

Margit Bussmann / Alexander Drost /
Steffen Fleßa / Sebastian van der Linden (eds.)

CHALLENGES OF THE BALTIC SEA REGION

Fragmentation and Harmonisation
in Transformation Processes



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wissenschaft

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baltic sea region

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**ROMBACH WISSENSCHAFT
STUDIES OF THE BALTIC SEA REGION**

Editors

Margit Bussmann, Alexander Drost, Steffen Fleßa
and Sebastian van der Linden

Volume 3

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The production of the book and its publication as open access have been generously funded by the Federal Ministry of Research, Technology and Space (project “Fragmented Transformations”, funding code 01UC2102).

Gefördert durch:



Bundesministerium
für Forschung, Technologie
und Raumfahrt

The **Deutsche Nationalbibliothek** lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data are available on the Internet at <http://dnb.d-nb.de>

1st Edition 2026

© The Authors: Margit Bussmann / Alexander Drost / Steffen Fleßa / Sebastian van der Linden (eds.)

Published by

Rombach Wissenschaft Verlag within Nomos Verlagsgesellschaft mbH & Co. KG
Waldseestraße 3 – 5 | 76530 Baden-Baden
www.nomos.de

Production of the printed version:
Nomos Verlagsgesellschaft mbH & Co. KG
Waldseestraße 3 – 5 | 76530 Baden-Baden

ISBN (Print) 978-3-98858-185-3

ISBN (ePDF) 978-3-98858-186-0

DOI: <https://doi.org/10.5771/9783988581860>



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Preface

This volume, *Challenges of the Baltic Sea Region: Fragmentation and Harmonisation in Transformation Processes*, presents the findings of a collaborative research project based at the Interdisciplinary Centre for Baltic Sea Region Research (Interdisziplinäres Forschungszentrum Ostseeraum, IFZO) at the University of Greifswald. The project was funded by the German Federal Ministry of Research, Technology and Space (BMFTR, 01UC2102) with the purpose of establishing the Centre and creating the structures needed to institutionalise the study of the Baltic Sea region as one of the University's key research areas.

It is the first volume of its kind to emerge from this initiative, bringing together the results of genuinely interdisciplinary research, and we very much hope it will be followed by many more.

The Baltic Sea region is shaped by overlapping processes of fragmentation and harmonisation—political, economic, social, cultural, and ecological. Capturing these dynamics requires perspectives that no single discipline can provide on its own. We are therefore deeply grateful to all researchers involved in the joint project for their willingness to look beyond their disciplinary horizons and to engage in the open, often challenging, and ultimately very fruitful exchange that made this book possible.

We are thankful to those who turned a collection of contributions into a coherent volume. We owe particular thanks to Franziska Sajdak, whose calm, careful eye, and ear for the right phrasing did much to shape the quality of this volume. We are likewise grateful to Bernd van Kampen, Sara Melzer and Yannik Wedemeyer of the IFZO team and to Marion Müller at Nomos for their valuable support throughout the process.

Greifswald, May 2026

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Transformation Space Baltic Sea Region

An Introduction

The Baltic Sea region is a space of profound change. Multiple transformation processes intersect in it, shaped by social and cultural shifts that unfold at varying speeds across distinct areas. Technical innovations, structural adaptations and social change go hand in hand. Consequently, a comprehensive understanding of the Baltic Sea region as a multifaceted transformation space requires an interdisciplinary approach. The maritime natural and cultural landscapes with a rural character are increasingly threatened by climate change. Environmental factors shape the transformation of Baltic Sea societies just as much as the shared legacy of historical experiences of war, crises, and division, which is continuously reframed by recent and ongoing crises, such as the annexation of Crimea, increased migration, the COVID-19 pandemic, and the war in Ukraine. The concept of transformation in this volume is associated with a fundamental and long-lasting change in structures, functions and relationships in social, technical and ecological systems.¹ Despite the planning and modelling of future developments, transformation processes in the Baltic Sea region have not been linear, but can be perceived as erratic and fragmented challenges for actors and societal structures.

Transformations are characterised by both internal and external logics. From an external perspective, they are often understood as ruptures in social or systemic development, in which one system replaces another. Karl Polanyi, for example, describes the ›Great Transformation‹ towards an industrial society—marked by the rise of a market economy and democracy—as such a rupture.² Similarly, the shift from socialism to post-socialism can be interpreted through this dual lens, as internal processes of adjustment coexist with external perceptions of radical systemic change. The transformation of the

1 Bohn, Carolin/Fuchs, Doris/Kerkhoff, Antonius/Müller, Christian: (Wie) Kann eine Transformation zur Nachhaltigkeit gelingen?, in: id.: Gegenwart und Zukunft sozial-ökologischer Transformation, Baden-Baden 2019, pp. 7–24; Patterson, J. et al.: Exploring the governance and politics of transformations towards sustainability, in: Environmental Innovation and Societal Transitions 24 (2017), pp. 1–16, <https://doi.org/10.1016/j.eist.2016.09.001>.

