a Dark Sky Park broadens the experience and opens one to a sense of awe and connection. The subsequent discussion of issues of light pollution and how to solve problems caused by this engenders new thoughts in students who may only know light-polluted cityscapes.

Challenges to fundamental beliefs outside of a classroom setting can produce a disorienting dilemma as a prerequisite for transformational learning. During the TriWadWalks, students found challenges to their own values and biases, meeting people who had different worldviews than their own, for example when visiting a historical wildlife trap (where large numbers of migratory waterfowl were “harvested”), and feeling their own values collide with the lived experiences of people subsisting in the challenging coastal environment. In all these Wadden Sea encounters, students had the possibility to talk to experts of different backgrounds and perspectives, and to further discuss sustainability issues within their peer group. This sharing of the disorienting dilemma with others, and exploring new roles and relationships is encompassed in a transformative learning process (Mezirow, 1991). Students could co-create knowledge in a real-world setting and engage with the socio-ecological environment. There were even opportunities to switch roles, as students facilitated a mudflat hiking tour or the art of bird watching as part of the programme. Following Heape and Liburd (2018, p. 236) students were encouraged to “embrace complexity and chaos, rather than strive for consensus” and:

[...] engender and facilitate situations in the field where differences of understanding are actively pursued and built on ... engage people in the co-construction of narratives, ...so that those involved can draw on and share their experience, their metaphors and their associations [...].

The aforementioned disorientation extended to students having their conceptions about what constituted nature challenged again and again, as so much of what appears to be natural in the Wadden area, and indeed in landscapes across the world, are actually the product of many years of active management by humans (Döring et al., 2021; Liburd et al., 2021). The Wadden Sea is a World Heritage natural site that would not exist in its current state without the repeated intervention of humans over the centuries, and thus resists the nature-culture dichotomy in favour of “intertwined webs of understanding, interpretation, and appreciating the Wadden Sea” (Liburd et al., 2021, p. 288). This blurring of nature and culture has important consequences for how students may engage in the future with conservation and environmental policy. For example, on Sylt, the students saw the conflicts and contradictions between the iconic natural landscape of the dunes, and their flow and fixation. The policies of dune stabilisation create stark trade-offs with biodiversity, coastal stability, the built environment and the tourism economy (see also Orth and Schütte in Chapter 8 of this volume).

More generally, field trips as a method of learning what is special about a visited place (also called idiographic approaches) are transferable to other places. Therefore, field trips to one region can be a key to deconstructing many other places, by searching for inter- and transdisciplinary knowledge that is related to new places and its people. In view of the many transformation processes that are taking place at a very different pace (Lathan et al., 2024), there are new and exciting topics everywhere that should be explored by and with students in the sense of transformative learning.

Co-producing knowledge about transformation processes, witnessing them on site and experiencing transformation in various areas of social action feed into experiential learning and spark transformational experiences and learning. One goal of the transformative learning process is that the new co-created worldview is integrated into one’s life and actions (Mezirow, 1991). However, transformative learning is a multi-step process that requires time, reflection, and iterative negotiation. The excursion is temporally limited and yet, we argue, serves an

important initiating and incubating role. Thus, we mention in brief other aspects of excursions such as the TriWadWalks that contribute to the transformative learning environment. The relaxed atmosphere of the TriWadWalks allowed students to engage with sustainability challenges in an inquiry-based, multimedia and multisensory way. The group was partially composed of academics representing multidisciplinary backgrounds. Shared leisure time, cooking, and meals created spaces for exchange and attempted to break down hierarchies or allowed for role-reversals. Finally, the learning environment had all the physical and psychological benefits of physical exercise and time spent outdoors. Thus, though we acknowledge the effect of a single or double, time-limited exception to the usual ivory tower setting to embark on sustainability paths remains limited, we argue such excursions provide essential sparks for transformative learning and merit broad institutional support.

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## 6. Steps towards more sustainability in the Wadden Sea

In many places of the world, such as the Wadden Sea, human-nature interactions are manifold and it cannot be taken for granted that the various interests and perspectives are aligned. The different interests and respective stakeholders need to be harmonised, in that a consensus must be reached that all can accept. While most challenges and constraints seem to be well understood, practical learning and action to effectively support sustainable transitions are rare. Transformative education in HEIs is a promising approach to support current decision-making processes and to strengthen transdisciplinarity in teaching. The inter- and transdisciplinary nature of challenges as well as the complex interconnections and interactions on different scales that are needed to produce sustainable solutions, by means of alternative forms of action, also challenge HEIs on many levels.

Our study revealed that HEIS likely fail to meet expectations to provide current and future decision-makers with the necessary tools (e.g., skills, knowledge, competencies) to initiate societal transformation. In this regard, within HEIS, critical reflections on the fundamental paradigms of individual disciplines in relation to interdisciplinary and transdisciplinary reasoning are required. Transformative learning in the field must gain a much stronger foothold in universities. Transdisciplinarity should be found beyond prefaces and module descriptions. Within lecture halls, interdisciplinary teaching is hard to achieve, let alone transdisciplinarity. In bachelor's and master's programmes, sufficient space should be provided for such open learning events, allowing to also leave classroom settings, during the semester and in the lecture-free period. Furthermore, our experiences with grounding theory in place in the Wadden Sea area represent the first meaningful steps towards more transformative education and sustainable action.

Overarching, possibly new and atypical structures must be created at HEIS that are genuinely transdisciplinary. Incorporating internationality to establish curious, transdisciplinary collaborations makes the experience for participants not only more rewarding but also opens opportunities to receive funding, a crucial dimension for continuity we could only touch upon in this chapter. Some national and international approaches towards networking for more sustainability already exist. Joining sustainable university networks should be urgently introduced where they are not yet established. Even on the individual university level, structural measures such as re-accreditation or university resolutions help to pave ways to strengthen transformative education. Transformative courses can easily be incorporated in more open study programmes such as General Studies, which should therefore receive more support, visibility, and recognition.

Research gaps exist in all of the areas mentioned. Firstly, in the context of sustainability as one of many cross-cutting issues, transformative education is not a top priority at universities in terms of resource allocation. Secondly, the importance of inter- and transdisciplinary field

trips is under-researched and underestimated, particularly in the context of transformative education. Based on our experience and existing literature, field trips seem to be a promising method to foster place-based transformative learning. Thirdly, focusing on the Wadden Sea, research and research cooperations within the area happen to be plentiful. Yet, they seem to be limited in the ability to disseminate knowledge and stimulate action due to HEIs' logics of knowledge production. This results in a lack of research and teaching results flowing back to relevant stakeholders in the area. However, in the event that HEIs are motivated to internalise responsibilities for shaping pathways towards greater sustainability, sustainable actions and transitions can emerge in research, teaching, and real-world practice.

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## Section 1: Teaching and Learning

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## Chapter 3

# *Group go-alongs: Participatory teacher/student engagements with others and nature*

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### 1. Introduction

To ensure future planetary health, we have to acknowledge and address the destructive effects humans have on nature. If we are to be(come) more sustainable, we need to change our living in and with nature fundamentally (see e.g., Shukla et al., 2019). To make such changes, first and foremost, we need to better understand nature and the many different ways in which we affect and engage with nature.

Tourism and leisure are some activities through which humans engage with nature. These engagements can be degenerative or regenerative, sustainable or unsustainable, giving back to, or taking away from nature. However, as with so many other aspects of being human, tourism and leisure activities

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## Section 1: Teaching and Learning

need to change radically if we are to fight the climate crisis as well as the biodiversity crisis (Hall, 2015).

In the quest to make tourism and leisure futures more sustainable and regenerative, we need to understand the nature of tourism's engagements with nature. It is as knowledge creators that tourism research and higher education in tourism have an important role to play in the quest for better futures. However, if tourism research and education are to do their part in transforming tourism, changes in how we teach and research can help us to move beyond traditional ways and means of scientific reasoning that are bound to classroom or office settings, efficient student-staff ratios, and enforced researcher-subject relationships. This may particularly be the case when nature is a key actor with whom we wish to actively engage through research practices and processes. Therefore, we need to develop and apply research and teaching methods that enhance being-in and being-with others and nature (Heidegger, 2001), methods that enable interaction and deep engagement with both the human and non-human outside academic settings.

The aim of this chapter is to introduce, discuss and problematise the potentials of group go-alongs as an innovative research and teaching approach, with go-alongs being “methods and techniques where researchers not only talk but also walk and increasingly drive, wheel, train, bicycle or something else with participants” (Duedahl & Blichfeldt, 2020; p. 439). With the vast majority of go-along studies concerning go-along interviews with an interviewee and a researcher (Bartlett et al., 2023; Alexander et al., 2020), we add to the existing academic discourse on go-alongs by focusing on go-alongs as a method and means to learn and co-create knowledge in a group setting. In doing so, we emphasise student-teacher interactions, the latent opportunities and potentials for such interactions as well as the co-creation of knowledge that group go-alongs may unfold. We do this by accounting for the ideas and understanding of go-alongs as a method and methodology that emerged during two TriWadWalks. The walks were interrelated group go-along experiments that were done in the

spring and autumn of 2022 in the Wadden Sea region, and which clearly induced participatory teacher/student engagements with others and nature (Kempenaar et al., 2024). During the first TriWadWalk a group of ca. 10 students and 10 teachers walked, biked (see Figure 1) and trained for five days through the Dutch-German Wadden Sea region, and in autumn a similar group travelled the German-Danish border area.



Figure 1: Teachers and students biking-along in the Wadden Sea region (Source: photo by authors).

### 2. From go-along interview to group go-alongs in tourism research and teaching

Tourism is an activity that entails movements in, with and through spaces and places, as well as engagements with these places and spaces. Accordingly, in a tourism context, a destination is not only a place to be reached. It is a place to be toured, enjoyed, explored, and experienced with all our bodily senses in a plethora of ways. Anyone who has ever sat at a café in a crowded tourism destination, resting her sore feet whilst gazing at the other tourists, may have pondered about the many ways in which we bodily engage with destinations. We taste them through local cuisine and locally grown food. We smell their unique scents whether they are the fresh salty air at the beach or the big cities' air filled with flavours of their buzzing activities. We hear their silences and noises. We gaze at them and take in their sceneries. On top of that come our bodily engagements with these places when we walk, run, drive, bicycle, ride or otherwise move in and through a destination.

All our senses and bodily engagement are activated when we move into unfamiliar villages and places, into the countryside and breathtaking landscapes or out into the wilderness where (almost) no people have yet set foot (Macpherson, 2016; Middleton, 2010). In our sneakers and hiking boots, we follow in the footsteps of the true explorers, down paths and trails now marked by discrete signs and trustworthy GPS coordinates. Being out there, we swim, boat, paddle, trek, hike, climb, run, canoe, ride (using all sorts of means of transportation), walk, bike, dive, fly, crawl, cave, trek and stroll our way into engaging with nature and others. But how can tourism researchers understand what happens “out there” if they stay in their offices and campuses? And how can researchers and educators share and develop such understandings with students if they stay in the classrooms and auditoriums?

Tourism researchers increasingly adopt methods where we not only talk about, but also walk, drive, tour, wheel, train, trek, bicycle etc. with others – methods that can be classified as go-

along. Research points to different potentials and advantages of go-alongs compared to other methods, such as conventional sedentary interviews. For example, go-alongs may enrich embodied understandings, participant empowerment, mutual trust and rapport-building (Anderson, 2004; Butler & Derrett, 2014; Carpiano, 2009; Spinney, 2011). There are plenty of high-quality research contributions and journal articles on go-alongs as a method (e.g., Anderson, 2004; Evans & Jones, 2011; Parent, 2016). However, most of the research on go-alongs focuses on researchers' interactions with those researched within spaces and places (including nature) known to research participants whilst being unknown terrains for the researcher. A few articles emphasise researchers' roles and experiences when they truly aspire to go along with research participants, beyond a "short" visit on site to do a walking interview (e.g., Duedahl & Blichfeldt, 2020). The 2022 TriWadWalks experiments aimed to go beyond just a visit and to immerse during the go-along activities with each other and with the surroundings.

Albeit go-alongs and walking interviews have been discussed intensively in recent years (see e.g., Bartlett et al. 2023; Heijnen et al., 2022), very little research digs into extending the interview-based go-along into group go-alongs (Alexander et al., 2020) and none in their potential as an educational environment for collaborative learning and higher education. To explore the potential of go-alongs for collaborative research and teaching in higher education, this chapter reflects on group go-alongs as a means for students and teachers to learn collaboratively as a group, and to engage with each other and with nature outside of classrooms, auditoriums, research labs, and into the landscapes and nature that we, and our students, wish to understand and engage with.

### 3• The 2022 TriWadWalks

This chapter joins the chorus of researchers who call for innovative, collaborative, and participatory methodologies, which may facilitate engagements with others and nature in different ways than a traditional excursion or fieldwork setting. We also add to the existing body of knowledge on innovative mobile research methods that enable researchers to not only observe but actively engage with nature and others. We do so by discussing key observations of TriWadWalk 2022: Crossing borders, blending perspectives. The 2022 TriWadWalks aimed to explore routes to a more integrative science for the international Wadden Sea region, which is located along the Dutch, German, and Danish coast. For more information on the TriWadWalk background, activities and routes, see Kempenaar et al. (2024) or the TriWadWalks website at the University of Groningen.<sup>7</sup>

The TriWadWalk 2022, with support from the Common Wadden Sea secretariat, the Faculty of Spatial Sciences, the Wadden Academy, the University of Southern Denmark and the European Union Erasmus Program, brought together a core group of ten scholars and ten students from Germany, the Netherlands and Denmark, who moved through the Wadden Sea region by foot, bike, ferry and train to blend perspectives from different scientific fields. In May 2022, the first TriWadWalk took place in the Germany-Netherlands border regions and in September 2022, the second TriWadWalk took place in the Germany-Denmark border region. In total, the group travelled close to 600 kilometers; half of this distance done biking and 15% done walking. The overall aim of the TriWadWalks was to deepen understanding of the Wadden Sea region, especially regarding sustainable development, climate change and explorations of potentials for future collaboration in teaching and research. Although inspired by go-along methods, the TriWadWalks were not primarily intended to research or explore the potential of group go-alongs as an innovative research and teaching methods. Along the way, though, we had several observations and reflections that provide glimpses of this potential.

<sup>7</sup> <https://www.rug.nl/rudolf-agricola-school/research/sustainable-landscapes-and-regions/files/triwadwalk-2022-crossing-borders-blending-perspectives>.

## 4• Observations and reflections

### More than moving-along

Go-alongs are usually coined as methods centred around movements and mobilities, but the TriWadWalk challenged the idea that go-along methods only relate to mobility and moving/going along. During the TriWadWalk it became clear that the go-alongs that lead to knowledge creation in tourism research and higher education were not only the walk- or bike-alongs. Instead, practices of cooking-along, glamping-along (Figure 2) and other more bodily immobile intermezzos between the orchestrated activities, lectures, talks with experts and mobilities included in the official itinerary ended up being precious moments of knowledge creation and sharing with others. The TriWadWalk certainly proved to methodologically allow better for students and faculty being-in and being-with others and nature (Heidegger, 2001) than when engaged in traditional classroom teaching or fieldtrips.



Figure 2: Cooking-along at the glamping site (Source: photo by authors).

### On equal terms

Interactions between teachers and students seemed more “equal” due to the 1:1 student/teacher ratio. In higher education, field trips are not uncommon, but usually students dramatically outnumber teachers, thus resembling the context of the mass university where the teacher speaks to, and oftentimes tries to edutain (e.g., Dismore et al., 2019), a larger group of students. Due to the equal number of teachers and students during the TriWadWalks, students and teachers thus meet on terms more equal than mass university teaching and lecturing allow for.

### Closeness and proximity

Furthermore, the fact that the group traveled, cooked, ate, and did domestic chores together as well as shared accommodations facilitated interactions between academic levels and positions that went beyond what is usual (but stayed within what is ethical). This meant that knowledge creation and sharing was facilitated by the closeness and proximity of participants. At universities, there is a strong tradition for student-teacher interaction to happen in an academic “vacuum,” where no domestic shores or mundane everyday practices intertwine with, or “disturb,” the interactions that are cast as interactions between intellects, cognitive processes and scientific discussions and debates. However, the go-alongs suggest that bodily movement, nature-induced distractions and undertaking of everyday mundane practice do not necessarily “disturb” mutually enriching learning processes, but instead can very well enrich these processes.



Figure 3: Accommodation on one of the TriWadWalks (Source: photo by authors).

### **Dynamic group composition with lively conversations**

With the exception of evenings and nights, which were spent at different venues such as the one in Figure 3, participants spend most of their time outside. Being mostly outside (walking, biking, sailing, taking the train or bus) allowed for more natural and lively interactions than classrooms, where students are traditionally seated through most of the lectures whilst teachers stand, talk, show, explain and perhaps pace around. While walking, biking, hiking, sailing etc. in larger groups, members of the group shifted position, walked etc. along with one person, then with another, then with three and then alone. Conversations remained lively and vivid because no matter how engaging conversations are, the flow is easily and naturally overtaken by events such as storing the luggage, eagles flying close by, the wind increasing etc.



Figure 4. Walking along in different group sizes engaged in lively conversations (Source: photo by authors).

### Students as teachers

Lively and vivid as these interactions were, to teachers it is unknown territory to leave behind the role as the one who knows and shares knowledge with students, and to fully embrace the opportunity to let students be the knowledgeable ones instead. Although being-in and being-with nature and others does not automatically erase academic hierarchical positionalities, examples of students leading the way and sharing their unique knowledge with the group were numerous. For example, when two students, who are experienced bird watchers, shared their knowledge with teachers with little or no bird watching competencies or when vegan students send teachers off with a grocery list for cooking a dinner satisfying the needs of all participants. Go-alongs as student-teacher interactions thus entail going along the paths and partaking in the practices lead by those in the group which qualify as the natural guides and leaders in specific nature-based settings and situations.



Figure 5. Preparing to step onto the mudflats for a walk led by one of the students, an experienced mudflat guide (Source: photo by authors).

### Leading bodily

Moving in and through nature with others allows for participants to be freed from traditional hierarchical structures. Planning and itineraries of the trips were very much the responsibility of teachers and on several occasions this became evident. At the end of a day-long hike, a bus had to be reached at a certain time and place. As often happens with larger hiking groups, in the start of the day, time was plenty, and the atmosphere relaxed. However, during the day, it

## Section 1: Teaching and Learning

became clear that the group had to speed up to meet the bus at the designated time and place, making some keep a speedier pace and leaving it to others to catch up with them: Bodily casting members of the group as leaders or laggards. Bodily competencies, skills and abilities become extremely visible during go-alongs, thus adding other hierarchies to group dynamics than those we know from the classrooms and lecture halls.

### Free and continuous interactions

Both while going-along and during the precious intermezzos in between the scheduled events and activities, students and teachers would interact spontaneously as the group consistently split up and recreated itself in a variety of forms and structures, ensuring that teachers and students could interact freely and vividly. These free and vivid interactions between teachers and students that arise and end with no set schedules differ fundamentally from traditional student-teacher interactions at universities, where teaching, meetings and supervision are planned and scheduled in advanced and have fixed starting and ending points in time.

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## 5. Discussion and conclusion

Duedahl and Blichfeldt (2020) argued that research go-alongs may cultivate human capabilities and competencies, which enable more caring, emphatic, and attentive ways of engaging through research. To this we add, based on our TriWadWalk experiences, the hypothesis that educational go-alongs undertaken by teachers and students together may cultivate human capabilities and competencies, which enable more caring, emphatic, and attentive ways of teaching, learning and empowering in higher education.

In order to understand, research and teach any subject or topic, we need to somehow relate to that subject or topic. What go-alongs first and foremost allow us to do is to relate directly to

spatial situations, nature-based topics and subjects, and to be both physically and mentally in touch with these topics and places as we teach and educate. Go-alongs allow us to be there, in nature, together with the phenomena we study and teach about and to move through the nature areas and landscapes we wish to understand. And, as Ingold (2004, p. 330) reminds us, “it is surely through our feet, in contact with the ground (albeit mediated by footwear), we are most fundamentally and continually ‘in touch’ with our surroundings.”

Bergeron et al. (2014) argued that understanding places is not simply a matter of being in these places but also a matter of moving in and through places. What go-alongs allow both teachers and students to do is to develop understandings of nature by moving in and through the nature that we wish to teach and learn about. Being there, in nature allows us to move away from the classrooms and lecture halls, which we normally inhabit. Go-alongs enable us to leave behind the filtered “blandscape” we are usually cocooned in when teaching and learning about nature (Evans & Jones, 2011). This is particularly relevant in both tourism education and other spatially oriented curricula engaged with landscapes, places, and how people use and interact with their environment.

Go-alongs may help students and teachers to collaboratively move beyond traditional ways and means of scientific reasoning. Furthermore, as exemplified by the pictures, being-in and being-with nature adds a valuable dimension to lecturing, it makes lectures on nature far more accessible and “vivid” than if they take place in a classroom far from nature – for example, when insightful information on sustainable development and mobile dunes is shared by an expert on location in the mobile dunes. This may particularly be the case when nature is a key actor, with whom we wish to actively engage during and through research processes. However, there are downsides too. For example, reading and engaging with texts, a valuable part of academic research and teaching comes less easy and naturally in nature. Our experience was also that it seems to take quite some effort to free students and teachers from their traditional roles. The TriWadWalk experiments suggest that group go-alongs can expect

to unfold their full potential for higher education and collaborative learning when participants (students as well as teachers) actually go-along with the fundamental principle of leaving everyday life, hierarchical structures and positionalities behind; accepting to being-in and being-with nature and others on more equal terms than what we are used to in traditional university settings and contexts.

In their article on go-alongs as a means to engage with nature and others for research purposes, Duedahl and Blichfeldt (2020, p. 5) argue: “At the core, go-alongs are all about the researcher going-along.” In this chapter, we extend this argument to also cover group go-alongs as an innovative means to improve teaching and learning in higher education and argue: At the core, educational go-alongs are all about teachers and students going-along, allowing themselves to immerse with nature and with others.

We hope that this chapter inspires students and teachers to engage with group go-alongs in nature as an innovative path to collaborative knowledge creation and sharing in higher education, in addition to or in combination with traditional methods. Thus, we hope that others will also start experimenting and experience how go-alongs, through co-navigation and co-learning, can become more than the sum of walking and talking (Huxham, 1996).

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## Chapter 4

# *Crossing borders and blending perspectives in designing long-term futures for the Dutch Wadden coast: Results from the 2023 Summer School*

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### 1. Introduction

This chapter introduces the 2023 Summer School “Design the Future of the Wadden Coast,” a multi-day event during which students and staff engaged with the Wadden Sea region and aimed to – just like the TriWadWalks – cross borders and blend perspectives. Although named a summer school it was set up as a design-atelier to develop conceptual designs for the long-term future of the Dutch Wadden coast. The focus was primarily on exploring strategies and options for redesigning the border between the land and the sea in order to overcome the challenges faced along the coast in the light of climate change. However, climate change was not the only perspective, the

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## Section 1: Teaching and Learning

long and rich cultural history of the region, its biodiversity and nature values, tourism, agriculture, and the everyday livelihoods of inhabitants, to name a few, were also taken into account and blended in ideas for the long-term future of this coastal region.

The Dutch Wadden coast is marked by a continuous line of dikes and dams. The landscape along this line tells the story of how people have been profiting over centuries from the fruits of the sea and the fertile grounds deposited by the sea. However, the landscape also bears the signs of an ongoing struggle of protecting the land against flooding from between Den Helder in the west and Bad Nieuweschans in the east. These dikes and dams have harnessed the dynamics of the Wadden Sea, created a hard and artificial boundary between the sea and the land, and almost completely removed the unique wet to dry, and salt- to freshwater gradients. However, sea level rise and other climate change impacts, such as salination, heavy rainfall, and prolonged periods of droughts (Philippart et al., 2020) highlight the urgency to examine the coastal zone more profoundly and create new opportunities to re-imagine this landscape. How can we prepare and adapt this landscape for its future while at the same time nurturing the values that thrive on the Wadden Sea dynamics, as well as the values that build on protection from these dynamics? The 2023 Summer School “Design the Future of the Wadden Coast,” organised as part of the 2023 Landscape Triennial<sup>9</sup> (Figure 1), addressed this fundamental long-term challenge and explored possible strategies and options for the Wadden coast.

<sup>9</sup> Since 2008, every three years a Landscape Triennial takes place in the Netherlands during the month of September. Each edition, the Triennial places a specific landscape in the Netherlands and its challenges centre stage, aiming to broaden, strengthen and deepen the public and professional engagement with this particular landscape.



Figure 1. The logo of the 2023 Landscape Triennial on the Dynamic Wadden Delta, symbolising the line of dikes and dams in the dynamic intertidal Wadden coast landscape (Source: Landscape Triennial 2023<sup>10</sup>).

The 2023 Summer School placed itself in a long-term tradition of regional designing in the Netherlands (e.g., Balz and Zonneveld, 2020). Since the 1980s, various private and public organisations have organised design competitions, exhibitions, research projects and other initiatives to employ regional designing to explore and define possible and desirable long-term futures. In regional designing, architects, urban designers, landscape architects, multiple disciplinary experts and stakeholders collaboratively envision “the future physical form and arrangement of settlements, infrastructures, water features, nature reserves and other land uses in a region, including the relationships between them, their aesthetic appearances, and how this future could come about” (Kempenaar, 2017, p. 13). The experts take a dynamic systems perspective through addressing multiple (geographic and time) scales, engaging with stakeholders, and reframing the region to develop feasible ideas about desirable future situations (Kempenaar & van den Brink, 2018).

<sup>10</sup> <https://landschapstriennale.com/editie-2023>

## Section 1: Teaching and Learning

Regional designing can serve various purposes (De Zwart, 2015) ranging from exploring, defining, or (re)framing issues and problems, to affecting or setting a (public or political) agenda, to proposing a specific future direction, or pointing out the relevant stakeholders and their connections. To be relevant and effective, regional design has to offer a future perspective that can be appreciated as a supplementary contribution to the more abstract zoning procedures and planning politics. It provides insights in dominant regional and local phenomena, it distinguishes the major exogenic and endogenic landscape factors, and it highlights dominant mechanisms of spatial transformation (Luiten & Sijmons, 2000).

The aim of the 2023 Summer School was to explore adaptation of the Wadden coastal area to become a future-proof, resilient marine system and biodiverse landscape, building on the values that historically and currently define the region. As part of the 2023 Landscape Triennial, the outcomes of the summer school became input for subsequent events that fuelled the professional and regional discourse on the future of the Wadden coast. The chapter first sketches the setup of the summer school, followed by a short description of its outcomes, and how the results were used in other events during the 2023 Landscape Triennial. The chapter ends with a critical reflection on the summer school and explores how blending TriWadWalk principles with the summer school could enhance both the learning experience as well as the quality and impact of a future, regional design-oriented summer school for the Wadden coast.

## 2 • 2023 Summer School “Design the Future of the Wadden Coast”

Besides learning about and grappling with the real-life challenge of envisioning a long-term future for the Wadden coast, the summer school organisers wanted to create an inspiring extra-curricular learning experience for students in the field of planning and design. During the summer school, the students interacted with experts from both academia and the field, participated in lively discussions with the staff, and collaborated in small teams of international students. Although predominantly studying at Dutch schools and universities, the students represented a variety of ages, nationalities and backgrounds. Most studied landscape architecture, landscape design or planning, but also students studying history, architecture, urban studies, and philosophy programmes joined the summer school. The summer school was not a part of an educational programme, and students did not receive credits for their participation. They signed up voluntarily to learn about the Wadden coast, be in the region, engage with other students, learn about regional designing, and have a fun week in a beautiful setting. The 2023 Summer School “Design the Future of the Wadden Coast” ran from Sunday August 27 to Friday September 1, 2023, with 30 students participating. The students and the organising team (Figure 2) arrived at the former farmstead of “Het Lage Noorden” (The Low North) on Sunday afternoon. Located at the foot of the Wadden Sea dike in Marrum (Friesland), with a campground and ample workshop space, “Het Lage Noorden” was a perfect location for the summer school.



Figure 2. The participants of the summer school on the dike near Delfzijl (Source: photo by authors).

After arriving and having a first meal together, the summer school started off with a short introduction to the Wadden, the Landscape Triennial, the setup of the summer school, and the composition of the teams. The students were divided in eight teams of three to four members from different schools and with different backgrounds. Each team worked on a specific part of the Wadden coast (Figure 3), which was randomly assigned to the teams. This ensured full coverage of the Dutch Wadden coast. The overall summer school setup followed the logic of a design process (e.g., Lawson and Dorst, 2013) with an exploring and research-oriented start (*exploring*), (re)framing of the issues at hand (*diagnosing*), developing possible solutions (*ideating*), refining the design ideas (*proposing*), and visualising and presenting the designs (*representing*).



Figure 3. The eight stretches of the Dutch Wadden coast that the student teams worked on (Source: Landscape Triennial 2023).

The first day of the summer school (*exploring*) was used to inspect the Wadden coast of Friesland and Groningen as a full day bus excursion. The second day fully focused on *diagnosing*. During this day the students worked on researching their part of the Wadden Coast, its specific situation and challenges, and on framing its issues (Figure 4). In the afternoon two experts gave a short lecture, the first on social issues and liveability in this peripheral region, and the other on the water management and the flood defence system. Both guests stayed for the afternoon and engaged with the teams in lively conversations and discussions on the qualities of the Wadden Coast landscape.



Figure 4. Researching and framing the issues of the Wadden coast (Source: photo by authors).

Wednesday, the third full day of the summer school, was centred around *ideating*, on developing possible ideas for the long-term future of the Wadden Coast. Wednesday was also a day full of input by various guests with short lectures and interaction with the teams to help the teams to deepen their understanding of the region. The morning commenced with a short lecture given by a visiting scholar from University of Southern Denmark on the nature/culture dichotomy. In the early afternoon, the students were presented with the story of “Holwerd at Sea” (Holwerd aan Zee in Dutch) by the landscape architect who was involved from the beginning of the local initiative to “breach” the dike and connect the village of Holwerd in Friesland to the Wadden Sea. In the late afternoon two nature conservationists each gave a short talk on the DNA of the Wadden Sea and the biology of the tidal forelands that resulted from the land reclamation along the Wadden dikes. The Thursday of the Summer school focused on *proposing*. In contrast to the busy schedule of Wednesday, Thursday was entirely

reserved for the students to work on their regional designs. Friday, the last day of the summer school, had its focus on *presenting*. After a busy and hectic morning, in which the student worked on finalising the presentation of their ideas, the exhibition of the summer school outcomes was ready at 13.30, right on time before the first guest started to arrive. Representatives of the provinces, municipalities and water management authorities, as well as other interested professionals and non-professionals, joined the final afternoon of the summer school to learn about the results (Figure 5).



Figure 5. Discussing the summer school outcomes with the Friday afternoon guests  
(Source: photo by authors).

### 3• The Summer School outcomes

While the students encountered multiple challenges, boundaries and perspectives during the week, they were able to blend their visions and experiences into eight inspiring and very different regional designs, jointly making up a portfolio of ideas for the long-term future of the Wadden coast. Each regional design addressed multiple issues and problems related to both climate change and other (regional) challenges, and, as such, blended different perspectives and ideas into an integral regional design for the future of a specific part of the Wadden coast. Short summaries of the designs are given in the following sub-sections, starting in the western part of the Dutch Wadden coastal landscape, moving eastwards towards the border with Germany.

#### **WAD-TVTAS<sup>11</sup>**

The students noted that the “Kop van Noord-Holland” currently offers no real reason for tourists to go or stay there. Inspired by the historic situation, the group proposed to (re)create a dynamic brackish wet zone between the North Sea and the IJssel lake, turning the towns of Wieringen (which is a former island), Anna Pauwlonia and Den Helder into islands (Figure 6). This opens up opportunities for the region to become a tourist destination, and aid in reducing the touristic pressure on the existing Wadden islands. Other benefits include the creation of a potentially biodiverse rich zone with a dynamic salt-sweet water gradient and increased regional water retention capacity. The group recognised that the idea of permanently flooding several polders will have an immense impact on the current landscape, predominantly used for agricultural purposes. However, considering that the Wieringermeer polder was reclaimed from the sea in 1930, a little under 100 years ago, creating new islands in 100 years from now could be(come) a feasible idea for the future.

<sup>11</sup> TVTAS is a mnemonic to remember the Dutch Wadden islands: Texel, Vlieland, Terschelling, Ameland, and Schiermonnikoog. This group proposed to add three new Wadden islands: Wieringen, Anna Pauwlonia and Den Helder, and to change the mnemonic into WAD-TVTAS.



Figure 6. Three new Wadden islands created by a dynamic brackish zone between the North Sea and the IJssel lake (Source: team WAD-TV TAS).

### Van Mossel naar Lisdodde

“Van Mossel naar Lisdodde” (From Mussel to Cattail) was the concept developed by the students working on the coast of Northwest Friesland. They embraced the slow but inescapable process of salinisation of the agricultural lands that lie inland of the current Wadden Sea dike. The vision aims to provide farmers with new business opportunities by introducing new crops, like mussel and cattail that thrive in salinised soil and water conditions. The plan will change and diversify the current agricultural landscape in different zones of wetness and saltiness in which the newly introduced crops can thrive (Figure 7). The design drew inspiration from, amongst other things, the experiments with salty crops that are set up as part of the Double Dike project, which was visited during the bus excursion on the first day of the summer school.

## Section 1: Teaching and Learning

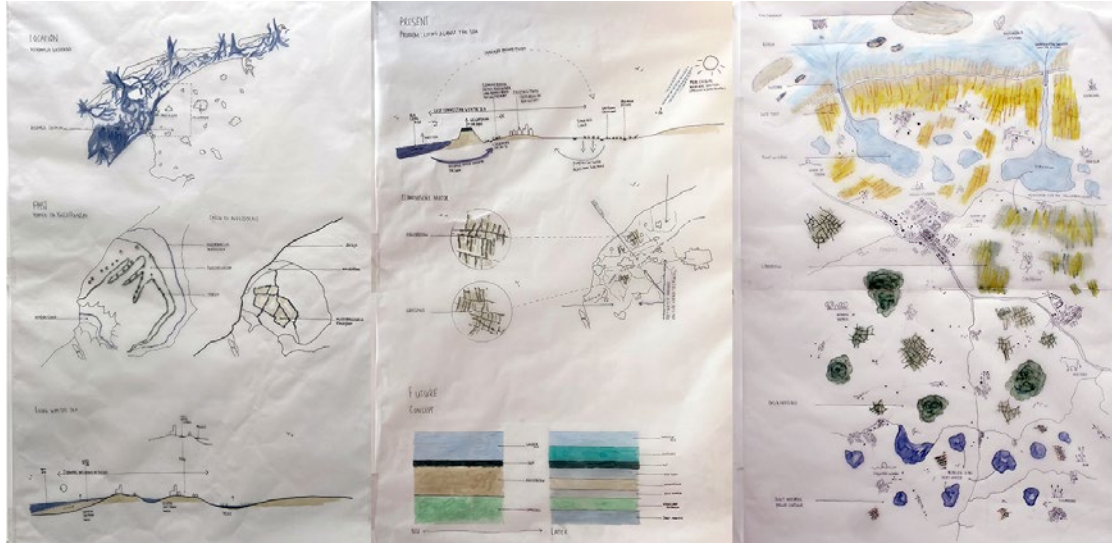


Figure 7. A new landscape with different zones of wetness and saltiness  
(Source: team Van Mossel naar Lisdodde).

### Liouwert oan See

The team working on “Het Bildt” envisioned connecting Leeuwarden, the provincial capital of Friesland, to the Wadden Sea via the former estuary of the Middelzee (Middle Sea) (Figure 8). It inspired their title Liouwert oan See (Leeuwarden by the Sea in Frisian). Such a connection would add a new and valuable route to the existing recreational water network in Friesland. The plan foresees significant alterations of the landscape with new waterways and flooding areas, while keeping the towns of St Annaparochie, St Jacobaparochie, and Vrouwenparochie protected. These towns are envisioned to become islands by 2200. The team imagined a development in multiple phases creating a plan that can be adjusted over time depending on the actual impacts of climate change.

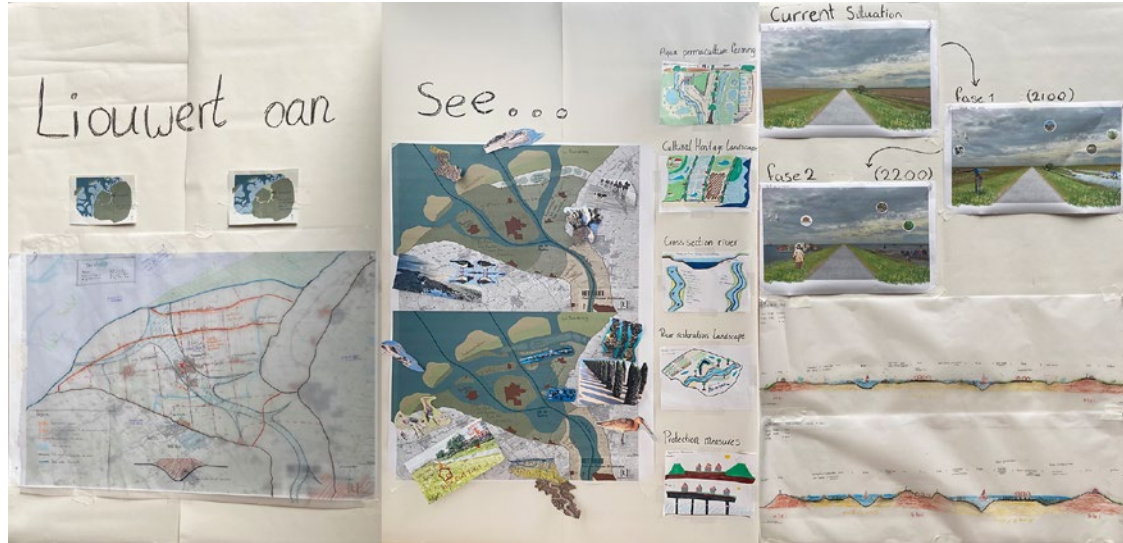


Figure 8. Connecting Leeuwarden to the Wadden Sea via the former estuary of the Middelzee  
(Source: team Liouwert oan See).

## Tiidlân

Team Tiidlân (meaning timeline in Frisian) looked at the northeastern part of the Frisian Wadden coast. As suggested by their title, the team considered a vast timeline by looking into the future and back in history over centuries. After an in-depth analysis of the history of the region they asked themselves: What will happen if sea levels rise by 7 metres? How can we then live in the northeastern part of the province of Friesland? The team proposed to invite the Wadden Sea in and broaden the intertidal landscape beyond the current sea dike (Figure 9). This would lead to a landscape with different gradients of wetness and saltiness. Villages and farms would be (staying) on the higher grounds and mounds. Furthermore, the team proposed mud-motors (piles of dredging material placed on strategic locations in the Wadden Sea tidal system) that will feed sedimentation material (mud) into the intertidal system to keep up building (new) higher grounds with new layers of sedimentation.

## Section 1: Teaching and Learning

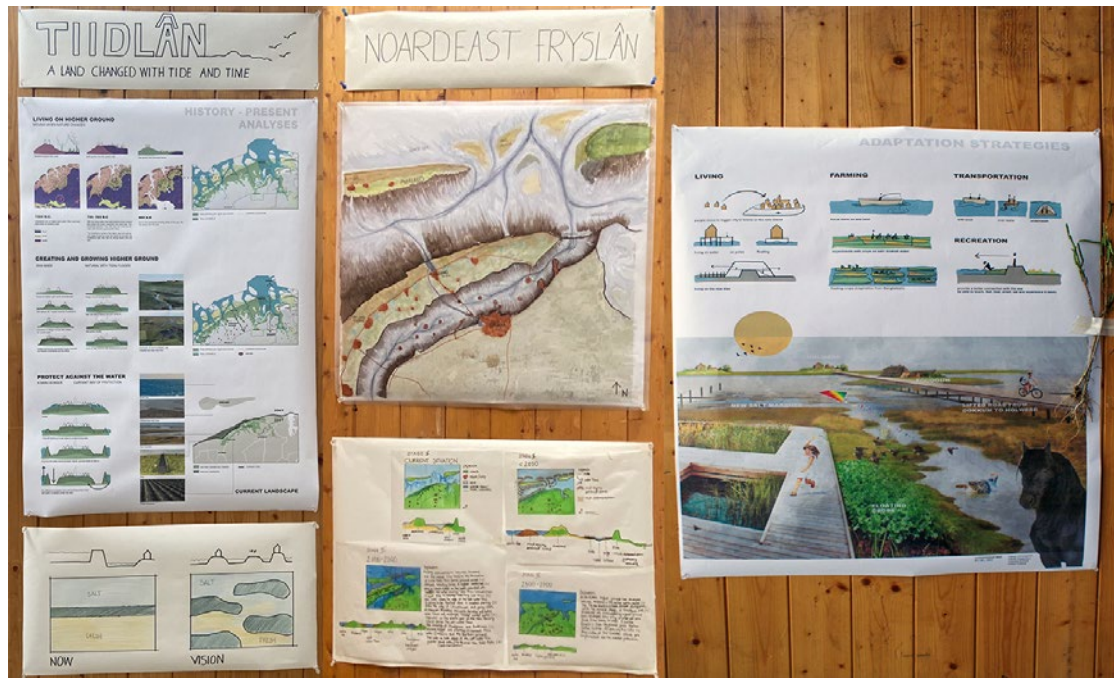


Figure 9. Invite the Wadden Sea in and broadening the intertidal landscape (Source: team Tiidlân).