2 Polanyi, Karl: The Great Transformation: the political and economic origins of our time, New York 1944.

German Democratic Republic (GDR) society exemplifies this perspective and is frequently analysed as a profound rupture in social and political structures.³

From an internal perspective, however, transformation processes are experienced and described as evolutionary, cyclical, erratic, discordant or even broken. Particularly within the social sciences, and especially in research on sustainability transformations, approaches have emerged that also account for continuous and incremental processes of change, placing less emphasis on disruptive moments that often only become visible retrospectively. These approaches are aimed at analysing long-term institutional and structural change. Against the background of eco-systemic and planetary limits,⁴ social change is conceptualised as only one dimension of broader eco-systemic dynamics. These dynamics are addressed through complementary perspectives drawn from transition research, social-ecological and sustainability research, social innovation research, and resilience research.⁵

This volume aims to explore current socio-ecological transformation processes in the Baltic Sea region in the context of the ongoing objective of sustainable development of the region and its societies. Although the consequences of Russia's war of aggression against Ukraine increasingly dominate attention and political agendas, questions of sustainable development under the specific conditions of the Baltic Sea region remain decisive for the region's transformation—especially in the context of growing securitisation. The contributions take into account the region's cultural diversity and the extent to which cultural, regional, and local influences shape transformation processes. Conversely, it also investigates how, in turn, these processes impact cultural and regional identities. The economic, social, and geopolitical transformations experienced by post-socialist societies in the 1990s are an important foundation, but have been intersecting with sustainability transformation as a new ›master challenge‹ since the 2000s. Research results will contribute to our understanding of the region's recent past, present and future.

Taking into account the non-linear and uneven nature of the various changes in the Baltic Sea region, the concept of fragmentation of transforma-

3 Schwartz, Michael: Transformationsgesellschaft. DDR-Geschichte im vereinigten Deutschland, in: Vierteljahrshefte für Zeitgeschichte 69 (2021), No. 2, pp. 346–360.

4 Bornemann, Basil: Environmental Governance in the Anthropocene: Challenges, Approaches and Critical Perspectives, in: Chandler, David/Müller, Franziska/Rothe, Delf (eds.): International Relations in the Anthropocene: New Agendas, New Agencies and New Approaches, Cham 2021, pp. 311–329.

5 Wittmayer, Julia/Hölscher, Katharina: Transformationsforschung. Definitionen, Ansätze, Methoden, Dessau-Roßlau 2017, p. 15.

tion processes provided the starting point for the present interdisciplinary investigations, in order to describe, understand and adequately analyse the meandering course of transformations. Here, fragments of the transformation process are seen as distinct yet interconnected parts of a larger whole, shaped by disruptions arising from differences in implementation and by the different perspectives, contexts, traditions, and locations of the actors and structures involved. The individual fragments of the transformation process remain distinct and can be analysed separately, even though they form an integrated whole. An understanding of fragmentation thus sheds light on the erratic paths these processes can take. Some of the available studies show that external pressure or crises situations, behavioural shifts and successful implementation strategies can channel the transformation process and purposefully bring together the fragments by harmonising different perspectives and innovation approaches. This dynamic creates a dialectical relationship between fragmentation and harmonisation, which reflects the complex interplay of cultural, social, economic, and political structures and institutions.

In this volume, we use the concept of *transformation spaces* to relate, first, to the historically conditioned and profound transformations of societies in the region and its diverse spatial constellations from local to transnational. It is then applied to distinguish the societal domains that are affected in different ways by this fundamental transformation. While these two dimensions may, but do not necessarily have to, be interdependent, it is essential for our purposes to consider them together. This is because transformations of political, economic, and social systems set the framework within which change in rural areas, the health sector, the military sphere, and human–nature relations unfolds—changes that are strongly shaped by societal conditions at both the national and transnational levels. These conditions are, at all times, informed by the experiences and expectations of societies and their actors. Consequently, shared heritage constitutes both an object of transformation research in its own right and a condition shaping other *transformation spaces*.