### [CO]NNECTION

[CO]NNECTION presents a vision for the Lauwersmeer area in which nature, agriculture and water management are united in an integrated regenerative system. The plan embraces the local heritage by re-introducing a salt-sweet gradient and building on existing and historic dikes and waterworks. The envisioned future water management and flood protection system is supported by a triple-dike system. Extensive freshwater buffers are located in and along the three river systems that feed into the Lauwersmeer. The triple-dike construction provides an adaptive coastal protection scheme in which several degrees of saline agriculture can be introduced in the lower lying areas (Figure 10). All interventions are envisioned to facilitate a renewed coastal community and culture in the Lauwersmeer region.

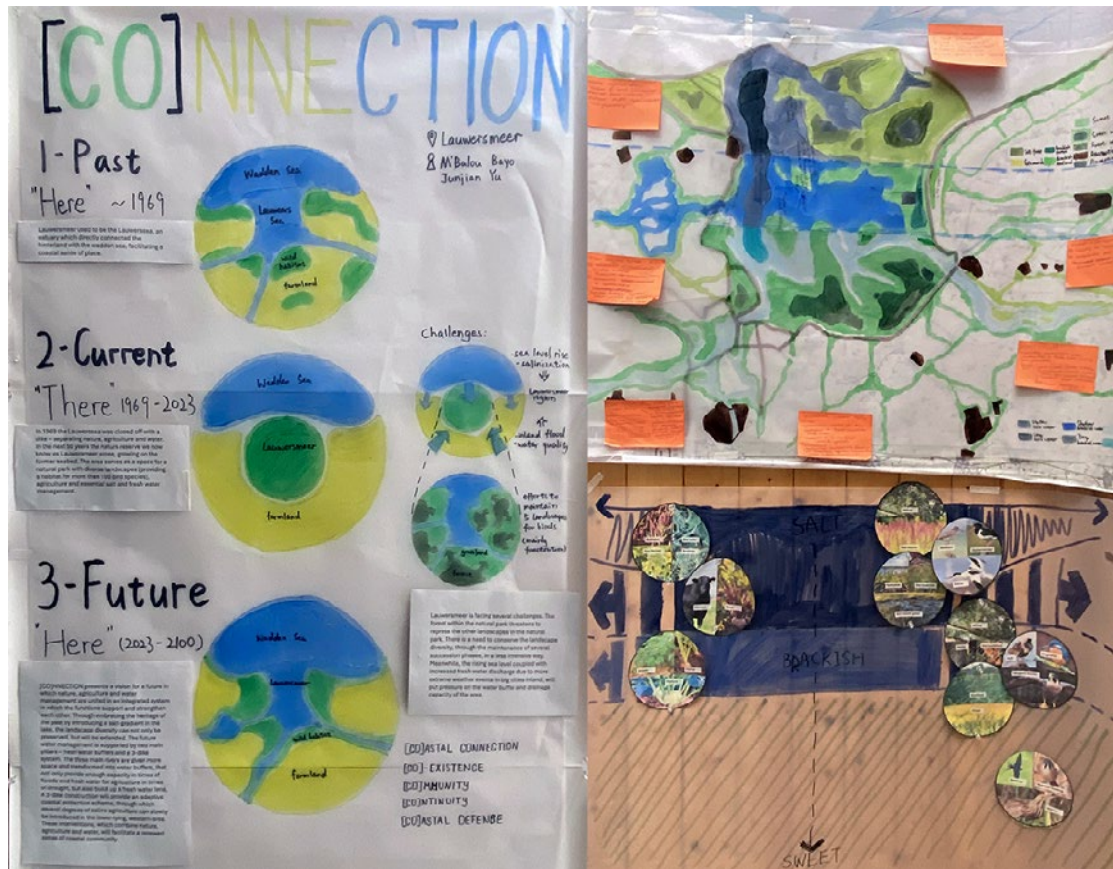


Figure 10. Future water and flood protection system supported by a triple-dike system (Source: team [co]NNECTION).

### We're going through a mud phase

“We are going through a mud phase” is the title of the proposal for the northern coast of the province of Groningen. Over centuries, the farmers in Groningen had the right to reclaim land in the salt marshes for arable farming. This has resulted in regularly moving the dike seawards and adding a new zone of arable land to the farms. The team proposes to continue the land reclamation process one more time and allow the land to “grow” until 2050. This will

## Section 1: Teaching and Learning

protect the existing land against rising sea levels for several decades. Meanwhile, all human settlement will retreat behind the last-former sea dike, with accompanying investments in sustainable agroforestry and agricultural systems (Figure 11). This retreat enables the development of a new, muddy nature reserve area between the current and last-former sea dike, which acts as an alternative for the existing mudflats and foraging areas for migrating birds, which are expected to “drown” due to sea level rise.



Figure 11. Growing the land one more time and retreating behind the last-former sea dike (Source: team We're going through a mud phase).

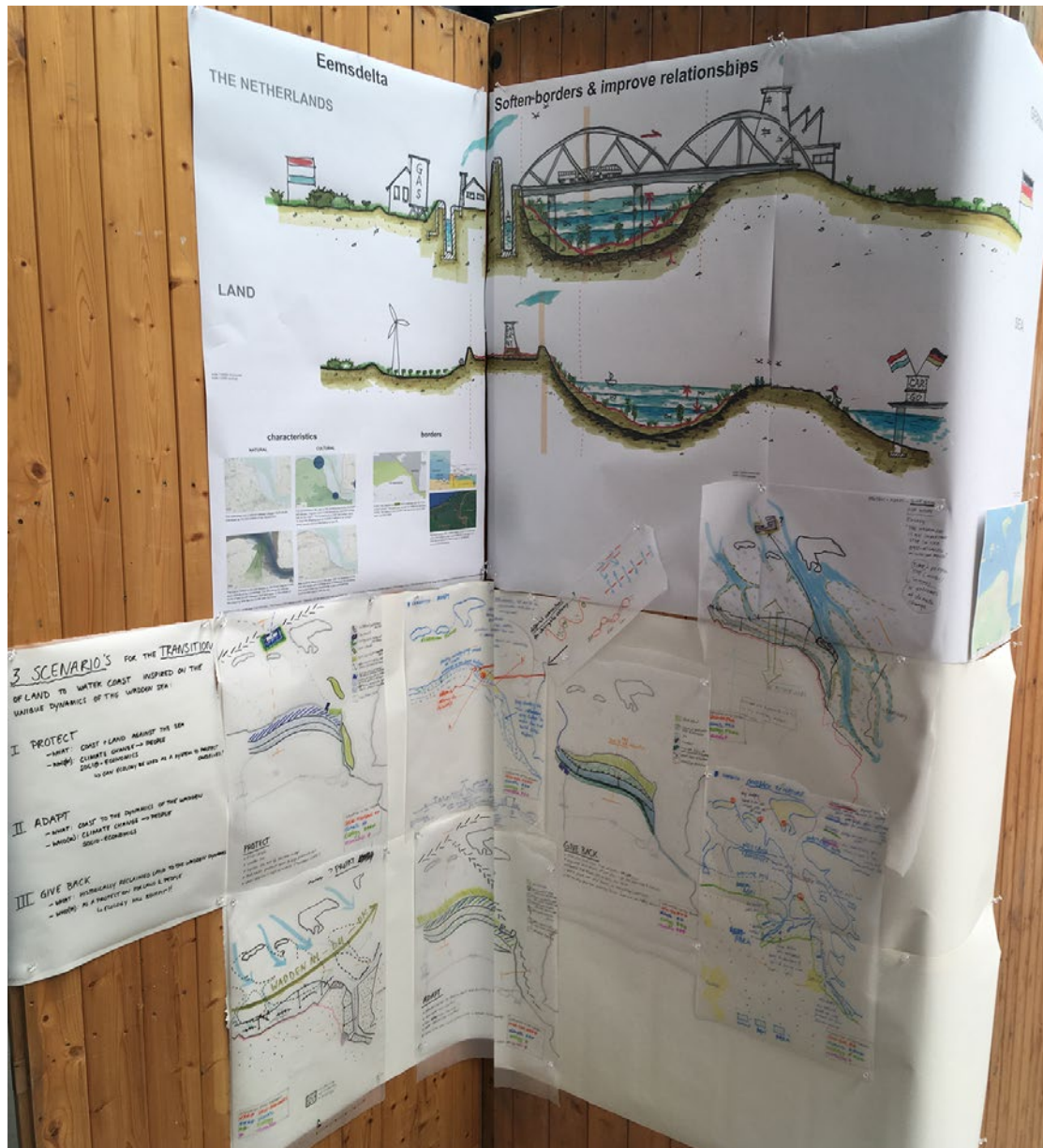


Figure 12. Cross-sections of the future zones between the Netherlands and Germany, and between land and sea (Source: team Softer Borders & Improve Relationships).

### Soften borders & improve relationships

The Eems-Dollard in northeastern Groningen is the last open estuary to the Wadden Sea in the Netherlands. Or to be more precise, it is an estuary shared with Germany, as the border between the two countries runs through it. With the Wadden Sea dike replaced various times throughout history, and the Wadden islands and sand banks continuously shifting due to sedimentation and erosion processes, the current border between land and sea drawn on maps seems rather artificial. The team explored both borders and their relationships. They concluded that it is time to focus not on a line, but on a zone to soften borders, and to improve relationships, and, as such, to capitalise on shared interests between the Netherlands and Germany, and to build new gradients between land and sea (Figure 12).

### Dollard Depoldered

The Dollard Depoldered team focused on the coast of Oldambt, deep in the Eems-Dollard estuary. The group noted that the in- and outflow of sedimentation was out of balance. Furthermore, they came to understand that the Oldambt polders were used to form a branch of estuary and have been reclaimed from the sea gradually in a sequence of reclamation projects since the sixteenth century. Their region also included the Blauwe Stad (Blue City), a controversial real estate development that originated in the 1990s/early 2000s consisting of new living areas around an artificial freshwater lake. The team elaborated a long-term strategy building on both the history of the region and the Blauwe Stad concept. The strategy can be used for centuries to adapt to the impacts of climate change depending on future needs. The team envisioned a slow retreat process, reversing the century old reclamation process over centuries again, while also balancing out the sedimentation process in this part of the Eems-Dollard. Meanwhile, the Blauwe Stad could be extended slowly eastwards, enlarging the regional freshwater buffer and retention capacity with new lakes, and if needed new housing development (Figure 13).



Figure 13. Reversing the century old reclamation process in steps (Source: team Dollard Depoldered).

The outcomes of the Summer School “Design the Future of the Wadden Coast” illustrated what can be imagined for the Wadden coast if landscape exploration is coupled with a far leap into the future (2100 and beyond). The regional design work envisioned the revitalisation of the gradient between saltwater and freshwater systems, celebrating the beneficial differentiation this would entail in ecological terms, supporting agricultural variety and opening up new touristic and recreational opportunities. In doing so, the students explored protect, retreat and adapt options in response to sea-level rise (Shukla et al., 2019) and developed strategies and options that blended these different response options with solutions for other regional and local challenges. The developed perspectives and regional designs proved to be valuable experiments and food for thought in subsequent triennial activities.

#### 4 • How the summer school outcomes fuelled subsequent [L]2023 Triennial activities

The summer school was part of the Panorama-line of the [L]2023 *Landscape Triennial*. This Panorama-line consisted of: 1) an exhibition with innovative and experimental projects along the Wadden Coast, 2) the 2023 Summer School “Design the Future of the Wadden Coast,” 3) the Toekomstatelier NL 2100 in which one of the National Advisors of the Dutch government on the physical living environment and a team of young landscape architects drafted elaborated design concepts for the Wadden coast in a week-long “artist in residence” stay on the Wadden coast, 4) the Montagekamer (Editing Room), a one-day event in which a small group of experts and lateral thinkers composed a long-term perspective on the future of Dutch Wadden Coast, and 5) the Wadden-symposium with approximately 300 participants.

The main message emerging from the student work that was brought forward in subsequent Panorama-line events was that in the long term the size, length, and materialisation of the hard barrier of dams and dikes that currently cuts the Wadden coast landscape in two extremely different worlds should be reconsidered. Future defence and adaptation strategies should look perpendicular to the current line of dikes and dams both inland and seaward. It should consider a broad zone and employ the potential of the landscape, not only to safeguard the land and livelihoods in the future, but also to create spaces for biodiversity and natural values to thrive. Another topic that gradually gained weight in the course of the Panorama-line, and that relates to the student-explorations, was the relevance of a regional design proposal that tries to look beyond imaginable time frames (more than two generations ahead of us). This resulted in distinguishing two sorts of design purposes: *defining* the essential, no-regret components of a resilient future-proof Wadden Sea coast and *exploring* the more hypothetical dimensions of how natural processes and human intervention would or could develop further (De Zwart, 2015). This distinction between

drawing a desirable landscape that should be constructed and an imaginable landscape that might develop cleared the way to debate which urgencies should be on the current agenda, and which prospects to engage with while leaving long-term choices undecided and open for future elaboration.

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## 5 • Towards a TriWadWalk Summer School?

Although we are, based on the responses from both students and professionals involved in the summer school and the rest of the Panorama line, confident the Summer School “Design the Future of the Wadden Coast” has been a valuable learning experience contributing to the professional and public debate on the future of the Dutch Wadden coast, there is room for improvement. Students had very limited – according to some, too little – time to familiarise themselves with the region enough to come to appropriate regional designs. Furthermore, in many ways the summer school had the characteristics of a traditional higher education activity with a group of students participating and only a few staff members organising and supervising. Moreover, with no involvement of inhabitants, entrepreneurs or other stakeholders in the design process, it was very much designing *for* and not designing *with* others (Heape & Liburd, 2018). Designing *with* others, however, is important for both the quality of (regional) design outcomes, as well as for the support, uptake, and implementation of designs (Kempenaar, 2017).

Including a TriWadWalk (Kempenaar et al., 2024) as part of the summer school or blending the summer school with a TriWadWalk could have counteracted these points of criticism and enhanced the summer school experience and impact. For example, a two-week summer school with first a TriWadWalk week, followed by a week of regional designing would provide a longer period of exploring and researching, and the inclusion of lived experiences.

## Section 1: Teaching and Learning

Travelling the landscape by various modes of transport, meeting experts, stakeholders, inhabitants and visitors, and going-along with others in various roles and activities would nurture a deeper understanding of a region and a strong basis for exploring strategies and making regional designs. This is because a balanced student staff group composition would accommodate changing roles and positions with students becoming teachers and teachers becoming students, making it a collaborative learning experience. Adding stakeholders to the group, as suggested by Kempenaar et al. (2024), would enhance collaborative learning even further, as it would enable engaging and grappling with a broader array of voices and perspectives.

Mixed teams of students, staff, professionals and inhabitants would create space for a dialogue to unfold around every regional design table (see De Jonge, 2009). Such a setting enables students to learn about and practice skills relating to “sensing and responding” and “balancing openness and direction” (Kempenaar and Van den Brink, 2018), which are important in facilitating collaborative design processes. Furthermore, such a mixed setting increases the relevance and potential impact of the developed insights and outcomes, since professionals and inhabitants can take them as direct input for real-life planning and decision-making processes. Finally, adding a design-week to a TriWadWalk could also enhance the TriWadWalks approach by giving it purpose and direction that opens up opportunities to employ the experience and gained understanding not only for educational or research purposes, but also for developing ideas and suggestions for real-life challenges. However, opportunities to set up such an extended TriWadWalk summer school on the Wadden coast, or other regions, have yet to be explored.

## Acknowledgements

The 2023 Summer school “Design the Future of the Wadden Coast” was organised by TU Delft, the University of Groningen, the Dutch Schools of Landscape Architecture, and the Landscape Triennial organisation. The Summer school could not have taken place without the support of TU Delft, the University of Groningen, The Dutch Schools of Landscape Architecture, NH Bos foundation, the Landscape Triennial foundation, and the 2023 Landscape Triennial organisation.

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## Chapter 5

# *Crossing borders: Student reflections on the TriWadWalk experience*

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### 1. Identification and perceptions of borders

The second part of the Trilateral Wadden Walks including teachers and students from several universities in Denmark, the Netherlands and Germany took place in the border region between Northern Germany and Southern Denmark. As student participants of the University of Oldenburg we travelled, mainly by bike, through the Rickelsbüller Koog and Margretenkoog, two protected areas within the border region, as well as from the island of Sylt to the island of Rømø. Both times, we were crossing the border from Germany to Denmark nearly without noticing as landscapes did not change strikingly. With the motto of the TriWadWalk being “Crossing borders, blending perspectives, tracing futures,” we began to consider the term “border” more from a philosophical perspective than just a geographical one. We started to reflect on what kind of metaphorical

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borders have come across during our journey and how we overcame them. This chapter aims at taking up all these situations, concluding which lessons and experiences have been the most memorable for us and how these might raise the potential for contributing to the sustainable development of the Wadden Sea region.

When reflecting on the term “border,” we indicated several aspects representing boundaries which we came across during our field trip and which we will evaluate within the scope of this chapter. The first actual border, as already mentioned above, is the political border between Denmark and Germany that we crossed on the mainland between Rickelsbüller Koog and Margretenkoog (Figure 1) as well as between the islands of Sylt and Rømø. Both times, when crossing this physical border, the landscapes remained remarkably consistent, which caused us to question the concept of a border beyond its geographical connotations. In fact, the border only exists because people believe in the construct of a national demarcation of their country and this concept only succeeds as long as there are enough people believing in its truth. Also, the fact that the exact course of the border has been changed multiple times in the past contributes to the idea of the border being more of a construct than a natural actuality. Without human influence, the region would still be dynamic due to the characteristics of the Wadden Sea but nobody would have noticed a difference when leaving the German and entering the Danish part of the region. In addition, minorities of Germans (in Denmark) and Danish (in Germany) are still committed to their history and cultural specialities, which results in the border region representing a fluid transition rather than a strict demarcation between two countries.



Figure 1: A stone at the German-Danish border marking the construction of a cross-border dike between 1979 and 1982 (Source: photo by Janne Liburd).

## Section 1: Teaching and Learning

Another aspect that we experienced as a potential boundary at first sight within our group of participants is language. In an international group of around 20 people, we had various native languages such as Dutch, Danish, English, German, Italian and Turkish. However, by using English as a common language we facilitated collaboration and exchange despite our different linguistic backgrounds. Even if it might have been an overcoming to switch to a language which is not our mother tongue, the aspect of language, which initially was a boundary, developed into a helpful tool for improving communication and teamwork.

Moreover, the group of our field trip included both teachers and students, all with different backgrounds and individual relationships with the Wadden Sea but sharing the same values regarding sustainability and sustainable development. Despite our distinct roles and partly different viewpoints, our regular discussion sessions in the evenings enabled the opportunity for mutual learning. With everyone contributing to the group with individual knowledge and experiences, our diverse backgrounds developed into bridges that connected different ways of perceiving and understanding the Wadden Sea region and its need for conservation. Also, the exchange of experiences and discussions between teachers and students got additionally nourished by the inputs of all the external people who took part and gave talks during the different activities of the TriWadWalk. Thereby, they contributed by widening the spectrum of expertise and knowledge. Keeping in mind all the different facets of the Wadden Sea that we got to experience during our daily excursions, the question of how every individual participant would define the term “conservation” in the context of the Wadden Sea and how the motto of the national park “let nature be nature” is understood was raised during one of our evening discussion sessions. The ensuing discussion broached the issue of topics such as hunting in the national park, the trespassing of restricted areas, the zonation of national parks and the general question to which extent it is legitimate to interfere with the ecosystem as a human being. Should nature be seen as something that includes or excludes humans? Are

humans part of the whole ecosystem concept? We concluded that everybody has a slightly different opinion on topics like these but that it is even more important to consider a mutual understanding of the intrinsic value of the Wadden Sea beyond all the different viewpoints.

When reflecting on our field trip, certain moments and situations stand out as key lessons, making us understand the importance of the willingness to listen to and learn from each other as well as to appreciate the diversity within and beyond our group. The listed situations helped us to realise that boundaries, figuratively, should be seen as an opportunity to reflect on our own viewpoints and to be open for perspectives of other people with different backgrounds and experiences that everybody can benefit from. In conclusion, these boundaries are not set in stone but should rather be seen as dynamic transitions: from one country to another, from the possibilities that different mother tongues can bring and between the personal and professional backgrounds and knowledge spectrums of teachers, students and all the external people who contributed to our excursion. In this context, even the Wadden Sea itself can be seen as a dynamic link between land and sea, representing the connector of two substantially different landscapes. During the TriWadWalk, we learned once more how important it is to sustain the Wadden Sea region, as it is home to both humans and nature. The variety of knowledge and experiences that every single person offers can, therefore, be essential to cross the defined boundaries, to blend perspectives and to trace futures regarding the sustainable development of the Wadden Sea region.

## 2. Learning outcomes and products of the TriWadWalk

Besides the analysis with borders and boundaries, further knowledge was created during the Trilateral Wadden Walk. Not only is it interesting to reflect on the trip across the three different countries skill- and knowledge-wise but also regarding the question how different kinds of learning were acquired and what experiences and outputs came with it.

When participating in the TriWadWalk, there were always possibilities to incorporate personal knowledge, of teachers and students alike. Some students were especially interested in ornithology and could engage other participants while watching birds on the mudflats (Figure 2). They could pass their knowledge on to other people and simultaneously expanding their own. The interest of other people in the ornithological knowledge in forms of curious questions and honest joy when discovering a new bird or identifying one correctly increased the aim to deepen the knowledge of avifaunistic species. Other participants had deeper knowledge of the tidal system of the Wadden Sea. The conditions of the falling and rising tide and its impact on the ecosystem with its inhabitants was visually explained by a student by drawing sketches in the sand. Not only does it increase personal knowledge, but it is also a learning experience, here in terms of presentation skills, when presenting a topic in front of a group. Another aspect were all the adventurous and practical learnings in combination with the field trip character of the TriWadWalk which led to a better long-term memorability. The students felt a huge difference between biking around the landscape and discussing a paradigm shift on the spot or discussing the same development in a closed lecture hall. It seemed it also had an effect not only on what can be remembered in general but also on what can consciously and sustainably be remembered and applied in the future by students. Additionally, the students could also benefit from the broad knowledge of all the participants with scientific background, as they all represented different disciplines and fields of research. Likewise, people from the teaching perspective could also learn from the students' knowledge since the latter came from different study programmes as well as from different professional

backgrounds. This shows once again the advantages of an interdisciplinary field of study. For us as students, passing down or acquiring knowledge in this rather unconventional way was a very interesting experience. It was a new way of learning in and out of several perspectives and is not comparable to the normal field trips we had participated in before.



Figure 2: Birdwatching at Rantum Basin, Sylt (Source: photo by Anne Orth).

Nevertheless, besides the obvious advantages, the notion of limitations in this way of learning should not be neglected. Firstly, the premise must be the interest in the topics covered along the walk, but also the will of active participation in talks and discussions. Without a personal interest in participation, the learning may be limited. Particularly from a student perspective, the interactive participation might pose a challenge. Confidence in speaking a foreign

## Section 1: Teaching and Learning

language can be an obstacle for joining an active session as well as the personal comfort zone of each individual in a group discussion. Especially the ratio of students to lecturers might come with more intimidation and cost of overcoming oneself in participating. This was certainly the case on this trip, as the proportion of lecturers and students was almost equal.

Different kinds of learning were created during the TriWadWalk, not just knowledge-wise but also in form of handling different perspectives or opinions. In the daily discussion sessions, these differentiating perspectives and opinions were noticeable and could evolve into heated debates. To touch on the interdisciplinary field again, this may be one reason for different understandings since everyone had preformed perspectives on certain topics due to their scientific or personal background, wishing to incorporate them in the evening discussions. Especially the discussion on human intervention in nature seemed to differentiate the group into its nationalities. Different approaches to working with nature as well as a dissatisfaction with experiences made in other countries could be observed. This might have created not just geographical borders but also discrepancies in ideational viewpoints. The goal of the TriWadWalk was to overcome exactly these boundaries of nationality and controversial opinions. Also, generational divisions were visible during several discussions, when opinions and attitudes seemed solidified, and positions seemed no longer up for debate. Nevertheless, we as the young generation felt that we were encouraged to question paradigms and keep a critical perspective during discussions. The need to change our mind as we learn new ways of thinking was one key message to be learned during the trip. One experience which comes to mind was a guided walk with Professor Karsten Reise to the mobile dunes near List on the island of Sylt. The general mindset from most of the group was that when conserving dunes, especially on an island with a lot of tourism, it is important to limit disturbances while simultaneously supporting the European beach grass (*Ammophila arenaria*), which plays a key role in holding the sand together. But since the dunes are mobile, human interference by planting more beach grass and thereby holding the dune at its present place does not necessarily contribute to their natural movement. The naturally moving dunes let the group

reconsider their perception of nature conservation in this case. Even though the discussions sometimes ended in groups debating with one another, everyone recognised the importance of the exchange of opinions. This experience taught the interaction with different opinions and views as well as the necessity of respecting other perspectives in a mutual discussion. Additionally, acquiring new input out of another viewpoint can be seen as an enrichment of one's own horizon.

Another form of learning was created already during and even more after the TriWadWalk. Along the way as well as afterwards, numerous products, some scientific and some not, were and are being created – such as this chapter. Each participant had his or her way of shaping their process. One participant drew tiny images of the experiences of the day while another was taking photos and therefore documenting the whole journey. Additionally, little videos were created afterwards. A more scientific product was created by some of the students, when they published an article on their perspective of the Trilateral Wadden Walk in the 2022 annual report of the Common Wadden Sea Secretariat (Menke et al., 2022). The students focused on overcoming boundaries and blending perspectives out of the standpoint of the youth. Generational and national boundaries were addressed as well as the demand of young voices being integrated in the process of desirable futures of the Wadden Sea as World Heritage Site. Also, a scientific poster summing up the learnings and experiences of both the first and second TriWadWalk was illustrated in the form of a poster afterwards by students from Oldenburg University. A scientific poster comprises scientific output and information about the experiences while also passing on knowledge and insights to a broader audience. This teaching approach offers a chance to break up the often as exclusive perceived group of scientists and gives room for interested people without scientific background. This goes along with the addressing of every stakeholder regardless of their professional background for the sustainable development which needs to be reached in the Wadden Sea region. Finally, each chapter in this book can be seen as a product from the TriWadWalk. They stand for different kinds of learning or issues that were recognised during the trip, which can be processed again

## Section 1: Teaching and Learning

with the input of other participants or experts in the field. These products are a combination of scientific and non-scientific output, which makes it more interesting for a broader audience and helps to address collaboration on various levels.

In conclusion, when reflecting on the TriWadWalk, we realised that the conservation and the sustainable development of the Wadden Sea region can only be achieved through collective effort and cross-border collaboration. Every day during the field trip, we went to different places by foot, bike, bus or boat and met different people ranging from volunteers to professionals from different countries. Every person we met had his or her own relationship with the Wadden Sea and could share insights and experiences we all would benefit from. With these people being not exclusively linked to academic research, the spectrum of expertise and knowledge widened even more. Also, when integrating the knowledge of citizens and people with non-scientific backgrounds in general, we need to build a common base consisting of open communication, awareness about the value of the different perspectives and exchange within knowledge-sharing working environments.

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## **Section 2:** **Scientific Explorations**





# Chapter 6

## *Crossing scales: Migratory birds and the relationship between the local and the global at the Wadden Sea*

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### 1. Introduction

During the German-Danish TriWadWalk excursion in September 2022, we visited Rantum Basin, a nature conservation area on the island of Sylt. The Rantum Basin (*Rantumbecken*) is an artificial lagoon area. In the late 1930s, almost 600 hectares of mudflats were enclosed by a 5 km long dike, to create a new intertidal area. This was to be used as an airport for seaplanes of the German military but proved unsuitable due to the prevailing wind conditions. Following the war, it was planned to convert the Rantum Basin to agricultural land with forty farms. In 1962, however, it was decided that the Rantum Basin would be protected as one of the largest and most diverse protected areas for seabirds in Europe. Thus, a former military landscape became an internationally recognised stopover site for migratory birds, all

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## Section 2: Scientific Explorations

within the space of a few decades (Wöbse, 2023). Since 1979, it has been the property of the state of Schleswig-Holstein. Significantly, the Rantum Basin offers areas of varying salinity, with a freshwater area separated by low-lying dikes from the rest of the basin. Artificial islands furthermore provide safe breeding grounds for terns and avocets. In the spring and autumn, thousands of birds in huge swarms can be observed at the lagoon (Verein Jordsand, n.d.).

On our tour of the area, we met with a representative of the *Verein Jordsand*, a nature conservation NGO responsible for the management of this protected area. Equipped with binoculars, our guide instructed us in how to spot and remember the names of the various species of gulls and other birds that have made their home on the lake. The lesser-black-backed gull (*Larus fuscus*) is distinguished from the more common European herring gull (*Larus argentatus*) by its bright yellow legs that, from a distance, with some imagination, resemble Wellington boots. We were told that the lesser-black-backed gull doesn't like to get its feet wet. Whereas European herring gulls are found all year round at the Wadden Sea coast, the less-black-backed gull is migratory, breeding at the Wadden Sea and the Atlantic coasts of Europe and wintering as far south as West Africa. More unusually, we also witnessed a solitary black swan that has become a regular visitor to the lake in recent years. The black swan is native to Australia, but was introduced to Europe in the late 18th century as a popular waterfowl species. Breeding populations have become established in a number of western European countries including Germany (Beemster & Klop, 2013). The term “black swan” also has a second meaning, of particular relevance in today's changing climate: due to their comparable rarity, “black swan” is used to refer to high-magnitude events such as natural disasters, which can occur but are statistically highly improbable (see Taleb, 2007).

The encounter with migratory birds at the Rantum Basin described above, raises a number of questions concerning the nature of nature at the Wadden Sea and the boundaries between the natural and the artificial. Perhaps most obvious is the question of whether the Rantum Basin itself, an artificial lagoon, belongs to the realm of nature or society. Similar to Beltringharder

Koog and Rickelsbüller Koog – protected areas of marshland behind the dikes on the mainland – the Rantum Basin functions as an important habitat and/or stopover site for more than 30 species of water- and seabird, yet lies outside the boundaries of the Schleswig-Holstein Wadden Sea National Park. One could also ask whether the lesser-black-backed gull is more or less relevant to Wadden Sea nature conservation than the herring gull because it is migratory and is only found there during the summer months, not to mention the black swan, an introduced species in an artificial landscape. The examples above also illustrate how we perceive and try to make sense of wild birds through a cultural lens. Telling stories about birds and other animals, whether apocryphal or factual, helps us better understand them and their worlds (Brennan, 2018).

Approximately ten to twelve million birds pass through the Wadden Sea every year. As it happens, a similar number of (human) tourists visit the Wadden Sea region each year. The Wadden Sea, as well as being a popular destination for summer tourists seeking rest, relaxation and perhaps adventure, is an essential stopover site on the East Atlantic and African-Eurasian flyways. An abundance of food and low levels of disturbance are critical factors ensuring the essential role of the Wadden Sea mudflats and saltmarshes in supporting the survival of migratory birds. For this reason, the Wadden Sea is of global ecological importance, as reflected in its inscription as a UNESCO World Heritage Site (Reise, 2021; Südbeck & Bairlein, 2018). The ecology and “outstanding universal value” of the Wadden Sea is thus dependent on its connections with distant places, extending from Siberia in the North to Antarctica in the South. Indeed, the Wadden Sea states have, as a condition of the inscription as a UNESCO World Heritage site, initiated an international partnership for the protection of migratory birds along the full extent of the East Atlantic Flyway (Südbeck, 2018; Figure 1).



Figure 1: The Wadden Sea as a stopover site along the East Atlantic Flyway  
(Source: Common Wadden Sea Secretariat).

The red knot (*Calidris canutus*), a member of the sandpiper family of shorebirds, winters at the coast of West Africa and flies 5,000 km non-stop before arriving at the Wadden Sea in early summer. Three to four weeks later, they depart the Wadden Sea for their Siberian or Canadian tundra breeding grounds. Later in the summer, the red knot returns to the Wadden Sea, again for a short period of rest and refuelling before the return flight to West Africa. The red knot spends only a limited period of time each year at the Wadden Sea, yet is critically dependent on this ecosystem as an essential stopover site on its migratory journey (Leyrer, 2018). Both red knots and bar-tailed godwits (*Limosa lapponica*) cover distances of approximately 30,000 km per year, amassing a total distance equivalent to the that between the Earth and the moon in the course of their lifetimes. The Wadden Sea is of critical importance due to the abundance of food available at low tide (worms, small crabs, mussels) and its location approximately midway between tundra breeding grounds and the West African coast.

In this chapter, I discuss the spatial positioning of Wadden Sea nature conservation between the local and the global, drawing on the history of protected area management, both internationally and at the Wadden Sea more specifically. Following this, I discuss how the global story of migratory birds is told and becomes meaningful through local place-based practices prior to drawing wider conclusions.

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## 2 • Negotiating the local and the global in nature conservation

Although the protection of highly mobile species evidently requires international, transboundary cooperation, nature conservation remains, by and large, a territorial practice. Protected areas, as socio-spatial entities, must be understood as the products of processes of

social, cultural and political construction. They are shaped through and contribute to the shaping of collective imaginaries of place, territory and landscape at multiple scales, from the local to the national, to the global. National parks must be understood as situated, context-specific phenomena with a global history, shaped by both transnational conservation discourses and local material practices (Gissibl et al., 2012; Kupper, 2012). Through contemporary and historical nature conservation practices, nature has been placed in spatial bounds and natural landscapes are carved out from their surrounding cultural hinterlands (Hughes, 2005; Kupper, 2012). Protected areas thus become heterotopic spaces, deliberately set apart from, and constructed as “other” to the realm of modern society while paradoxically embedded in processes of state territorialisation and modernisation (Foucault, 1986; Kupper, 2012, p. 14-15). Protected area management appeals to narratives of natural and cultural heritage, creating boundary lines between nature that belongs and disturbances from “outside.” Protected area management is, furthermore, typically framed in territorial terms, with national parks appealing to a sense of collective identity at the scale of the nation-state (Gissibl et al., 2012). Historically, imaginaries of “national nature,” concerned with iconic and emblematic landscapes, have played a significant role in the designation and management of protected areas (Ritson et al., 2024). National parks, it is argued, can only be fully understood in relation to discourses and imaginaries of the state and the nation (Mels, 2002; Olwig, 2012). The historical development of national parks is interwoven with processes of state territorialisation, a contradictory process of *civilising* nature, bringing nature within the realm of modern civilisation and the nation-state while celebrating its wildness (Gissibl et al., 2012).

National parks, in the contemporary context, continue to reflect these tensions. In the words of Ritson et al. (2024, p. 184), “national parks are layered and often contradictory entities” with ecological, political and cultural functions. In their public-facing role, national parks attract visitors to protected landscapes, while in their ecological function, they are concerned with protecting ecosystems, species and landscapes from human influence. It is not uncommon for recently established national parks to proclaim the protection of “untouched

nature” and “pristine wilderness,” erasing the cultural history of the landscape to be protected. Ritson et al. (2024) argue that the association of national parks with national(ist) imaginaries is outdated and discredited but suggest that the appeal to a collective national identity is potentially helpful in fostering public engagement with protected areas and their vulnerable ecologies. At an analytical level, we can ask how national parks are implicated in processes of place-making both materially and imaginatively; how they “stake out an imaginative territory” (Ritson et al., 2024, p. 194; see also Williams, 2018). In practice, the appeal to collective imaginaries of place may be multi-scalar, with place meanings constructed and negotiated at multiple distinct scales, from the local to the regional, to the national, international and global. Appeals to higher spatial scales, and in particular, the global, are associated with an affirmation of intrinsic, universal value to humanity as a whole. A shift to higher spatial scales, while strategically beneficial and justifiable from a scientific conservation perspective, may create a sense of disconnect between conservation regimes and the place-based relational values through which natural areas become meaningful to people, whether local communities or visitors.

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### 3 • Protected area management at the Wadden Sea: Local, national, international?

Conservation practices at the Wadden Sea are inherently embedded in particular places and narratives of place. They involve the construction of boundaries between protected nature and the surrounding “cultural landscape” and build, to varying degrees, on the place-based emotional attachment of both local communities and visitors to the Wadden Sea (Egberts, 2019; Walsh, 2018). The institutionalisation of nature conservation at the Wadden Sea, through the establishment of national parks and protracted debates on the World Heritage designation, is, however, a story of tension between local and global imaginaries (see Krauss &

## Section 2: Scientific Explorations

Döring, 2003; Krauss, 2005; Walsh, 2020). For many residents of the Wadden Sea coast and islands in Schleswig-Holstein, the efforts of conservationists were an unwelcome intervention from outside. From their perspective, the Wadden Sea was a cultural landscape, far removed from any idea of wilderness or pristine nature. Indeed, the framing of the Wadden Sea as essentialised nature inadvertently fostered the construction of an essentialist Frisian cultural identity, leading to a further polarisation of debates along the established fault-lines of nature versus culture (Krauss, 2005). The attempts to nominate the Wadden Sea as UNESCO World Heritage were interpreted as a form of globalisation, establishing the global rather than the local as the appropriate frame of reference for understanding and making sense of “their” coastal landscape, and neglecting the rich cultural heritage of the region (Krauss & Döring, 2003). At the same time, the Wadden Sea is an international success story in transboundary cooperation, an example to follow for conservation efforts elsewhere.

Historically, the Wadden Sea has been viewed as a wasteland, with the mainland dikes demarcating a line of separation between the tamed and ordered reclaimed marshlands behind the dikes and the wilderness of the mudflats, saltmarshes and tidal channels in front of the dikes. The “discovery” of the tidal mudflats as a place of ecological value, more than one hundred years ago, coincided with the recognition of the Wadden Sea as a coherent ecosystem, extending from the Netherlands along the German North Sea coast to southern Denmark (Wöbse, 2017). In the late 19th century, a growing community of trophy hunters, ornithologists and amateur bird lovers became aware of the importance of the Wadden Sea as a resting and breeding ground for migrating birds (Seitz, 2018, Wöbse 2023). Birds were, for centuries, understood and managed as a resource by island communities, providing meat, eggs and feathers. Gradually, as their use value declined, they came to be valued for aesthetic and ecological reasons, particularly by visitors to the Wadden Sea (see also Husum Marboe, 2010; Rheinheimer, 2007). The first protected areas for birds, date from before World War I, as scientific organisations and conservation societies, such as *Verein Jordsand* established in 1907,

began to purchase sites for bird preservation. The same year, the Eastern Frisian island of Memmert was declared a protected bird colony by the Prussian government in Berlin.

It was, however, not until the 1960s and the 1970s and the rise of ecological thinking and activism that the perception of the Wadden Sea in wider society began to change substantially. Protests against dike-building and land reclamation projects across the length of the Wadden Sea coast (e.g., Ameland (Netherlands) in the 1960s, Nordstrander Bucht (Northern Friesland, Germany) in the 1980s, Tønder marshes (Denmark), 1980s/1990s) further led to a re-evaluation of the nature in the front of the dikes and a growing awareness of the urgent need for conservation measures (see Krauss, 2008; Walsh, 2021b). Already in the 1970s, scientists from the Netherlands, Germany and Denmark came together to produce a large-format book on Wadden Sea, aimed at a wider lay audience. This book (Abrahamse et al., 1976) significantly was published in each of the three national languages and made concrete recommendations for the protection of the Wadden Sea as an international transboundary nature reserve.

In parallel to these efforts, the International Union for the Conservation of Nature (IUCN), commissioned by the Dutch Wadden Sea Society, prepared a draft international convention for the protection of the Wadden Sea, which were presented to the three national governments in 1974. The IUCN proposals, although they met with political opposition, particularly from the German government, provided the foundation for the trilateral intergovernmental cooperation initiated in 1978. A joint intergovernmental declaration on the protection of the Wadden Sea followed in 1982. The creation of a common Wadden Sea Secretariat, agreement on the boundaries of the conservation area, and the preparation of a common trilateral Wadden Sea conservation plan and monitoring programme were important milestones in the development and consolidation of a trilateral, transboundary institutional framework for the coordination of conservation efforts at national and regional levels. In the same period, the East Atlantic Flyway emerged as an important transboundary conservation

## Section 2: Scientific Explorations

space, successfully crossing the boundary from science to policy (Eren et al., 2024). The emergence of the Wadden Sea as a transnational conservation space, profoundly transformed the public perception of this coastal landscape over a relatively short period of time (Wöbse, 2017, 2022). This transformation, however, was deeply contested and accompanied by a long series of protest actions, particularly in northern Friesland and southern Denmark (Krauss, 2005, 2008). Discussions on the feasibility of nominating the Wadden Sea as a UNESCO World Heritage Site (WHS) began as early as the late 1980s (Enemark, 2021). Although quite some time passed before the designation of the Dutch and German Wadden Sea as a WHS in 2009 and the addition of Denmark (and Hamburg) in 2014, securing the position of the Wadden Sea on the world stage was a long-held aim of the trilateral cooperation (Enemark, 2021).

Wadden Sea nature conservation has thus been international and transboundary before it was national, and migratory birds played a very significant role in the construction and framing of the Wadden Sea as a coherent ecosystem and landscape of international importance. In this way, nature conservation at the Wadden Sea has, to a large extent, escaped the nationalist ideological associations which have coloured the history of nature conservation on the land. It is nonetheless the case that the conservation and management of the Wadden Sea has evolved very differently in each of the three countries, characterised by marked differences in institutional arrangements, governance cultures and underlying understandings of nature, landscape and nature-society relations (see also Walsh, 2020, 2021a, 2021b). Indeed, the history of the trilateral Wadden Sea cooperation, while a success story in transboundary conservation also provides valuable insights into the ways in which national governments and their bureaucracies can present substantial obstacles to transnational cooperative endeavours (Enemark, 2021).

In the following, I discuss these distinct national and regional trajectories, focusing on the historical development of national parks at the Wadden Sea in Germany, Denmark and the Netherlands. The first Wadden Sea national parks were established in 1985 and 1986 in Lower

Saxony and Schleswig-Holstein, respectively. Both national parks cover large areas, extending along the full length of the coastline of their respective federal states. Their designation followed years of public debate but minimal, if any, consultation on the actual plans for the national parks themselves. Indeed, opposition was substantial, and the coastal and island municipalities in Schleswig-Holstein each voted against the establishment of a national park. The Hamburg Wadden Sea National Park was established in 1990 to provide protection for an enclave of the city-state of Hamburg, located at the mouth of the Elbe River, including the islands of Neuwerk, Scharhörn and Nigehörn.

Two Dutch national parks have been established: Schiermonnikoog in 1989, followed by the Dunes of Texel National Park in 2002. Both national parks comprise very small areas of land on the islands of Schiermonnikoog and Texel, respectively. The conservation of the wider Dutch Wadden Sea area is managed through planning policies and regulations. It was not until 2010 that the Danish Wadden Sea was designated a national park. In this case, however, park designation followed extensive open-ended public consultation process, with the decision on whether to designate the area as a national park made conditional on the support of the local population and their elected representatives (Jensen & Hansen, 2008; Walsh, 2021b). This marked a significant departure from the “top-down” expert-led approach of the 1980s. In addition, UNESCO biosphere reserves have been established in Schleswig-Holstein (1990) and Lower Saxony (1992). Table 1 provides an overview of national and international conservation regimes at the Wadden Sea. The UNESCO Biosphere Reserves are managed by local and regional actors in accordance with criteria established at the international level of UNESCO. The Wadden Sea national parks are administered and managed to varying degrees by local and/or regional governance actors. They are simultaneously embedded within national policy discourses and categorised in accordance with the globally applicable criteria of the IUCN.

## Section 2: Scientific Explorations

Table 1: National and international conservation regimes at the Wadden Sea  
(Source: author's elaboration, multiple sources).

Protected Area	Protected Area Type	Established	Area (Current extent, km <sup>2</sup> )	Country
<b>National</b>				
Danish Wadden Sea Nature Reserve	Game and Wildlife Reserve (national regulations)	1979	1,243	DK
Planning Key Decision Wadden Sea	National planning regulations	1980		NL
Schleswig-Holstein Wadden Sea National Park	National Park (IUCN II)	1985	4,415	DE
Lower Saxony Wadden Sea National Park	National Park (IUCN II)	1986	3,450	DE
Schiermonnikoog National Park	National Park (IUCN II)	1989	72	NL
Hamburg Wadden Sea National Park	National Park (IUCN II)	1990	137.5	DE
UNESCO Biosphere Reserve Schleswig-Holstein Wadden Sea and Halligs	UNESCO Biosphere Reserve	1990	4,431	DE
UNESCO Biosphere Reserve Lower Saxony Wadden Sea	UNESCO Biosphere Reserve	1992	4,171	DE
Dunes of Texel National Park	National Park (IUCN II)	2002	43	NL
Danish Wadden Sea National Park	National Park (IUCN V)	2010	1,466	DK
<b>International</b>				
Trilateral Intergovernmental Declaration on the Protection of the Wadden Sea	Political Declaration	1982	14,950	DE / DK / NL
Wetland of International Importance	Ramsar Site	1984	2,710	DE / DK / NL
Wadden Sea World Heritage	UNESCO World Heritage site	2009 / 2014	11,434	DE / DK / NL

As noted above, national parks thus represent the concrete manifestations of both national and global discourses. The Wadden Sea national parks reflect evolving ideas on the purpose and function of protected areas and, to varying extents, the framing of the Wadden Sea as a transboundary ecosystem of transnational relevance. They are, however, also products of

national discourses, legal frameworks and governance traditions that have served to shape the rhetorical framing and practical working of national parks in each national context. It is due to the federal nature of the German state that three German Wadden Sea national parks have been established, albeit within a common framework provided by the German Nature Conservation Act. The German Wadden Sea national parks are thus national in name only and do not seek to appeal to a national sense of identity in any way. Indeed, the objectives of German national parks are formulated in terms of the protection of pristine nature for its intrinsic value and unique character. The nature of the Wadden Sea has thus been discursively and geographically separated from the surrounding coastal regions of Schleswig-Holstein and Lower Saxony, with protected area management actively contributing to the reinforcement of the dike line as a symbolic boundary between spaces for nature and spaces for society and culture (Walsh, 2018, 2020). In Lower Saxony, the process of establishing and delimiting the boundaries of the development zone for the UNESCO Biosphere Reserve has demonstrated the challenges associated with fostering identification among coastal municipalities and communities with the Wadden Sea (Walsh, 2021b).

The Schiermonnikoog national park was established as the first of a second generation of Dutch national parks. These national parks were explicitly intended to represent all Dutch landscapes and the Dutch history of human interaction with the landscape. Their discursive framing thus combined elements of natural and cultural heritage conservation within an explicitly Dutch national context. The collective role of national parks in showcasing the nature and landscapes of the Netherlands is encapsulated by the following opening statement on the national park website: “Schiermonnikoog is a national park since 1989. The island thus belongs to the select company of the twenty Dutch national parks, which taken together offer a good impression of the diverse national landscapes our land has to offer” (vzv Schiermonnikoog, 2024, translated by the author). The Dunes of Texel national park is similarly understood to have a representative, public-facing character, as a relatively extensive natural landscape offering “many opportunities” for enjoyment (Nationaal Park Duinen van Texel, n.d.).

## Section 2: Scientific Explorations

The positioning of the Wadden Sea as both local and international is most evident in the case of the Danish Wadden Sea National Park (DWSNP). The first national park plan (Nationalpark Vadehavet, 2012) frames the Wadden Sea as “Denmark’s international national park” and forefronts the positioning of the national park within its trilateral context of cooperation across the Wadden Sea and the wider global dimension with an image locating the Wadden Sea on the East Atlantic Flyway, appearing in the first chapter, prior to a map of the boundaries and immediate geographical context of national park itself, and a satellite image of the trilateral Wadden Sea area (Nationalpark Vadehavet, 2012, p. 8-10). At the same time, the DWSNP is firmly embedded within democratic structures at the local level, promoting a sense of ownership and commitment to the Wadden Sea on the part of the neighbouring coastal and island municipalities, as well as facilitating deliberative, pluralist governance (see Walsh, 2021a). The establishment of the national park has led to enhanced cooperation among the four Danish Wadden Sea municipalities (Esbjerg, Fanø, Tønder and Varde), with the national park providing a common focus for activities (Walsh, 2021a). This inclusive, participatory ethos is emphasised in the following quote from the current national park management plan. The national park plan “is not only the plan of the board, council and secretariat, it is the plan for the whole national park” (Nationalpark Vadehavet, p. 11; Walsh, 2021b).

In summary, it is possible to identify multiple processes of scalar positioning, operating in parallel, which have served to frame, legitimise and delimit Wadden Sea conservation in distinct ways (Table 2). At the Wadden Sea, we find a complex mosaic of protected areas of various sizes, some of which overlap significantly and interact with each other in different ways. They are each the product of their own specific histories and institutional trajectories, embedded within local, regional, national and international discourses and practices. The prominence of the trilateral scale of the Wadden Sea intergovernmental cooperation notwithstanding, the socio-spatial construction of Wadden Sea nature conservation is multi-scalar with reference to a broad range of geographical scales from the local to the global (see also Liburd et al., 2021). Protected area management instruments are, in governance terms,

located at specific spatial scales but also make explicit and deliberate reference to the other scales. Scalar positioning in nature conservation is not incidental, but reflects varying emphases on democratic legitimacy, practices of collective identity construction, transboundary cooperation and coherence, as well as appeals to universality and global significance.

Table 2: Geographical Scales and Associative Meanings at the Wadden Sea  
(Source: author's own elaboration).

Geographical Scale	Associative Meaning	Examples
Local	Democratic participation and legitimacy, landscape awareness and appreciation, sense of place	Danish Wadden Sea National Park
Regional	Regionally-specific cultural heritage and sense of identity (e.g., Frisian), subnational decision-making structures	Biosphere reserves in Lower Saxony and Schleswig-Holstein
National	Wadden Sea as representative of 'national nature'	Dutch national parks and national Wadden Sea policy, Wadden Sea as counterpart to urbanised Randstad
Trilateral	Emphasis on transboundary cooperation, ecosystem integrity and coherence	Trilateral intergovernmental cooperation, Common Wadden Sea Secretariat and Wadden Sea World Heritage Partnership
Global	Reference to universal values and international, transboundary connections	World Heritage designation, Wadden Sea Flyway Initiative

These scales are not inherently hierarchical, but conservation designations at higher scales may be perceived to carry greater weight and authority. Competing scalar imaginaries of the Wadden Sea have, in the past, led to tensions and conflict, in particular, where concerns for global ecological interconnections are perceived to clash with local, place-based imaginaries of the Wadden Sea coast and seascape as manmade and cultural. It is possible, however, also for the diverse imaginaries of the Wadden Sea at multiple scales to complement and enrich each other. Bird migration is both symbolic and symptomatic of global ecological significance and thus features centrally in the narration of Wadden Sea nature. At the same time, however, the story of Wadden Sea conservation reaches a wider public and becomes meaningful primarily through local events and place-based experiences.

### 4 • Bird migration: Telling a global story through place-based practices

Bird migration is central to the narratives of Wadden Sea nature presented at exhibitions and information centres across the region. Yet the stories told and the ways in which visitors engage with the phenomenon of bird migration vary from place to place, reflecting their embedding in particular situated contexts. In a publication produced by the Lower Saxony Wadden Sea National Park, the rationale for a focus on migratory birds is explained by their role in symbolising the global meaning of the Wadden Sea ecosystem: “The migratory birds bring into focus the global meaning of the Wadden Sea, show the international connections and interdependencies, and tell stories of faraway places and other cultures” (Lottmann et al., 2018). Every year in October, migratory birds at the Wadden Sea become the focus of attention of a week-long series of activities taking place across the coastal region of Lower Saxony, attracting thousands of bird enthusiasts and interested participants both from within the region and further afield. It is significant that events take place at multiple locations along the coast and on the islands, at the time of peak Autumn migration, encouraging birdwatchers and interested visitors to seek out and experience birds “in the field” rather than solely through national park exhibitions or other sources. Teams of birdwatchers based at different locations across the region compete with each other to spot the largest number of different species over the course of the week. Each year, international representatives from a selected country along the East Atlantic Flyway are invited to attend the Migratory Bird Days, introducing an element of intercultural exchange, and demonstrating the potential of ecological connectivities to act as a foundation for intercultural connection and exchange of knowledge and experience across a wider space beyond the boundaries of the Wadden Sea itself.

Interactive exhibitions at the Danish Wadden Sea Centre (located close to the town of Ribe), invite visitors to make comparisons between the journeys undertaken by migratory birds and

their own mobility as travellers to the Wadden Sea. This is illustrated in the following quotes from an interview with the then-director of the interpretative centre:

//For many people, it's nearly [crazy] to fly so many kilometres only to get one chick... But the story is somehow very beautiful. Because in every person, we like to travel. And this bird has travelled so many kilometres, crossing so many countries, so many cultures, so many dangers. And to understand that, and... they have succeeded. They are still there. (Walsh 2021a, p. 263)

Deliberate efforts are made to bridge the worlds of experience of people and birds rather than accentuating a nature-society divide: “to bring birds near the people” (Walsh, 2021a, p. 263) This approach is closely aligned with the emphasis of the DWSNP on grounding the national park within its local context, while simultaneously forefronting the global story of the Wadden Sea. Guided tours in Spring and Autumn take visitors to experience a phenomenon known as the black sun, where large flocks of common starlings gather above the marshes of Ribe and Tønder, almost obliterating the setting sun (Figure 2). This phenomenon, technically known as a murmuration, is not by any means (Goodeneough et al., 2017) exclusive to the Danish Wadden Sea, but is particularly associated with this landscape, in part due to the large size of the flocks found here. Common starlings typically migrate seasonally between northern and western Europe and southwestern Europe and northern Africa. As a farmland breeding species (Heldbjerg et al., 2019), they are not specifically associated with the Wadden Sea, but feature prominently in the popular imaginary of this area. The case of the black sun illustrates how a natural phenomenon is given meaning in relation to a specific local place-based context.



Figure 2: The 'black sun' at the Danish Wadden Sea coast (Source: © Torben Andersen).

On the Hallig islands of northern Friesland (Schleswig-Holstein), the national park administration, working together with the local municipalities and Biosphere Reserve, has organised an annual festival (*Ringelganstage*) since 1998, centred on the conservation of brent geese (Lottmann et al., 2018). The brent geese arrive from Siberia in April and May and are found in large numbers on the Halligs in particular, where they feast on the fresh grass, to the extent that local farmers must import alternative feed for their cattle. The geese have thus not always been welcome on the Halligs and compensation was required to pay for the additional costs incurred by the farmers. The brent goose festival reflects and fosters a shift in perception of the geese. Each year, one individual is awarded a golden brent goose feather for their contribution to the conservation of the geese and their habitats (Krauss, 2008). Significantly,

this honour has been bestowed on a wide range of individuals, including both researchers, conservationists and members of the local community who have acted as “bridge-builders” (Biosphäre Die Halligen, n.d.). The festival combines appreciation of the work of nature conservation with respect and celebration of traditional Hallig cultural heritage and thus helps to dismantle barriers between the natural and the cultural in this specific situated context. The above examples illustrate how the global story of migratory birds at the Wadden Sea is, through specific events, embedded in particular places, reflecting local place-meanings and cultural practices.

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## 5 • Conclusions

At first glance, highly mobile species such as migratory birds constitute a provocation to dominant modes of nature conservation, focused on protecting nature within sharply delimited bounded spaces. Migratory birds do not respect the boundaries of protected areas, nor indeed national boundaries, and thus present a challenge for conservationists. This chapter has examined how the transboundary phenomenon of migratory birds has informed the construction of the Wadden Sea as an international space worthy of protection at a global scale, as well as how the global narrative of bird migration is told in ways that are embedded in particular places and situated contexts. National parks at the Wadden Sea are in many respects more international and local or regional than they are national and the narratives of “national nature” and iconic landscapes associated with particular imaginaries of national identity play an insignificant role. Rather, migratory birds as transboundary charismatic species, have played a significant role in showcasing the international significance of the Wadden Sea and the construction of the Wadden Sea as a trilateral transboundary conservation area. It may be concluded that the Wadden Sea as a spatial construct is positioned at, and in relation to multiple scales with, diverse but not necessarily contradictory associative meanings.

## Section 2: Scientific Explorations

As noted in the introductory chapter to this volume, considerable effort has been invested in the presentation of the Dutch-German-Danish trilateral Wadden Sea as a single, coherent ecological and conservation space. This is exemplified by the UNESCO World Heritage Status as well as the recent trilateral emphasis on “one Wadden Sea” (e.g., Common Wadden Sea Secretariat, 2023). These efforts are, perhaps, intended to focus attention on what has been achieved at the transboundary level, the considerable differences in institutional structures, protected area management regimes and nature conservation philosophies in each jurisdiction notwithstanding. This chapter, however, has shown that it is possible to relate the global story of bird migration to place-based experiences and practices in meaningful ways that build on rather than downplay the rich cultural diversity found across the Wadden Sea region. Wadden Sea nature and nature conservation can be both globally significant *and* embedded in particular places with their situated associative meanings. Indeed, it may be possible to build on rich place-based stories and experiences of migratory birds at the Wadden Sea, to better understand how people perceive, relate to, make use of and protect migratory birds at other sites along the East Atlantic Flyway, the other places these birds call home on their journeys from the Arctic to the African coast and back. As at the Wadden Sea, we can expect that migratory birds, whether at their breeding grounds in the far north or at the west coast of Africa are embedded in specific social, cultural and historical contexts, which inform and shape their perception, use and protection, by both local communities and management authorities.

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## Section 2: Scientific Explorations

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# Chapter 7

## *Blue carbon and the Wadden Sea – Controversies in managing coastal vegetated ecosystems as carbon sinks*

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### 1. Introduction

Ongoing human-made climate change “has led to widespread adverse impacts and related losses and damages to nature and people” (IPCC, 2023, p. 5). Current greenhouse gas emissions and national emission reduction targets fail to hold the 1.5-2°C global warming limit of the Paris Agreement. Therefore, in recent years, carbon dioxide removal (CDR) on top of emission reduction has been discussed in science and policy circles as a key element to achieving national and global emission targets (Mcleod et al., 2011; Schenuit et al., 2023). CDR refers to strategies for extracting CO<sub>2</sub> from the atmosphere and storing it long-term. It includes nature-based solutions such as afforestation or the rewetting and renaturation of peatlands, as well as more technical approaches such as direct air CO<sub>2</sub> capture and storage in geological

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## Section 2: Scientific Explorations

formations. In 2009, the term blue carbon was introduced (Nellemann et al., 2009) and has been framed as a potentially important natural part of a climate solution. Blue carbon refers to carbon fluxes and carbon storage in marine systems with a strong focus on coastal ecosystems (IPCC, 2019). To date, no European blue carbon project exists. Worldwide, there are nine verified blue carbon projects (see Friess et al., 2022), and they all focus on mangroves. The question that arises is: does the Wadden Sea have the potential for a blue carbon strategy?

The Wadden Sea is the world's largest coastal ecosystem of intertidal mudflats and sand, stretching along the North Sea coasts of the Netherlands, Germany and Denmark. The area is an important habitat for numerous animal and plant species and considered one of the world's most important areas for migratory birds. Its salt marshes alone are the habitat of about 2,300 species, the non-vegetated areas support a further 2,700 species (Stempel et al., 2017). The coastal area also attracts millions of tourists annually and is home to other economic activities such as fishing and shipping. Governance actors at multiple levels from the regional to the transnational develop measures to ensure that the interplay of different interests does not threaten the Wadden Sea's ecological integrity. Climate change and sea level rise are perceived as threats to the Wadden Sea. Accordingly, those managing the region discuss options on how to protect the region from climate change. However, managing the ecosystem to function as carbon sinks and thereby contributing to climate change alleviation is hardly taken into account.

This chapter discusses the potential of blending perspectives and integrating blue carbon strategies in management activities along the Wadden Sea. The existing coastal vegetated ecosystems (CVES) of the Wadden Sea are assessed in the context of combatting climate change by generating negative emissions. Ongoing management activities and motivations are compared to potential blue carbon interventions. Due to a lack of knowledge on blue carbon and missing actors promoting CVES as carbon sinks, the future significance of blue carbon interventions remains blurred. Major regional actors, including the tourism industry, coastal

protection, and nature conservationists, all show contradictory tendencies towards aligning with blue carbon perspectives. We encountered some of their representatives on the TriWadWalks in May-June and September 2022. The role of scientific research, societal participation in knowledge production and decision-making, and political leadership are discussed as preconditions to eventually be able to determine whether blue carbon interventions might become legitimate management options.

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## 2 • Climate action, blue carbon, and carbon dioxide removal

This section introduces the idea of interventions in CVEs to sequester atmospheric carbon, side effects and societal regulations. Actions that address climate change (hereafter, climate action) can be differentiated into those with foci on adaptation, mitigation or removal. Adaptation refers to measures enabling nature and people to live with the consequences and impacts of climate change, like raising dikes as coastal protection against incoming storm surges and sea level rise. Mitigation aims to avoid or reduce greenhouse gas emissions, e.g., by shifting to renewable energy or transforming transportation systems away from fossil-based ones. *Carbon dioxide removal* (CDR) and *negative emissions* are umbrella terms for interventions attempting to reverse global warming (Renforth et al., 2023). According to the IPCC, CDR ‘excludes natural CO<sub>2</sub> uptake not directly caused by human activities’ (IPCC, 2022, p. 114). In other words, for CDR, management activities are needed to enhance CO<sub>2</sub> uptake, and only those additional anthropogenic negative emissions shall be counted as CDR. Thereby, this chapter does not focus on technology-intense, engineering-based interventions in Earth’s biogeochemical cycles but on nature-based solutions enhancing CVEs’ inherent carbon intake and storage functions.

According to the IPCC special report on the ocean and cryosphere, “[a]ll biologically-driven carbon fluxes and storage in marine systems that are amenable to management can be

## Section 2: Scientific Explorations

considered as blue carbon” (IPCC, 2019, p. 680). CVES such as salt marshes, seagrass meadows, or mangrove forests naturally sequester and store carbon. Covering only a small fraction of the ocean but accumulating half the ocean’s carbon, CVES play a significant role in debates about blue carbon. Their carbon burial rates per unit area are roughly 30 to 50 times higher than those of land-based forests (Mcleod et al., 2011), with a high variability depending on the actual site. Rooted vegetation, high primary production of biomass and waterlogged conditions decreasing microbial decomposition are the main reasons for high carbon sequestration rates in wetlands. Since all blue carbon ecosystems worldwide are under pressure from human activities and climate change, they shrink in size and quality (Hilmi et al., 2021).

In addition to their carbon uptake potential, vegetated coastal ecosystems provide essential benefits for climate change adaptation and mitigation. They slow down ocean currents, waves and as a consequence have a positive effect on preventing storm surges’ impacts. They protect coasts from erosion and against rising sea levels through vertical growth by sediment accumulations (Allen, 2000; Hilmi et al., 2021). From a climate action perspective to reduce carbon emissions, the use of seagrasses and macroalgae as a potentially sustainable, eco-friendly, and climate-friendly raw material has only recently gained new appeal – e.g., for house insulating, for packaging, for food and fodder, or as a soil conditioner in agriculture. Besides their abilities to combat climate change, these ecosystems are known as biodiversity hotspots; being spawning grounds and refuges for young (economically valuable) fish (Hilmi et al., 2021). Beyond their ecological and structural importance these ecosystems are part of coastal cultural landscapes and of coastal residents’ identity (Döring & Ratter, 2018a, 2018b, 2021). They also contribute to the recreation and health of people as well as to strengthening tourism.

To increase the potential of CVES as carbon sinks, the level of intervention in terms of scale and form are rarely discussed in applied research (Fink & Ratter, 2024). Anthropogenic activities range from protection and conservation to preserve these ecosystems, via the expansion of areas within or beyond former spread, to the creation of new habitats. The range

of possible interventions to strengthen ecosystems and their services comprises both targeted measures within vegetated areas (*in situ*), measures to expand areas, and the creation of new areas for these ecosystems, as well as measures to generally change environmental baseline conditions. The latter includes regulations regarding pollution from agriculture or shipping and destructive fishing techniques. Hydrodynamic flow regimes are central to the flourishing of coastal ecosystems and carbon sequestration can be enhanced by increasing salinity and wetness (Allen, 2000; Esselink et al., 2017; Mueller et al., 2023). Interventions in this respect both inside and outside the designated areas are considered promising. *In situ* measures comprise planting and seeding activities to densify vegetation. Expansion can be achieved through seeding and planting or hydrodynamic interventions. Furthermore, ecosystem design covers activities that are conceivable to resemble suitable areas for CVEs on a macro-scale (Zimmer, 2018). Expansions and ecosystem design usually come at the expense of pre-existing landscapes and ecosystems, which adversely affects societal acceptance of such interventions (Döring & Ratter, 2021; Fink & Ratter, 2024).

While the ultimate goal of CDR interventions is combatting climate change, governmental regulations determine economic potentials as well as the qualities and quantities of CDR measures. One way to economise CDR measures would be to generate and trade so-called carbon credits from negative emissions. In order to negotiate prices and possibly trade negative emissions, a certification scheme is needed to lay a foundation. Uncertainties regarding additionality, durability, monitoring, reporting and verification of blue carbon (Williamson & Gattuso, 2022) have not yet been comprehensively addressed and transferred into global standards (Fridahl et al., 2023). Regarding the Wadden Sea area, no baseline exists on the carbon stock in the different vegetated and non-vegetated marine systems, nor sufficient data on current rates of CO<sub>2</sub> uptakes – let alone clarity about the possible additional effects of certain measures (Mueller et al., 2023). In the EU so far, blue carbon has not entered any member state's CO<sub>2</sub> budgeting or voluntary carbon markets (Fridahl et al., 2023; Schenuit et al., 2023). Globally, there are currently only nine blue carbon projects generating carbon credits (Friess et al., 2022).

### 3 • Coastal vegetated ecosystems and management activities in the Wadden Sea

This section discusses occurrences, trends, and threats of CVES in the Wadden Sea as well as related actors and motivations in human-nature interactions. The dominant and name-giving ecosystems of the Wadden Sea are *wad* (Dutch and Frisian), *das Watt* (German), or *vade* (Danish): intertidal mudflats. The area covers around 14,700 km<sup>2</sup> and is dominated by this marine and brackish sandy-muddy system (Strempel et al., 2017). Many plant and animal species live here and have adapted to the changing tides. Throughout the last centuries, humans systematically transformed the landscape for resource exploitation, dwelling, coastal protection and commercialisation. Industrial-scale fisheries, agriculture, and bird hunting peaked in the first half of the 20th century. This led to a massive decline and loss of many habitats and fish, mammal, and bird species and eventually to the collapse of many traditional fisheries and the entire bird hunting industry.<sup>15</sup> Conservation efforts began with a societal shift in the 1960s and gained momentum from the 1970s on. Step by step, the Wadden Sea shifted to a service-based, tourism economy and conservation area (Lotze et al., 2005). The nature conservation and environmental protection efforts of the past decades have shown successes. Although the ecosystems are still under pressure, following the designation of the national parks, the biosphere reserves and the international recognition of the trilateral Wadden Sea as a UNESCO World Heritage Site, the state of the area can be classified as more vital and diverse than it has been for a long time (Common Wadden Sea Secretariat, 2023). Intertidal mudflats are classified as non-vegetated ecosystems and are home to various typically small-scale animals such as snails, worms, mussels, and crabs. The most widespread vegetated habitats are salt marshes, covering approximately 400 km<sup>2</sup> or 3% of the Wadden Sea area. There is a long history of artificially constructing salt marshes for land reclamation and shoreline protection. Such foreland salt marshes make up more than 50% of today's salt marshes in the region (Esselink et

<sup>15</sup> During the TriWadWalk, the participants encountered a duck decoy, the Vogelkoje Eidum, Sylt. A guided tour through the decommissioned facility and a presentation on the dimensions of wildlife trapping impressively illustrated this almost forgotten practice.

al., 2017; Mueller et al., 2023). Along with other land-use changes, most natural salt marshes have been lost or turned into semi-natural systems. In total, these salt marshes were reduced by half in the 19th century (Giuliani & Bellucci, 2018). In recent decades, their size has remained stable (Esselink et al., 2017).

In addition to salt marshes, another important vegetated ecosystem is seagrass, covering roughly 200 km<sup>2</sup> in the Wadden Sea area. However, seagrass mapping is argued to be incomplete (Röschel et al., 2022) and its distribution varies greatly throughout the region. Probably more than 90% of seagrass occurs in the northern half of the Wadden Sea, off the coast of Schleswig-Holstein and Denmark, thereby mostly in Northern Friesland. Moreover, seagrass density varies. In the southwestern (Dutch) Wadden Sea, seagrass mostly occurs as scattered plants, covering less than 5% of the actual seagrass area, whereas central (Lower Saxony) Wadden Sea seagrass is characterised by coverage densities between 5 to 20%, and the northern Wadden Sea seagrass occurs in dense beds, beyond 20% coverage densities (Dolch et al., 2017; Küfog GmbH & Steuwer, 2020). Historically, Wadden Sea seagrass was much more widespread. In the 1930s, a disease eliminated all subtidal seagrass beds and they have not recovered since. Most likely, anthropogenic eutrophication through riverine nutrient inputs led to another massive decline of seagrass in the southwestern and central Wadden Sea in the 1970s and 1980s. These trends seem to be ongoing, as the southwestern region has lost almost all dense seagrass beds, with a decline of more than 90% between 2009 and 2014 (Dolch et al., 2017). In the central region, seagrass coverage and quality are subject to fluctuations. While seagrass coverage grew from 18.8 km<sup>2</sup> to 37.6 km<sup>2</sup> between 2008 and 2013 and 6 km<sup>2</sup> dense beds reoccurred, in the following five years, the total coverage declined to 8.6 km<sup>2</sup> with 0.9 km<sup>2</sup> dense beds (Küfog GmbH & Steuwer, 2020). For the northern Wadden Sea, the total coverage area and dense beds occurrence seem stable at a high level between 2009 and 2015, though considerable variation occurs within the region (Dolch et al., 2017).

## Section 2: Scientific Explorations

Estimates on the amount of carbon salt marshes and seagrass beds store and sequester in the Wadden Sea are limited to only a few specific sites (e.g., Mueller et al., 2023), and extrapolation methods are lacking. While it is generally known that increases in salinity and wetness enhance CO<sub>2</sub> uptake, the site-specific effectiveness of different forms and scales of blue carbon interventions is unknown.

Human-nature interactions in the Wadden Sea area are governed by three nations: the Netherlands, Germany, and Denmark. The competent authorities of the Netherlands and Denmark governing the Wadden Sea are the ministries on the national level. Managing the German part is mainly in the hands of the states of Lower Saxony, Hamburg, and Schleswig-Holstein. In order to protect the Wadden Sea as an ecological entity, trilateral cooperation started in 1978 and the Common Wadden Sea Secretariat (CWSS) was founded in 1987. From the 1980s to the early 2000s, most of the German and Dutch parts became national parks, and Denmark followed in the late 2000s. Due to ongoing management and protection activities, preserving natural processes to function largely undisturbed, most Dutch and German parts became UNESCO World Heritage in 2009 (UNESCO, 2009), and the Danish parts followed in 2014, due to increased efforts in protection, monitoring and heavy regulations of economic activities (Common Wadden Sea Secretariat, 2016). The multiplicity of actors allows for a variety of approaches that mirror regional differences (Zijlstra et al., 2017), but a common Wadden identity of the local populations with shared values and responsibilities of managing the World Heritage does not exist (Schroor et al., 2017). While blue carbon perspectives are absent, management from social, ecological and economic perspectives are well established in the Wadden Sea region. The establishment of protected areas illustrates the significance of nature conservation perspectives in political administration.

From a political ecology perspective (Peluso & Watts, 2001), the Wadden Sea area can be interpreted as an arena where power struggles are being exerted. In the last decades, the enforcement of nature protection shaped the social, cultural and economic environment of

adjacent coastal populations. While in the early years of integrating ecological perspectives into government action, regulations on fisheries and other socio-economic activities potentially disturbing the environment were accompanied by massive protests (Döring & Ratter, 2021; Walsh, 2020), today, nature conservation has gained widespread acceptance in the region (Fink & Ratter, 2024). Nevertheless, competing interests between tourism development and coastal protection are still shaping the region. The interplay of these major drivers of human-nature interactions in this region is better characterised as conflicting rather than complementing or mutually enriching, as the following examples show. First, while management concepts such as natural coastal defence align nature protection with coastal protection, artificial shoreline protection measures such as dikes dominate the shoreline (Zijlstra et al., 2017), as the viability of only nature-based solutions is being scrutinised (Jordan et al., 2023). Second, while labels such as ‘sustainable’ or ‘ecological’ tourism seek mutual benefits (Liburd et al., 2024), trade-offs exist regarding generating tourism revenues. Indeed, some focal points in the region are discussed in the context of over-tourism: excessive tourism which puts a strain on the local communities and residents,<sup>16</sup> the overuse of ecologically sensitive areas, accompanied by nature and climate unfriendly forms of mobility (Hartman et al., 2017). Different actors from economic, social, cultural and ecological interests continue to struggle over the sovereignty of interpretation of the Wadden Sea and how it should be managed. It is not yet clear how and by whom a blue carbon perspective could be introduced into the arena.

<sup>16</sup> During the TriWadWalks, local administrations on Borkum gave vivid examples of the difficulties of mediating between residents and tourists, resulting in developing concepts and projects to define a liveable future for residents more independent from tourism development.

### 4• Blurred potentials for blue carbon interventions

This section analyses the relations between blue carbon and nature conservation and between coastal protection and tourism. CVES like salt marshes and seagrass meadows are expected to better serve carbon sequestration than non-vegetated ecosystems like beaches or mudflats. Links between nature conservation and blue carbon perspectives are inconsistent as nature conservation itself is not a homogenous concept, which is reflected in the distinction between nature conservation and restoration (Swart et al., 2001; Wallington et al., 2005; Walsh, 2021). The classical conservation approach is based on the idea of a “balance of nature” or “equilibrium paradigm” (Pickett et al., 1992). Although this approach is considered outdated, it remains influential in the Wadden Sea area. From such a perspective, natural systems are considered as self-regulating and striving for a climax. Natural entities such as ecosystems were supposed to be structurally complete in and of themselves. After a disturbance, they would eventually return to a state of equilibrium. In practice, the desired climax or equilibrium state was thought to be reached and maintained by isolation from human interference, so nature conservation in the narrower sense was mostly visible through the establishment and maintenance of nature reserves (Pickett et al., 1992; Wallington et al., 2005).

In contrast to the equilibrium paradigm, for the last five decades conservation and ecology science have emphasised ecosystem dynamics, focusing on complexity and non-linearity and opposing the equilibrium paradigm. From such a perspective, disturbance at various scales is considered an inherent feature of the internal dynamics of ecosystems (Wallington et al., 2005). Disturbance can be understood as essential renewal which increases species diversity. Instead of one stable climax, historical contingency, uncertainty, multiple states and shifts between them better describe ecological systems. This implies for the role of humans that human-induced disturbance is an integral part of most ecosystems, with contradictory

implications for conserving biodiversity.<sup>17</sup> Traditional conservation approaches excluding humans do not halt visible nature degradation and biodiversity loss on local to global scales, as ecosystems are not striving for balance and human impacts on ecosystems need not be exclusively harmful (IPBES, 2019). From this, some ecologists deduce a growing need for restoration, to assist nature in recovering and re-establishing ecological integrity (Swart et al., 2001).

On the continuum between the active and passive roles of humans, the competent authorities and national parks have close links to conservation perspectives, highlighted in the slogan “Let nature be nature,” a mantra that their representatives like to repeat. For example, in the Netherlands, artificial reef constructions for shoreline protection and ecosystem restoration have gained momentum. Yet such activities only appear outside the Wadden Sea protected areas, e.g., within offshore wind farms or off Rotterdam (TenneT, 2023; Wingrove, 2023). Yet in Lower Saxony, the implementing organisation for some compensation measures is the national park authority. In compensation areas, the Lower Saxony Wadden Sea National Park established more active restoration practices. In particular, for the more natural re-development of salt marshes, they have been undertaking large-scale and comparatively radical measures for several years, such as the removal of topsoil or the dismantling of summer dikes (NLWKN, 2022) – measures that also likely increase long-term carbon sequestration. As blue carbon initiatives seek intervention to generate measurable additionality in CO<sub>2</sub> storage, they seem more compatible with restoration approaches than with conservation. Restoration might overlap with *in situ* levels of blue carbon intervention. Yet neither conservation nor restoration concepts allow for a human-made exchange of entire ecosystems, so compatibility with CVE expansions beyond areas of origin or the creation of new CVE habitats barely seems

<sup>17</sup> During the TriWadWalk, the aftermath of outdated nature conservation approaches and contradictions of reacting to them became apparent in the treatment of the Lister dunes, Sylt (see also Orth and Schütte in Chapter 8 of this volume). Beach grass was planted to stabilise mobile dunes, now causing a high coverage of permanent vegetation. While this reduces dynamics, early succession patches, pioneer plants and biodiversity in general, and while human disturbances in the dune grasslands could increase biodiversity and climate change resilience of dune ecosystems, human intervention keeps being subject to strict regulations, which favour maintaining the status quo.

conceivable. In sum, integrating a blue-carbon expansion in the management of the UNESCO World Heritage currently appears to be unrealistic.

The ultimate goal of coastal protection is to save human lives. The core area of the coastal protection authorities' work is dike work and sand nourishments along the coastlines. *CVES* lying seawards from the dikes help to lower wave energy and protect the dikes and the land. Such synergies already exist and the forelands are designed in ways which allow for salt marshes to grow. Yet these salt marshes are commonly shaped by artificial trenches for drainage. Disturbing the water saturation of salt marshes has negative effects on the ecology (Esselink et al., 2017; NLWKN, 2022) and probably on blue carbon intake (Rupprecht, 2023). The closing of such trenches requires heavy equipment. Alternatively, the complete removal of topsoil can also be useful to create a natural and more efficient carbon sink (Esselink et al., 2017). Such measures could both be seen as *in situ* as well as ecosystem-design interventions and the Lower Saxony National Park authority is already implementing these measures, but from a nature restoration perspective (NLWKN, 2022). Further seaward expansion of existing salt marshes or expansions of seagrass meadows to create additionality in blue carbon effects are beyond the area of sole responsibility of the coastal protection authorities but include conservation authorities, e.g., the national park of Schleswig-Holstein typically starts 150 m off the dikes (Böhn, 2021). Whereas building with natural materials is a tradition along the North Sea coast (Jordan et al., 2023), joint projects on “Building with Nature” are currently rare (Zijlstra et al., 2017). Onshore expansions to replace dikes with nature-based solutions including expanded saltmarshes would encounter fear and resistance from many people representing both local populations and coastal protection authorities. Potential blue carbon promoters could align with natural coastal protection advocates. Otherwise, *in situ* valorisation of the existing salt marshes seems to be a plausible common ground unifying blue carbon and coastal protection perspectives.

Eco-tourism advertises with natural beaches and coastlines, which would not contradict the existence of CVES. On the one hand, “naturalness” would speak in favour of the presence of both non-vegetative and vegetative coastal ecosystems and the absence of any intervention. On the other hand, a natural environment might not only be “unspoiled nature” but in the context of human-shaped environments, “real nature” could also be actively re-established or newly created (Böhn, 2021). The tourism industry seeks to maximise the value of coastal zones by relying on material infrastructure and clean beaches. This leaves hardly any place for CVES. Nevertheless, marketing agencies developed campaigns on how to take advantage of local characteristics. In this way, climate protection measures could be promoted in tourism, and blue carbon interventions could theoretically even be cross-financed as compensation measures for tourism’s carbon footprint (Carolinensiel, 2024).

In dealing with uncertainties and dynamics and making decisions about the role of humans in conservation and restoration efforts, clear goal setting is crucial (Wallington et al., 2005). As plenty stories of failure and success in nature conservation and climate mitigation approaches reveal, decision-making that impacts humans and their environments must always be exerted by the actual people being affected to avoid resistance (Cohen et al., 2014; Segreto et al., 2020). Choices of conservation and restoration management goals and practices need to be made collectively to support longevity, an essential criterion when aiming to store blue carbon for centuries. Ecologists’ and practitioners’ roles include informing communities so the people affected can make informed decisions based on knowledge and values. Coastal populations along the Wadden Sea hardly know about CVES’ potential for carbon fixation and the potential implications for climate change and their region (Fink & Ratter, 2024). Integrating blue carbon into nature conservation, therefore, faces major obstacles. Firstly, it is still unclear, how much CO<sub>2</sub> exactly CVES in the Wadden Sea sequester. Secondly, the very ideas of CDR and blue carbon are not widespread among coastal dwellers; values and opinions are still in formation. Such a lack of knowledge of blue carbon impedes the creation of synergies. Thirdly, blue carbon management presupposes active interventions to generate additionality. This could be

aligned with restoration goals but not with the established practice of nature reserves in isolation from human interference. Finally, the most likely actors to promote and implement blue carbon interventions still need to be identified.