Transformation Space Baltic Sea Region

Contemporary transformations in the post-Cold War era, following the division of the Baltic Sea region by the Iron Curtain, are part of centuries-long experiences of change that have shaped the region into a historical transformation space formed by both anticipated and unexpected developments. Hereby, the Baltic Sea region is a construct that differs in scope, nature and

sense of belonging depending on one's perspective.⁶ Therefore, one can speak of different Baltic Sea regions depending on the temporal, spatial and social order.⁷ The central point of reference for most of these conceptualisations is the sea. Networks, cultural exchange and regional unity are determined by the sea between the littoral countries. When discussing the multiple configurations of the Baltic Sea region, we recognise the diversity of ways in which it has been conceptualised, shaped by distinct selections of historical events, influential actors, and institutional frameworks. These configurations are not fixed; rather, they reflect shifting narratives, scenarios, and models that emphasise particular dimensions. For example, the Hanseatic trade network represents an early economic formation, while Swedish and Russian hegemonies illustrate nationally and geopolitically dominated viewpoints. In contrast, the Cold War divide and the post-1991 Baltic Sea region, represented for example in the Council of the Baltic Sea States, reflect multinational or even global dynamics. Together, these configurations underscore the region's complex identity.

From a historical perspective, these different configurations of the Baltic Sea region appear in their chronological order as one transformation space with an evolutionary character. However, this linearity is not the case. None of the historical turns had been a logical and necessary consequence. Rather, each mark a distinctive transformation space in which for instance economic structures, social standards, technical innovations and political institutions developed. In analogy to the assumption of different Baltic Sea regions, we propose to distinguish transformation spaces which are fragments that can be temporally delimited in their overarching impact on society, particularly through a historical perspective. At the same time, however, these transformation spaces are also distinguishable in terms of content by the object of transformation. Transformation processes thus have a temporal, spatial and content-related component, which in turn can vary in duration, size and innovation due to the cultural and social conditions of change. Due to the simultaneity of transformation processes, the (fluid) spaces in which these processes take place can overlap or be interconnected.

6 For a discussion of regional constructs, see Ermann, Ulrich/Priebs, Axel: *Die Region—ein Phantom?*, in: Ermann, Ulrich/Höfner, Malte/Hastniker, Sabine/Preininger, Ernst Michael/Simic, Danko (eds.): *Die Region—Eine Begriffserkundung*, Bielefeld 2021, pp. 13–25.

7 Drost, Alexander: *Ostseeräume. Umbruch zwischen kultureller Einheit und politischer Krise in einer europäischen Seeregion um 1800*, in: Loeser, Martin (ed.): *»Verwandlung der Welt«? Die Musikkultur des Ostseeraums in der Sattelzeit*, Berlin 2016, pp. 21–33.

For the Baltic Sea region and the establishment of a regional identity, Christianisation marked such a transformation space that was formed in the process of cultural unification of the medieval Baltic Sea region, which was already closely intertwined through Vikings and the connections between the Holy Roman Empire and the Nordic domains.⁸ At the same time, and closely connected to this, was the economic transformation of the region. In the context of the Hanseatic League, trade relations assumed a constitutive role in corporatist developments, informing processes of appropriating the Baltic Sea region and fostering a perception of the region as interconnected through trading outposts. Neither of these transformations spaces is congruent, nor do they have the same duration. However, both processes were largely dependent on each other, and their history is therefore often told in conjunction where they overlap. The decline of the Hanseatic League in the 17th century marks another transformation space of economic and governmental change but has to be separated from the Christianisation narrative. Consumption patterns and global trade with the Americas and Asia on the one hand, and territorialisation of stately power interfered with the Hanseatic structures. Additionally, the Reformation, as a cultural, social and political transformation, caused an ecclesiastical reorganisation in the Baltic Sea region. This reorganisation required the strengthening of monarchical structures,⁹ new social structures in the form of manorialism¹⁰ and a retrospectively perceived cultural space ›Baltic Sea‹ as ›*mare lutheranum*‹.¹¹

The subsequent formation of imperial structures, on the one hand, and their military enforcement, on the other, show the innovations in military and diplomatic matters, thus refuting the long-held assumption of North-Eastern Europe's backwardness in the early modern period.¹² However, the distinct fragments of these transformation spaces can usually not be identified by disruptive events. The Baltic Sea region is a space of ›peaceful‹ non-disruptive transformation. Especially the Nordic socio-political transformations can be

8 North, Michael: Geschichte der Ostsee. Handel und Kulturen, München 2011; Selart, Anti (ed.): Baltic Crusades and Societal Innovation in Medieval Livonia, 1200–1350, Leiden 2022.

9 Klinge, Matti: Die Ostseewelt, Helsinki 2010.

10 North: Geschichte der Ostsee, pp. 121ff.

11 Assel, Heinrich/Steiger, Johann Anselm/Walter, Axel E. (eds.): Reformatio Baltica. Kulturwirkungen der Reformation in den Metropolen des Ostseeraums, Berlin/Boston 2018.

12 Frost, Robert I.: The Northern Wars: War, State and Society in Northeastern Europe, 1558–1721, Harlow, UK 2000.

described as adaptive rather than revolutionary.¹³ For Scandinavia, including Finland, a classification of the »*Sattelzeit*«¹⁴ in the global perspectives on transformation through enlightenment means that the ›political cultures‹¹⁵ of the Baltic Sea region experienced less of a crisis than continuous change.

The Baltic Sea region has long been temporally and spatially divided in terms of political development since the end of the 18th century. The transformation space of nation state building is a fragmented one comprising the states in the west and north of the Baltic Sea region as one fragment and those in the east as another. Nation building in the north-west is characterised by a lack of political or national patriotism but cultural patriotism in the form of (pan-)Scandinavism that continues to this day.¹⁶ The international significance of the ›Nordic model‹ plays an important role as well: strong welfare states in which, not least, transformations of the gender order, postulated as an ideal since the Enlightenment, have been tested and partially realised. The eastern fragment of the transformation space can be distinguished by belated developments and different power-political structures. As expressed by the search for and discovery of a common language, literature, and history, it had not yet developed into a form of subversive political patriotism and thus, delayed brief phases of nation-state formation until the 20th century. Alongside the nationalisation processes, the incomplete agrarian reforms of the 19th century and the change in land use also had a long-term impact on the structures of rural areas in the Baltic Sea region well into the 20th and 21st centuries.

Disruptive change, however, was a major feature of the ›Transformation Space Baltic Sea region‹ of the 20th century. For the Baltic states, Finland and Poland, the end of the First World War and the revolution in Russia marked the beginning of a state transformation characterised by the development of independent state institutions and democratic societies. At the same time, the international system was strengthened by the emergence of

13 Ihalainen, Pasi/Sennefelt, Karin/Bregnsbo, Michael/Winton, Patrick (eds.): *Scandinavia in the Age of Revolution. Nordic Political Cultures, 1740–1820*, Farnham, UK 2011.

14 Koselleck, Reinhart: *Einleitung*, in: Brunner, Otto/Conze, Werner/Koselleck, Reinhart (eds.): *Geschichtliche Grundbegriffe. Historisches Lexikon zur politisch-sozialen Sprache in Deutschland*. Band 1, Stuttgart 1972, pp. XIII–XXIII.

15 Munck, Thomas: *Preface*, in: Ihalainen, Pasi/Sennefelt, Karin/Bregnsbo, Michael/Winton, Patrick (eds.): *Scandinavia in the Age of Revolution. Nordic Political Cultures, 1740–1820*, Farnham, UK 2011, pp. XVII–XX.

16 Glenthøj, Rasmus/Nordhagen Ottosen, Morten: *Experiences of War and Nationality in Denmark and Norway, 1807–1815*, Basingstoke 2014.

multilateral institutions such as the League of Nations, which, for example, shaped the post-war peace order, including the Free City status of Gdańsk. The transformation space of nation building in the east disintegrated into a historical fragment with the Second World War and only reappeared as an important reference point in the nation building process after the fall of the Iron Curtain. The Second World War, however, marks the emergence of new transformation spaces, focused on national, international and transnational reorganisation, the reconstruction of economies and societies under different auspices, with distinct and ideologised social and legal structures. Out of these transformations, the Baltic Sea region emerged as a deeply divided space. The Soviet-backed transformation into socialist or communist societies in the Eastern Bloc was in direct opposition to the liberal-democratic transformation of Western societies in the Baltic Sea region along US lines. Likewise, the economic transformation in the sense of a planned economy in the East contrasted with the market economy of the West. Both transformations were characterised by an ideologisation, the corset of which could only be abandoned with the collapse of the Eastern Bloc as another disruptive event. This was the point of departure for the fragmented transformation processes that have been ongoing since the 1990s.