In climate change research, comparisons between modelled futures with or without climate change interventions and their respective opportunity costs have gained some attention (Gardiner, 2010). The current ongoing discourse among scientists – including in our research project *sea4soCieTy* – backs the position that future development of sea level rise and growing *CVES* are mutually interlinked. If sea level rise might cause a collapse of today's intertidal mudflat ecosystems, then parts of today's tidal mudflat ecosystems can be considered as 'already lost'. This perspective would make the dilemma of ecosystem replacement obsolete. However, in contrast to the mudflats, *CVES* are expected to be able to grow vertically with rising sea levels and not only have a chance of survival but can also be understood as blue carbon ecosystems that help mitigate climate change. Furthermore, another option might be less intense interventions of altering hydrodynamics to nourish both mudflats and *CVES* with sediments. Nature conservationists, if open to alternatives, could ally with blue carbon management ideals and identify 'lost' areas for expansion or ecosystem design and commonly exploit a broad variety of options.

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### 5. Ways forward – Clarifying blue carbon potentials in the Wadden Sea

Four major gaps in research, research communication, governance of the Wadden Sea, and nature conservation efforts can be identified. Firstly, from a technical point of view, uncertainties remain as to how much atmospheric carbon can be stored in *CVES* of the Wadden Sea compared to mudflats and other ecosystems. The effectiveness of blue carbon

measures to store CO<sub>2</sub> remains vague, but indications of greater storage potential prevail (Hilmi et al., 2021; Mcleod et al., 2011; Nellemann et al., 2009). To progress towards application, such further research into blue carbon sequestration rates and their additionality needs to be conducted in transdisciplinary settings.

Secondly, efforts in the co-production of knowledge and steering the development of shared values are crucial. CVES are threatened by human interventions like pollution, land-use changes, and climate change. Major drivers are economic activities and coastal protection. A dialogue on societal values goes beyond only informing people but fostering collective decisions which can pave the way to collaborative actions and evolve to established practices. In this context, the role of blue carbon interventions in the Wadden Sea should be considered.

Thirdly, political and administrative systems have key roles to play in organising the decision-making processes and implementing the decisions. In theory, the diversity of political systems of the three Wadden countries and their sub-national units speaks both for sufficient legitimisation, as local values and cultural characteristics can be incorporated, and for sufficient competition to shape best practices. Yet beyond structural components, it is the actors and their actions which matter. As the level of quality and legitimation differs between states and authorities, there seems to be a lack of exchange both with each other to integrate successful practices from neighbours and with applied science to stay informed about emerging concepts (Schroor et al., 2017; Walsh, 2019, 2021).

Fourthly, climate change activists and nature conservationists are both dedicated to a liveable future and, in this case, want CVES to thrive. Not only do interests overlap, but actions could overlap as well, as climate crises and biodiversity crises are interconnected. A purposeful development would be the creation of unifying narratives and common strategies. But such a common understanding is not yet in sight. A battle for interpretative sovereignty would inevitably also be a power struggle, with corresponding winners and losers – at the expense of

## Section 2: Scientific Explorations

climate protection or biodiversity and, ultimately, people and nature. It is an even less likely scenario that the international community will reduce its greenhouse gas emissions so significantly and quickly that questions about CDR will become obsolete.

The described controversies about integrating blue carbon initiatives into the Wadden Sea environmental protection schemes demonstrate the need to clarify the blurred contexts, to uncover the hidden ambiguities and uncertainties, as well as to foster inclusive dialogue and transparency in communicating about blue carbon. This way, coastal populations can make informed decisions about whether blue carbon interventions might become acceptable for them and support reasonable management options. The Wadden Sea has the potential for efficiently integrating a blue carbon strategy, but the path to success is not plain sailing.

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## Section 2: Scientific Explorations

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## Chapter 8

# *Dynamic dune management on Sylt: A modelling approach*

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### 1. Introduction: A field trip to the dunes of Sylt

The idea of the Trilateral Wadden Walk was to create links between different scientific disciplines and local stakeholders. This is why we met with Prof. Dr. Karsten Reise, an expert in marine and coastal ecology, who knows the island of Sylt like the back of his hand and, therefore, offered to take us on a trip to the Listland dunes (Figure 1). The Listland dunes are one of the few places along the German Wadden Sea coast where, in addition to a mosaic of yellow and grey dunes and brownish dune heaths, mobile dunes can still be found. It was precisely these dunes that were the destination and subject of our excursion, where we discussed the functioning of dunes within the coastal landscape and their implications for coastal protection.

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Figure 1: Visiting the Listland dunes, TriWadWalk September 2022 (Source: © Anne Orth).

Over thousands of years, moving dunes balanced the loss of sediment on the western shore with sand accumulation on the eastern shore of the island (Oost et al., 2012; Reise, 2015; Reise & MacLean, 2018). Before the end of the 18th century, people traditionally used the dunes for firewood, grazing and fodder production (Kiehl and Kollmann, 2019; Provoost et al., 2011). In the course of the so-called *Plaggenwirtschaft*, sods were extracted from the heath and valley landscapes of the dunes (Grootjans et al., 2002). With the spread of human settlements and tourism on the island of Sylt, concerns arose that the mobile dunes would eventually bury houses, fields, and (military) infrastructure. These concerns kicked off the development of deliberate dune management (Osswald et al., 2019). In the 19th century, dunes were

systematically fixed in position through plantings. Rabbit diseases, the spread of invasive species, anthropogenic nitrogen deposition, reduced grazing intensity, and new dune management policies additionally supported the stabilisation of the mobile sand masses by causing the permanent vegetation cover to increase (Osswald et al., 2019; Pye et al., 2014). This way of managing dune ecosystems led to a paradigm in which dunes were no longer seen as a threat to livelihoods but as coastal defences.

Coastal dune habitats are highly diverse, ranging from drift lines and dune slacks to foredunes, heath, and dune grasslands. All these habitats are ecologically valuable, providing a unique and dynamic mosaic that supports various animals and plants. Some habitats, such as coastal heath, are more stable. In contrast, others, like drift lines, are more dynamic, continually reshaped by intense weather conditions and strong winds that blow sand into the dunes and distribute it within the dune system, causing them to migrate (Arens et al., 2013). This dynamic nature of dune systems leads to a constantly changing mosaic where many habitats are intermittent. Open, early succession dune patches in particular are critical and biodiverse habitats (Cooper & Jackson, 2021; Provoost et al., 2011). Their flora and fauna are often endemic, highly adapted to the harsh, dry, sandy conditions, and form unique assemblages (Bird et al., 2020). The ongoing stabilisation of coastal dunes is accompanied by the homogenisation of the dune landscapes, in which a few dominant plants spread at the expense of pioneer species (Osswald et al., 2019). The result is a sharp decline in pioneer stages and biodiversity in general (Arens et al., 2013; Pye et al., 2014).

The biodiversity and climate crises affect the ecological balance of the dune system, significantly impacting the island's and dune's future. Rising sea levels and the increasing strength and frequency of storm surges cause erosion and threaten the coastline (Ahrendt, 2001). The dunes on the island of Sylt have endured thousands of years of sea level fluctuations as generations of mobile dunes transported sand from exposed to sheltered shores. However, the systematic stabilisation of the mobile dunes has stopped this dynamic

and brought the sand conveyor belt to an almost complete standstill (Osswald et al., 2019). Like sand dikes, the dunes themselves are used as coastal protection installations. This state of affairs seems contradictory since Sylt's flat coastline is particularly vulnerable to environmental hazards associated with sea level rise, as sediment gets easily washed away (Fischer & Reise, 2011; Reise & MacLean, 2018). This knowledge challenges our understanding of dunes and coastal protection. It raises key questions: How closely is dune condition linked to biodiversity value? Does protecting dunes equate to protecting the island? And if so, what does dune protection entail?

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### 2. Agent-based modelling: A case study of the Listland dunes

The scenario described above underscores the complex nature of both the dune ecosystem itself and with respect to its interconnections with the human sphere. These relationships manifest as highly complex systems, which are challenging to assess in a straightforward manner. A method of exploring the system dynamics is required so that any type of intervention can be explored in advance. The process of developing an intervention strategy is closely connected with questions of governance and transdisciplinarity. The creation of a model could help to give various stakeholders an overview of the system dynamics and possible future behaviour. The term *model* is used in many different contexts. We follow Stachowiak's definition: "A model is a purposeful abbreviated representation of something" (Stachowiak, 1973, p. 131), which in our case represents the dune ecosystem. By abbreviating the dune system characteristics, the overall system dynamics can be simulated to paint a clearer picture of possible intervention impacts (Romanowska, 2015).

Dune management has a long history in which the needs and fears of islanders have played an important role. Paradigm shifts in the perception and management of mobile dunes can be perceived as threatening developments, which is why a space for discussion with different stakeholders must be created when rethinking management systems (see also Tubridy et al., 2022, Walsh, 2021). Agent-based modelling can play a decisive role in the development, comparison, and evaluation of different scenarios and future perspectives of dune management. In the following, we will revisit the Listland dunes since they served as a study area for modelling the various options for dune management on Sylt. Agents in the model, which was coded in NetLogo, are defined as sand grains, sheep and marram grass. Each pixel was assigned an initial vegetation amount and elevation value. Sand grains sprout on low-vegetation patches and move towards the eastern part of the island, driven by the wind. How quickly they reach the edge of the simulation area depends on the elevation and vegetation values of the individual pixels that the sand grain passes. Sand, positioned on high points in the dunescape, is easily carried away by the wind, especially if there is no or low vegetation to shelter it. If sand grains accumulate on a patch, its elevation increases. At the same time, its vegetation value decreases, mimicking the burial of plants. Through this feedback loop, the model simulates dune growth and migration. In the NetLogo interface, the user can either choose between three predefined scenarios, which were inspired by our excursion to the Listland dunes and our discussions among the group, or users can independently change parameters before running the model. The parameters are the number of agents with which the model starts the simulation.

### Letting nature be nature

True to the motto of the German Wadden Sea National Parks, the Letting Nature be Nature (hereafter LNBN) approach is characterised by the complete absence of human intervention (see Walsh, 2020). In the model, this translates to the absence of sheep and plant agents as well as beach nourishments.

### Business-as-usual (stabilising dune management)

The Business-as-usual (hereafter BAU) scenario describes the current management type in the area of interest. Following the prevailing coastal protection paradigm, dunes are stabilised by planting marram grass to prevent erosion and keep the dunes in place. In this scenario, dunes are considered primarily from a coastal protection perspective, and stable dunes, undisturbed by humans and animals, are considered essential for the protection of the islands (see Oßwald, 2020). The vegetation faces no external degradation threats due to grazing or walking paths, as the area is declared a nature reserve. In the model simulation of this scenario, the focus is on the development of marram grass vegetation. There is no additional sand import, just as no sheep turtles are introduced under this management type.

### Dynamic dune management

Three groups of factors influence the natural mobility of dunes: climatic factors such as wind, precipitation, and humidity; sediment properties and availability; and vegetation cover (Klijn, 1990). While the first group cannot be directly controlled by human intervention, the latter aspects offer conceivable approaches for Dynamic Dune Management (hereafter DDM). In our model, the default DDM is therefore simulated by the absence of artificial dune plantings and the introduction of sheep turtles as grazing animals, as well as additional sand grain turtles in the form of beach nourishments. Beach nourishments have been carried out at our study site since the 1990s (Osswald et al., 2019). As on many North Sea Island beaches, the primary aim is to counteract beach erosion. While the absence of marram grass plantations ensures that active fixation of dunes is no longer promoted, the additional sand import could further trigger the dynamisation of dune landscapes. However, active interventions are required to remobilise overgrown dune systems (Arens et al., 2013). The trampling and cropping of the vegetation layer and the creation of open sand patches using grazing animals can catalyse more significant blowouts (Provoost et al., 2011). Using animals stands to reason from a nature conservation point of view. Theoretically, however, human footpaths in the dunes would have a similar effect (Pye et al., 2014).

Two criteria were studied to compare the different scenarios: the biodiversity rate and the elevation development. Biodiversity is an essential indicator of the functioning of natural ecosystems (Duffy, 2009). Especially for dynamic and complex coastal dune systems, in which mechanical workings are rarely understood, utilising biodiversity as an indicator for the overall system state may offer a pragmatic strategy for sustaining multiple ecosystem services (Duffy, 2009). The biodiversity rate in our model indicates the balance between low-, medium-, and high-vegetation patches relative to the maximum possible patch count in the simulation. It is calculated under the presumption that in healthy dynamic dune systems, at least 30% to 40% of bare sand is required to sustain biodiversity (Cooper & Jackson, 2021). The biodiversity value is, therefore, based on the habitat mosaic of a natural dune system and not on any species counts or their composition. The study of elevation development refers to the long-term adaptation of barrier islands to rapidly rising sea levels through shifting dunes, which contribute to sediment accumulation on the island of Sylt (Osswald et al., 2019). In our model, elevation development serves as an indicator based on the elevation classes of the patches. Elevation change represents the movement and allocation of sediments, essentially acting as a proxy for dune movement.

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### 3 • Results and discussion

In order to obtain comparable results, the dune management scenarios described above were run several times in NetLogo. The collected data was statistically analysed.

#### **Biodiversity rate**

The statistical analysis of the mean biodiversity rates indicated a significant difference among the dune management types, with the LNBN scenario scoring the lowest. This result suggests that there is a positive link between dune mobility and biodiversity. However, a

## Section 2: Scientific Explorations

mere absence of marram grass plantings and a withdrawal of all human activity in the dunes will not exceed the threshold at which wind and sand push back expanding vegetation (Tsoar, 2005). An essential catalyst for the remobilisation of dunes is the removal of soil and vegetation (Arens et al., 2013). Thus, the relative success of the DDM approach is likely to be attributed not only to the absence of marram grass plantings but also to the introduction of grazers. Furthermore, the influx of sediment from the beach into the dune system is increased by beach nourishments. Adding sand to a beach or frontal dune system directly increases the amount of loose, bare sand exposed to wind action. This encourages the formation of embryo dunes and foredune ridges. The sand transported to inland parts of a dune field can promote the formation of sand sheets and rejuvenate surface vegetation (Pye et al., 2014).

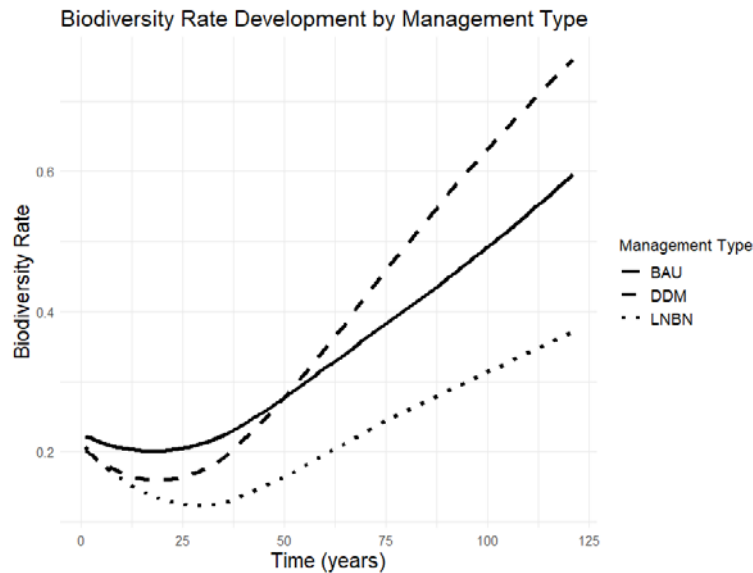


Figure 2: Biodiversity rate development over time by management type (Source: authors).

## Elevation development

As with the biodiversity rate, the LNBN scenario also performs worst in terms of elevation. The barely increasing elevation can be explained by a sediment deficit in the dunes landscape caused by the absence of beach nourishments and a high degree of vegetation cover that suppresses aeolian sediment transport. The remaining marram grass stabilises the dunes; hence, there is minimal or no sand transfer (Arens et al., 2013). The modelling results return an eminent relation between the occurrence of high-elevation and medium-vegetation patches. Medium-vegetation patches are essential for land accretion, as they allow sediment to migrate faster than high-vegetation patches but ensure a residence time of sand grains long enough to promote elevation increase. However, this only happens when aeolian sediment transport is vital, and enough sand is introduced into the system.

In the long run, the highest elevation development rate is obtained in the DDM scenario. The absence of marram grass plantations, additional sediment import through beach nourishments, and the sheep-induced vegetation push-back collectively lead to an increase in bare sand patches. They, in turn, contribute to the formation and mobilisation of new dunes that migrate and thereby form a new sand conveyor belt (Osswald et al., 2019). We conclude that under the premise of sufficient sediment supply, a mosaic of open, sandy areas and areas with medium vegetation represents the ideal condition under which the land can adapt to increasing sea levels. It thus seems worth taking up and further developing the DDM approach to create gateways for aeolian sand transport across the island, which are necessary to strengthen the resilience and future adaptability of the dune system in the face of the climate crisis. The model used in this study is a mere digital abbreviation of the complex and far-reaching ecosystem of the Listland dunes. Sand, for example, is used as a generic term; no further distinction is made between sediment types, such as clay or silt. Likewise, no distinction is made between different mechanisms of sediment transport such as landslides, wind abrasion, or outlets. Detailed investigations of sediment dynamics in the study area would be needed to enhance the model's accuracy.

## Section 2: Scientific Explorations

Another factor that the model does not take into account is individual species characteristics, which are relevant for predicting both biodiversity and vegetation growth.



Figure 3: Elevation change over time by management type (Source: authors).

## 4. Outlook and conclusion

Overall, the model offers room for refinement and adaptation to different local contexts or a broader range of system dynamics. The mere digital version of this model, however, only returns hypothetical scenarios. More reliable assessments would result from corresponding field experiments. The presented modelling approach is intended to aid in understanding and questioning the existing dune management paradigm given the climate crisis and the associated threat to islands like Sylt. Creating a space to test alternative management designs

supports decision-makers and can be used as a participatory tool to shape the future of dune management on Sylt in co-creation with stakeholders. We thus propose to embed this research in a transdisciplinary and locally rooted framework. The research process should be discussed in the field to increase the credibility of its results.

With this study, we aim to inspire readers to acquaint themselves with the concept and process of modelling in all its facets, as it proves valuable in bolstering grassroots science initiatives within communities. Furthermore, it serves as a valuable resource for evaluating potential intervention points in the context of contentious decision-making processes, as it provides insights into system dynamics under different future scenarios. This is particularly important as the main challenge in changing people's mindsets towards the adoption of more dynamic dune management practices is to overcome entrenched path dependencies, such as the legacy of past management strategies, rigid institutional approaches and exclusionary governance practices that resist adaptive and inclusive approaches (Tubridy et al., 2022). The TriWadWalks provided numerous insights for all participants. The excursion to the Listland dunes led by Prof. Dr. Karsten Reise was the inspiration for our subsequent modelling work, from which we learnt the following lessons.

Firstly, the need for more dynamic approaches to dune management arises from the decline in biodiversity and the threat to dune systems and, ultimately, the island community from sea level rise. Aeolian sediment transport could be reactivated by promoting the development of open sand areas and by the additional sand import through beach nourishments. The shifting sand would not only promote biodiversity but also aggradation and thus facilitate the dunes' ability to cope with increasing sea levels in the future (Osswald et al., 2019).

Secondly, daring to question and rethink supposedly entrenched systems and dynamics can open up new perspectives. Whether coastal protection principles or national park philosophies, paradigms have long and complex histories but continue to be influenced and

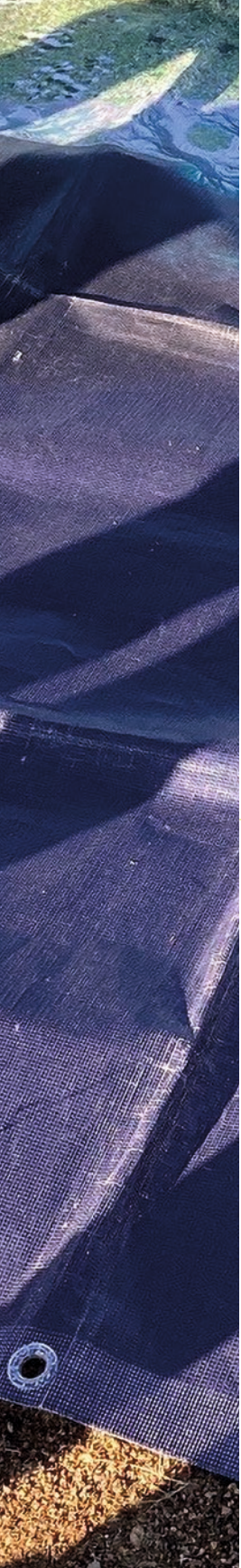
changed by people and their living conditions. The joint anticipation of desirable futures for the Listland dunes requires an understanding of the complex background and the constant reinterpretation of paradigms such as “Letting nature be nature” or “Dune protection is island protection.” When comparing different future scenarios in particular, putting aside black-and-white thinking and discussing individual components of these scenarios with an open-minded attitude helps foster a fruitful discussion on possible interventions while including many perspectives when discussing conservation issues. Accordingly, it is desirable to embed modelling and dune management approaches further in their social-ecological contexts.

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## Chapter 9

# *Young people in the Wadden “hinterlands”: Reflections on liveability and the future for youth in Eemsdelta municipality, North-East Groningen*

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### 1. Introduction

In the broader context of rural transformation and economic decline, and the socioeconomic consequences associated with this, this chapter explores the liveability of the Eemsdelta municipality (adjacent to the Ems estuary, in the Dutch Wadden area) as experienced and evaluated by young people growing up in the region. We connect the discussion to the future aspirations and wishes of the youth and aspects that could or that do keep them connected to Eemsdelta.

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## Section 2: Scientific Explorations

We visited Campus Eemsdelta (Figure 1), located in the town Appingedam, during the Dutch-German TriWadWalk excursion in May-June 2022. A few months later, in September 2022, the campus opened its doors to 1700 pupils from four different (levels of) schools. The campus positions itself as a central point for creating a sustainable and livable future for the declining rural and industrial municipality of Eemsdelta. In addition to providing good quality innovative education, the campus aims to stimulate the connection between (local) businesses, local government and the pupils, between institutions of higher education and secondary education, and ultimately between young people and the region. Enhancing a sense of belonging and providing a reason to be proud of the region are also part of the high ambitions of the campus, considering the area has been heavily stigmatised and faced several challenges, most recently due to the gas-extraction induced earthquakes (Van der Voort & Vanclay, 2015).



Figure 1. Campus Eemsdelta Groningen after completion in 2023 with the Ems estuary and the wind turbines of Eemshaven industrial park on the background (Source: photo by Tim Lechner).

During the TriWadWalk, Klaas Reinders, the director of the project Eemsdelta Campus Groningen, gave us a tour of the campus. The director proudly explained how each square meter and element present on campus had been carefully considered and selected to make the place a flagship of sustainability as well as social cohesion. The walls of the buildings, covered with panels that look like wood but are made of rice husks (a circular biological waste product compressed into composite panels by a local company), and the outside space between the school buildings designed to contribute to the interaction between pupils of the different schools, are just a few examples of this attention to detail. Stimulating young people to meet and learn from each other across the different school levels was a central concern for the project director due to its potential effect on what he calls *kansengelijkheid*, or equality of opportunities, for all young people in the region (Zwart, 2023). The campus management and the municipality consider such equality of opportunities crucial for connecting young people to the region and providing them a better chance to create a bright future there.

The above ambitions are not surprising considering that, similarly to many other predominantly rural mainland/coastal areas around the Dutch Wadden, in the past years, the Eemsdelta municipality has experienced a significant population decline. From 2012 to 2022, the population decline was 7%, the steepest decline in the province of Groningen (SPG, 2023). Eemsdelta’s population is projected to decrease by more than 11% by 2040 and nearly 21% by 2050 (Gopal et al., 2022). The population composition has also changed, in a comparable trend to other Dutch rural municipalities along the Wadden coast and beyond. The share of young people (aged 0-19) in Eemsdelta has decreased slightly more than the national average, while the share of people aged 65+ is 5% higher than the national average (SPG, 2023). Compared to the national average, the Dutch Wadden hinterlands also lag behind in terms of facilities and services. For instance, in 2021, the average distance to a cinema in Eemsdelta was 24.8 km, compared to the national average of 6.5 km. While the national average distance to hospitals has decreased by 6% from 5,1 to 4,8 km, it has increased by 10% from 6,3 to 7 km in Eemsdelta and the surrounding rural regions (CBS, 2024). In light of the above, attracting

## Section 2: Scientific Explorations

young people to (stay in, return, or move to) the region is of high importance to the municipality. The mantra of the three B's *binden, boeien, behouden*, or “connecting, captivating, retaining” is echoed in connection to youth and liveability in different strategic documents of the local schools and the municipality as well as by experts, decision-makers, employers and the school board (e.g., Eemsdelta municipality, n.d.).

In this chapter we focus on exploring the everyday places, liveability and future of young people growing up in what we term the Wadden hinterlands. Both the theoretical discussion and the findings are divided into two parts. We are first concerned with understanding aspects that make places meaningful for young people, are relevant for their evaluation and experiences of liveability, which could potentially “connect, captivate and retain” youth in the region. In the second part we discuss to what extent young people appreciate different tangible and intangible aspects linked to the liveability of their home region and how or whether this appreciation translates into their future plans and intentions to stay or to leave.

### Conceptualising the Wadden hinterlands

What we term the Wadden hinterlands in this chapter refers to the communities and small rural municipalities on the mainland coast(s) of the Wadden Sea. In contrast to the Wadden islands, which from the 1950s onwards have attracted enormous tourist interest (Heslinga, 2018), the Wadden hinterlands share many characteristics with what Bijker et al. (2012) term “less popular rural areas.” The Wadden hinterlands with their open, marine clay landscape, with a significant proportion of large-scale arable farmland and the coast defined by land reclamation, dikes and marshlands, are not considered attractive by an average tourist. While the (sandy) islands flourish (and are gentrifying) due to tourism, the mainland hinterlands are shrinking, becoming depopulated, and stagnating economically (Wadden Academy, 2021). Compared to the popular locations, the hinterlands have relatively fewer natural and recreational areas, a relatively low proportion of hotel and catering industry employment and lower house prices (Bijker et al., 2021). Similarly to many rural communities elsewhere, in the

majority of Wadden hinterlands, population decline, population ageing, and a decline in the number of households are either ongoing or expected (Rijnks, 2020). Although some of the dominant trends described above are shared by all Wadden hinterlands, there can be differences in the specific population dynamics and the opportunities and challenges that are faced by the different regions and national contexts (Wadden Academy, 2021). For example, in the neighbouring German Wadden hinterlands, the situation is rather different as many municipalities (both along the mainland coast and in the hinterlands off the coast) have become part of the greater Wadden region tourist destinations (Mehnen et al., 2023).

The Wadden hinterlands in the Netherlands belong to the provinces of Groningen and Fryslân. In this chapter we focus on the former, zooming in on Eemsdelta municipality in the North-East of Groningen. The Dutch Wadden hinterlands are rather distant (both symbolically and geographically) from the central government of the Netherlands located in the West of the country. In Fryslân this symbolic distance is predominantly associated with a distinct linguistic, ethnic and cultural regional identity. In Groningen, on the other hand, in addition to the decline in the status and economic importance of agriculture, the decades of gas extraction from the Groningen gas field, the resulting localised earthquakes and the concerns of the inhabitants not being properly acknowledged by the central government, have had a major impact (Van der Voort & Vanclay, 2015; Westerman, 1999). Since discovering Europe’s largest gas deposit in 1959, the area has been crucial for the Dutch energy sector and economy. However, the financial gains from the gas extraction had relatively little local effect on average income per capita, as they were largely allocated through the national government (Rijnks, 2020). Moreover, the gas extraction has caused localised earthquakes, leading to significant economic and social issues and considerable distrust in the (national) government (SPG, 2022). There has since been widespread recognition that a depreciation of property value has occurred in the area, due to the physical damage to the buildings but also the reduced attractiveness of the region in general. In light of this, a compensation scheme has commenced, with approximately 100,000 homeowners in the Groningen “earthquake area”

## Section 2: Scientific Explorations

entitled to compensation for the damage they suffer due to the depreciation of their property value. However, the compensation scheme remains disputed and controversial (de Kam & Hol, 2024).

Other relevant aspects influencing liveability include accessibility to (essential) services and facilities, which, similarly to other peripheral areas, is lower than the national average, also in the context of the Wadden hinterlands (CBS, 2024; Rijnks, 2020). For instance, residents of the Fryslân coastal area travel an average of 12.7 km to the nearest hospital, compared to the national average of 4.8 km (CBS, 2024). The Dutch Wadden hinterlands face significant challenges in maintaining services, jobs and well-being for youth in particular. While in the North-East of Groningen overall unemployment rates are comparable to national and provincial averages (CBS, 2022), *youth* unemployment is 5 to 10 percentage points higher (CBS, 2022). Additionally, the municipalities Oldambt and Eemsdelta have higher rates of children living in poverty compared to the national and provincial averages (SPG, 2023). According to the monitor of the SPG (2023), the overall liveability in the northeast of Groningen is rated lower than the national average, with particularly Eemsdelta ranking low compared to the rest of the province. This is mainly related to poor evaluations of services and facilities, especially cultural amenities (SPG, 2023). Yet the quality of the physical environment, social cohesion, and safety are rated above the national average.

Contending that substantial parts of the Wadden hinterlands are “plagued by demographic and economic decline,” Schroor et al. (2017, p. 14) remark that the viability of the region is undermined and “the acceptance and continuing identification” of the residents with the region is threatened. Hence, it is relevant to understand what aspects make the region meaningful for (young) people, in order to better grasp how to establish a bright(er) future in this dynamic region.

## 2 • Theoretical framework

### Liveability, affordances and place attachment

In Dutch policy discourse, the concept of liveability is frequently used to estimate how individuals value the quality of their living environment and which determinants influence this evaluation (Gieling, 2018). In academic literature, liveability is considered a rather ambiguous term that lacks a single definition. De Chazal (2010, p. 587) proposes that liveability can be broadly defined as “a statement of desires related to the contentment with life in a particular location of an individual or set of individuals.” Earlier research by Van Kamp et al. (2003) suggests the concept can best be expressed in the form of *desires* represented by *domains* such as physical environment, personal and community development. Regardless of a clear-cut definition, the concept of liveability is most often discussed by distinguishing *tangible* (functional, material) and *intangible* (attachment, social, personal, emotional) aspects connected to the living environment and the degree to which this living environment as a whole fits the needs of its residents (Hofstede, 2024; Lloyd et al., 2016). Following Lloyd et al. (2016), when analysing liveability in this chapter, we distinguish young people’s subjective evaluation of the quality of both *tangible* (e.g., facilities, infrastructure and services) and *intangible* (e.g., place attachment) features of their home region (see Figure 2). Typically, the tangible aspects are considered more objective and are evaluated by how well an area meets functional needs. Intangible aspects are more subjective, connected to an (emotional) attachment to a place and community (Erickson et al., 2018). While it may be more challenging to get a glimpse into the intangible side of liveability, it is nevertheless found central to people’s satisfaction with place, also at the Wadden Sea coast. Van der Vaart et al. (2018), for instance, explored how the arts influence people’s place attachment and subsequent coping with (potential) place change at the Wadden Sea coast, while Ratter and Gee (2012) found that the perception of *Heimat* of residents on the German North Sea coast is connected to their willingness to become involved in preserving it.

## Section 2: Scientific Explorations

The tangible features related to liveability can include elements such as transport and infrastructure, quality of public space, housing or availability of facilities and services (Christiaanse, 2024). The landscape and the natural environment can also be grouped under the tangible aspects of a place to the extent that they fit the functional requirements and needs of young people. In social psychology such physical-environmental aspects are discussed using the term “affordances” (Gibson, 1979). An affordance refers to the “possibility for action” provided to an individual by their environment – by the substances, surfaces, objects, and other living creatures that surround the person (Gibson, 1979). To illustrate, Abbott-Chapman (2006) found that teenagers’ favorite places tend to include places with water, because such places afford opportunities for popular and desired activities, such as fishing, sailing or swimming. Affordances of a place can also contribute to people becoming (emotionally) attached to a place, indicating a degree of overlap and intersections between the tangible and intangible aspects of liveability.

When discussing the intangible aspects of place relevant for liveability in this chapter, we use the term “place attachment.” Place attachment is one of the most frequently used terms to indicate the close ties between people and places (Lewicka, 2011). Place attachment implies the feeling of being included and of being a part of a place or group (Pretty et al., 2003). In addition, place attachment signifies a certain fit with and being acknowledged as a member in a place and by the other members (Benedicto & Moran, 2007). Attachment to particular locales develops by means of experiences, activities and interaction, and with time spent in a place (Trell & van Hoven, 2011). Identifying oneself with a particular place requires continuity, knowledge of and familiarity with it. Emotions play a central role in people’s ties with places (see Van der Vaart et al. (2018) for an example on the Dutch Wadden Sea coast). In Gustafson’s (2001) study, for instance, respondents associated their daily places with emotions such as security and a sense of home. In liveability literature, such personal aspects of place are used to illustrate how *intangible* elements influence the satisfaction of people with their living environment.

Place attachment is associated with many positive outcomes for individuals and communities. Osterman (2000, p. 343), for instance, states that young people who experience a sense of belonging in their everyday context have a “stronger supply of inner resources,” they “perceive themselves to be more competent and autonomous,” have “higher levels of intrinsic motivation” and a “stronger sense of identity,” but also a “willingness to conform to and adopt established norms and values.” In line with this, place attachment is argued to support and strengthen a person’s (psychological) well-being and health and to motivate individuals to be involved in local life. It can foster care for society in general and people’s immediate environment in particular.

### Liveability and youth

In this chapter, we focus on the experiences of young people aged between 11-18 years. Age is a relevant identity-marker that can be used to better understand the *desires* or the “fit” between the living environment and an individual or a group (Trell et al., 2012). The legal and societal status of adulthood affords adults more influence, a greater voice and more freedom of action in the use of places and the definition of barriers to places (Hay, 1998). As a dominant group, adults often define places and narratives about places. This, in turn, affords them more opportunities to develop a positive and caring attachment to these places. On the other hand, due to youth’s status of being “in between” (i.e., between children and adults), there are hardly any designated places for youth. While they are no longer in place on the playgrounds, they are denied access to many adult places. In addition, young people often actively reject adult-provided places, which they associate with excessive surveillance (Trell & van Hoven, 2011). Looking at rural areas, alternatives that young people experience in these areas might be limited by certain typical characteristics such as remoteness and a lack of public transport, low population density implying a restricted peer group, and a small number of leisure facilities. This can further add to the disconnection from, and dissatisfaction with, their local rural places. For young people’s place attachment and for fulfilling their needs with regards to what they expect of their living environment, the social aspects of place, connected to the relations

## Section 2: Scientific Explorations

and interaction with other (young) people, are perhaps most influential. Social psychologists argue that youth is a key period of identity construction (Erikson, 1968), and it is predominantly in relations and interaction with others that identities develop. The social affordances of places – the possibility for interaction, meeting, seeing others and being seen – are therefore particularly influential for young people’s place preference. In research by Trell et al. (2012), for example, interaction with friends and peers at the hamburger kiosk and house of culture resulted in these locations becoming meaningful for youths in rural Estonia.

In the process of forming relations to places, research indicates that unlike many adults, young people are more likely to become attached to and content with places after a brief but intense experience (Post, 2008). Young people are better and faster able to become attached (though also detached) to places through their actions and ability to be in the “here and now” (although this might be under pressure due to their increasing use and influence of digital technologies/smartphone/social media, see Hari, 2022). Such intense experiences are facilitated by their imagination, which is more closely tied to activities they deploy. While for adults, heritage and the past play an important role in their relationship to places, for the youth, it is more important to be free to engage in desired activities and have enough room for exploration and discovery. From this perspective, though depending on the type of activity desired, rural areas may actually be ideal for some young people, since such areas provide ample space for exploration and engaging in individual sport activities/hiking. It must also be acknowledged that today’s youth (often referred to as Generation Z) in the Global North in particular, are extremely technologically savvy, growing up in the digital age, without having known a time when the Internet and smart devices did not exist (Nicolas, 2019). The prevalence of internet, smartphones and social media in adolescents’ daily lives is undeniable, and that may influence how the youth relates (or doesn’t) to off-line physical places and communities. However, not much research is available yet to demonstrate how and whether “traditional” or “offline” place attachment interacts with and is influenced by digitalisation

and social media for youth, although some research with other demographics suggests no relationship between smartphone use and place attachment (Amerson et al., 2019).

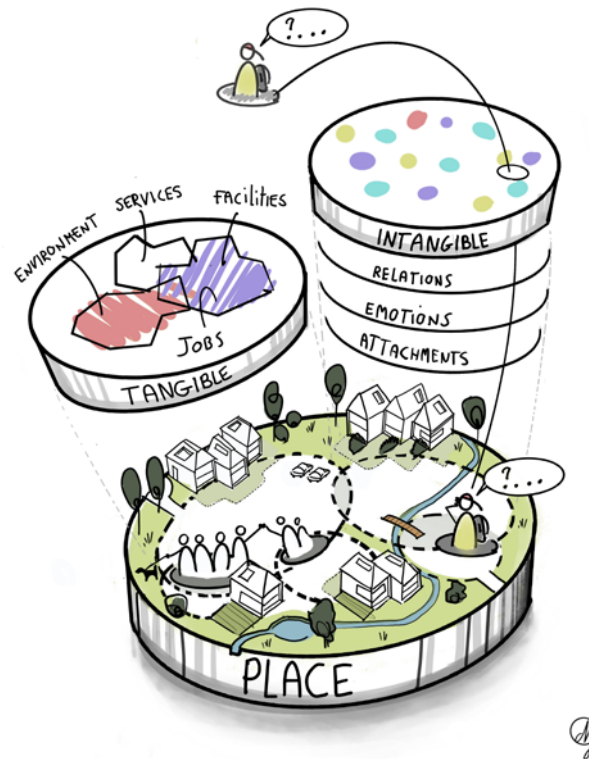


Figure 2: Liveability and youth (Source: design by Niels Grootjans).

### Youth appreciation of place and decisions to stay

When analysing the liveability of rural areas, it is important to be aware that young people might choose to live in (or leave) rural areas for various reasons (e.g., Thissen et al., 2010; Wolfe et al., 2020). In addition, as Hofstede et al. (2022a) explain, “staying rural” is not a

## Section 2: Scientific Explorations

passive phenomenon that just happens, but a process that is actively renegotiated in different life stages. Most rural young people who expect to stay exert considerable agency and make sense of their rural identity for the future (Stockdale et al., 2018).

When discussing tangible and intangible aspects of liveability for rural youth, many studies overlook how much young people actually value these aspects and how these impact on their intentions to stay. For instance, Theodori and Theodori (2015) analysed the role of community attachment for youth migration intentions, but did not reflect on the actual level of attachment the young people felt towards the community. In addition, public debates may emphasise aspects of places that young people themselves do not necessarily prioritise when making future residential plans without verifying their actual impact. For example, the housing market is emphasised as key for tackling rural liveability challenges throughout Dutch public debates (e.g., Van den Berg & Smit, 2024). However, in the study by Hofstede et al. (2022a), housing did not emerge as decisive for youth in East-Groningen with regard to their expectations to stay. It is important to note that this does not mean housing is irrelevant for liveability but that it played no significant role in youth staying expectations. Further research by Hofstede et al. (2022b) found other tangible aspects of liveability, such as employment opportunities and the availability of services and facilities, to be influential in young adults' decision to stay in East-Groningen.

Studies have shown that rural young adults highly value the rural landscape and emotional connections to the community when deciding whether to stay (Matysiak, 2018). In the context of East-Groningen, Hofstede et al. (2022b) found that the appreciation of the open sea-clay landscape, which is comparable to other coastal areas along the (Dutch) Wadden, seemed to be a key reason for young adults to wish to stay in the region. While in their study only a small share of young adults in East-Groningen appreciated their local social network, this factor did not seem to affect their expectation to stay. In other countries (e.g., rural Northern Ireland), social networks proved to play a larger role in influencing young people's

decisions to stay, while emotional bonds with family were found more influential in the context of rural Germany (Hofstede et al., 2022b). While young adult rural stayers report a high level of attachment to the familial, physical, and social elements of rural places, many view the tangible aspects of liveability, in particular the availability of local employment opportunities to match youth qualifications, as a structural constraint for stayers (Stockdale et al., 2018). Finding suitable employment can indeed be a crucial reason to commit to a place. However, it tends to result in less long-term commitment to rural areas compared to intangible aspects (e.g., Ulrich-Schad et al., 2013).

In sum, when studying youth and liveability in rural hinterlands and looking at the rural futures, it is important to not only research how different tangible and intangible aspects of liveability of a region are appreciated by the youth but also to evaluate to what extent these aspects matter in youth expectation to stay. A low appreciation of certain tangible or intangible aspects of liveability does not automatically imply that this aspect can keep youth connected to or motivate them to settle in the region.