Policy transfers after the fall of the Iron Curtain were initially framed by narratives of peace and prosperity. Yet, viewed three decades later, they appear considerably more complex than the assumed linearity had implied. This can be seen, for example, in the continuing powerful debates on different readings of the transformation process that has taken place in Eastern Europe and the Baltic Sea region since the 1990s.¹⁷ While the unexpectedly heterogeneous ›East‹ found itself and perceives itself in a second-class position despite unique efforts in the adaptation and transformation of political and economic systems,¹⁸ the liberal and capitalist West's expectations of the ›East‹ and its ›harmonious and supposedly smooth‹¹⁹ integration into the economic and political system of liberal capitalism were disappointed. Rather, the economic and political transformation of post-socialist societies and the entire Baltic

17 Nußberger, Angelika/Aust, Martin/Heinemann-Grüder, Andreas/Schmid, Ulrich: Osteuropa zwischen Mauerfall und Ukrainekrieg. Besichtigung einer Epoche, Frankfurt a.M. 2022, pp. 14–21.

18 Kalmar, Ivan: *White But Not Quite*. Central Europe's illiberal revolt, Bristol 2022, p. 45; Oschmann, Dirk: *Der Osten: eine westdeutsche Erfindung*, Berlin 2023, pp. 56f.; Morina, Christina: *Tausend Aufbrüche*. Die Deutschen und ihre Demokratie seit den 1980er Jahren, München 2023, pp. 21–23, pp. 239–242.

19 Nußberger/Aust/Heinemann-Grüder/Schmid: *Osteuropa*, p. 15.

Sea region is characterised by ruptures. These became apparent during the 2008 financial crisis and in the treatment of migrants in 2015, but were particularly evident in responses to and assessments of Russia's aggression against Ukraine since 2014 and the ensuing full-scale war since 2022. This seemed to mark an epochal turning point,²⁰ which further intensified the increased evaluation of transformation societies and their results after 25 or 30 years and against the background of new nationalist tendencies in the wake of the migration crisis,²¹ pandemic,²² and Brexit,²³ thus highlighting the fractures in the integration and transformation processes. Despite a macro-regional strategy for the Baltic Sea region (2009/13) and *Fridays for future* as a transnational movement with global impact since 2018, the sustainability transformation has also not been able to develop an unbroken perceptible continuity. It has been slowed down, shifted and fragmented by crises and the associated transformations that have become necessary socially, economically, and politically.

Transformation Spaces in the Baltic Sea Region

This volume centres on the socio-ecological transformation of the Baltic Sea region, framing it as the master challenge for the region's future development. Four key areas have been identified in which transformation processes affect society as a whole: security architecture and securitisation, infrastructures, sustainability, and heritage. The authors examine these areas within the interplay of fragmentation and harmonisation. They apply a set of cross-cutting research criteria to operationalise the analysis of fragmented transformation processes in the Baltic Sea region. On this basis, they identify and describe the transformation spaces that emerge from them.

While security architecture constitutes a distinct transformation space in its own right—one that has received heightened attention over the past decade as Russia shifted from a cooperative to a confrontational policy—securitisa-

20 *ibid.*

21 Brug, Wouter van der/Harteveld, Eelco: The conditional effects of the refugee crisis on immigration attitudes and nationalism, in: *European Union Politics* 22 (2021), No. 2, pp. 227–247.

22 Lewandowsky, Marcel/Leonhardt, Christoph/Blätte, Andreas: Germany: The Alternative for Germany in the COVID-19 Pandemic, in: Ringe, Nils/Rennó, Lucio (eds.): *Populists and the Pandemic. How Populists Around the World Responded to COVID-19*, London 2022, pp. 237–249.

23 Brubaker, Roger: Why populism?, in: *Theory and Society* 46 (2017), No. 5, pp. 357–385.

tion represents a related but broader phenomenon. Emerging from the same geopolitical shift, securitisation extends beyond the military sphere and affects other transformation spaces, including energy transitions and infrastructures, legal frameworks, and even the cultural heritage shaped by old and emerging hegemonies within the region. Legacies, however, also affect the transformation of security architecture. In their in-depth study of hard security measures, Andris Banka and Margit Bussmann identify a cooperative deterrence-based process of harmonisation in the transformation of regional military structures. This process includes NATO's enlargement and Germany's emergence in a new role as a military power in the Baltic Sea region. With Germany's historical legacy as an aggressor widely regarded as overcome and the expansion of NATO to encompass all democratic littoral states, Banka and Bussmann nevertheless identify remaining elements of fragmentation in the security architecture, namely in military infrastructure and mobility.

Infrastructures constitute another central field of analysis in this volume. They provide the material and organisational foundations for social order, economic development, and socio-political stability. Infrastructures themselves have undergone profound transformations. They must adapt to sustainability goals, respond to securitisation dynamics, and ensure the provision of essential public services across the entire country, also in rural areas.