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### 3 • Research methods

This chapter is based on data from a research project that started in 2020 and is conducted with support from the Municipality of Eemsdelta and the Stichting vo Eemsdelta (the organisation uniting most of the schools located on the Eemsdelta campus). The project runs until 2025 and consists of different phases of data collection using a variety of qualitative, quantitative and participatory research methods to evaluate the appreciation of the new campus, the satisfaction of pupils with their schools and with the liveability of the region. The main sources of data for this chapter consist of a survey and interviews.

## Section 2: Scientific Explorations

The survey was conducted in May 2022 and utilised a digital data collection approach through Qualtrics software. Employing a multi-stage sampling strategy, representative school classes were selected to cover different educational levels and school years. All pupils within the chosen classes were included in the sample, resulting in a final sample size of 364 pupils, representing 39% of the total pupil population of the two selected schools at the Eemsdelta campus. The survey occurred within the classroom setting under the supervision of teachers. Of the sampled pupils, 287 responded to the survey, resulting in a response rate of 79%. The characteristics of the sample had a gender distribution of 39% boys, 53% girls, and 8% identifying as other or opting not to disclose. In terms of educational levels, 32% of the respondents were categorised at the pre-vocational level, 50% at the pre-applied university level, and 18% at the pre-university level. The age range was 11 to 19 years with a median and average age of 15.

The survey covered various topics, from perceptions of the school campus and liveability in the region to future residential plans. Most questions were rated on a five-point scale but the survey also included open questions and questions to rank opportunities, places, and facilities.

The intangible aspects of liveability were measured with statements like “I feel at home in this area” and “I consider my region as a beautiful place to live in terms of landscape.” The tangible aspects were measured with statements like “There are enough options in my region to find a job in the sector I want to work” and “There are enough options in my region to find a house as a starter.” Future residential plans of the pupils were measured by asking “Where are you planning to reside after you are done with school?” Pupils were provided with seven fixed choices corresponding to geographical areas zooming out from Eemsdelta to other areas in the province of Groningen, to the Netherlands and finally abroad (Figure 3). Additional insights and data for all above aspects were gained from the open questions in the survey and from qualitative semi-structured interviews. In 2021 and 2022, 17 interviews were conducted. The interviewees included five pupils of the selected schools, six parents, and six local experts and

decision-makers from the schools and municipality. The interviews lasted for approximately 1 hour, were transcribed and deductively coded following the conceptual model (Figure 2).

## 4 • Findings and discussion

### Youth’s place attachment, affordances and liveability in Eemsdelta

When measuring liveability, the overall satisfaction with one’s living place is a good first indicator. Survey data indicates the majority of the respondents to be (very) satisfied. The average rating given to one’s living place was a 7.9 (10-point scale), with 30.7% considering their living place to be *excellent* (i.e., rated with a 10). Furthermore, 85% of the respondents indicated they have lived in the Eemsdelta region for 10 or more years. Pupils added statements like “I have lived here my whole life” or “I have been in this area from my birth” to the open question space a number of times, to elaborate on their residential history. Hence, the data illustrate the relatively stable residential history of the respondents and indicate that they should be well acquainted and equipped with relevant insights to evaluate the liveability in the region.

Focusing on intangible aspects of liveability, the pupils seem to have strong affective ties to the area with 73% (completely) agreeing with the statement “I feel at home in the region.” The interview data reveal some of the underlying reasons:

“I am looking out at a wide field with cows at my house and I think: if I would live in a city, I would miss this. I think I would also miss the solidarity.” (Olivia, 14)

“It’s a beautiful area because it’s all well organised and because the people are friendly.”  
(Jan, 15)

## Section 2: Scientific Explorations

Answers to the open survey question asking respondents to explain the score they gave their living place echo the interviews. Some youth indicate they highly appreciate and are emotionally connected to the physical aspects of their daily places such as the open landscape for providing peace of mind and a possibility to recharge oneself. Others emphasise the social side of a place, pointing to a feeling of togetherness and the close-knit community. For some it is a mix of the above.

Despite the overall strong feeling of home, a further analysis revealed the likelihood that a pupil (strongly) agrees with the statement “I feel at home in the region” to decrease for older respondents, with 28% for each additional year. Adolescence is a stage of becoming independent, which includes distancing from “roots” and instead looking for own new “routes.” The attachment to their childhood home may become more relevant and stronger again as people age and perhaps yearn for certain memories (Hofstede, 2024).

To get a further insight into what exactly the youth appreciate about their region, they were asked to rank six aspects (associated with liveability) which were relevant for them to enjoy living in the region. Safety was selected as the top factor by the majority, followed by facilities and quality of the housing (other aspects in the list included: sense of community; accessibility and infrastructure; clean and healthy environment). While safety was selected as a major determinant, this also emerged as a controversial topic in answers to the open survey questions and throughout the interviews. Whereas some respondents state they feel “very safe when at home” as an explanation for why they like the region, others write that “It is unsafe, a lot of shooting and stabbing” to explain their low rating. For both youth and adults, safety is also associated with the earthquake problems and the related damage and worries in the region. Better, faster and more reasonable solutions to the earthquake problems, which appropriately consider the wishes and worries of local residents, are often listed as aspects that could increase respondents’ satisfaction with the region. A parent, for instance, noted:

“There’s a lot of demolishing [of houses deemed dangerous due to earthquakes] and in our opinion it’s not necessary to such an extent and it creates a lot of unrest in the neighborhoods. In Delfzijl a lot of buildings have been demolished and they have insufficiently been replaced with new affordable housing options.”

Focusing on the pupil’s attachment to the physical aspects of the region, the majority of the respondents (59%) think their home region is a beautiful place to live in with 31% staying neutral and 10% disagreeing:

“I am quite satisfied with the area still being quite village-like. It’s not like in Groningen [city] where you only have roads and houses. You have much more space here for greenery and water. That’s a pro.” (Leon, 14)

“I feel very safe and happy when I am at home. There are also fun things to do in the area, such as a forest or basketball court.” (Femke, 16)

As the above quotes show, some pupils appreciate the physical affordances such as greenery, water and having access to a forest. However, there are also pupils (mostly older teenagers), who perceive greenery and space as insufficient qualities to fit their needs:

“There’s a lot of nature in Appingedam but there are no designated grass-fields and such to have a nice picnic and just sit with friends.” (Tania, 16)

In the affordances literature a difference is made between perceived, utilised and shaped affordances, with the latter two implying the concrete actions taken by individuals upon what is available, and affordances created or manipulated by people respectively (Kytta, 2003). From the quote above it emerges that, while the affordance of the green space is present in theory, young people may not feel the agency to shape it into one fitting their own needs.

## Section 2: Scientific Explorations

For others, the physical affordances lie not so much in what is present, but are connected to the *absence* of certain disturbances. One pupil, for instance, noted: “I live nicely near the countryside where you are not bothered by cars or other things,” while another indicated: “we have a nicely remote house, without people living on top or next to us.” In line with this, many pupils pointed to the calmness or peace they experience in the region, which they associate with distance or closeness (to other houses or settlements), similarly to Anna (14), who says:

“I live on a farm, in the countryside. It is nice and quiet here. The only downside is that I have to bike for 45 minutes to get to school.”

Echoing the above respondent, many young people appreciate the distance from others in terms of providing solitude but, at the same time, do not appreciate it when it comes to the effort they have to make for reaching certain services and facilities, including institutes for higher education.

In addition, some pupils associate peace with a level of dullness making statements like “It’s quite peaceful here, there’s not much spectacular happening.” However, at the same time most respondents appreciate their social ties in the region. The share of pupils who positively appreciate the physical characteristics of the region is higher (i.e., 66%) for pre-academic and pre-applied grades than the pre-vocational education level (i.e., 41%). Although it cannot be conclusively explained, it can be related to trend of rural areas shifting from being a place of agricultural production to a place of consumption and leisure (Horáková & Boscoboinik, 2012). Pupils in vocational schools perhaps evaluate the area in relation to its production capacity and outlook while other groups may view it more in relation to its leisure potential.

Zooming in on other affordances of Eemsdelta, 37% of our survey respondents indicate to (completely) agree with the statement “There are enough opportunities for youth to develop themselves in this municipality,” while 43% is neutral or does not express a clear opinion and

20% (completely) disagrees with the statement. The reasons to be satisfied were reflected on by an interviewee:

“Here [in Eemsdelta] I can just get on my bike and go wherever I wish. I can also get a job at an early age and have lots of space for playing sports.” (Emma, 14)

Contrasting the above, in the open survey questions and in interviews, a number of respondents is not satisfied with the affordances of the region in terms of *activities* available for youth in particular:

“It is a nice village but for youth in my age there is little to do. I hope this improves in the future and that more people will come here or stay living here” (Timothy, 15)

All adult interviewees were also rather critical about the *facilities* for young people, in particular for older teenagers. The interviewed youth worker even claims that:

“Most young people want to leave the [Eemsdelta] region because there’s simply not enough for them to do. [...] There’s enough till they are about 12 but then there’s a gap. [...] Liveability for youth here ranges from tolerable to insufficient.”

Parents view the region as not stimulating or challenging (in a positive sense) enough for the youth, and lacking in “spectacular” events or activities which they connect to pride in the region. As a positive exception, parents pointed to DelfSail, which is promoted as the largest Sailing event of the North Netherlands and among others includes arts, music and maritime markets. However, this event is only organised once every five years.

A quarter of the survey respondents (completely) disagrees with the statement “There are sufficient opportunities in the region to find a job in the sector in which I want to work,”

## Section 2: Scientific Explorations

with 39% staying neutral and 36% (completely) agreeing. These results are perhaps not surprising in light of the significant challenges that the Dutch Wadden hinterlands face in maintaining jobs, services and well-being for youth in particular (CBS, 2022). Looking at the personal characteristics of the survey respondents in relation to their appreciation of this tangible aspect of liveability, the evaluation of job opportunities in the region is highest among pupils preparing for (applied) university studies with 37.1% of them having a positive evaluation. Only 25.7% of pupils in pre-vocational education are positive about the labor market in Eemsdelta. It's possible that pupils in pre-academic tracks have a more positive outlook on their future career opportunities in general and also appreciate the presence of many higher education jobs in the Eemsdelta port area in particular. During his interview, the project director of Campus Eemsdelta emphasised that due to demographic trends in the area the labor market is in fact changing, pointing out that “because of the ageing population in this region there will be a lot of new jobs available. Also for highly educated people.”

Young people are rather pessimistic about their prospects in relation to other tangible aspects of liveability, such as finding housing in the region. Almost a third (30%) (completely) disagrees with the statement “There is enough housing for ‘starters’ in the region,” with 44% staying neutral and 26% (completely) agreeing. Such concerns are shared by the interviewed experts and parents. A youth worker expressed:

“As a young person you actually can't stay living here. There are too few houses or the houses are too expensive or not available. [...] So the youth don't want to stay but they couldn't stay either [even if they wanted to].”

Some are afraid that due to demolishing older buildings and replacing these with more durable – but also more expensive – earthquake proof buildings, there will be no affordable houses in the region left for youth. At the same time, the ranking question above indicated that the quality of the housing is relatively important for youth in order to enjoy living in the region.

### Future residential plans of Eemsdelta youth after high school

Our survey findings indicate that more than 60% of the respondents intend to live in one of the northern provinces of the Netherlands after completing high school. About a third aims to remain in Eemsdelta, while almost a quarter plans to reside in the city of Groningen, which serves as a crucial (secondary vocational and tertiary) educational centre for youth in the area (Figure 3). In addition, the city of Groningen generates 56% of the employment of the province Groningen with the academic hospital, the University of Groningen, the national education executive agency (DUO), natural gas companies, and other private and public service jobs as major contributors (Provincie Groningen, 2023).



Figure 3. Future plans of Eemsdelta youth, total numbers (Source: Geodienst, University of Groningen).

## Section 2: Scientific Explorations

Looking at the personal characteristics of the respondents, the survey reveals that pupils nearing the end of their secondary school are more likely to consider living farther from Eemsdelta compared to their peers at the start of their secondary education. This is not surprising since plans tend to become clearer towards the end of the secondary education trajectory, when pupils need to decide on their study (or career) paths. Interestingly, the likelihood of planning to reside outside of the Eemsdelta municipality did not vary based on pupils' educational level. This contrasts with the dominant assumption that more academically inclined pupils are the ones who typically leave their rural home areas (e.g., Demi et al., 2009). Our interviews further illustrate that moving for educational ambitions is not limited to those pursuing academic studies only. A respondent (male, 13) explained he was planning to relocate to another part of the Netherlands to pursue his dream of studying to become a train driver.

While pupils' educational level did not play such a significant role as expected, gender on the other hand appeared to be an important determinant for explaining pupils' residential plans in relation to the distance from Eemsdelta. The findings illustrate that boys are more inclined to stay in Eemsdelta, with the share of pupils planning to stay in Eemsdelta being 21% higher for boys than for girls. Girls show a stronger tendency to opt for locations elsewhere in the Netherlands. This gender difference still holds when controlling for other personal characteristics and the extent to which the respondents appreciate the tangible and intangible aspects in Eemsdelta. One possible explanation for this finding is that girls tend to reach "mental adulthood" earlier than boys (Klimstra et al., 2010), leading them to seek opportunities outside the region and desiring greater independence already before reaching the final years of their secondary education. The findings could furthermore be explained by girls being more willing to move farther away for specific desired studies. In addition, the rural labor market, which traditionally offers more opportunities for men, as well as the masculine culture associated with "the rural" could contribute to the boys seeing their future more likely connected to their rural home region. A study on the migration intentions of

adolescents on the Dutch Wadden islands witnessed “island-girls” perceiving their local communities as male oriented (Van Iwaarden, 2023). Researching rural youth in Sweden, Forsberg (2019, p. 328) explains similar tendencies, stating that “[g]irls, to a greater degree than the boys, continue to higher education straight after graduation. This is sometimes partly explained by men feeling more ‘at home’ in forest communities in Northern Sweden where there is a traditional male dominating culture.”

While a large share of respondents plans to move to the city of Groningen, we found no statistically significant difference (sign. > 0,05) between boys and girls intending to move there. A potential interpretation could be that for the girls, this buzzing, student and international city fulfils the requirements for independence and a sufficient contrast with their rural homes, while for the boys Groningen is viewed as close enough to the home region and familiar context, while offering a good variety of study programs. The interviews and answers to the open survey questions illustrated a number of pupils being open or happy to reside outside Eemsdelta provided their family remained within reach.

The influence of gender on residential plans can vary depending on age and geographical context. For instance, research by Thissen et al. (2010) found no significant gender effect on the residential expectations of youth (age 13-21) in a different region in the Northern Netherlands. Similarly, in the research by Hofstede et al. (2022b), focusing on the northeast of the province of Groningen, gender was not found to influence young adults’ (age 18-30) expectations to stay. Looking at our results, when considering the rather young age of our respondents (i.e., 11-18), it is possible that the role of gender may diminish once the young people get older and the boys “catch up” with the girls in terms of maturity. A bit later in life this trend might even be reversed, as Haartsen and Thissen (2014), focusing on young adult females (age 18-30), found that this group may conversely be more inclined to stay in rural areas than their male counterparts. Such inclination was explained with women’s stronger commitment to local projects and relationships (cf. Fischer and Malmberg, 2001).

### Liveability and future plans

A multiple regression analysis shows that the evaluation of both tangible and intangible aspects of liveability did not matter in predicting whether pupils plan to stay in Eemsdelta or not. Our data show that a high level of feeling at home and appreciating the environmental features of an area is neither a guarantee that pupils will stay in Eemsdelta after finishing school, nor is a low level of place attachment a potential cause for leaving. It could be that intangible aspects are not perceived as crucial for youth at this age. They may become more important for staying (or returning) at a later age as indicated by Hofstede et al. (2022b). In their study, focusing on young adults aged 18-30, the intangible aspects did seem to be central in young people's decision to stay in a rural municipality adjacent to Eemsdelta.

Youth's perception of the housing market illustrates the importance to differentiate between the level of appreciation of individual aspects of liveability and the actual role these play in residential plans. Although only 26% of the respondents have a high appreciation of housing opportunities in the Eemsdelta region, the multiple regression analysis showed that housing opportunities have no influence on pupils' future residential plans. Pupils recognised housing market challenges as a nationwide problem and some even felt that their region was still comparatively affordable.

The housing market in Eemsdelta is statistically indeed less tight than elsewhere in the Netherlands (ABF Research, 2024). The difference in house prices can be (partly) explained by the earthquake issues in Eemsdelta (De Kam & Hol, 2024). However, this contrasts with the perception and worries that were expressed by the interviewed parents and experts about youth being unable to find suitable housing in the region, as well as with the large share of pupils being pessimistic about their opportunities on the local housing market.

Similarly to housing, the multiple regression analysis showed that employment opportunities have no influence on pupils' future residential plans to stay in Eemsdelta. Nevertheless, the picture changes when we analyze the expectancy to stay in the province of Groningen and the

Northern Netherlands in general. Especially pupils from the age of 15 view the regional labor market positively (being driven perhaps by closeness to the city of Groningen) and they are also more likely to stay in or close to their home region, compared to those who do not share the same positive regional labor market appreciation. Other aspects remained insignificant for staying at the scale of the province and the Northern Netherlands.

Further analysis of the role of the labor market revealed relevant differences between boys and girls. Boys’ residential plans to stay or leave the region or Northern Netherlands are not affected by their appreciation of the labor market. Girls show similar results for Eemsdelta municipality but differ when it comes to staying in the Northern Netherlands. Girls who view the Eemsdelta labor market negatively are 3.5 times more likely to plan to leave the Northern Netherlands compared to girls with a positive view of the regional labor market. The gender effect holds when controlling for the level of education to ensure it is not the overrepresentation of pre-academic education that plays a role. Thus, the appreciation of the labor market could explain why girls are more inclined to plan to reside in a location outside Northern Netherlands. This is in line with the finding by Van Iwaarden (2023) who observed that future labor market opportunities play a key role in shaping migration intentions on Dutch Wadden islands, in particular for girls.

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## 5 • Conclusions

In this chapter we explored how young people in rural mainland communities of the Wadden experience living in this area of outstanding universal value. How do they relate to their daily meaningful places, evaluate the liveability of their home-region and envision their future? In our study, we focused on the municipality Eemsdelta in the Netherlands and on young people in the age group 11-18 years. We termed our focus region “the Wadden hinterlands” – hinting

## Section 2: Scientific Explorations

at the dominant perception of the small rural communities and municipalities on the mainland coasts of the Wadden Sea as less popular areas (Bijker et al., 2012). Population decline, ageing and an associated decline in liveability in terms of the availability of facilities and services is expected in the majority of the (Dutch) Wadden hinterlands (Wadden Academy, 2021). In light of this, attracting young people to stay, return, or move to the region is of high importance and the newly opened Campus Eemsdelta Groningen is promoted and embraced as a key accelerator in this respect.

Our findings show that the majority of the young people are (very) satisfied with their living place and have strong affective ties to the region. Various tangible and intangible aspects contribute to the youth's experienced liveability, though different respondents emphasise different aspects regarding what they value most. The open sea-clay landscape typical across the mainland coast of the three Wadden, is considered beautiful and praised for offering peace of mind and an opportunity to recharge. At the same time, the large distances resulting from the settlement pattern are dreaded for the effort it takes to reach certain services and facilities or they lead to a characterisation of the region as being “dull.” Our results illustrate that the majority of respondents aim to remain in the northern Netherlands after finishing school, with about a third choosing to stay in Eemsdelta. The pupils nearing the end of their high school seem more likely to consider living farther away from Eemsdelta. No differences were found with regard to pupils' educational level, but gender did appear to be an important determinant for explaining pupils' residential plans, with boys being more inclined to stay in Eemsdelta.

Our findings highlight the importance to not only inquire into the level of appreciation of aspects related to liveability but also evaluate the actual role these play in youth residential plans. For instance, we show that a positive evaluation of the *local* labor market does not imply the youth will stay in Eemsdelta. Investing in the broader *regional* labor market (in the case of our research, with a focus on the two Dutch Wadden provinces more broadly) seems

more promising, particularly for providing more prospects for girls to stay or return to the region. Combining this with a better understanding of the types of tertiary education that attract girls to other parts of the country and, subsequently, advocating for the availability of comparable studies closer by could be good first steps. Research elsewhere indicates educational facilities in general to be of greatest importance for (young) people to either stay in or come back to the rural region they grew up in (Tent et al., 2024). In addition to considering the preferences of (young) people, Wadden Academy (2021) argues that work and income in the Wadden Sea region need to suit the region, i.e., activities should not harm the natural values of the World Heritage Site and ensure that the landscape remains attractive for residents and tourists. Further research is needed to explore what specific economic activities could fulfill both – match (young) people’s knowledge, wishes and experience while having a low impact on the ecosystem, thereby creating more targeted and appealing “Wadden jobs” (Wadden Academy, 2021). The new school campus has a lot of potential in this respect, with the connections it attempts to make (visible) between the businesses and young people and between the higher education and secondary education available in the region at a very early age, while promoting sustainability and circularity.

Having said that, it also needs to be acknowledged that it can be challenging for local decision-makers to play into the future plans of youth. Future plans of youth tend to be ever-dynamic as the Wadden landscape itself, as the following well illustrates:

“Sometimes you wake up and think: you know, I will become a lawyer [advocaat]. Next it’s: no, an architect. Something with an ‘a’ I think. I will just follow the alphabet, tomorrow I will become a farmer [boerin].” (Emma, 14)

Staying in contact with youth that have left via, e.g., social media or targeted events and activities which emphasise regional belonging, identity and pride, may be a further influential strategy for the Wadden hinterlands to connect, captivate and stimulate the return of youth.

## Section 2: Scientific Explorations

Research in coastal rural Denmark illustrates that when municipalities stay in contact with youth that have left, it can increase the chances of youth returning to reside in their home region (Mærsk, 2022). Research on return migration underlines that growing up in a specific region is an important predictor of the return of youth to their rural home region after the completion of their studies elsewhere (Mærsk, 2022; Rérat, 2014). According to Mærsk (2022, p. 183), return intentions are influenced by “everyday practices of staying in touch, feelings of belonging and perceptions of job possibilities, all of which the rural municipality can stimulate through various events and communication strategies.” What the above furthermore illustrates is the relevance of drawing more on the trilateral collaboration and innovative perspectives across the three Wadden Sea countries to learn lessons, not only in the realm of nature conservation but also for socio-economic development and well-being for communities in the Wadden hinterlands. In addition to the Wadden Sea Heritage Site being a good practice example of transboundary cooperation in nature conservation, the trilateral unity might eventually extend to the “Waddenland” communities (Schroor, 2018), to better inform decision-making, that in addition to cultural heritage would also keep the future generations in mind. With the TriWadWalks, a promising start was made to listen to and learn from diverse *local* stakeholders and actors in this region of outstanding *global* value in order to arrive at a fuller, cross-disciplinary understanding of the potentials and challenges of this place, which most young people in our research considered of outstanding value as their home. Young people are an essential and valuable part of any community, including the Wadden communities, often possessing unique insights and skills that can help address challenges and solve problems within their daily contexts and beyond, to shape future places that are intergenerationally and socio-politically (more) inclusive and perhaps resilient. It is therefore crucial to better listen to young people’s voices and to engage in “blending perspectives” (Menke et al., 2022, p. 11) with youth, as the (future) agents of socio-ecological transformation in the Wadden Sea.

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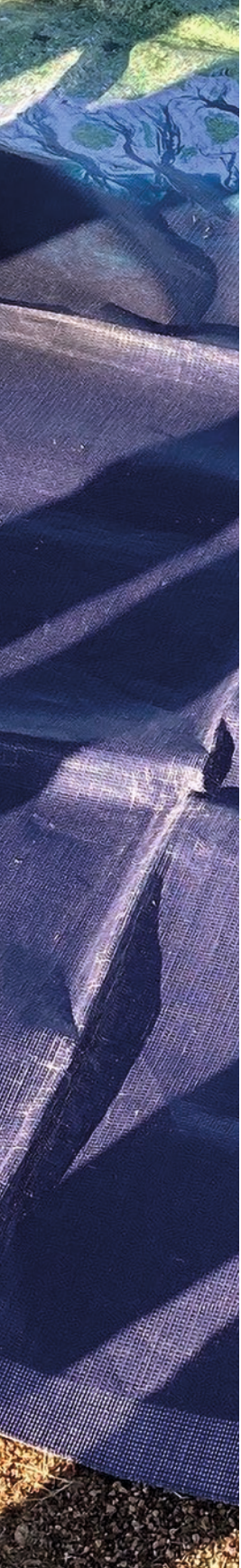
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## Chapter 10

# *Sustainable tourism in the trilateral Wadden area: A pondering exploration of complexities and – perhaps – a glimpse of a more sustainable society*

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### 1. Introduction

The TriWadWalks were both a scientific and a touristic experience. When the group travelled the Wadden landscape they naturally enjoyed it – as they would as tourists. Similar to regular tourists they were in awe of the spaciousness, the dunes and the beaches, the birds and the skies, biking and walking; they delighted in it. But since they were all also scientists and university students, they were also looking below the surface. They were thinking about the social fabric of the area, visiting entrepreneurs and schools, sharing knowledge among each other about background socio-economic and natural and geographical

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processes and about sustainable development as a key interest. The current chapter is a reflection of that double-sided scientist-tourist experience.

To give structure to the thoughts of the author on sustainable tourism during the TriWadWalks, this chapter explores the Sustainable TALC framework. The Sustainable TALC framework was developed in earlier work by the author. The exploration of the TriWadWalks experience with the Sustainable TALC in this chapter is not systematic since the TriWadWalks were empirically not of that character. The Sustainable TALC framework here acts as a sounding board, as a way of structuring the manifold thoughts based on personal experiences and background that arose during the trip and related to sustainable tourism.

### **The Wadden Sea Region and sustainable tourism**

The international Wadden Sea Region in which the TriWadWalks took place spans across three countries: the Netherlands, Germany and Denmark (see Figure 2 and 3 on page 18 and 19). Large parts of the Wadden Sea Region have been designated as World Heritage site because of their natural qualities. Tourism on the inhabited islands, i.e., on the five Dutch, 13 German and three Danish inhabited islands of this international Wadden Sea Region, is well-developed with yearly millions of visiting tourists (Yarar et al, 2022). The Wadden Islands, also called the Frisian Islands, shield the mudflat region of the Wadden Sea from the North Sea. Large parts of the Wadden Sea fall dry during low tide. The shallow Wadden Sea itself is popular for recreational boating activities. The basis for the success of this tourism area is its natural attractiveness: the Wadden Islands with their sandy dunes and beaches, the open space, the Wadden Sea and wetlands with its many birds and seals, the clean air and the peace and quiet which can be found (Sijtsma et al., 2012; Sijtsma et al., 2019). However, the Wadden Sea Region – in contrast to the largely sea-focused World Heritage site – also comprises a mainland area. Tourism development is quite unequal here in space. Generally, tourism along the mainland coast is far less developed in the Netherlands and Denmark than on the islands, but especially in Germany, several well-developed exceptions to this rule occur, also experienced during the TriWadWalks.

While there is no trilateral sustainable tourism policy across the Wadden Sea Region, there are several elements of tourism policies in place that strive towards sustainable tourism. For instance, in the Netherlands there are active – local – policies to not increase the number of beds on the Wadden islands. Furthermore, several parts of the Wadden area fall under Natura 2000 protection, safeguarding the ecological quality of a major asset that tourism thrives on. Trilaterally, and less solid from a policy perspective, there are also some ideas about sustainable tourism.<sup>21</sup> Importantly, within the Wadden Sea Region tourism is not the only economic activity. The region also hosts fisheries, (intensive) agriculture, mining of natural gas, energy power plants and wind farms, industrial activities like car assembly and car distribution sites and intensive maritime transport and logistics serving the urban hinterland along with various services. Each of these sectors and activities face sustainability challenges and also here many policies are in place which somehow try to reach a more sustainable development of the trilateral Wadden Sea Region (Common Wadden Sea Secretariat, 2014, 2023).

Despite some policy commitment to sustainable tourism development in the Wadden Sea Region, realisation in practice faces many complexities. This chapter ponders over the complexities to reach sustainable tourism development in the Wadden Sea Region, against the background of designing effective policies and governance structures (Kamann et al., 1998; Runhaar et al., 2016; Vezzoni et al., 2023). The author in earlier work (Hartman & Sijtsma, 2018; Sijtsma et al., 2015) developed a theoretical framework for sustainable tourism. It integrates the tourism area life cycle (TALC) developed by Butler (1980) with more recent findings from the TALC and sustainability and sustainable tourism literature in later years (Agarwal, 1997; Baum, 1998; Butler, 1999, 2006a, 2006b, 2024; Oreja Rodríguez et al., 2008). The framework is called the “Sustainable-TALC.” The framework is a conceptual operationalisation of sustainable nature-based tourism. It makes explicit that sustainable tourism is about a longer-term balance of visitor numbers, valuable visitor experiences, the quality of the surrounding nature and landscape, and the contributions of tourism to the liveability and

<sup>21</sup> [www.waddensea-worldheritage.org/sustainable-tourism-strategy](http://www.waddensea-worldheritage.org/sustainable-tourism-strategy)

economy of the hosting local community. This can only come about if there is some degree of policy consensus within the tourism sector but also within broader multi-sector and multi-level governance that affects tourism. Firstly, the Sustainable TALC framework is introduced. Subsequently, the experiences and thoughts of the author during the TriWadWalks are explored using the framework for structuring. The chapter ends with a short conclusion.

### 2. The Sustainable TALC framework

The Sustainable TALC (S-TALK) framework, like the original TALC framework, is mainly conceptual, while referring explicitly to empirical and operational aspects of tourism. The S-TALC starts from the TALC framework introduced in Butler's 1980 seminal paper. In the TALC the two axes, visitors and time, are central. In this two-axis framework, five evolutionary stages for a tourism area are defined as exploration, involvement, development, consolidation, and stagnation. The 1980 paper has some 10,000 citations in Google Scholar (mid-2024) and despite the obvious simplicity of the framework remains fairly robust and widely used in tourism worldwide (Agarwal, 1997; Baum, 1998; Butler, 2006a, 2006b, 2024; Getz, 1992; Gore et al., 2022; León et al., 2007). Butler in his original paper paid attention to carrying capacity. According to Butler, reaching critical levels in carrying capacity causes an area to first stagnate and later decline. Butler (1980) writes:

Eventually, however, the rate of increase in visitor numbers will decline as levels of carrying capacity are reached. These may be identified in terms of environmental factors (e.g. land scarcity, water quality, air quality), of physical plant (e.g. transportation, accommodation, other services), or of social factors (e.g. crowding, resentment by the local population). As the attractiveness of the area declines (...), because of overuse and the impacts of visitors, the actual number of visitors may also eventually decline. (p. 6)

The S-TALC framework can be seen as a simplified attempt to make these carrying capacity levels more explicit. In Figure 1 a refined framework is shown that makes explicit different critical sustainability and carrying capacity levels: the ‘S-TALC’ framework (see Hartman & Sijtsma, 2018; Sijtsma et al., 2015).

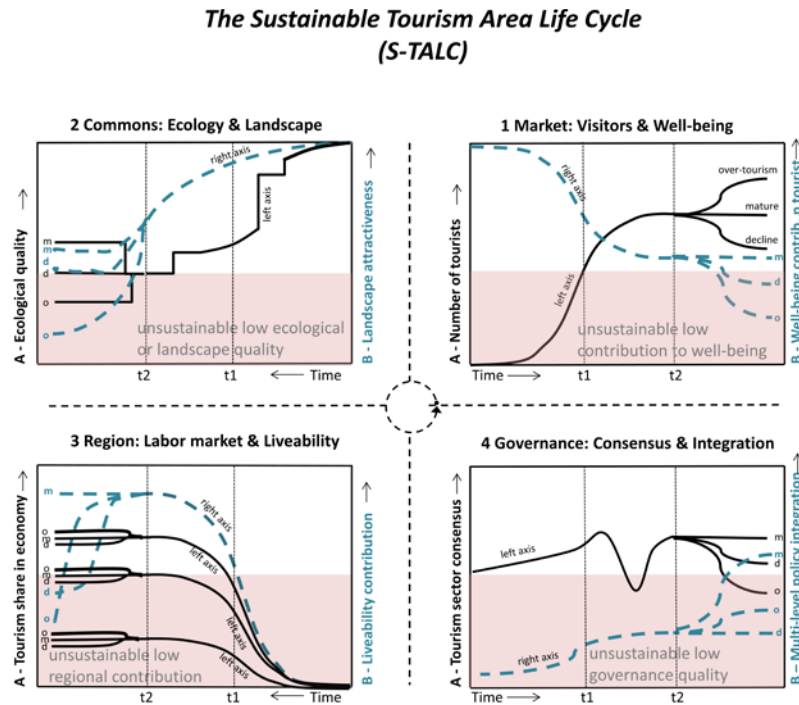


Figure 1. Sustainable Tourism Area Life Cycle (S-TALC) with its four quadrants and perspectives: Market, Commons, Region, Governance (Source: the author).

The S-TALC is conceptual but also a – potential – measurement and monitoring framework. It has four perspectives in four quadrants (numbered anticlockwise according to the mathematical habit): 1 Market: Number of visitors and Visitors’ well-being; 2 Commons: Ecology and

## Section 2: Scientific Explorations

Landscape; 3 Region: Labour Market and Liveability, and 4 Governance: Consensus and Integration. Within every perspective two key performance indicators are shown along with their possible movement over time. In the four perspectives critical unsustainability zones are highlighted. The four quadrants share a common time x-axis but have different and double y-axes (A&B), highlighting a total of eight variables and their possible development. The developments sketched in the different quadrants can be seen as default developments; they seem to hold general logic in timing and growth and decline in relation to the basic TALC visitor number curve of quadrant 1. The four quadrants are described in more detail below.

The first quadrant takes *the Market perspective*, and measures Number of tourists and the Well-being contribution. Thus, the figure not only shows the number of tourists (IA) as was the core of Butler's original TALC, but also the contribution a tourist area makes to the well-being of the tourists (IB). This well-being may refer to manifold aspects of well-being, but – especially relevant for the quest for sustainable development – it may also reflect an increased importance of the search for meaningful and authentic experiences related to the site visited (Bryman, 1999; Wang, 1999). It should be noted however that within the S-TALC the original TALC curve has also been slightly adapted. It takes mature tourism development as its anchor point for sustainable development and this mature development will continuously include rejuvenation and decline; going substantially above this mature state is here defined as over-tourism, leading to a decline in the authentic contribution to well-being.

The second quadrant shows *the Commons perspective*, measuring Ecology & Landscape quality. Clearly this is relevant to the Wadden area, which attracts visitors because of its natural and landscape capital. The second quadrant measures the ecological quality of the area on the left-hand y-axis (2A). In the Wadden area numerous nature protection schemes have been in place for a long time. Several monitoring variables may serve here, and these may be aggregated to a single variable – biodiversity points or ecological weighted hectares – too (e.g., Bos & Ruijs, 2021; Sijtsma, van der Heide, et al., 2013; Sijtsma et al., 2020). Regardless of the particular

indicator chosen, clearly for a nature-based tourism area it is essential to safeguard its ecological capital (León et al., 2007); while it is also clear that the development over time need not follow the smooth shape of the TALC curve. The Commons perspective has a second y-axis, showing the landscape attractiveness of the area to visitors (2B). Different units of measurement may be applied here, for instance the hotspot index (De Vries et al., 2013; Sijtsma, Farjon, et al., 2013; Sijtsma et al., 2017). Obviously, in the early stages of tourism the impact of tourism may be small on both axes but serious ecological and landscape damage may occur due to growth of tourism. Interestingly, if environmental limits are safeguarded, as in large parts of the Wadden area, then the mature development stage of the area may be long. Already in his original life cycle paper, Butler mentions those areas “in which the development is kept within predetermined capacity limits” (1980, p. 11; Butler 2006a, 2006b), may experience very long periods of continued attractiveness. Furthermore, “in the case of the truly unique area, could one anticipate an almost timeless attractiveness,” and “many established tourist areas [...] attract visitors who have spent their vacations in these areas for several decades and the preferences of these repeat visitors show little sign of changing” (Butler, 1980, p.8).

The third quadrant takes *the (hosting) Region perspective* focussing on Labour market & Liveability. It shows as indicators the development of tourism employment as a share in the regional economy as well as the contribution tourism makes to liveability. Employment, its development, and size are important variables from a regional labour market perspective, but here the tourism share in the regional economy is the key variable (3A). Tourism development cannot be taken for granted over time (the main point of the original TALC framework), and continuous policy support is needed (Hovinen, 2002). Having a substantial share in the economy can be seen as a prerequisite for such support and thus for effective policy-making and acquiring sufficient (public) investment. But mere growth of tourism is not sufficient to make the share in the economy substantial: this depends primarily on the size of the hosting economy. This explains why the curve for employment share shows three different curves after

## Section 2: Scientific Explorations

the starting phase: in the first the hosting economy is big and tourism, despite growth, has a small and a critically low part of the total economy. The highest curve shows a situation where tourism is able to reach a substantial share in the regional economy; the most sustainable situation in the sense that it will assure prolonged policy commitment and the (relatively) largest contribution to the region via the labour market. In between lies the curve just on the edge of a critically low share in regional employment.

The contribution of tourism to the liveability of the tourism area is also a key aspect to achieve sustainable development (3B) (Dwyer, 2023). The curve for liveability here largely resembles the TALC curve shape of the first quadrant. Tourism impinges on the local culture and interacts in many ways with the local inhabitants. Tourism can have a very positive influence, but areas of tension can arise too. As is well-known, in highly developed stages of a tourism area huge tensions can arise between tourism and local liveability (e.g., in Venice and Amsterdam) (Seraphin et al., 2018). Such a situation may for instance drive up housing prices, making houses unaffordable for locals. Liveability is also strongly linked to a sense of community. Rural areas and islands in particular are known for their strong communities (Royle, 2014). While a community spirit is attractive for tourism, that same spirit may also be at peril through – too large-scale – tourism development.

Lastly, the fourth quadrant sets out *the Governance perspective*. The key indicator on the left axis is consensus about the direction of tourism development (4A). Obviously not everybody has to speak and hold visions as if they were one, but without a reasonable amount of consensus among tourism stakeholders (i.e., entrepreneurs, public policy makers, and NGOs) about the direction that tourism development should take, the chances of positive development decrease (Baum, 1998; Butler, 2024; Sijtsma et al., 2015). A second key aspect of effective tourism policy is the integration of several levels of policy and governance, from global (actors) to local (actors), and from domain to domain (4B). Sustainable tourism development may be strongly

dependent on the domain of general labour market policy or general educational policies, but the challenge is how to make different domains work together.

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### 3 • The pondering exploration of sustainable tourism using the S-TALC framework and the TriWadWalks

#### The market perspective

During the TriWadWalks the realism and urgency of explicitly adding the second curve of the Well-being contribution was very clear. The group visited very attractive places on the mainland like Upleward in the German Krumnhörn, Ezinge in the Dutch Middag-Humsterland and Tønder in Denmark and sailed the Wadden Sea with its spectacular views on different ferries. Yet the enchantment was perhaps clearest on the beaches. Whether it was on Borkum, Schiermonnikoog, Sylt, or Rømø – invariably coming to the island beaches gave a sense of lightness and liberation (see Figure 2). It is amazing how simple and fulfilling life can become at the beach. Earlier work by the author wrote about the “deep feelings” that the shallow Wadden Sea Region evoked in its visitors (Sijtsma et al., 2012, p. 147), such as: “I’ve experienced a lot of freedom in an overwhelming nature” and “I always feel like I can finally breathe and I actually do; frequently and deeply!!” In a later, more systematic analysis using Maslow’s pyramid of needs and text analysis (Davis et al., 2016), it was confirmed that among all appreciated nature in the Netherlands, the Wadden Sea Region is extremely high in the extent and breadth of the emotions it triggers. In line with this it was telling that during one of the reflective team sessions one TriWadWalks group member said: “There is real heaven.”



Figure 2: The beach and sea at Schiermonnikoog with a TriWadWalks team member in the waves  
(Source: photo by author).

One could argue that the large visitor numbers to the Wadden Sea Region shows that many long for and appreciate the simple life with its fulfilling character. Interestingly enough the informal talks during the TriWadWalks suggested that to several team members living in a very simple way was also in other ways an inspiration or goal. One team member had practiced sleeping outside without a tent, another often took extremely long bicycle rides with her father, and many in the team preferred meeting outside since “in nature we can better connect.” This might be more important than is often acknowledged or visible in current-day

urbanised society. Earlier research by the author (Sijtsma et al., 2012) showed that lack of green space in cities triggers holiday nights to greener places and second homes outside the city. However, this type of analysis still has the flavour that the agglomerative activities connected to urban life are the ultimate priority and the holidays or recreation are necessary “pressure releases” to this. The TriWadWalks gave rise to the thought that the causality could eventually be turned around. It might be that being in areas like the Wadden Sea Region is to people the more ultimate aim, the more fulfilling higher need (Roncken, 2018). Interestingly, this simple and deeply nature-connected life is something that is lived in the current day and age by indigenous people as (Kimmerer, 2013; Krenak, 2023). Taking our TriWadWalk thoughts further in a bold way, one could then argue that the western society has come full circle. Society has developed from a very simple nature-related lifestyle in the distant past to a modern urban lifestyle but now shows – at least through its recreational and nature-based touristic behaviour – a clear longing to something simple and nature-related again.