The interplay between security concerns, sustainable development and technological change becomes most evident in the field of energy, and particularly in the energy transition. Michael Kalis and Marie Becker stress the potential of the Baltic Sea region for a sustainable energy transition which became also evident in the joint efforts and response to the energy crisis caused by the Russian war in Ukraine. In the heightened awareness for energy security Kalis and Becker see an opportunity for overcoming currently different national transition policies which form quite different transformation spaces within the entire region. Nuclear power, LNG, hydrogen—the Baltic Sea region so far has seen a multi-speed and a multi-pathway development of energy supply. Hydrogen hereby proposes a chance for another harmonisation of renewable energy policies, as Kalis points out in his second chapter in this volume. Adapting the concept of energy trilemma, he analyses the national and transnational hydrogen policies and regional hydrogen economy, which in the context of securitisation and decarbonisation, form a Nordic–Baltic Hydrogen Corridor. Nevertheless, while both studies demonstrate how regional responses to external and internal threats—linked both to energy security and to the protection of critical infrastructures—can produce harmonising effects, Kalis also shows, how different perceptions about stable energy supply in

many respects continues to be dominated by national decision-making and regulatory frameworks, despite the presence of the EU and the Council of the Baltic Sea States.

Transformations in the health infrastructures of the Baltic Sea states reveal a comparable degree of fragmentation. Innovation acts as a key driver of systemic change. Steffen Fleßa and Melissa Nawroth therefore examine the adoption of innovations in healthcare services across the region and analyse the transformation spaces that emerge, which remain predominantly national in scope. From digitalisation to vaccines: viewed from a comparative regional perspective, global innovations in healthcare follow markedly different timelines and pathways in terms of adoption and systemic adaptation. Fleßa and Nawroth demonstrate that these differences cannot be explained by quantitative indicators alone. Rather, divergent transformation trajectories are shaped by systemic, cultural and local factors. Training traditions, institutional responsibilities, financing structures, and public discourses reflect distinct national cultures of adaptive capacity within health systems. Thus, in the fields of digital health, pre-clinical emergency care, and COVID-19 vaccination alike, renewal processes remain fragmented despite shared experiences of cross-border crises.

A similarly fragmented picture emerges in the field of public service provision in rural areas. The Baltic Sea region is characterised by its cross-border rural structures, which give rise—below the national level—to highly diverse responses to the dual challenge of limited demand and the nationwide maintenance of service provision. Even defining ›rural areas‹ proves difficult, although for comparative statistical purposes the NUTS 3 classification (Nomenclature of Territorial Units for Statistics) has become established as a framework for identifying sparsely populated regions. The comparative analysis of public structures in Estonia, Latvia, Lithuania, Finland, Sweden, Denmark, Poland, and Germany, and the mobility of policies between these countries, by Clemens Lisdat, Frauke Richter-Wilde, Daniel Schiller, and Christine Tamásy demonstrates that fragmentation in renewal processes is rooted primarily in differing degrees of administrative decentralisation, the financial autonomy of local authorities, and the associated distribution of responsibilities.

In the context of transformation aims and achievements, one might expect EU-wide programmes to exert a harmonising influence on the renewal of public service systems in rural areas, particularly in light of the substantial financial resources allocated to rural development and EU cohesion policy. The leading programme in this regard is LEADER (*Liaison Entre Actions de*

Développement de l'Économie Rurale). In their analysis of the programme's transformation, Vassilis Kitsos and Christine Tamásy operationalise criteria such as area size, population, and density to show how the policy-defined spaces vary across Baltic Sea states. Their attempt to identify coherence effects below the EU level, at the macro-regional or regional scale, reveals only limited harmonisation despite the programme's considerable flexibility.

Europe has committed itself to a sustainable and environmentally responsible transformation of its democratic systems and structures. This commitment extends to policies on rural development, the energy transition, and the expansion of security infrastructures. As a master challenge—articulated, for example, in the EU Strategy for the Baltic Sea Region and implemented through initiatives such as the Blue Bioeconomy Roadmap—sustainable transformation constitutes a genuinely transnational transformation space. It becomes visible in numerous cross-border connectors for renewable energy transmission, in joint efforts to protect fish stocks in the Baltic Sea, in the promotion of sustainable building materials, and in the rewetting of peatlands across the region. Sustainability thus emerges as a cross-cutting and influential factor across all transformation spaces introduced in this volume. It demonstrates that transformative processes and initiatives depend fundamentally on broad societal engagement. Their success requires not only public support but also the active transfer of conceptual knowledge into practical action.