Less bold and more related to the S-TALC framework, our experiences and thoughts underline that adding the monitoring of the contribution to (higher) well-being is valid and giving it proper importance beyond mere visitor numbers is key. Especially when visiting Sylt, much was said about over-tourism. Over-tourism is often discussed in terms of an extremely high number of tourists, and subsequent gentrification, i.e., of the tourism experience and housing on Sylt being less and less affordable to many people, which brings us to the liveability perspective of quadrant 3.

### **The commons perspective**

During the TriWadWalks the nature and landscape quality dimensions in S-TALC were clearly experienced. One can wonder about the relationship between the two (Sijtsma et al., 2016). During the TriWadWalks it showed that for many team members landscape attractiveness is more accessible to experience than nature or biodiversity, while the formal protection of nature and biodiversity is much more developed and stronger. For several members of the team,

## Section 2: Scientific Explorations

nature and biodiversity needed some expert guidance to be fully appreciated. While anyone in the team could see flocks of birds and could enjoy the mere sounds of birds, experiences open with some guidance. The group engaged in a birdwatching activity at the Rantum Basin on Sylt and learned to spot bird life there. At Lauwersoog the group was introduced to the protection intricacies of birds on the Wadden mainland coast. The group walked part of the mudflats on Sylt while one the students showed different shells and taught the others about the micro-ecosystem of shells, worms and the birds that depend on them (see Figure 3).



Figure 3: Guided by an expert student some TriWadWalks team members learn about the intricacies of nature in the Wadden soil (Source: photo by author).

Although biodiversity knowledge of an area may be the privilege of a few and landscape appreciation may be widely experienced by many, research shows that areas with high landscape appreciation and high biodiversity overlap considerably (Davis et al., 2016). But considerably is not fully, and therefore the TriWadWalks experiences confirm that the two aspects require separate consideration in the S-TALC framework.

Furthermore, landscape quality is not given strong protection like biodiversity. During the TriWadWalks quite some infringements upon landscape quality were witnessed. Recent years have seen the growth of large wind farms either in the Wadden mainland or at the North Sea in sight of the Wadden islands. While travelling the landscape this was prominently visible in Delfzijl and Eemshaven, but also in the German and Danish National Parks. Among the TriWadWalks team it was a continuous subject of discussion – also because in the Danish part of the mainland Wadden at that time, there was the threat of putting up a testing site for 450 meters tall ocean wind turbines.

At night, darkness is also one of the key landscape qualities of the Wadden, also for tourists. Astronomers at the telescope site in Lauwersmeer in the Netherlands told the TriWadWalks group that the clear vision of the dark sky is increasingly being polluted by the ever-growing number of satellites in the sky (among others by the TESLA Starlink satellites, now some 6,000 low orbit satellites aiming to grow to some 30,000). They even expect that around 2050 it will not be able to do much serious star observation anymore due to the darkness-disturbing satellites. Technically it seems to be possible to build less light polluting satellites but thus far there is little attention for this issue and the governance of dark skies. All this clearly shows the relevance of assessing both biodiversity *and* landscape quality for sustainable tourism, and the accumulated pressures on the Wadden Sea nature and landscape quality.

### The regional perspective

The experience in the TriWadWalks showed stark differences between the mainland and islands as to the tourism share of the economy. In general tourism is much less developed on the mainland. But on the German East Frisian mainland, for example Norden, the starting point of the TriWadWalks trip, is a notable exception in the trilateral area. It has a long history of wellness and health tourism and a substantial share in the economy. In the Dutch and Danish parts of the mainland this is generally quite different. In the small and picturesque Danish town of Højer, relatively large investments were made in liveability, cultural heritage and touristic attractiveness through public-private partnerships. The group encountered schools in Appingedam where large investments were needed for earthquake damage prevention caused by gas extraction.



Figure 4: The TriWadWalks team looking at the large-scale investment in education facilities at Appingedam in the Netherlands (Source: photo by TriWadWalks team).

As to liveability, the group experienced that tourism can contribute or jeopardise several aspects of a sense of community. To a liveable community, viable education, health care and affordable housing are key. Scale matters: generally, a sufficiently large scale is needed to deliver quality at acceptable costs. The TriWadWalks confirmed what is well-known within the small island communities (Rømø some 600 people, Schiermonnikoog some 1000 inhabitants): maintaining primary and secondary education is a key vulnerability. Without such education or without good enough quality, the community is simply under threat. And so, then, is tourism! If the families that organise tourism no longer want to live in the place because of low quality education or health care, the local community falls apart. But at the mainland scale-and-quality in education is an issue as well, as was visible in the new school that was being built in Appingedam combining various types of schools at different levels in one building, creating economies of scale.

### **The governance perspective**

The relevance of governance aspects was prominent during the TriWadWalks. The tourism entrepreneurs encountered during the TriWadWalks and the initiatives discussed seemed to be quite sensitive to the community and physical environment. Increasing the number of tourists may be an issue for mainland Wadden tourism, but even there the search seems to be for relatively small-scale activities. One initiative even aimed for regenerative tourism; tourism making a positive contribution to the Wadden area (see Chapter 13). The group experienced this firsthand, with for instance, healthy breakfasts with carefully chosen local produce and home-baked bread, with yoga rooms and high-quality hike and bike routes, with the subtle and powerful marketing effort of “iconic places” at Borkum, and many more. In light of this, the biggest challenge for tourism seems to be gentrification: how affordable can tourism remain for all income levels? In earlier work by the author, it was found that house prices per square meter on Sylt are comparable to outer London and outer Paris (Sijtsma et al., 2014), underlining that the pressure on house prices is huge. A case in point was the stay at the Sylt camping site where one could clearly witness a slow but steady movement towards a

## Section 2: Scientific Explorations

“glamping” site, with only few ordinary tents and more and more luxury tents and cottages. The high(er) quality consensus caters for economic viability without growth in tourist numbers, but the affordability to lower income people may suffer. During the TriWadWalks the complexities and harsh reality showed tourism being (only) one sector, (only) one activity within the whole spectrum of sectors, activities and multilevel governance perspectives.



Figure 5: The RWE coal fuelled power plant at Eemshaven (Source: photo by author).

The ferry to Borkum passes the RWE Eemshaven Centrale, a 3 billion Euro, coal-fuelled power plant that has provided millions of Dutch households with electricity since 2014. Already at

the start it was clear that CO<sub>2</sub> emissions coming from the plant made it less sustainable. The Borkum tourism industry protested heavily because of potential health effects of the air pollution, the visual landscape impact, and overall impact on the image of the island and the region. It is remarkable how the Dutch central government, in recent attempts to reduce the Dutch CO<sub>2</sub> emissions by 5%, have initiated negotiations to compensate RWE for closing the facility! National and international energy policy is influential in the region. During the Borkum visit, the group learned that one of the leading political parties of Germany held a high-level meeting at the island to prepare Borkum for an upcoming decision to allow natural gas extraction north of the island in the North Sea following the European Union's sanctions on Russia. This would again cause visual pollution at Borkum, now at the North Sea side.

What could be learned from this for multi-sector, multilevel governance and sustainable tourism? One sees a small island, a “real heaven,” in the sense that to thousands of people, being on the island seems to make a simple and fulfilling life in close connection to nature possible. But one also sees that making that heaven sustainable, allowing that potential to flourish, requires a strong(er) governance defence. The Dutch poet Lucebert wrote a famous line in one of his poems: “Everything of worth is defenceless” (Lucebert, 1953). How true this seems to be here. Why were the protests of Borkum to the coming of RWE not listened to? How are the millions of tourists that enjoy the Wadden heaven involved in decisions about renewed natural gas extraction? Compared to the “elephants” of big corporations (RWE, Tesla) and the national government priorities, the small “mice” of the Wadden tourism sector or the Wadden municipalities seem to have little governance power.

However, identifying soft values may help to enhance power (Liburd & Becken, 2017; Meijles et al., 2021). Especially if this can be done on a large scale by use of public participation geographical information systems (PPGIS) (Bijker & Sijtsma, 2017; Hilbers et al., 2022; Mansournia et al., 2024). Earlier work using the Greenmapper PPGIS software<sup>22</sup> showed that if

<sup>22</sup> [www.greenmapper.org](http://www.greenmapper.org)

one asks people in the Netherlands, Germany and Denmark to mark – on a national scale – one nature-related place that is attractive, valuable or important to them, many of them mark the Wadden area. Calling people that mark the Wadden in this way “fans,” this research identified that the Wadden Sea Region has an estimated community of fans of 14 million people in the Netherlands, Germany and Denmark (Sijtsma et al., 2019). That is a very large fanbase indeed and this may hold potential for enhanced online-powered governance (Bijker et al., 2014). Especially since this fanbase cherishes the soft and vulnerable values the Wadden Sea Region brings to them. In the current work of the author with the online Greenmapper PPGIS platform, experiments to more actively engage such communities of fans are made to give voice to soft values in multilevel governance processes (Ramirez Aranda and Vezzoni, 2022). Perhaps in time, to paraphrase Lucebert, this can enhance the defence of something of worth.

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## 4 • Conclusions

The four perspectives and eight variables of the Sustainable-TALC framework were used as a framework to order reflections on the complexities of sustainable tourism in the Wadden Sea. This four-quadrant pondering exploration tentatively highlights a few key points. First, it indicated that the infringes on landscape values are abundantly creeping up due to limited Wadden landscape protection – limited especially compared to the protection regimes of biodiversity. Interestingly, in this development the large multinational companies seem to be important and strong actors and the defence of the soft value of the landscape appreciation seems to be weak. Second, the experience during the TriWadWalks hinted that it is not so much lack of vision or purposeful investment strategy within the tourism sector itself that is a problem for sustainable tourism. Many tourism initiatives are sensitive to the community and physical environment, even aiming for regenerative tourism. But it is the multisector and

multilevel governance, related to for instance education, health care, and other economic sectors, that appears as the weak spot of sustainable tourism. Possibly a stronger online organisation and engagement of the community of (millions of) Wadden fans, i.e., the people that carry the Wadden area in their hearts (even) when they are not there, may enhance governance. Finally, the exploration suggested that the longing for a simple connected life that Wadden tourism exemplifies may be undervalued or even misunderstood in the modern-day world. Wadden tourism is currently seen more as a temporary escape from the modern way of living, while one can also argue that it seems to be for many more an ideal way of living more sustainably: more connected socially and more connected to nature. The future research of sustainable Wadden tourism may as such – perhaps – provide a glimpse of a more sustainable society.

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## **Section 3: Voices from the Region**





# Chapter 11

## *Challenges of climate change for land drainage on the Wadden Sea coast – Results of the KLEVER-Risk project*

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### 1. Introduction: Land drainage on the Wadden Sea coast

This chapter is about the impacts of climate change and the resulting adaptation requirements for land drainage along the Wadden Sea coast. The main results of the KLEVER-Risk project are presented, in which the drainage situation in the western part of East Frisia on the German North Sea coast was examined in more detail.

Human settlement at the Wadden Sea coast has always been associated with particular challenges regarding coastal protection and water management. The

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### Section 3: Voices from the Region

coastal landscape evolved due to sediment deposits caused by regular inundation as well as the influence of storm surges. The coastal area is in large parts only just above sea level, in some places even below. The construction of dikes along the Wadden Sea coast, which began around 1000 years ago, provided people with significantly improved protection against high tides and storm surges, but also interrupted the continuous transition between land and sea that had existed until then. Henceforth, precipitation accumulating on the coastal inland could no longer drain naturally into the North Sea, which meant that the diking of the coast also required controlled drainage of the dike hinterland in order to ensure effective protection from inland floods as well as storm surges. Since then, the historically developed and continuously expanded drainage systems have been used to artificially regulate the water levels of the inland waters and drain excess precipitation into the North Sea through tide gates and pumping stations. It is only through these human interventions that it can be ensured that the cultural landscape that has developed in this coastal region can be used as a settlement and economic area the way it is today.



Figure 1: Tide gate and pumping station Knock in the area of the water board Emden at the East Frisian coast (Source: I. Entwässerungsverband Emden).

With the large-scale expansion of the drainage systems since the 1950s and 1960s, society's expectations of the level of protection to be provided have also risen continuously. Whereas in former times it was considered normal that low-lying areas would be flooded during winter months, such inundations are no longer compatible with current land use requirements and demands. The rise in standards in relation to land drainage have led to an increasing intensification of agriculture as well as the creation of industrial, commercial and residential zones in low-lying areas of coastal regions in recent decades. This has significantly increased the potential damage caused by flooding in these areas – and therefore also the requirements for inland flood protection (Ahlhorn et al., 2018; Ratter et al., 2024).

However, despite the current, highly developed state of the drainage systems, it is not possible to guarantee full protection against inland floods. Certain extreme weather events, technical faults or long-term power cuts at tide gates and pumping stations increase the general risk of exceeding the capacity of drainage systems, and accordingly cause partial or complete failure of their functioning. An extreme weather combination that could push the land drainage to its limits would be the concurrence of

- **abundant winter precipitation that meets already saturated soil and causes exceptionally high volumes of surface runoff within a short timespan, alongside**
- **prolonged storm surge tides, that lead to decreased discharge capacities of the pumping stations due to high tidal water levels (Spiekermann et al., 2023).**

In these situations, an increased demand for drainage meets a limited discharge capacity. This, in turn, results in rising water levels of inland waters despite the continuous operation of the pumping stations, which can sometimes reach critical levels. Most recently, during the turn of the year 2023/24, the accumulating water masses of consecutive low-pressure systems with high precipitation could not or only partly be discharged, due to high water levels of the tidal

waters, which led to the flooding of many low-lying areas. Due to climate change, it can be assumed that, in addition to storm surges, winter precipitation runoff from the dike hinterland will also intensify in the coastal area, posing major challenges for land drainage. The probability of extreme weather events, that can lead to inland flooding situations, is likely to increase considerably in the future (Bormann et al., 2024). If flood risk should not increase at the same rate, suitable risk management measures must be designed and implemented to improve the resilience of coastal areas.

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## 2. The KLEVER-Risk project

Between 2019 and 2023, the KLEVER-Risk project investigated the adaptation requirements of land drainage on the German North Sea coast (Spiekermann et al., 2023). As part of the project, carried out by the Carl von Ossietzky University of Oldenburg and the Jade University of Applied Sciences (Oldenburg), the East Frisian coastal area was used as a case study to:

- **analyse the effects of climate change and sea level rise on land drainage and**
- **develop proposals for measures to manage inland flood risks, by considering the expected climatic changes.**

The water boards of Norden, Emden, Oldersum and Aurich, as well as the district of Aurich, the urban municipality of Emden and the Lower Saxony Water Management, Coastal Defence and Nature Conservation Agency (NLWKN) were involved in the project as cooperation partners. They contributed their respective expertise in various workshops on different thematic aspects in which other relevant stakeholders also took part.

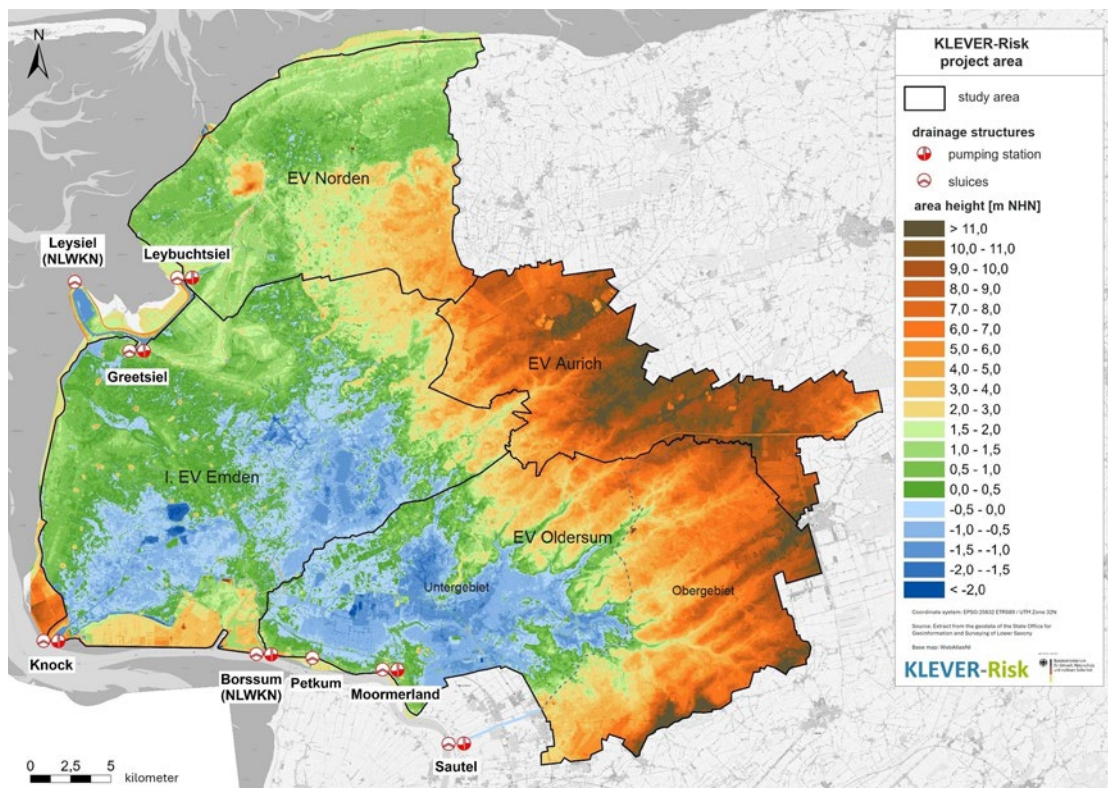


Figure 2: Map of the KLEVER-Risk project area in the western part of East Frisia showing the ground levels and the locations of tide gates and pumping stations (Spiekermann et al., 2023, translated).

The KLEVER-Risk project area covers the four water boards in the western part of East Frisia. As Figure 2 illustrates, the study area includes both the low-lying marshland areas in the dike hinterland as well as higher-lying moraine areas. While the ground levels in the dike-protected lowland areas are up to  $-2.5$  m below sea level, the terrain in the moraine areas to the east rises to heights of up to 12 m above sea level. Based on the topographical conditions in the four study areas, which also represent separate catchment areas, differing drainage structures have developed:

- The areas of the Norden and Emden water boards as well as the western part of the Oldersum water board are traversed by marshland waters, most of whom are man-made, to drain off excess water to tide gates and pumping stations at the dike. There are numerous inland pumping stations in the particularly low-lying areas that lift water into the main watercourse (see Figure 3).
- The areas of the Aurich water board and the eastern part of the Oldersum water board are characterised by the post-glacial sandy soils, the so-called *Geest*. Within the *Geest* waters, an unrestricted runoff, regulated by weirs, is possible. The drainage of these areas into the tidal waters is enabled by using channels, which run through the low-lying areas to the tide gates and pumping stations at the dike.

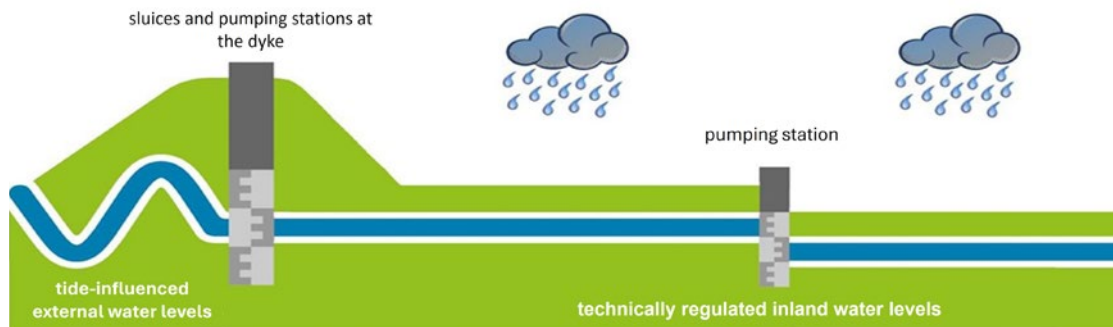


Figure 3: Principle of land drainage in coastal lowlands (Source: Spiekermann et al., 2023, translated).

### 3. Impact of climate change on land drainage<sup>24</sup>

The weather recordings of the last 100 years show unambiguous changes in recorded temperatures and precipitation (NIKO, 2023). Climate research projects these changes into the

<sup>24</sup> The following sections present the key findings of the KLEVER-Risk project. A more detailed description can be found in Spiekermann et al., 2023.

future with the help of climate models and assumes a further acceleration in the rise in temperatures, an increase in winter precipitation at the expense of summer precipitation, and an increase in extreme weather events on the North Sea coast (DWD, 2018). To be able to forecast future climate change developments, mathematical models are required that reflect the global physical processes in the atmosphere as well as the neighbouring systems (oceans, land surfaces), complemented by further assumptions that are incorporated into the models as boundary conditions. In particular, assumptions about future greenhouse gas emissions and concentrations are required to model future climate development. As these developments cannot be clearly predicted, the Intergovernmental Panel on Climate Change (IPCC) has devised different scenarios (IPCC, 2023). The climate models are calculated for these various scenarios, the combinations of which then result in so-called ensembles. In the scope of the KLEVER-Risk project, an ensemble consisting of three regional climate models (REMO, WETTREG and XDS) and five different scenarios (RCP8.5, RCP4.5, A2, A1B and B1) was used to map the range of possible climate developments in the East Frisian coastal region. In particular, the climate parameter of precipitation was considered, as this has the greatest effect on runoff generation and thus on the requirements for land drainage (Bormann & Kebschull, 2023).

### Changes in precipitation

The climate projections for the German North Sea region up to the year 2100 show that a significant change in the seasonal distribution of precipitation is to be expected. It can be assumed that winter precipitation will increase significantly on average and summer precipitation will tend to decrease. However, particularly in the winter months, most of the precipitation is runoff already, as evaporation is low, and the water saturation of the soil is high. The expected increase will therefore lead to correspondingly higher winter runoff. Even though summers are predicted to be drier, an increase in heavy rainfall events is expected as well, which can lead to extreme amounts of precipitation and runoff in a very short time (Nds. MU, 2022).

### Changes in water runoff

In order to estimate the effects of changes in precipitation on the runoff generation in the study area, the hydrological model SIMULAT was used in the KLEVER-Risk project (Bormann & Kebschull, 2023). It was driven using the climate simulations of the above-mentioned regional climate models separately for all four water board areas. The calculated ensembles were compared with the recorded runoff and pumping volumes of the control period in the past. The difference between the water discharge in the control period and in the climate model calculations results in climate change induced change signals. Of particular interest were changes regarding the seasonality of runoff generation as well as of extreme events, which can severely strain the land drainage system. Figure 4 shows an example of the climate change-induced changes in mean monthly runoff generation for the period 2071-2100 for the area of the water board Emden.

All in all, the ensemble calculations for the four analysed water boards show the following change signals by the end of the 21st century:

- **an increase in the annual runoff rate of up to +13%;**
- **a significant increase in runoff generation in winter of up to +28%;**
- **a significant decrease in runoff generation in summer of up to -22%;**
- **a significant increase in extreme runoff events in short-term periods (days, weeks).**

The results with regard to climate change induced changes in runoff generation in the winter half-year and during extreme events show that increased drainage demand can be expected in the coastal area in the future. At the same time, climate change will also entail longer dry periods in summer, for which water management must also prepare (Spiekermann et al., 2023).

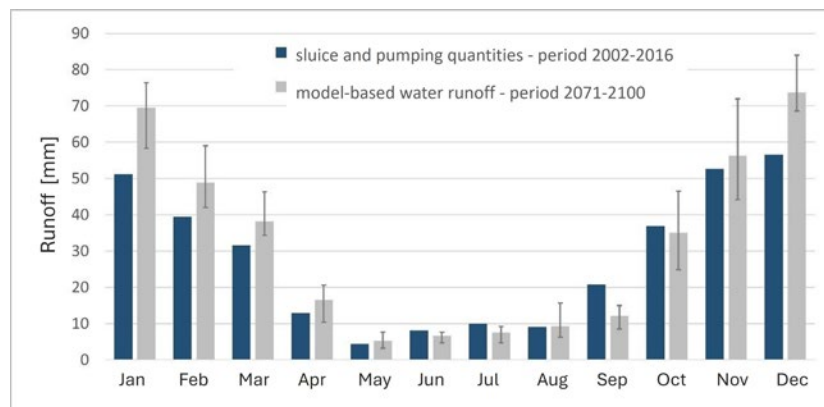


Figure 4: Model-based estimation of the change in mean monthly runoff generation in the area of the water board Emden for the period 2071-2100 compared to the measured discharge quantities of the tide gates and pumping stations in the control period 2002-2016 (Source: Spiekermann et al., 2023, translated).

## 4 • Impact of sea level rise on land drainage

Global sea level rise has different regional impacts due to ocean currents and coastal morphology. The regional model calculations of the IPCC scenarios RCP4.5 and RCP8.5 were evaluated for the analyses regarding the future development on the East Frisian North Sea coast. As part of the KLEVER-Risk project, both the mean values of all models (ensemble mean) and the 95% percentiles (value exceeded by 5% of the models) were analysed for the scenarios. The corresponding projections show an expected sea level rise of between 50 and 110 cm for the German Bight by the end of the 21st century (Bormann et al., 2023).

The sea level rise affects inland drainage through changes in both the low tide and the high tide. During low tide, sea level rise has an impact on the future operation of tide gates. If the

### Section 3: Voices from the Region

water level falls less at low tide, land drainage by using tide gates is restricted or completely impossible, resulting in increased pump operation. However, the higher sea level during high tide will also make pump operation more difficult in future. The station pumps are designed for a certain geodetic head (height difference between the internal and external water levels). If a critical geodetic head is exceeded during high tidal water levels, the pumping capacity decreases significantly and in some cases the pumps have to be switched off completely to protect the equipment. Rising tidal water levels due to sea level rise therefore result in pumps having to run more frequently under a greater load or being switched off and consequently pumping less water (Spiekermann et al., 2023; see Figure 5).

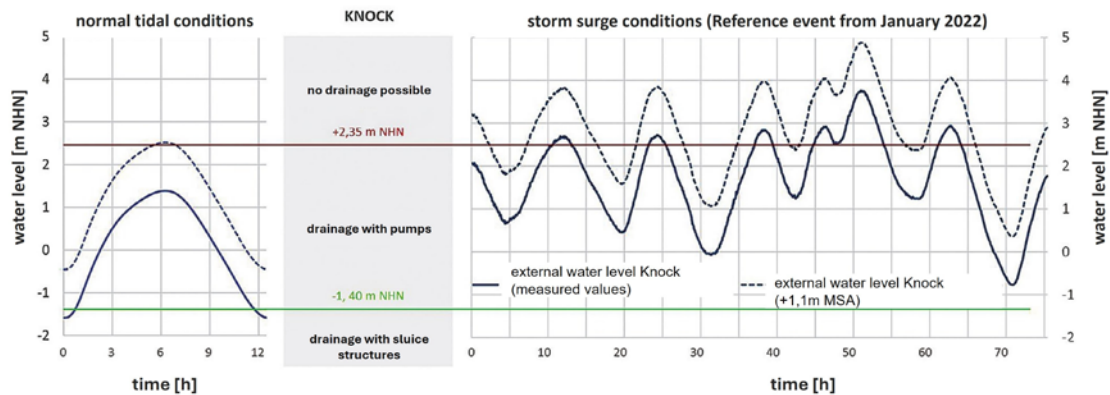


Figure 5: Possible operating states at the tide gate and pumping station Knock under normal tidal conditions (left) and under storm surge conditions (right); today (solid blue line) and with a sea level rise of 110 cm by the year 2100 (dashed blue line) (Source: Spiekermann et al., 2023, translated).

Within the scope of the KLEVER-Risk project, the effects described above were quantified by investigating the change in potential tide gate opening hours during the winter half-year as well as the change in potential discharge capacity of the tide gates and pumping stations (Bormann et al., 2023). Both calculations assume a sea level rise of 110 cm by 2100 (95% percentile of the IPCC scenario RCP8.5 for the German Bight).

## 5 • Change in potential tide gate opening hours in the winter half-year

Figure 5 shows an example of the normal tide curve over a tidal cycle (12.5 hours) for the gauge at the tide gate and pumping station Knock. Under current conditions (solid blue line), the tidal water level falls below the target inland water level of 1.4 m below normal height zero (NHN) for 1.3 hours during the winter half-year. During this period, free gradient drainage can occur through the tidal gate. During the rest of the tidal cycle, pumps must be used for drainage. Assuming that the tidal low water rises at the same rate as the mean sea level, the number of available tide gate opening hours would be reduced accordingly in future. The blue dashed line in Figure 5 shows the normal tidal curve shifted upwards by 110 cm (corresponding to the 95% percentile of the sea level rise scenario RCP8.5 for the year 2100). The tide gate would then no longer have any opening times. The process of the expected decrease in the potential number of discharge hours up to the year 2100 over time is shown in Figure 6.

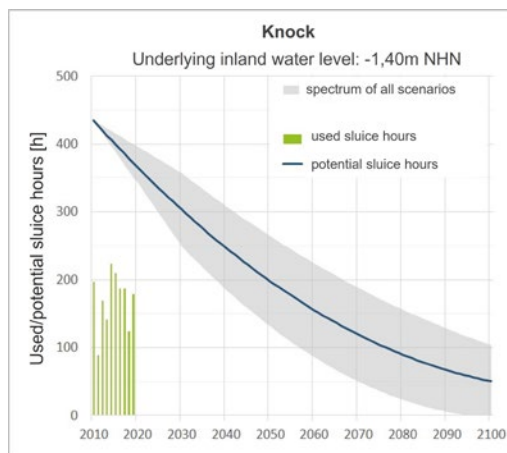


Figure 6: Impact of sea level rise scenarios on the potential tide gate opening hours in the winter half year at the tide gate and pumping station Knock (Source: Spiekermann et al., 2023, translated).

## 6. Change in the potential discharge capacities of the tide gates and pumping stations

To describe the impact of sea level rise on feasible drainage systems of the four water board areas, the change in the potential discharge capacities of the various tide gates and pumping stations was estimated. A distinction was made between the discharge capacities under normal tide conditions and under storm surge conditions (reference storm surge tide of January 2012). Consistently with the investigation of potential tide gate opening hours, the simplifying assumption was made that the high and low tide peaks would each shift upwards by 110 cm by 2100 to the same extent as the underlying sea level rise (RCP8.5, 95% percentile) (see Figure 5). When determining the discharge capacities that can be realised under the respective tidal water level conditions, continuous operation of the tide gates and pumping stations over several tidal cycles was assumed due to high drainage demands. Considering the three operating states described below and shown as examples for the tide gate and pumping station Knock in Figure 5, the average discharge capacities of the tide gates and pumping stations were then calculated depending on the respective tidal cycle.

- **Discharge via tide gate:** The tidal water level is lower than the inland water level at the respective tide gate and pumping station. When calculating the discharge capacity, these periods were modelled with a mean tide gate capacity of the corresponding structure.
- **Discharge via pumping station:** The tidal water level is higher than the inland water level. During these periods, the discharge capacity corresponds to the pumping capacity of the respective pumping station, which is dependent on the geodetic head (difference between external and internal water level). When calculating the discharge capacity, the varying geodetic heads over the pumping period were considered accordingly.
- **No discharge possible:** The tidal water level is higher than the safe level for pump operation, thus pumps can no longer be used for technical reasons. No drainage is possible during these periods, the discharge capacity is zero.

Figure 7 shows the calculated changes in the potential discharge capacity of the tide gate and pumping station Knock that would result from the increasing geodetic heads of the pumps and the increasingly frequent shutdowns of pumping station due to excessively high tidal water levels. The considerable performance constraints that exist under normal tidal conditions (-25%) and especially under storm surge conditions (-60%) already illustrate the substantial effects of rising sea levels on land drainage.

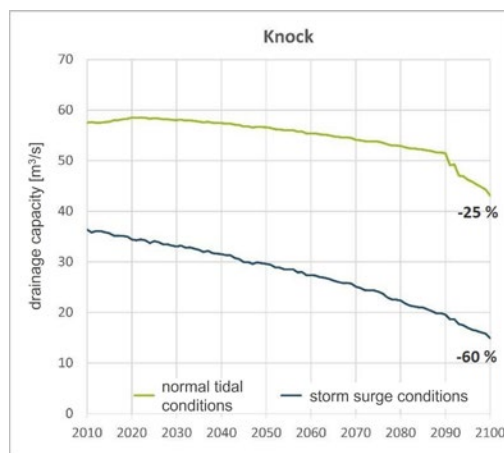


Figure 7: Changes in the potential discharge capacity of the tide gate and pumping station Knock in relation to normal tidal conditions (green line) and storm surge conditions (reference chain tide; blue line) with a sea level rise of 110 cm by the year 2100 (RCP8.5, 95% percentile) (Source: Spiekermann et al., 2023, translated).

### 7• Options to adapt land drainage systems

The analyses carried out as part of KLEVER-Risk project clearly show that the consequences of climate change make it necessary to adapt the existing land drainage systems in the coastal lowlands. The volumes of water that need to be drained in the winter months will increase significantly as a result of the expected changes in precipitation, meaning that a considerable increase in drainage demand can be assumed. At the same time, sea level rise will lead to a decrease in potential discharge capacity for tide gates. In the future, the possibility to drain by using tide gates will reduce significantly, in certain areas it will no longer be possible at all; instead, more water will have to be pumped. At the same time, sea level rise will also reduce the pumping capacity of existing pumping stations, so that the existing discharge capacities will be strongly reduced overall. A key objective of the KLEVER-Risk project was to identify suitable options for adapting land drainage. To this end, numerous workshops were held with regional stakeholders as part of the project, in which a wide range of possible measures were developed (Spiekermann et al., 2023). The main results of this stakeholder participation are summarised below.

#### **Direction of future inland flood protection in the coastal area**

Against the background of rising sea levels and increasing extremes in precipitation, an adjustment of pumping capacities combined with an expansion of retention capacities will be necessary to maintain the status quo of inland flood protection in the coastal region. In view of the lengthy planning and implementation periods, anticipatory adaptation planning over several decades is required. Planning also needs to consider the backlog of investment which can be observed in the drainage structures along the North Sea coast. The majority of the structures are older than 50 years, which means there will be a considerable need to modernise drainage technology in the coming decades in addition to the need for adaptation.

However, upgrading drainage technology alone will not suffice to cope with the consequences of climate change. Integrative concepts are required that both enable efficient drainage and promote water storage in the landscape. On the one hand, this can make drainage more flexible and, on the other, counter the consequences of increasingly long and intensive dry periods, during which water demand will increase. By implementing retention measures, corresponding synergy effects can be created, as these can serve both short-term flood relief and longer-term water retention. As part of the KLEVER-Risk project, a repertoire of potential retention measures was drawn up for the project area.

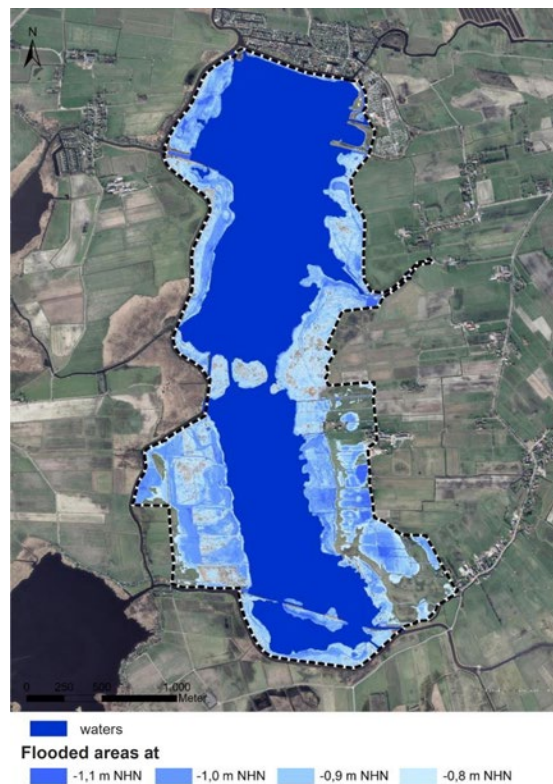


Figure 8: Example of retention measures: Reservoir inundation of the “Großes Meer” near Südbrookmerland in the area of the water board Emden (Source: Spiekermann et al., 2023, translated).

### Strengthening of inland flood risk management

In view of the increasing frequency and intensity of extreme weather events due to climate change, it is necessary to take a closer look at the risks of potential inland flooding events in the coastal lowlands. As extreme weather events can overload the drainage systems of the coastal lowlands, and technical defects or power failures at the pumping stations can even cause the land drainage system to fail completely, it is not possible to guarantee full protection against inland flood events. There are residual risks that can only be countered by supplementary inland flood risk management measures. The KLEVER-Risk project identified the following approaches, among others:

- **Drawing up inland flood alarm plans:** To react quickly and appropriately in a potential inland flood situation, it is necessary to have clearly structured flow charts and immediately accessible information on existing emergency management options. As part of the KLEVER-Risk project, a joint concept was developed with the participating water boards to draw up area-based inland flood alarm plans, which can be implemented immediately by the water boards.
- **Preparation of inland flood hazard maps for the coastal area:** The flood hazard maps in accordance with the EU Flood Risk Management Directive, that are available to date, are limited to the visualisation of potential storm surge hazards in the coastal area. These maps therefore do not yet contain any information on the risks of inland flooding caused by precipitation in the coastal area. To close this gap, the KLEVER-Risk project developed a methodological approach for the creation of inland flood hazard maps for the coastal area and applied it to parts of the project area on a trial basis.
- **Consideration of inland flood risks in spatial planning:** The hazard maps mentioned above are based on the topography and thus directly indicate low-lying areas that are the most difficult to drain and have the highest flood risks. These maps can therefore provide a helpful information basis for future spatial planning decisions. The potential for damage in areas at risk of inland flooding can be significantly reduced through planning regulations for land use precaution (restrictions on the use of flood-prone areas) and building precaution (requirements for flood-adapted construction methods).

## 8 • Conclusion

Together with coastal protection, land drainage has always played an essential role in human settlement on the Wadden Sea coast. Due to the consequences of climate change, the demands on drainage management will continue to increase in the future. The necessary adaptation should not only be aimed at engineering solutions to increase drainage capacities, but also include nature-based solutions such as storing water in the coastal landscape. In addition, more consistent consideration of flood risks in spatial planning is required to improve the resilience of the coastal region.

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## Chapter 12

# *Biolandhof Agena & Dreyer – Regional organic farming in and for the East Frisia region*

Heiko Dreyer

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### 1. Brief historical outline

Our farm is located in Hagenpolder, which was diked in 1770, on the East Frisian North Sea coast and thus in the immediate vicinity of the Lower Saxony Wadden Sea Biosphere Reserve, in the so-called development zone. The farm was built in 1835 in the style of the typical timber-framed East Frisian *Gulfhof* (*gulf house*), where the barn and work areas are part of the same building as the living quarters. The Hagenpolder was once part of the Leybucht, whose foothills extended to the village of Marienhaf and beyond (see Figure 1). Over the centuries, this bay was diked piece by piece. In the following centuries, polders were diked again and again, so that the Leybucht was reduced to its current size by 1950.

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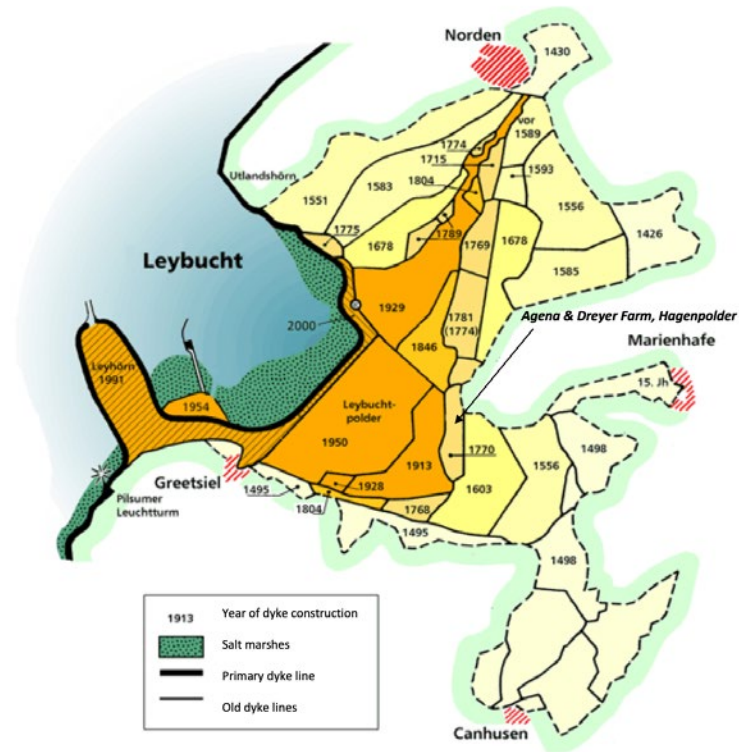


Figure 1: Location of the Agena & Dreyer farm on reclaimed polder lands at the Leybucht  
(Source: adapted from NLWKN online [NLWKN, n.d.]).