Part of this transfer is the adaptation of the concept of *Ocean Literacy* into its Baltic Sea-specific form, *Baltic Sea Literacy*, as elaborated and operationalised by Rebecca Demmler and Susanne Kleemann. In their chapter, they examine both structural and individual reservoirs of knowledge and agency in relation to the sustainable management of the Baltic Sea and its natural resources. Their analysis situates individual awareness of marine risks alongside the expansion of sustainability-driven regulatory frameworks designed to protect the sea. This relationship forms part of the broader process of sustainable transformation. Demmler and Kleemann advocate a more collaborative approach that bridges top-down regulation and bottom-up engagement. By applying the concept and investigating individual threat perceptions—particularly regarding marine pollution—and personal engagement with the sea, Baltic Sea Literacy has the potential to strengthen environmental awareness and promote responsible behaviour. It thus constitutes an important instrument for fostering societal participation in region-wide efforts toward the sustainable transformation of the maritime environment and the advancement of blue governance.

Another cross-cutting and transnational transformation space with considerable impact on the processes addressed in this volume emerges from shared cultural heritage. As a re-actualisation of the past in the present, historical legacies shape processes of meaning-making and thereby influence culturally embedded identities of individuals and societies. In this way, legacies contribute to the constitution of transformation spaces. Experiences gained in times of crisis may be reactivated in subsequent crises and can provide valuable interpretative and practical resources. At the same time, however, legacies may generate inertia, hinder change through rigid structures, or reproduce negative experiences and political misuse.

In their study, Isabelle Dolezalek and Charlotte Wenke show how the shifting interpretations of the Hiddensee gold treasure give rise to a transformation space of shared cultural heritage spanning the Baltic Sea region. Their analysis highlights the powerful role of cultural factors in shaping transformation processes. Drawing on an interactive model based on continuous exchange with the public, they trace the changing meanings attributed to the treasure through political, social, and cultural narratives. These reinterpretations have been closely tied to political systems and ideologies, as well as to experiences of precarity and crisis. In both mediated projections and direct exhibition practices, the historical value of the artefact is juxtaposed with its material worth. By foregrounding the transformation of its cultural meaning, the authors contribute to the preservation of this heritage through critical reinterpretation rather than static conservation.

Those who have not yet grasped the depth and conflictual nature of contemporary geopolitical, security, and democratic debates will encounter in Solveig Wang's contribution the enduring force of historical experience and its transformation within postcolonial societies connected to the Baltic Sea region. Focusing on the statues of Volodymyr the Great in Kyiv and Hans Egede in Nuuk, Wang conceptualises fragmentation through the ambivalence of monuments as simultaneous symbols of authority and sites of resistance. By extending the spatial imagination of the Baltic Sea region both historically and in the present, the chapter situates debates about monument removal within broader societal polarisation. Here, authoritative narratives are so fundamentally contested that they themselves become catalysts of conflict.

A distinctive feature of these studies of transformation processes in the Baltic Sea region—and of the underlying concept of transformation spaces emerging in specific contexts shaped by particular actors, perspectives, innovations, and legacies—is the interdisciplinary exchange that enables their visualisation. Although such collaboration has been demanding and not

uniformly successful, it has revealed a long-term cartographic transformation process stretching from 18th-century land surveys to 21st-century digital mapping. In their chapter, Sebastian van der Linden, Bernd Bobertz, Peter Stoll and Jörg Hartleib examine the harmonisation of methods, data, and techniques that today allow maps to be produced, interpreted, and understood across different national contexts within the Baltic Sea region. This harmonised cartographic foundation provides the basis for a platform capable of making fragmented transformation spaces visible and comparable.

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Baltic Sea Region Security Architecture

Toward Fragmentation or Harmonisation?

Introduction

The security architecture in the Baltic Sea region underwent a profound transformation, accompanied by transformation processes in other spheres of political, economic, and social life. These parallel and partly overlapping changes intersect with transformations of the defence sectors, providing ground for different and sometimes conflicting aims and perspectives. Some developments were triggered by peaceful, others by threatening events. The region has been confronted with multiple overlapping transformation spaces that call for innovative solutions and continuous transformations to avoid severe disruptions of functioning structures, striving for more coherent approaches. This chapter reflects on two decades of transformational processes that have taken place in the Baltic Sea region's security architecture. Using the terms »fragmentation« and »harmonisation« as core conceptual touchstones, the following discusses the key processes and actors that have shaped the regional security landscape. During the 1990s, the Baltic Sea region was still considered an area of low tensions; however, Russia's growing assertiveness toward its neighbours began to challenge this perception.¹ After the Russian annexation of Crimea in 2014 and its further aggression against Ukraine in 2022, countries in the region have reacted in a largely united manner and converged in their foreign and defence policies. What can be described as a previously fragmented approach to security among the littoral states, depending on the different threat perceptions and membership statuses in NATO, transformed into a more unified response with cooperative deterrence at its core. All democratic states in the region are now member states of NATO and cooperate closely in defence policy, for example, as part of the Enhanced Forward Presence (eFP) and in conducting joint military exercises.