The last land reclamation took place at the end of the 1940s with the construction of the Störtebeker dike. In the following years, there were plans to dike the entire bay in order to significantly shorten the dike line and improve coastal protection. However, this measure was ultimately abandoned for reasons of nature conservation. Only smaller coastal protection measures were realised (such as the embankment of the Leyhörn in 1991, which has been a nature reserve since 1994). The area of the former Leybucht is home to the Agena & Dreyer organic farm.

As usual, the farm was run as a mixed farm in the early days. Part of the land was used for arable farming, while the other part was used as grassland for the cattle. Many older marshland areas, in particular, were more suitable for grassland than arable farming. The old dikes were also used for grazing. Many dikes have been removed over the last 70 years, as their protective function was no longer necessary due to the construction of new dikes. From around 1930, mechanisation also began on the farm with the first tractors. Over the course of the next 30 years, horses were completely replaced as a means of traction. Today, modern tractors often have up to 300 hp and can do many times more work than horses used to do. Human labour was also no longer needed in the course of mechanisation in agriculture. Due to industrialisation (e.g., the vw plant in Emden), many former farm workers found work outside of agriculture. Around 1960, dairy farming was abolished on our farm. Laying hens, breeding sows and fattening pigs were still kept for several years. In the course of specialisation in agriculture, we have been farming completely without livestock since 1988. Until then, arable farming was carried out conventionally, at a high level of intensity, with the corresponding use of fertilisers and pesticides.

In 1989, shortly after Garrelt Agena took over the farm from his father, the decision was made to convert the farm to organic farming under the umbrella of the Bioland association. This makes the farm one of the longest-running organic farms on the entire East Frisian peninsula. After converting to organic farming, the farm also started to develop direct marketing. In addition to arable farming, direct marketing is now the second important pillar of the farm. The delivery service for vegetable crates has existed since 1993, and the Saturday stall at the weekly market in Norden has been in operation since 1998. The farm shop was set up in 1995. In the 1990s, the cultivation of vegetables and potatoes became a further focus alongside the cultivation of cereals.



Figure 2: The Agena & Dreyer organic farm in Krummhörn has been farmed organically for 30 years (Source: photo by Ingo Mose).

In 2016, Garrelt Agena handed over the farm to his successor, Heiko Dreyer, as part of an extra-familial handover. For Garrelt Agena, it was a matter close to his heart that the organic farm should continue in its existing form, even if no one from his own family would continue to run the business. Heiko Dreyer has lived on the farm with his family since July 2016. The Dreyer family runs the farm, which now has 15 permanent employees and just as many temporary workers. This means that the history of the Agena & Dreyer organic farm can continue to be written in the future.

Biolandhof Agena & Dreyer has been a partner of the Lower Saxony Wadden Sea National Park and UNESCO Biosphere Reserve for many years. Since 2023, the development zone of the Biosphere Reserve has been expanded to include the Leybucht polders, among several areas

on the East Frisian mainland. The intended purpose of the development zone in the biosphere region is to promote sustainable development (see also Chapter 14 in this book). The aim is to enable economic prosperity, ensure social cohesion and fundamentally preserve the ecological basis of life for future generations. The Agena & Dreyer organic farm sees itself as an ideal example of how to achieve these goals, as ecological and economic sustainability are at the forefront of the farm's activities. Sustainable utilisation of natural resources in order to achieve the highest possible value creation within the region forms the basis of the farm. At the same time, the aim is to provide people in the region with high-quality food from the region for a sustainable way of life while ensuring fair cooperation with business partners and employees.

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## 2 • Arable farming

Today, various crops such as spelt, wheat, oats, barley, rye, field beans, clover, as well as potatoes and carrots, are grown on an area of around 300 hectares. The fertile marsh soils consist of around 50% silt, 15-35% clay, 15-35% sand and 1-2% humus. They were rated with 65 to 90 soil points. Potatoes and carrots can only be grown in areas where there is a high sand content. These crops are of central economic importance to the farm. The farm is predominantly round, with an average area of around 10 hectares. The average annual temperature is around 9 degrees Celsius, with an average annual precipitation of 840 litres per square metre.

The farm manager attaches particular importance to a very varied and balanced crop rotation. The standard crop rotation consists of around seven crops (e.g., clover-grass-clover-grass-wheat-spelt-field beans-wheat-oats or clover-grass-clover-grass-wheat-potatoes-rye-field beans-wheat-potatoes). Close attention is paid to the use of catch crops. These catch crops serve, in particular, to build up humus and thus promote soil fertility.

### Section 3: Voices from the Region

Part of the farm's mission statement of "agriculture with short distances" is that the majority of products are marketed and processed in the region. A few examples are listed below. All the cereals produced on the farm are processed by the Bioland Mühle Erks mill in Horsten, East Frisia. There is already a long-standing partnership with Mühle Erks (Erk's mill). Spelt, rye and spring wheat are grown on up to a quarter of the farm area for further processing at the mill. At Mühle Erks, the grain is processed into various flours and baking mixes. The Agena & Dreyer organic farm is able to buy back a small proportion of the flour and sell it on to its customers. However, Mühle Erks sells the majority of the flour to end consumers or regional bakers via food retailers in East Frisia. This means that the entire value chain takes place within the region. The potatoes grown on the farm are known far beyond the region under the name "Klei potatoes." The term "Klei" (gley in English) refers to the marshy soil. The word "Klei" comes from Middle Low German and is related to the verb "*kleben*" (to glue). It expresses the fact that the soil tends to stick stubbornly to shoes. The more common term in soil science is "gley." Gley potatoes are known for their good flavour. This is due to the high and balanced nutrient content in the soil. The majority of the farm's potatoes are marketed in East Frisia. This includes not only its own direct marketing but also a large number of resellers, such as regional food retailers, wholesalers and other organic shops.

In organic farming, the use of synthetic chemical pesticides and synthetic (nitrogen) fertilisers is completely avoided. However, in order to provide the plants with optimum growing conditions, fertilisers of animal origin are used. These include dry chicken manure, cattle slurry and dung. As the farm only has a few laying hens of its own, there are so-called feed-manure cooperations with other livestock farms in the neighbourhood. The Agena & Dreyer organic farm grows feed on its land for the animals of the cooperating farms (e.g., clover grass for dairy cattle or feed wheat for laying hens). In return, the cooperating farms provide slurry or manure. This means that the cultivated clover grass can also be utilised well in the region. All of the harvested produce is stored on the farm and can, therefore, be marketed throughout the year. In addition to a warehouse for around 700 tonnes of grain, the farm now has a

potato warehouse with a capacity of around 500 tonnes and a 50-tonne vegetable cold store to supply customers with fresh potatoes and vegetables all year round.

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### 3 • Vegetable growing

A variety of vegetables are grown on the farm. On the fertile and nutrient-rich marsh soils, the vegetables thrive and develop an excellent flavour. The East Frisian gley soils are known far beyond the region for their tasty cabbage. A species-rich vegetable field covers an area of around ten hectares and includes around 40 different vegetable crops. These include “perennial favourites” such as carrots and cabbage, rediscovered varieties such as chard and fennel, exotic varieties such as sweet potatoes and aubergines, as well as rarities such as sugar snap peas, watercress and turnip tops.

One focus is on the production of stored vegetables. This refers to vegetables that are harvested in autumn and then stored in a cold store to be processed and marketed over the winter and into the following summer. The most important crops include carrots, beetroot, celery and cabbage. In addition, kale, Brussels sprouts and broad beans are, of course, a must on an East Frisian vegetable farm. However, the location is less suitable for the particularly early cultivation of crops for an early harvest in spring.

For this purpose, the company operates a total of five plastic film greenhouses with a total area of 1500 square metres. Not only can fresh lettuce, kohlrabi (cabbage turnip), radishes and spinach be harvested in these greenhouses in spring. In summer, tomatoes, cucumbers, peppers and aubergines are also cultivated here. In autumn and winter, lamb’s lettuce, purslane, and Asian lettuce are grown so that customers are offered fresh lettuce all year round.

### Section 3: Voices from the Region

The operations manager is always on the lookout for new crops that could be of interest to customers. However, the location is a major challenge. Although the soil is quite fertile, the growing season is significantly shorter compared to regions in southern Germany. What's more, many vegetable crops are rather thermophilic (prefer warmer temperatures) and struggle somewhat in the harsh North Sea climate. One advantage, however, is that the soil has a high-water storage potential, which means that artificial irrigation can be largely dispensed with, as is usually the case in vegetable growing.

#### 4. Direct marketing

The vegetable products grown are mainly marketed to the end consumer through the farm's direct marketing organisation. Direct marketing includes a vegetable box delivery service, a stall at the weekly market in Norden, and a small but well-stocked farm shop.



Figure 3: Fleet of small vans for delivery services (Source: photo by Elen-Maarja Trell).

The vegetable box delivery service accounts for the largest share. The delivery service mainly supplies private households, but also offices, companies and other organic food shops on the East Frisian peninsula and on the islands of Norderney and Juist. An online shop is operated for this purpose. Customers can put together their own shopping basket or opt for a surprise box. The surprise box is available in different price categories. It is put together anew every week with products that have just been harvested on the farm or can be prepared from the warehouse. Each of the 600 or so households is supplied once a week. The assortment of the farm shop and the delivery service is supplemented by the purchase of many products so that an extensive range of organic food and natural cosmetics can be offered. A close network has been established with friendly organic farmers and organic producers from the surrounding area so that numerous regional organic products can be offered. The cooperation with regional organic wholesalers also complements the company's own range of fruit and vegetables.

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## 5 • Conclusion

With its dedication to organic farming the Agena & Dreyer farm has functioned as pioneer of organic farming as well as direct marketing in the whole area of the Krummhörn and East Frisia as a whole. As such it strongly contributes to the idea of the new Wadden Sea Biosphere Region targeting a sustainable transformation of the region. Other farmers and businesses beyond may use the example of the farm as an inspiration and role model for similar initiatives in the future.<sup>26</sup>

<sup>26</sup> Further information at: [www.biolandhof-agena.de](http://www.biolandhof-agena.de)

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## Chapter 13

# *Rethinking tourism – Regenerative tourism development in the Wadden Sea National Park*

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### 1• Introduction

In September 2022, the TriWadWalk group of university staff and students visited a Bed and Breakfast known as *Klægager*, which is a fully renovated, award-winning marsh farm located at the borders of the Danish Wadden Sea National Park (Figure 1). The TriWadWalk group was first treated to a traditional “coffee table,” typical of Southern Jutland, where guests are served as many as 21 different types of soft, hard and dry cakes. By way of introduction, I am the seventh-generation owner of Klægager, which was converted in the wake of the global financial crisis from a traditional pig farm into a small Bed and Breakfast by my parents. While writing my master’s thesis in International Tourism and Leisure Management at the University of Southern Denmark, the generational transition of ownership was made. Thankfully, my parents agreed to run the business while I concentrated on

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### Section 3: Voices from the Region

doing research and proudly graduating with honours. This chapter is based on my master's thesis research and my journey to becoming a reflective tourism practitioner dedicated to sustainable and regenerative tourism in the Wadden Sea.



Figure 1: Klægager traditional farmhouse and Bed and Breakfast, southern Denmark (source: the author).

Tourism is a global, social and economic phenomenon (Heape & Liburd, 2018) that involves a plethora of entities belonging to different industries and areas of society. Within the complexity of tourism, the issues occurring are so-called “Wicked Problems” (Rittel & Webber, 1983) that do not present themselves with definitive or defined solutions. On the contrary, they often present themselves with multiple different possibilities, with new issues emerging from each measure taken into action. Thus, there are no easy answers or best practices applicable when it comes to questions about tourism and sustainability. Before the COVID-19 pandemic put a halt to most of the global mobility and thus international travel,

tourism had reached unsustainable levels in many destinations (Becken & Kaur, 2021; Ioannides & Gyimóthy, 2020; Higgins-Desbiolles, 2018). The stop in tourism further exposed the derivative social and environmental imprints tourism has had on the world throughout the years (Liburd, 2022). Cities like Copenhagen and Barcelona witnessed citizens who welcomed the stop in tourism (Liburd, 2022; Nugent, 2021). Soon, there were stories about clear water and dolphins returning to the canals of Venice or the mountain summits of the Himalayas becoming visible again due to a decrease in smog and similar (e.g., Clifford, 2020; Picheta, 2020). Also, in Denmark, there have been ongoing discussions and an outcry from locals fearing that the limits of tourism have been reached, arising every time when new tourism projects or similar are being presented (e.g., Gohr, 2021; Larsen & Østergaard, 2020).

//It is clear that tourism and the many leisure activities cannot continue to exploit common scarce resources to their own advantage or with short-term economic gain in mind. There are limits to tourism, and it is not a free ride to use and protect Denmark's common nature and cultural heritage. (Liburd, 2022, p. 131)

Instead of returning to the old ways, the COVID-19 pandemic offered an opportunity to re-think tourism as we know it and guide it towards a more sustainable recovery (Duxbury et al., 2020; Ioannides & Gyimóthy, 2020; Lew et al., 2020; Liburd, 2022; Rastegar et al., 2021; Richardson et al., 2020). Calls for reconsidering the governance of tourism are being ever more apparent (Rastegar et al., 2021). Collaborations for future sustainable development should be based on a holistic system approach with civic society and stewards being a pivotal part (Liburd, 2018; Liburd & Becken, 2017; van den Born et al., 2017). There are numerous ways to rethink tourism, but within the realm of sustainable tourism development (STD), an emerging concept has started to form: regenerative tourism. Despite having received scant attention in the literature, regenerative tourism focuses on how tourism can be seen as a tool for local well-being, revitalisation and sustainability (Duxbury et al., 2020). It focuses on contributing to the regeneration and “giving back” to local communities, cultures, nature,

etc., with micro-scale regenerative initiatives, and pushes beyond traditional sustainable approaches (Hoxie et al., 2012). However, Pollock (2020) claims that there are more layers to regenerative tourism than just “doing more good” and that regenerative tourism should look at the root of the problem rather than the symptoms. Thus, Pollock calls for a change of paradigm and claims that a future for regenerative tourism only exists if an ontological threshold or change of lens occurs. Becken and Kaur (2021) argue that within this regenerative paradigm, more consideration should be given to agreed rules, traditions and values of a destination and should thus involve people, culture and land. This, along with the notion from Liburd et. al. (2020) that says there is need for novel ways and new attitudes of minds to develop inclusive processes for STD, points to regenerative tourism should be anchored in a value-based and holistic system (e.g., Tadaki et al., 2017), collaborating and designing with others. When design is used as a method, and a vast plethora of tourism stakeholders join together to design with each other, new and latent opportunities appear for STD (Liburd, 2022). This is called co-designing for sustainable tourism development and consists of a unique range of processes, methods, tools and an attitude of mind that makes it possible in practice to explore and engage others in producing different perspectives on STD (Liburd, 2022; Liburd et al., 2020). Tourism Co-design is an integral part of STD and is, according to Heape and Liburd (2018), a way to constantly re-evaluate the dynamic reality of tourism. To do so, co-design employs a holistic approach, encompassing different factors and stakeholders’ perspectives while re-imagining tourism and fostering collaboration with others (Duedahl, 2020).

While writing my master’s degree, I researched how regenerative tourism could be developed in the Danish Wadden Sea National Park (DWSNP). Having spent my childhood and youth close to the DWSNP and currently owning a tourism business just on the outskirts of the park, the DWSNP serves as a geographical frame for my work. My business – *Klægager* – is an old traditional farm in Frisian style, now serving as a Bed and Breakfast, venue and much more. It has served as a tool in the development of this chapter, as it served as the physical

framing for several of the applied methods for gathering data. The remainder of this chapter will thus be based on said work.

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## 2 • Co-designing for a regenerative future

Applying a co-design approach opens the door for a plethora of methods and tools to collect data and create knowledge, ranging from workshops, go-alongs, context mapping, roleplaying and more, that in a participatory and collaborative manner seek to identify latent opportunities (e.g., Buur & Matthews, 2008; Nielsen & Liburd, 2025; Sanders & Stappers, 2008). This repertoire of methods allows for an open learning environment with a focus on identifying potential futures and tacit knowledge by designing with others rather than for them (Heape & Liburd, 2018). According to Hanington and Martin (2019), an integral part of applied methods and approaches are the conversations they facilitate with different stakeholders and how different methods can help designers have the right conversations at the right time. I thus decided to experiment with a selected mix of these methods in different situations, as different design methods provide different opportunities to “structure conversations that can help us better understand and empathise with people” (Hanington & Martin, 2019, p. 6). All applied methods for this thesis were only possible due to my network and possibilities as a business owner, as most of them were already existing events that I decided to utilise because they were great opportunities to either gather a lot of relevant stakeholders at the same place and time or to do regenerative activities in nature. Some of these events were either at Klægager or other events/tours in and around the DWSNP, which were planned by people other than myself but could be used or pivoted to fit in my data gathering. All the methods and approaches applied for the data gathering were conducted in the spring of 2022 and consisted of the following:

- **A guestbook placed at Klægager, where guests had the opportunity to write their thoughts on regenerative tourism;**
- **A “Havfalds” tour on Rømø where locals and tourists collected garbage at the beach;**
- **An oyster-picking tour mainly with tourists;**
- **A “product-knowledge” tour visiting local businesses;**
- **Three workshops where the co-designers made collages about regenerative tourism futures.**

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### 3. The road to a regenerative future

Striving towards regenerative tourism futures is not something that happens overnight but rather a long journey (Pollock, 2020). As mentioned, Duxbury et al. (2020) describe regenerative tourism as “giving back” to a destination, and as the co-design methods show, there are multiple views on what tourism with a focus on this could look like, but with some common denominators appearing across the different co-design methods. Firstly, there are multiple ideas, ways and already implemented activities that revolve regenerative activities in the DWSNP. Many of them are simple yet tangible and already existing, like gathering garbage and invasive species, or suggestions for activities such as building birdhouses and insect hotels. The workshops further pointed out that some co-designers saw activities such as shelter stays, hiking and bike rides, along with other types of sustainable transport to use at a destination, as important when imagining regenerative tourism futures.

While all these could be argued as being sustainable (e.g., Huber et al., 2022; Truppen, 2021), questions remain on whether they can be considered regenerative or not. Hoxie et al. (2012) claim that regenerative design goes beyond sustainability, as the latter is focused on “doing less damage” rather than leaving a positive or regenerative outcome. While shelter stays, hiking,

bike rides and similar are all activities aimed at leaving little to no impact and thus doing less damage, they are not in itself traditionally regenerative as there is no traditionally regenerative aspect in them, but they can still act as a step on the road towards regeneration.

However, despite Pollock (2020) suggesting that regenerative tourism is more than “giving back” to nature or a destination, the co-design methods show that some co-designers and participants describe the tangible regenerative activities as “giving back.” This was shown both on one of the go-alongs, where a German couple thought the “Havfalds” tour was a good way of “giving back” to a destination they frequently enjoyed visiting. Similarly, all co-design methods saw co-designers or participants whose thought of “giving back” was more intangible such as appreciating and protecting a destination’s nature and culture, while other co-designers regarded the notion of giving back more monetarily, such as spending money on local accommodation, dining, products and more, so the money spent would largely remain in the local community. Others had not directly thought about the notion of “giving back” when travelling but still had ideas for regenerative tourism futures or appreciated how their actions had regenerative effects. This was especially present in the first workshop, where many of the younger co-designers working on collages initially had trouble finding content for them, as they had never thought in those terms before, but after discussing the topic and finding another angle to it, ideas and experiences started emerging. During one of the go-alongs, several tourists on the Oyster Safari had similarly not given any thought to oyster gathering being a form of regenerative activity, but discovering this added to the overall experience.

The latter case exemplifies how an activity can be both regenerative and educational and how tourists participating learn something about the destination. During the different co-design methods, learning about a destination was deemed important by both tourists and tourism practitioners alike, e.g., tourists who want to attend guided tours to learn how to protect nature, or locals who enjoy conversations with guests about the place they are visiting.

### Section 3: Voices from the Region

Scholars such as Pollock (2020) and Holliday (2016) also regard regenerative design as an informed and intent practice. Informed, in this case, means that the learning aspect is pivotal in a regenerative system. The scholars claim that tourists, as well as practitioners, need to learn and understand how nature works if they intend to form a regenerative partnership with nature rather than just using it as a limited resource. This notion was also backed by the Sort Safari guide on the final go-along, which claimed that the first step in caring about nature was learning about it.

There are many ways to learn about a destination, whether it is through reading, visiting museums or attending guided tours. However, according to the co-design methods, engaging, meeting or talking with local people is the most preferable option. Overall, emphasis was being put on how a regenerative tourism future involved the locals at a destination, but that tourists should treat both them and nature with respect. This involvement could be everything from visiting food markets, attending local events, or simply speaking and engaging with the hosts at the place of accommodation. Not only does interacting with locals provide a source of knowledge about a destination, it can, according to the co-design methods, also make a trip more authentic and heighten the overall experience. As one co-designer on a go-along claimed, meeting and talking to locals were half of the experience when travelling, a notion that was also implied in the various guestbook entries. This desire for interaction between locals and tourists is not only beneficial for the tourists, but just as much for the locals and even nature. When talking to the various tourism practitioners on the third go-along, they expressed how they genuinely enjoyed interacting with tourists who showed interest in the area and that their own respect and love of nature could influence the tourists to feel the same.

However, regardless of different renderings or variations of interpretations of “giving back” projected by the co-designers, Pollock (2020) suggests that, despite being a part of it, regenerative tourism is much more than making incremental improvements in nature through

mere activities or adding regenerative features to an already existing tourism strategy. Reaching a regenerative tourism system posits a paradigm shift away from seeing nature as an extractable resource to a view of nature as a finite living system (Pollock, 2020). A paradigm shift is not something that happens fast and is not something that can be forced upon people but is rather a slow, gradually evolving process that people initiate on their own will. As stated by Meadows (1999), a shift occurs when you point out the failures of the old paradigm and work with active change agents in the vast and open-minded middle ground of people and further insert people of power representing the new paradigm acting as ambassadors. By looking at the past, there is evidence that the paradigm shift has already begun. In the 1970s, economist Milton Friedman, for instance, released the Friedman Doctrine, in which he argued that businesses and companies had no responsibility towards the public or society but that their sole purpose was to make money for their shareholders (Friedman, 1970). This viewpoint has since changed, exemplified by former Unilever CEO, Paul Polman, who claims that successful companies of the future need to make real contributions to society (Polman & Winston, 2021). Polman further claims that while sustainability is good, it is no longer enough, and more and more companies are starting to understand the importance of being regenerative (Ignatius, 2021). Pollock (2020) argues that the paradigm shift has already begun and that things have changed drastically in the past 50 years, with the COVID-19 pandemic accelerating the shift. According to Pollock and in line with Polman, we have moved away from Friedman's way of thinking towards a more sustainable paradigm and are now on the verge of the next shift towards a regenerative paradigm. She further claims that all people have a role to play in this, but states the importance of some people staying in the old paradigm while other people shift to the new so things do not come to a halt.

The different co-design methods also showed signs of said paradigm shift, happening in the WSNP. In the third workshop it was expressed, both verbally and through a collage, that tourists needed to switch from an ego-way of thinking to an eco-way of thinking. Here, the co-designers emphasised how, in the past couple of years, people had adopted a lot of “good”

habits at home and that similar habits are needed in nature and while being a tourist. The first two workshops also showed examples of this. Despite many co-designers claiming not to have thought about it, many of their ideas and statements showed an understanding that a change is needed, and that tourism and tourists could contribute to this change. This was, for instance, exemplified by one of the co-designers, who understood that tourism is no longer only about what the destination can do for tourists, but also the other way around. The guides on the “Havfalds” tour also claimed that their visitors showed a growing interest in doing something good for nature while on vacation, which was exemplified by the previously mentioned German couple and the local woman who attended.

During the workshops, some of the more environmentally conscious co-designers further claimed that within their circle of friends, people were starting to think in more environmentally sustainable ways. This was not only during their everyday lives, but also while travelling, suggesting a change in the mindset of younger tourists. In one of the guestbook entries, it was similarly understood that tourists could tamper with the unspoilt nature in the WSNP and that they thus needed to act respectfully towards both nature and the locals. It is, however, not only the demand from tourists wanting to do more good when travelling that is on the rise. The supply of regenerative activities from tourism practitioners, who are considering offering more such activities or tours, is also rising, and more and more beach cleaning initiatives are forming (National Park Vadehavet, 2022). The co-design methods, along with researchers, thus show that the shift of paradigm has begun. With the shift, a new tourism system in which we regard nature as a partner rather than a resource, has the potential to appear.

## 4• A new tourism system

If sustainability is about “doing less damage,” Pollock (2020) proposes that regenerative tourism is about developing the innate capability of a value-based system to self-organise, thrive and evolve and about creating the conditions for life to flourish. Becken and Kaur (2021) use the analogy of a tree to express their take on a value-based regenerative tourism system that is based on the values of the destination it takes place. While Becken and Kaur’s Tourism Tree (see Figure 2) represents a tourism system based specifically in New Zealand, the concept and ideas of the tree can be translated to other parts of the world as well. If translating this analogy to the WSNP, the roots of the system should be based on the values present amongst the locals in the WSNP as well as the regenerative principles. However, it could be argued that this rooted value approach could be criticised for presuming that “locals know best” when it comes to sustainable development and tourism. Contrary to this, Hughes and Morrison-Sanders (2018) propose a needs-based approach for STD that includes both the host community (e.g., locals) and the wider community (e.g., tourists). Here, the scholars consider the needs of both locals and tourists in the present generation and the future generation, defining STD as tourism that “accommodates the pluralistic nature of sustainable development whilst working towards shared objectives” (Hughes & Morrison-Sanders, 2018, p. 124).

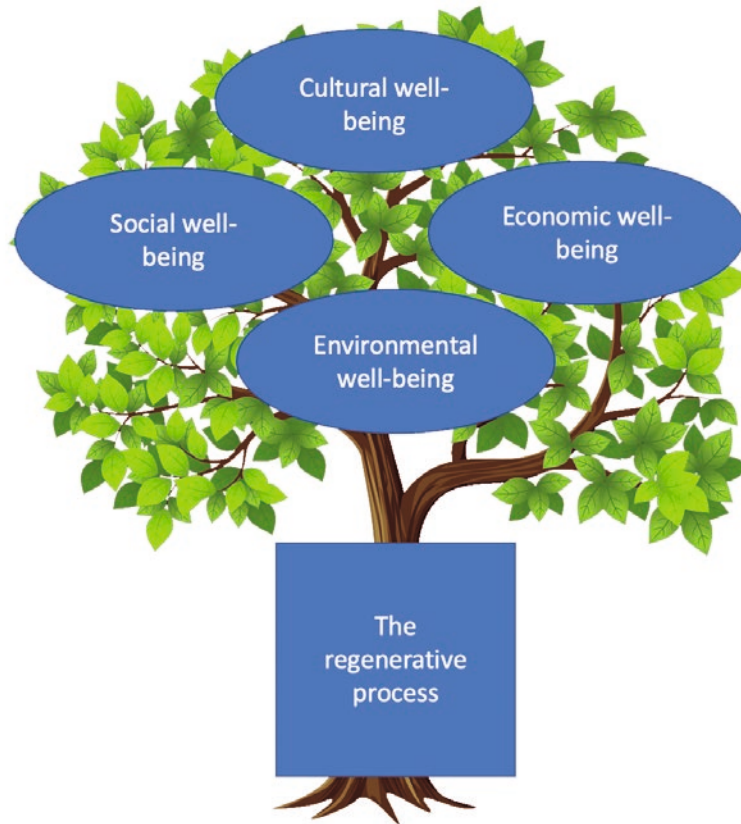


Figure 2: The tourism tree: value-based regenerative tourism  
(Source: adapted by the author from Becken and Kauer 2021).

It could thus be argued that tourists should not be disregarded from a tourism system but rather included in the root system of the Tourism Tree. This, along with Pollock's (2020) notion of a regenerative tourism system, should be based on a vision of a desired tourism future and leaves the Tourism Tree with room for more possibilities. This vision would be dynamic and change with time and as it is the case with values, future research is needed on how and why values change over time, and about the possible need to recognise both immutable and adaptable values, and equally about how to reconcile universal versus national

and local values (Liburd & Becken, 2017). In Becken and Kaur's (2021) Tourism Tree, the trunk could represent the regeneration of the WSNP through tourism, which culminates in a healthy crown that grows environmental, economic, cultural, and social well-being for humans and non-humans alike.

According to Becken and Kaur (2021), the different outcomes of well-being represented in the crown of the tree can create benefits on both a national and local level (Gerhards & Greenwood, 2021) and present a number of different indicators for measurements to capture outputs and outcomes, some of which will be elaborated in the following. Starting with the environmental benefits, the researchers, among others, found that a regenerative tourism system could increase the percentage of visitors actively contributing to conservation of nature and the percentage of natural/cultural heritage sites as well as ecosystems restored through tourism. The different co-design methods showed signs of this, especially tourists on the different go-alongs who were actively contributing to the conservation of nature, albeit some did it without the restoration aspect being the main focus of their actions. As mentioned before, the guides and Tønninggaard further saw this as a growing trend amongst their visitors. Another example of this stems from the third workshop, where the co-designers compared the WSNP to a great pantry, where they were able to forage and gather invasive species, and thus using nature while simultaneously taking care of it.

Continuing with social well-being, Becken and Kaur (2021) present that a regenerative tourism system can increase the visitor experience at a destination. This showed especially during the go-alongs, where the tourists on the Oyster Safari had little idea they were doing regenerative activities, but as soon as they were told, it lifted their experience. It could further increase the percentage of visitors wanting to experience authentic heritage, which is also highlighted in the guestbook entries, where emphasis was put on authentic experiences. This was also emphasised by co-designers during the collage-making in the workshops and tourism practitioners on the final go-along, who claimed authentic experiences could stem from eating

### Section 3: Voices from the Region

local food and engaging with or learning about local traditions or customs. Moreover, Becken and Kaur (2021) suggest that more locally sourced products will be produced and purchased, a notion which is backed especially by the co-designers from the workshops. Here, many of the co-designers saw a regenerative tourism future where tourists would mainly eat, stay and buy locally produced goods, as this was a way of giving back to the community.

Looking at the indicators for cultural well-being, the scholars propose that a regenerative tourism system could reinvest visitor expenditure into cultural sites and conservation, which also leads to economic well-being. One of the “Havfalds” guides said that despite the tour being *de facto* free, he presumed tourists would be willing to pay for it, especially if the money were reinvested into nature conservation projects. The oyster safari further showed that tourists are willing to pay for experiences in nature, but as stated previously, they are getting something tangible for the money paid, which could act as motivation for the payment. Many of the collages and notes created during the workshops did see suggestions to paid regenerative activities or ideas regarding conservation. These included ideas such as buying 1 square meter of marshland for conservation or guided tours that included planting trees or similar. Continuing with other economic well-being, there was consensus amongst the co-designers that keeping local businesses afloat by using them on vacation was part of a regenerative future. This consensus stemmed from both tourists and practitioners alike, who believed that using smaller businesses is preferable to using bigger ones.

While Becken and Kaur’s (2021) model of a regenerative tourism system has been criticised by the scholars themselves for resembling traditional production models, I still find the analogy of a tree to be useful. Tourism, in many instances before the COVID-19 pandemic, has been mainly focused on economy and growth, where a tree represents both life and complexity rather than simple growth. While a tree is inarguably something that grows, the main purpose of a tree is not to continue to grow bigger and bigger until the crown reaches the clouds. The main purpose of a tree is to become a habitat and ecosystem for other life (Watson, 2006). It

grows upwards to a certain size, whereafter it continues to grow more complex and provides conditions for other life to flourish. Considering this biology, the Tourism Tree is a good analogy for a regenerative tourism system, as such a system, according to Pollock (2020), should thrive and evolve and create the conditions for life to flourish.

However, where a tree analogy can show the dynamics and road from roots to crown of a single living species, it fails to see the complexity and dynamics of all the surrounding life it creates the grounds for and partners with. If the co-design methods have shown anything, it is the importance of local communities in a regenerative tourism system, and thus, I believe that a regenerative tourism system should be seen more like a community rather than a single entity, e.g., a tree. Instead of focusing on a single tree, I thus propose that we extend Becken and Kaurs (2021) tourism system by taking a bird's perspective and view the entire forest as a regenerative tourism system. The roots, trunks and crowns remain the same, but a forest is not a simple collection of numerous individual trees, but rather a complex and dynamic community of various trees, plants, fungi and other species. All these species communicate with one another (Wohlleben & Knudsen, 2016). They warn each other of various threats and pests and protect and nourish not only their offspring but also older and weaker trees.

A forest is thus much like a community or destination in a holistic regenerative tourism system, where communication between stakeholders and locals are a pivotal part (Duxbury et al., 2020; Rossier et al., 2020). According to Pollock (2020), the fundamentals of regenerative tourism is that it is place based, influenced by context, and it is about people coming together in their communities to develop the capability of welcoming people, managing tourism and to dream the future they want for their destination. As the Tourism Tree shows, this must be rooted in the values of the destination and must thus come from the bottom up and not the top down, a notion that was also agreed upon by some co-designers during the first workshop. When looking at a destination as a communicating forest, the inclusion and engagement from the community will not only provide for a deep sharing of values and

### Section 3: Voices from the Region

aspirations amongst the stakeholders (Duxbury et al., 2020), it will further emphasise the unique features of each destination, and tell the narratives emerging from local history, culture and traditions (Becken & Kaur, 2021; Duxbury et al., 2020; Rossier et al., 2020).

The regenerative forest should thus remind the tourism academe and the tourism industry that a regenerative tourism system does not consist of a single entity or individual but is rather a partnership between a plethora of tourism stakeholders, nature and the general ecosystem. It is a highly collaborative endeavour that involves multiple stakeholders, that together will shape the future of tourism and thus aligns with the notion from Heape and Liburd (2018) that “collaboration with others is a quintessential expression of an ethical, ongoing involvement of others through a respect for their ways of being in the world and their sense of values” (p. 232). By taking this holistic and value-based system approach that is built from the bottom up, it allows for civic society and stewardship, the latter of which, according to Neubaum (2013), can be defined as “caring and loyal devotion to an organisation, institution or social group” (p. 2). While Neubaum’s definition does not mention any devotion towards nature, stewardship does, according to Liburd and Becken (2017), put emphasis on the people involved in conservation efforts, their personal values and dynamic interrelations, which are all present in the regenerative forest analogy. When talking with local stakeholders on the final go-along, this sense of stewardship also appeared. One of the local tourism practitioners claimed that their care for the destination had a contagious effect on their guests, a notion that was backed by an entry in the guestbook.

The development of a regenerative tourism system is – much like the paradigm shift – not something that happens overnight. The data provided through the co-design processes, show a glimpse of various variations of interpretations of how different stakeholders would view a regenerative future in the WSNP, but to truly develop regenerative tourism, a clear vision of the future must be created by the locals (Pollock, 2020). This vision should be rooted in the values and needs of the locals and tourists that firstly should be mapped and could come in

the form of scenarios (e.g., Martin & Hanington, 2012) based on knowledge provided from studies such as this.

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## 5 • Concluding reflections

Taking on a co-design process allowed all those involved to unfold their own variations of interpretations of what regenerative tourism and “giving back” to nature means. The various co-design methods saw multiple renderings of these, where many involved had not given any thought to a regenerative mindset while travelling but, through co-design methods, began to create ideas and meaning of the concept. As stated by Liburd et al. (2020), co-designing tourism for sustainable development is thus about shifting fixed notions by instead adopting an attitude of mind that legitimises alternative perceptions of “how what is, who I am, who we are and desire, can become” (Liburd et al., 2020, p. 16). These changes and transformations of understanding emerged through conversations and negotiations *with* others. Transformation thus occurs in the micro detail of interactions between many people who collaborate and thus co-design counter-positions reductionist approaches, as it “represents the quintessence of collaboration where the sum of the work is more than its individual parts” (Liburd et al., 2020, p. 16).

The other co-design methods saw examples of some tourists actively trying to give back to the destination while travelling (e.g., on the “Havfald” tour), where others questioned the notion of “giving back” to nature by asking, “What did we take?” (Workshop 2), confirming the nuances of the concept and the many different variations of interpretations that exist within regenerative tourism. The regenerative activities already present in the WSNP, e.g., oyster picking and garbage collecting, also saw two very different approaches to regenerative tourism. Where the guides at Tønninggaard questioned the feasibility and even the morality of

charging tourists to attend their guided garbage collecting tours, the oyster safari costs tourists a relatively large amount of money, despite both activities being available to do for free on your own hand.

A noteworthy shift away from focusing solely on economic growth in tourism, notwithstanding, economic factors cannot be completely disregarded when running a business. In an ideal world, balance between the 3-pillars of sustainability should be found, but this would prove to be a difficult, if not impossible task (Hall et al., 2015; McCool, 2015). As claimed by Butler (2015), without economic viability and return on investment, the other pillars can become irrelevant. Many of the business owners, participants and co-designers involved in the co-design methods also claimed how keeping local businesses afloat was a way of “giving back.” Economic factors are pivotal to sustaining a business, and while offering free tours is truly noble, it may not be sustainable in the long run and can thus not be prioritised by the business, as is also the case with Tønninggaard and the “Havfalds” tours.

The overarching contribution of this research is that there is evidence of regenerative tourism developing in the WSNP and that the paradigm shift has started, which can be seen throughout the different co-design methods. As mentioned, regenerative development in a tourism context has received little attention, and what has been done so far has been on a policy-making level, with no real results to show yet (e.g., Becken & Kaur, 2021; Pollock, 2020). The research further showed that to develop a fully regenerative tourism system, more research is needed to explore the values of both the host and the wider community. While it was beyond the scope of this chapter to uncover these, it still gave voice to tourists and explored some of the relational values some tourists and stakeholders had with nature, which is a starting point. Similarly, more work is needed to create a clear vision of what a desired regenerative tourism future could look like, but as stated, the findings from this research could contribute to that. It is also important to recognise the limitations of my work, as my different co-design methods and outcomes are all context-related and thus contingent on the

specific places and people involved. As stated in the introduction, problems within tourism do not offer any “one-size-fits-all” solutions, and thus, it is recommended that future research on regenerative tourism through co-design methods be carried out in alternative contexts.

Transferring knowledge from academia directly to a business model is not necessarily easy and feasible, but the knowledge gathered about regenerative tourism development in the Wadden Sea National Park does allow for a more regenerative-inspired way of thinking in the day-to-day running of Klægager. As shown by the study, learning about a destination is an important part in the tourists’ regenerative process. Talking to our guests about our region, the Wadden Sea and the Marsh and thus sharing our love for the destination is the first step in our regenerative strategy. Hopefully, our devotion to the destination is contagious, and teaching the tourists about regenerative activities and regenerative tourism in itself is interesting to them. Likewise, going into partnerships with other local businesses, e.g., food producers, and sharing the story about the locality with our guests not only helps to keep local businesses afloat but also gives our guests an experience that is tailored to the destination they are visiting.

While I must agree with Hall et al. (2015), McCool (2015) and Butler (2015), that economic viability and return on investment is essential when running a healthy business, regenerative considerations can and should be implemented. It is, however, my experience that the tourists visiting Klægager are willing to pay the extra cost local food products normally cost, compared to more mass-produced and broader available products, while it simultaneously adds to their overall experience. Another regenerative aspect that is also economically viable is how we make flower decorations for parties, weddings, birthdays, etc. There is an offer for the guests hosting the party to make them flower decorations or “ditch-bouquets,” “*Groftekants buketter*” as we call them, which are flowers, branches, mushrooms, etc. that can be picked in ditches, gardens and fields around the farm, and thus always fit the season. These are not overly ambitious and extraordinary bouquets but pretty decorations that fit perfectly with the

concept at Klægager. After their use, the flowers are returned to nature, where their seeds will regenerate and provide decorations for the coming season.

As described earlier, regenerative tourism is not only about doing more or less tangible things, but just as much a mindset that can be adopted when running a business. A mindset that I have adopted at Klægager is to not focus on growth in terms of the number of tourists visiting. We operate 5 double rooms and 2 single rooms, and even though it could be profitable to add additional capacity, it is not in our interest to do so. We know that tourists visit us for peace and tranquillity, and by expanding with too many visitors, this could be jeopardised, while we simultaneously would have less time to talk and interact with each guest, the family and nature, which are the reasons we enjoy having a B&B by the Danish Wadden Sea National Park.


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## Chapter 14

# *Lower Saxony Wadden Sea Biosphere Region – Emergence and prospects of a model region for sustainable development*

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Lower Saxony Wadden Sea National Park Authority<sup>28</sup>

### 1. Origin and further development

In 1992, the Wadden Sea was designated as a biosphere reserve by UNESCO as part of its *Man and the Biosphere* (MAB) programme, covering the area of the Lower Saxon Wadden Sea National Park from 1986. At the time, this was due to the intensive environmental research carried out in the large-scale project “Ecosystem Research Wadden Sea.” At the time of the first designation, biosphere reserves were places for research into the coexistence of man and nature, so that conceptual synergies arose between the national park and the designation as a UNESCO biosphere reserve. In the meantime, the orientation of the MAB programme has changed – the focus is now on the claim to be a model region for sustainable development. In organisational terms, the administrative office of the Lower Saxony Wadden Sea Biosphere Region has

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### Section 3: Voices from the Region

been part of the Lower Saxony Wadden Sea National Park Authority (NLPV) since 1992 and is anchored in the National Park Act (NWattNPG).

The MAB programme was established in 1971 and has been continuously developed over the more than 50 years of its existence (Cluesener-Godt et al., 2022). In the beginning, its designated UNESCO biosphere reserves functioned as a reference network of largely natural habitats that should be used to assess human-induced changes. After 1995, these were given the status of model regions for sustainable development following the so-called Seville Strategy. From this point onwards, they had to fulfil criteria such as zoning into core area, buffer zone and transition area and support for the functions of conservation, logistics (education/research) and development. Since 2016, UNESCO biosphere reserves have been areas in which exemplary ways of achieving the UN Sustainable Development Goals are being pursued. They are subject to periodic reviews – known as evaluations – at 10-year intervals (UNESCO, 2022).

These changes to the MAB programme led to a critical assessment of the Lower Saxony Wadden Sea Biosphere Reserve during the first evaluation in 2003. The reason for this was the extensive focussing of activities on areas strictly protected by the national park, but which had no inhabitants. As a result, there was no basis for sustainable regional development; instead, activities focused on nature conservation, education, information and research. As a solution to this special situation, a “functional transition area” was defined, which comprised the districts and independent towns on the coast of Lower Saxony that border the national park. This area was defined as an action area for the biosphere reserve’s partner network (see below).

In 2009 and 2014, the entire Wadden Sea was recognised as a trilateral World Heritage Site. This also included the Lower Saxon Wadden Sea National Park and the core area and buffer zone of the biosphere reserve. On the occasion of the second evaluation in 2013, this was seen by the MAB programme as an additional enhancement of the biosphere reserve's potential.

The close link between the World Nature Heritage Site, national park and biosphere reserve [...] offers Lower Saxony the opportunity to establish an integrated sustainability management system for its entire Wadden Sea region and thus develop a global model, particularly for coastal regions. (Excerpt from an unpublished statement from the MAB National Committee to the Lower Saxony Environment Minister, 2014)

However, this evaluation also called for the requirements of a modern biosphere reserve to be met by establishing a formal transition area. At the meeting of the International Coordination Council of the MAB programme in 2016, it was even stated that the biosphere reserve did not meet the existing criteria. There was a risk of the award being revoked. This was averted following a visit to the three German Wadden Sea biosphere reserves in 2017 with the presentation of the implementation concept for the establishment of a transition area. In February 2019, the necessary process was then started. In this step, known as the consultation phase, negotiations were initiated with the 32 municipalities located directly on the Wadden Sea coast or on the East Frisian Islands to voluntarily join the transition area (Figure 1). This initially involved presenting the concept of the transition area to the respective mayors and in the respective municipal committees and councils. At the same time, an accompanying, comprehensive participatory process was carried out for all interested municipalities.

### Section 3: Voices from the Region

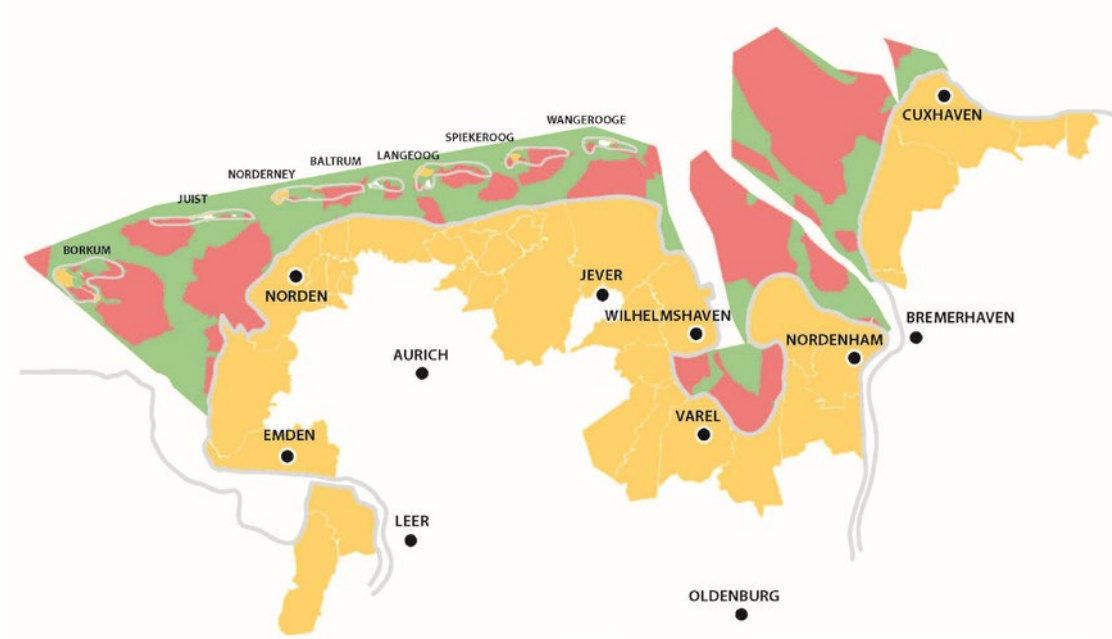


Figure 1. The Wadden Sea coast and East Frisian Islands  
(Source: Lower Saxony Wadden Sea National Park Authority).

The central body of this participatory process was the *plenum*, the assembly of the municipalities and districts on the coast that were interested in the process. From this, a *steering group* was appointed, consisting of representatives from four municipalities and two districts. This group accompanied and supported the work of the national park administration during the consultation phase. In addition, to the municipal committees, there were two overarching forms of participation, which were accompanied by external moderation. Experts and representatives of stakeholder groups were invited to so-called *thematic working groups* for the various fields of action. In addition, publicly accessible *municipal working groups* were organised in municipalities that had expressed an interest in this. These working groups produced proposals for objectives and projects for sustainable

regional development in the transition area. These proposals were ultimately incorporated into co-operation agreements concluded between the state of Lower Saxony (represented by the National Park Authority) and those municipalities that voluntarily joined the transition area on the basis of council resolutions. These cooperation agreements contained a general part that was the same for all municipalities and an annex with an individual work programme tailored to the respective municipality.

However, not all municipalities that were contacted during the consultations ultimately joined the transition area. Concerns were also raised during this extensive process. In principle, they were directed against possible interference by the National Park Authority in municipal planning sovereignty or additional nature conservation requirements, which were feared by the agricultural sector in particular. To address these concerns, the Lower Saxony Wadden Sea National Park Law was therefore amended on 10 June 2021. This clarified that the National Park Authority has no sovereign powers in the transition area of the biosphere region, i.e. outside the areas of the national park.

In August 2021, 11 municipalities signed cooperation agreements at a ceremony in Gödens Castle in the municipality of Sande. The town of Jever was added in July 2022. 12 municipalities have thus declared their accession to the transition area (from west to east): Jemgum, Norden, Hage, Spiekeroog, Schortens, Jever, Wilhelmshaven, Sande, Zetel, Nordenham, the town of Geestland with the sub-areas of Imsum and Langen, and the town of Cuxhaven with sub-areas (Figure 2). In September 2022, the application for renewed designation as a UNESCO biosphere reserve was sent to the MAB programme via the German MAB National Committee (Nationalparkverwaltung Niedersächsisches Wattenmeer, 2022). In June 2023, the biosphere reserve was finally recognised by the International Coordination Council of the MAB Programme in its new spatial extent.

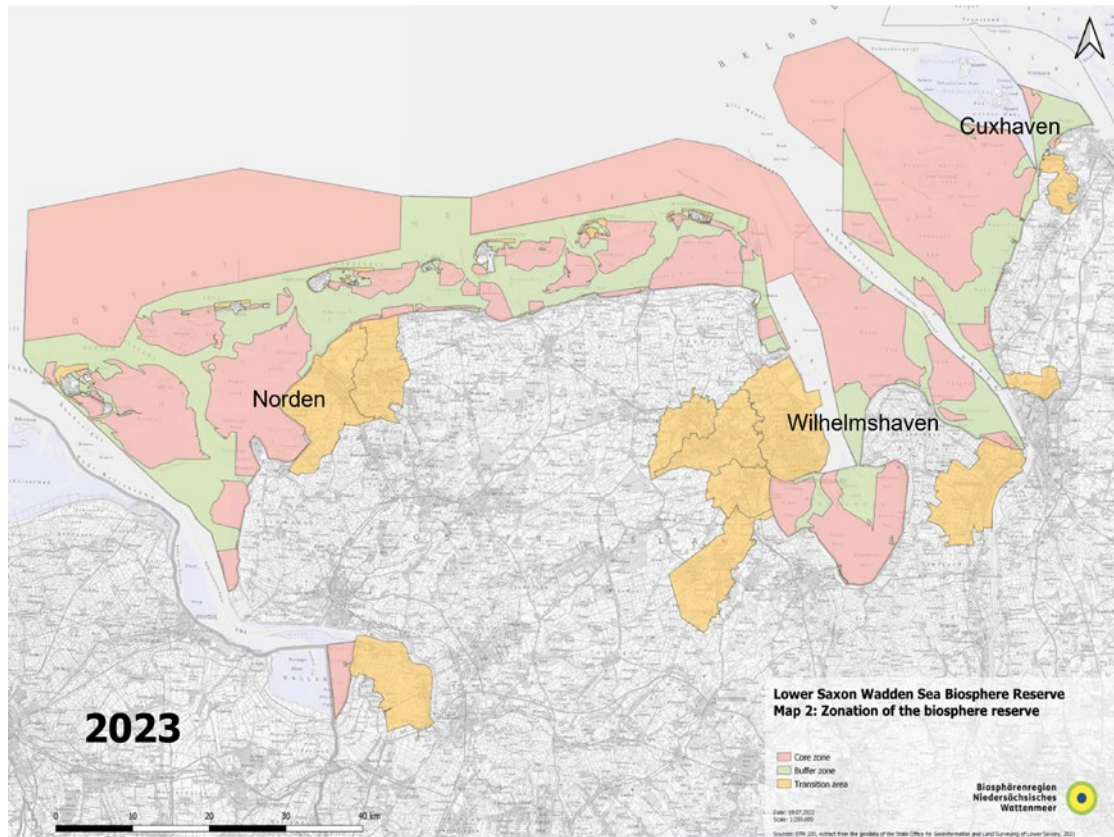


Figure 2. Zonation of the biosphere reserve (Source: Lower Saxony Wadden Sea National Park Authority).

The newly designated UNESCO biosphere reserve covers an area of 4171.31 km<sup>2</sup>. At 736.95 km<sup>2</sup>, the transition area alone is almost as large as the city-state of Hamburg (755.09 km<sup>2</sup>). While the core area and buffer zone of the biosphere region are uninhabited, the transition area has a population of 209,983 people (as of 2020). Compared to other biosphere reserves, the biosphere region is characterised by a number of special features. By including the East Frisian Islands with their beaches, dunes and salt marshes and the transition area on the mainland with marshes, geest and moorland, it is the only Wadden Sea biosphere reserve to encompass

the entire diversity of habitats on the German North Sea coast. With the towns of Wilhelmshaven and Nordenham, it is the only German biosphere reserve with urban areas. In combination with the World Nature Heritage Site and the National Park, it combines the exceptional universal value of the natural environment and ambitious nature conservation with the pursuit of sustainable development.

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## 2 • From individual projects to a framework for regional development

To move closer to the goals of the Seville Strategy, the UNESCO biosphere reserves are testing model solutions to sustainability challenges. In the Lower Saxony Wadden Sea Biosphere Region, initial projects outside of the national park areas have generated impetus and co-operation for sustainable regional development. As described above, the work of UNESCO biosphere reserves is orientated towards the three functions of conservation, logistics (education/ research) and development. Nature conservation is the basic mandate for a national park, and thus also for the Lower Saxon Wadden Sea National Park, as defined in the NWattNPG. In fulfilling this mandate, the biosphere region has more strictly protected areas than required by the criteria of the MAB programme. This can be seen in Figure 2 from the large spatial shares of the core area and buffer zone at 57.7% and 24.6% respectively. The criteria for UNESCO biosphere reserves only require a combined value of 20% for the core area and buffer zone (BMU, 2018). This means that the conservation function is more than sufficiently fulfilled here.

The areas of research and education are summarised under the logistics function. The first recognition of the biosphere region in 1992 was largely based on the highly interdisciplinary “Ecosystem Research Wadden Sea,” which was carried out in both Lower Saxony and Schleswig-Holstein. Between 1989 and 1999, four sub-projects provided the basis for a better

### Section 3: Voices from the Region

understanding of the Wadden Sea system as well as for more effective conservation (Behrends et al., 2004). In addition, a network of research institutions and researchers was established. After this the focus of the activities of the National Park Authority was on supporting and advising university research and the design, implementation and evaluation of the “Trilateral Monitoring and Assessment Programme” (TMAP) of the three Wadden Sea states of the Netherlands, Germany and Denmark (Südbeck et al., 2009). Since 2022, it has been possible to realise its own research approaches to a greater extent, particularly in connection with issues relating to natural dynamics, biodiversity, nature conservation, and tourism. At the beginning of 2024, a separate department focussing on research was established within the National Park Authority. Since the establishment of the national park, education for the national park and biosphere region – under the term environmental education – has been the responsibility of the 18 information facilities distributed along the coast of Lower Saxony, which are known as National Park Houses or Centres. They welcome up to 900,000 visitors every year. They also organise at least 8,000 events each year (National Park Authority, own data, as of 2023). Based on these activities, they have been recognised as “extracurricular places for education for sustainable development” by the Lower Saxony Ministry of Education and Cultural Affairs since 2018.

As an approach to nature (conservation) education for children from the Wadden Sea region, the concept of the Junior Ranger Programme was introduced in 2010 under the leadership of the Nationale Naturlandschaften (NNL e. V.). This was the first time that the Education for Sustainable Development (ESD) approach was consciously implemented. The participating children encounter the nature of the Wadden Sea in regional groups and at camps lasting several days. In addition, their skills for active participation in social processes are strengthened. To achieve these goals, the children are offered the opportunity to go through a multi-stage qualification path. The next step in implementing ESD in the Wadden Sea region is the designation of *Biosphere Schools*, which began in 2018 with five schools. These schools feel closely connected to the natural and cultural landscape of the Wadden Sea, have

sustainable regional development in their mission statement and implement sustainable action in their own sphere of influence (Carbach, 2023). Other schools have subsequently adopted this profile, so that as of 2024, 17 schools are part of this network, which meets twice a year to share experiences and plan joint activities. The vision for future work in the biosphere region is for the Biosphere Schools to work closely with the national park institutions and other educational partners (museums, universities) to create a *sustainable educational landscape*.

With regard to the third function of UNESCO biosphere reserves, the development function, there have been activities in the region since 1997. At that time, the training of so-called national park mudflat and visitor guides began. The most influential programme regarding the development function is the partner network of the biosphere region and national park, which was officially launched in 2009. With 284 partners from various areas of business and education (Figure 3, as of 2024), the partner network of the Lower Saxony Wadden Sea Biosphere Region is now the largest among Germany's large protected areas. The concept of the partner network is based on the idea of involving the people in the region in the conservation of the Wadden Sea and communicating that everyone can contribute to this through their own actions. To achieve this, the partner network is based on three pillars: Ambassadors of the Wadden Sea, Sustainable Management, and Co-operation. All members of the partner network are ambassadors for the Wadden Sea. They communicate this to the outside world and sensitise their own guests and customers to the uniqueness and need for conservation of the Wadden Sea. Each member of the partner network actively contributes to the conservation of the Wadden Sea through their own sustainable behaviour within the company and in their own actions. This starts with the consumption of resources and does not end with the purchase of regional and organic food. Co-operation within a network is important on the one hand to strengthen cooperation within the network, and on the other hand, to shape the region sustainably together. For this reason, the development of co-operation initiatives is the third pillar of the partner network. In the early days, the network focused

### Section 3: Voices from the Region

more on the tourism sector. To follow to the idea of sustainable regional development, representatives of other economic sectors and educational organisations that operate sustainably were gradually included. This allows co-operation initiatives to develop and the network's idea of actively shaping the region to be pursued.

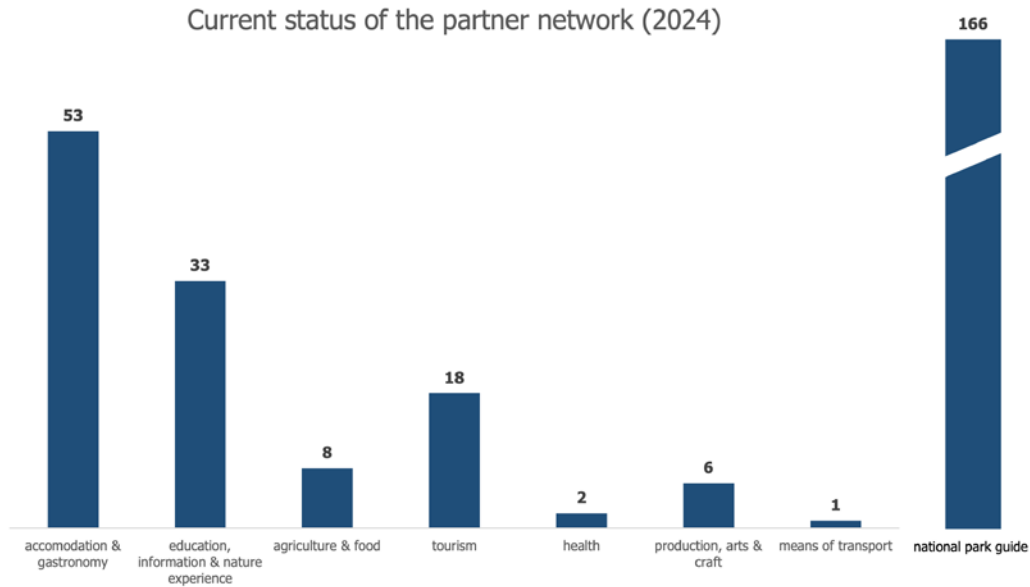


Figure 3. The Lower Saxony Wadden Sea Biosphere Region Partner Network (Source: Lower Saxony Wadden Sea National Park Authority).

With the advisory council of the partner network convened in 2010, criteria were developed in a co-design approach and the first certifications of partners were carried out. In 2015, the “Certified Wadden Sea Nature and Landscape Guide” (National Park Guide) award was then established. The holders of this award now make up more than half of the partners and are important communicators of the special features and conservation value of the Wadden Sea region. In the further development of the partner network, emphasis was not only placed on

gaining more partners. Another focus was their participation in joint events, such as the Biosphere Concerts or Biosphere Menu Days. In addition, the expansion of cooperation between individual partners was supported. From Figure 3 it is obvious that the majority of the members of the partner network are involved in tourism. In a more than 225-year-old tourism region this result is not surprising. In the early days of the biosphere reserve, tourism and nature conservation were regarded as contradicting activities endangering each others' interests. Today, the respective stakeholders have understood that both sectors are interdependent. The approach of sustainable tourism is the basic principle of the activities on the partner network.

2017 also saw the start of the labelling of sustainable regional products, the *Wadden Sea products*. These were advertised on a dedicated website. Efforts to develop new products and value chains began in 2020. Using the example of the biosphere sausage made from dike lamb from the biosphere community of Sande, it was also confirmed that these products have a special, identity-creating effect.

One of the concerns of sustainable development is the preservation of a vibrant regional culture. There are various approaches to this in the Lower Saxony Wadden Sea Biosphere Region. One example of this is the publication of two books in the regional languages of High German, Low German and Frisian, which deal with the region's birdlife (Walentowitz, 2018). Integrative projects that combine regional culture and identity with aspects of sustainability are an excellent way of bringing the latter out of academic circles and among the local population. One very successful example of this is the renovation of the Altmarienhausen estate. This ensemble, consisting of the traditional *Gulfhof* farmhouse with its local history museum, listed tower, orchard meadow, and catering business, was redesigned in cooperation with the volunteers working there and adapted to current standards with EU and governmental funding. The result is a widely effective example of the successful work of the biosphere region.

### 3• Perspectives

Of course, work in the biosphere region is by no means complete once it has been designated by UNESCO. Rather, the aim is to underpin approaches to sustainable regional development at regional, trilateral and international level with ongoing work and new initiatives, thereby contributing to the achievement of the United Nations Sustainable Development Goals. However, there are also numerous opportunities to promote sustainable regional development within the region's actual sphere of influence. One of the mandatory tasks associated with UNESCO recognition is the participatory creation of a management plan with the municipalities and people in the new transition area, which also has the character of a joint work programme for the coming years. It is also important to ensure the continuation of the existing Partner Network and Education for Sustainable Development programmes. The acquisition of funding and funding advice for integrative projects with the municipalities will become more important. In terms of fields of action, the focus will be on climate change adaptation, education and the promotion of biodiversity as well as public welfare-orientated economic activity in regional value chains. A truly unique feature of the partner network would be the utilisation of its potential as a shaping force in sustainable regional development.

The integrative approach of biosphere reserves can contribute to the common goal of *landscape and culture* within the framework of trilateral co-operation for the protection of the Wadden Sea. Linking the trilateral cooperation area, which has been recognised as a World Nature Heritage Site, and the adjacent coastal region to form a cultural and ecological network, a *Waddenland*, is an attractive and rewarding challenge. The three biosphere reserves in the German part of the Wadden Sea offer various approaches to this. The island of Neuwerk, located in the Wadden Sea part of Hamburg, represents a microcosm in which the impact of projects is very directly comprehensible. In Schleswig-Holstein, the focus will be on carrying the unique culture of the Halligen islands into the future against the backdrop of

climate change and rising sea levels. In this context, the Lower Saxony Wadden Sea Biosphere Region, with its large inland transition area, can serve as a model for the connection between the dynamic natural landscape of the Wadden Sea and the cultural landscape of the marshes behind the dikes.

There are two recognisable priorities for future work at an international level. On the one hand, it is important to continue our involvement in the World Network of Island and Coastal Biosphere Reserves (WNICBR). The organisation of the network's annual meeting in Wilhelmshaven in 2022 was an important step in this direction. However, it remains important to also contribute to the agreed activities. The work on the role of biosphere reserves as stepping stones in a biotope network of migratory species is entirely in line with this cooperation. This also coincides with the trilateral endeavours to preserve the populations of migratory birds along the East Atlantic flyway.

The Niimi Biosphere Reserve in The Gambia received significant support from the Lower Saxony Wadden Sea Biosphere Region in the preparation of its application to UNESCO as well as many on-site activities and meetings. Future cooperation can relate to a wide range of areas of sustainable living in West Africa; in addition to research, education, and monitoring, there are many points of contact with regional cycles and sustainable tourism. Joint initiatives to improve the local quality of life or education could perhaps also contribute small building blocks to solving the major issue of migration. Such graduated action can then lead to the creation of an exemplary sustainability management system for coastal regions and a common, sustainable path for the coast of Lower Saxony.

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## Conclusion





## Chapter 15

# Conclusion: Collaborative Wadden Sea futures

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“Never lose the desire to walk. I walk every day for my everyday wellbeing and I walk from any illness. I have walked myself to my best thoughts, and I know of no thought so heavy that one cannot walk away from it. [...] When you keep on walking like this, it will probably go well.”

Søren Kierkegaard (1813-1855) in 1847, letter to his sister-in-law, Henriette Kierkegaard

The primary goal of our TriWadWalks explorations was to cross borders and blend perspectives from various scientific institutions, disciplines, ages, cultural backgrounds, and stakeholder communities. We did this by collaboratively developing teaching and research pathways that are multi-, inter-, and transdisciplinary, thus contributing to a more integrative understanding of the Wadden Sea region and its connection to the Wadden Sea World Heritage Site. But why is this needed, wherein lie the problems, what are the benefits? Revisiting in turn the sections of our book, we discern

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## Conclusion

critical past orientations and present learnings from crossing borders and blending perspectives to propose promising paths for collaborative Wadden Sea futures.

Section 1 on Teaching and Learning starts with a compelling argument by Wittlich et al. (Chapter 2) that current disciplinary structures and formal learning facilities in universities are insufficient, particularly if the aim is to create “real world impacts” where present and future generation decision-makers act sustainably. Such pondering upon the premises and doings of the university has not ceased since the 1809/10 founding of the Humboldt University in Berlin (e.g., Barnett, 2011, 2013; Jaspers, [1946] 1965; Liburd, 2013; Newman, [1851] 1976; Scott, 1993). Their implied separation in disciplines and the idea of the university set apart from the world adopts a Biblical imagery from the Song of Solomon of the ivory tower that symbolises noble purity. In the university context, the ivory tower analogy is applied to describe intellectuals who deliberately engage in pursuits that are disconnected from the practical concerns of everyday life. Wittlich et al. proposed fostering place-based transformative learning for sustainable action. In recent decades, there has been much discussion concerning the role and relevance of university research and teaching beyond the academy and development of innovative practices for “real world” engagement. These discussions encompass a broad spectrum from radical activist research (e.g., Fuller & Kitchin, 2004) to policy relevance (e.g., Bandola-Gill, 2019) to transdisciplinarity (e.g., Scholz & Steiner, 2015). In particular, universities are argued to play a critical role in sustainable regional development (Blume et al., 2017, Schneidewind et al., 2016), although the extent to which universities should serve their particular regional context rather than the production of global knowledge remains a matter of debate (Harrison & Turok, 2017). Recent interventions from the environmental and conservation humanities highlight the actual and potential roles humanities and critical social science perspectives can play in informing and responding to current environmental challenges at both local and global scales (Holm & Brennan, 2018, Ritson et al., 2024).

Broadening the learning environment beyond the traditional classroom, Blichfeldt and Kempenaar (Chapter 3) reflect on the method of Go Alongs as a means of shared knowledge creation while moving through the nature areas and landscapes we wish to understand. In an example of practice-oriented engaged teaching Kempenaar and Luiten (Chapter 4) experiment with summer school activities. They design future coastal adaptation scenarios with students across a range of disciplines, including landscape architecture, landscape design and planning, history, architecture, urban studies, and philosophy. The student reflections by Siebel and Schellworth (Chapter 5) are not only a testimony to the richness of learning when crossing disciplinary borders. They capture a deep appreciation of cultural and natural diversity and encounters with practitioners along the way that blended their perspectives on futures for the sustainable development of the Wadden Sea region. Returning to the issues of sustainable development and futures below, what comes to fore is an understanding of teaching and learning that extends beyond the knowledge, skills, and competencies predefined by higher education curricula.

The TriWadWalk contributions in Section 1 collectively present a compelling case for expanding into lifewide learning. The notion of lifewide learning differs from lifelong learning, commonly defined as learning activity undertaken throughout life. Lifewide learning adopts a holistic approach to learning by insisting that at any point in time, for example, while a learner is engaged in higher education “an individual’s life contains many parallel and interconnected journeys and experiences and that these individually and collectively contribute to the on-going personal and potentially professional development of the person” (Jackson, 2010, p. 4). Learning with others while crossing personal, intellectual and physical borders, being on the move and immersed in the landscape, cultivates certain qualities, or human dispositions, including carefulness, thoughtfulness, criticality, receptiveness, resilience, courage, and stillness so that students can act purposefully and judiciously (Barnett, 2004, p. 258). Calling for an ontological shift in

## Conclusion

higher education, Barnett points to learning for not only knowledge and skills (and competences) but for “authentic being” (2004, p. 259).

Yet the TriWadWalks involve greater intervention on the lifeworld of students than teachers may find feasible due to work constraints at the current university, or they may ideologically dispute the mandate of the university teacher for such deep engagement with the students (Feldt & Feldt, 2009). Intellectual considerations, such as teachers’ concerns, chances of climbing the career ladder, maximising self-performance, and gaining recognition may impede lifewide collaborative teaching and learning (Walsh & Kahn, 2010). If the dialogue in collaborative efforts is biased and unequal between partners, some may find that one’s authentic identity and ownership to the joint process is undermined. Attention to the self in higher education involves a critical exploration of one’s own being in both ontological and epistemological terms (Heape & Liburd, 2018). Fostering deeper self-awareness and reflexivity is a way to open up to perspectives beyond the self, as eminently demonstrated by Siebel and Schellworth (Chapter 4). This should not be mistaken for self-indulgence. Rather, it reflects an emancipatory, critical view of higher education and research (see also Rose, 1997). It is one where academic freedom encompasses the freedom of students, rooted in a critical examination of how and what is being taught, learned, and achieved (Barnett, 1990) in collaboration with others (Menke et al, 2022). The TriWadWalks demonstrate the benefits of incorporating multi-, transdisciplinary and lifewide perspectives of learning outside of the classroom while the traditional learning environment “remains a possibility” (hooks, 1994, p. 207).



Figure 1. Making traces (Source: photo by authors).

The scientific explorations in Section 2 advance the crossing of perspectives, borders and scales. In Chapter 6, Walsh examines dominant narratives surrounding the Wadden Sea, such as its portrayal as a world-class natural site, to critically interrogate what constitutes nature and to question the boundaries between the natural and artificial, as well as the cultural constructs that shape our understanding of nature. Walsh demonstrates how collective imaginaries of the Wadden Sea, spanning local, national, and global scales, influence evolving conservation regimes. This interplay is reflected in a complex mosaic of

## Conclusion

conservation laws and the globally significant patterns of bird migration, each rooted in place-specific associations and meanings. By scrutinising the Dutch-German-Danish trilateral narrative, Walsh challenges the portrayal of the Wadden Sea as a singular, unified ecological and conservation zone, arguing that this view often obscures, rather than embraces, the rich cultural diversity across the region.

Fink and Ratter (Chapter 7) address the complex interplay of global and local dimensions of climate change by exploring the potential of a blue carbon strategy in the Wadden Sea. “Blue carbon” refers to carbon storage and fluxes within marine ecosystems, particularly in coastal vegetated areas like salt marshes and seagrass meadows, which, when effectively managed, could play a role in climate mitigation. Blue carbon interventions vary in scope, from regenerating or expanding salt marshes and seagrass meadows to boost carbon sequestration, to more transformative onshore changes, such as replacing traditional dikes with nature-based solutions. However, these larger interventions can provoke concern and resistance from local residents, as well as domestic and international tourists. This highlights a critical need for transdisciplinary research to clarify blue carbon sequestration rates and their additionality, while also addressing the societal values, collective decision-making processes, and climate actions required for effective implementation of blue carbon strategies.

The dual climate and biodiversity crises, resulting in rising sea levels and increasing strength and frequency of storm surges, cause erosion and threaten the ecological balance of the coastal dune system. Crossing traditional hierarchical research borders, students Orth and Schütte engage in research and investigate the discourse and practice of dynamic dune management on the island of Sylt (Chapter 8). The TriWadWalks visit to the Sylt Listland dunes was led by Prof. Dr. Karsten Reise, who provided rich insight to the diversity of coastal dune habitats, from drift lines and dune slacks to foredunes, heath, and dune grasslands, inspired their original agent-based modelling work. Cognizant of laboratory experiment limitations, Orth and Schütte not only question but critically propose to

rethink dune management. Going beyond well-established management paradigms, e.g., “Letting nature be nature” and “Dune protection is island protection” they introduce scenario modelling to foster fruitful discussions on possible interventions for desirable futures sensitive to socio-ecological contexts.

Together with youth in the Wadden hinterlands, the latter of which refers to the communities and small rural municipalities on the mainland coast of the Wadden Sea, Trel, Hofstede and van der Vaart explore the liveability of the Eemsdelta municipality in the Dutch Wadden area as experienced and evaluated by 11-to-19-year-olds growing up in the region (Chapter 9). Like most of the Wadden hinterlands, and especially those that have not become tourist destinations, the Eemsdelta municipality face population decline and ageing, depreciation of property value, and decline in the number of services and facilities (Mehnen et al, 2023). While the quality of the natural environment, social cohesion, and safety in the region are rated above the national average, Trel et al. provide a rigorous understanding of the future aspirations and wishes of the youth and call for more attention to young people’s voices and perspectives to shape places that are intergenerationally and socio-politically more inclusive and resilient.



Figure 2. Looking ahead (Source: photo by authors).

Sijtsma’s pondering explorations of sustainable tourism in the Wadden Sea Region during the TriWadWalks (Chapter 10) points to a multitude of Wadden Sea impacts and vulnerabilities. While tourism is easily singled out as the villain, Sijtsma captures the nuances of cumulative impacts threatening the Wadden Sea area. From a governance perspective, he points to the silencing of the community of millions of “Wadden fans” described as “people who carry the Wadden area in their hearts (even) when they are not there.”

As demonstrated in Section 2, the TriWadWalks provided a promising start for listening to and learning from diverse local stakeholders and actors in this region, which result in a rigorous blend of research perspectives *with* (rather than *for*) others, including the future agents of socio-ecological transformation in and of the Wadden Sea. The contributions collectively advance knowledge beyond the *Trilateral Research Agenda's* (2018) division along traditional thematic lines, namely *Climate, water, sediments and subsurface; Ecology, biodiversity and spatial processes; Cultural heritage, identity and historical embedding and Economy, society and sustainable development*. Unequivocally, Section 2 establishes the need for transdisciplinary research to embrace the dynamics and complexities of the Wadden Sea, and act on multi-scale challenges and opportunities for more desirable futures rather than furthering narrowly defined disciplinary-specific research agendas. This aligns with Enemark et al.'s (2018) call for integration across the natural and cultural sciences in the protection of both natural and cultural values at the Wadden Sea, in the context of the Anthropocene. The contributions in this section, however, also go beyond this call for integration. It demonstrates the value of critical, interpretive perspectives, whether it is in relation to fundamental questions concerning the definition of nature and natural processes or the relationship between local and global perspectives, as well as questioning dominant narratives of blue carbon, dynamic management and regional economic development.

Finally, Section 3 on the voices from the region is dedicated to the pluriverse of the Wadden Sea where diverse hopes can be sown, multiple opportunities can be cultivated, and a tapestry of meaningful lives can be woven by richly different and caring people who engage with others. The first contribution by Spiekermann and Schaal addresses the challenges posed by climate change to inland drainage schemes in the marshlands of East Friesland (Chapter 11). They present the results from the KLEVER-Risk project (2019-2023). The KLEVER-Risk project is a collaboration between the Carl von Ossietzky University of Oldenburg and the Jade University of Applied Sciences, Oldenburg, in close partnership with the water boards of Norden, Emden, Oldersum and Aurich, the district of Aurich, the urban municipality of Emden and

## Conclusion

the Lower Saxony Water Management, Coastal Defence and Nature Conservation Agency. In response to rising sea levels and increasing precipitation extremes, they propose to enhance pumping capacities alongside expanding retention capacities to sustain current inland flood protection levels in the coastal region. Still, this will not guarantee full protection against inland flood events. They argue that residual risks should be countered by supplementary inland flood risk management measures. Predictive forecasting based on evidence from the past can make future scenarios relatable. Yet by admitting uncertainty, if not path-dependency, a lesson learned from Chapter 11 is also that the future is not yet determined. Consequently, we need to practice futures thinking about what desirable alternatives could be, which resonates well with the findings of the previous sections.

Chapter 12, written by Dreyer, explores the transformation of a conventional farm on the Krummhörn peninsula in East Frisia to organic farming in the late 1980s. As one of the early pioneers of organic agriculture in the region, the farm has served as a model for environmentally friendly farming practices, inspiring other farmers to follow suit. This includes innovative approaches to direct marketing, such as the establishment of a farm shop and a delivery service, which have contributed to the farm's successful business model.

Dreyer, whose family has managed the farm since 2016, highlights how the philosophy of organic farming and direct marketing aligns with the vision of the new Wadden Sea Biosphere Region. This region is committed to fostering a sustainable transformation of both the regional economy and society at large. However, Dreyer notes that it remains uncertain to what extent consumers are willing to adjust their eating habits to support a more extensive agricultural transition within and beyond the Lower Saxon Wadden Sea Biosphere Region.

Chapter 13 by Lorenzen is an example of what Trell et al. (Chapter 9) characterised as one of “the rural young people who expect to stay [in the Eemsdelta] exert considerable agency and make sense of their rural identity for the future.” Jannik Lorenzen is the seventh-generation

owner of *Klægager*, a marsh farm located at the border of the Danish Wadden Sea National Park. The traditional Frisian style marsh farm was converted from a pig farm into a small bed and breakfast by his parents in the wake of the global financial crisis. Instead of developing tourism for his guests, Lorenzen applies the method of tourism co-design *with* his guests and other stakeholders to identify sustainable and regenerative opportunities. He objects to the concept of regenerative tourism framed merely as “giving back” through small-scale nature improvements or as an add-on to existing tourism strategies. Aligned with Liburd and Walsh (2022) he argues that regenerative tourism constitutes a paradigm shift: from seeing nature as an extractable tourism resource to a systemic view of humans/tourists in nature and part of complex living systems. At *Klægager* regenerative tourism is not only about doing tangible things in nature, but just as much a mindset that can be adopted when running a tourism business. How this is to be manifested in everyday operations remains an ongoing and evolving challenge.

Lastly, Rahmel, Martin and Südbeck describe the evolution and prospects of the Lower Saxony Wadden Sea Biosphere Region (Chapter 14). Their ambitious goal is to support sustainable regional development through ongoing efforts and new initiatives at regional, trilateral, and international levels focused on achieving the United Nations Sustainable Development Goals (see also Weixlbaumer et al., 2020). Corresponding to the earlier Lower Saxony Wadden Sea National Park, the biosphere reserve was significantly expanded in 2023 to include several mainland coastal municipalities between the Dollart and the Elbe estuary. This enlargement has transformed the reserve into a broader “laboratory” for sustainability transition initiatives and projects, creating opportunities for a greater number of stakeholders to participate. The expanded territory is intended to foster collaboration and promote the idea of sustainability across the entire Wadden Sea coast.

The Biosphere Region aims to provide a cohesive framework for regional development on a larger scale, moving beyond isolated initiatives. This vision is actively promoted through a

## Conclusion

network of biosphere partners, including farmers, tourism businesses, and schools, among others. While it remains too early to determine whether this network will evolve into a significant driver and shaping force for sustainability transitions in the region, the Biosphere Region represents a new learning environment, well suited for multi-disciplinary scientific explorations.

In sum, this book is the product of a unique endeavour – transboundary explorations by foot, bike and public transport through a unique coastal landscape by an international and interdisciplinary group of university researchers and students. Each of the chapters was informed by this grounding in the landscape as well as intergenerational dialogue among students, staff and practitioners encountered while on route. As a result of the TriWadWalks origins and format, shaped by the editors’ combined 117 years of teaching and research experience in higher education, we intentionally set out to challenge conventional boundaries between research and teaching, as well as theory and practice. Moreover, by focusing on two cross-border regions, we moved beyond the transnational narrative of “One Wadden Sea” to reveal how local communities and practices in each national and regional jurisdiction face similar challenges. However, they are also marked by notable differences and complexities, which open valuable opportunities for enriched cross-border learning, research, and ongoing experimentation. These efforts refine the responsibilities involved in shaping desirable futures. The TriWadWalks thus provide further evidence of Liburd’s (2013) reclaim of the Humboldtian aims of higher education, and the university at large, as collaborative space for “receiving and contributing to critical knowledge about the past and present; a space for transformation of the self and a space to engage in future world-making” (p. 7). We walk on, knowing that within these latent possibilities lie the potential to dismantle current lock-ins and critically engage with the complex, wicked problems of the 21st century in the Wadden Sea and beyond.



Figure 3. Walk on (Source: photo by authors).

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The Wadden Sea Region represents many of the tensions and contradictions of contemporary society, e.g. climate change, tourism, and sustainable development, placed in sharp relief by the presence of the UNESCO Wadden Sea World Heritage. *Crossing borders, blending perspectives* is the first edited work to explore transboundary landscapes through multi- and transdisciplinary perspectives by researchers and students jointly moving across national borders. Listening to and engaging with diverse stakeholders, practitioners and decision-makers, 10 students and 10 researchers engaged in interactive learning whilst walking and biking a total of 600 km to explore and make sense of contradictions, interrelations and transformations in the past, present and future.

The book contains contributions from researchers, student experiences, and practitioners' voices from the region that highlight contrasts, links, and interrelationships between society and ecology, cultural and natural heritage, teaching and learning. It charts a course for multi- and transdisciplinary research and suggests advances in higher education.

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