1 Ekengren, Magnus: A return to geopolitics? The future of the security community in the Baltic Sea Region, in: *Global Affairs* 4 (2018), No. 4, pp. 503–519, DOI: 10.1080/23340460.2018.1535250. (18.09.2024).

Moreover, a profound transformation relates to Germany's role as a security provider. While previously a reluctant regional power, its strong preferences for multilateral approaches are now complemented by an increased willingness in the German political establishment to take up a leadership role in regional defence. This transformation led to a convergence with the expectations of the Baltic political elite and public opinion that continuously asked for a more substantial German military presence. Harmonisation has also taken a more institutional form. Writing in 2017, Barbara Kunz observed that the security architecture remained fragmented since among the nine countries in the region, the three Baltic states, Poland, Germany, and Denmark, were protected by NATO's Article Five guarantees, while Sweden and Finland continued to pursue the policy of military non-alignment.² This is no longer the case. Not only have these two Nordic countries become full members of NATO, but Sweden has also deployed 500 troops to Latvia, thus further showcasing regional unity and commitment to collective approaches to defence.³ The regional landscape, however, remains fragmented in some respects, such as the incompatible military infrastructure and underdeveloped mobility. Consensus on the necessity of further harmonisation and integration of Baltic railways and road networks with the rest of Europe exists, but implementation is costly and remains a challenge for the future.

Constructing a Cooperative Deterrence Model

The security landscape of the Baltic Sea region has undergone fundamental changes. These transformation processes have not followed a linear trajectory but moved rather erratically. After a short phase of cooperation with Russia in the early 1990s, relations began to deteriorate after the 2008 Russo-Georgian War and worsened considerably following Russia's 2014 annexation of Crimea. These developments heightened mutual threat perceptions.⁴ The once hopeful vision of the Baltic Sea region, as defined by cultural exchange

2 Kunz, Barbara: Fragmentation of the security architecture in the Baltic, in: *Les Champs de Mars* 1, (2018), No. 29, pp. 83–107, shs.cairn.info/journal-les-champs-de-mars-2017-1-page-83?lang=en (11.03.2025).

3 NATO: Sweden joins Multinational Brigade in Latvia, 2024, www.mncne.nato.int/newsroom/news/2025/sweden-joins-multinational-brigade-in-latvia (11.03.2025).

4 Forsberg, Tuomas/Herd, Graeme: Russia and NATO: From Windows of Opportunities to Closed Doors, in: *Journal of Contemporary European Studies* 23 (2015), No. 1, pp. 41–57, DOI: 10.1080/14782804.2014.1001824. (08.07.2024).

and commerce, is now regularly discussed as a NATO lake where European states strategize how to deter and, if need be, defend themselves against Russia. These dynamics have brought back heated debates about deterrence, a concept reminiscent of the Cold War days. To use a standard definition, deterrence is the »use of a threat by one party in an attempt to convince another party to refrain from some action.«⁵ In this context, NATO has sought to adopt various measures—troop deployments, prepositioning of weaponry, military exercises, and regular high-level meetings to convince Moscow that aggression against any of the alliance members would be severely painful and simply not worth it.

Among these policies, forward-based troop deployments are the strongest expression of alliances' willingness to honour collective treaty obligations. Scholarly literature has treated allied troop placements as more credible signals of commitment than rhetorical pledges or arms transfers.⁶ The underlying assumption here is that if allied troops come under attack, this would generate strong incentives for further military action by the actor who has suffered casualties.⁷ With this signalling logic in mind, during the 2016 NATO Warsaw Summit, the transatlantic alliance unveiled plans to station enhanced Forward Presence (eFP) battlegroups in Poland and the three Baltic states. Although initially, these deployments were relatively small in troop numbers, at around 1500 in each country, what stood out about them was the sheer number of involved nations. For instance, the Canadian-led battlegroup in Latvia, which is the most multinational of all, consists of 13 different allied countries: Albania, Canada, the Czech Republic, Denmark, Iceland, Italy, North Macedonia, Montenegro, Poland, Slovakia, Slovenia, Spain, and Sweden. The number of flags present in these missions serves as a symbolic expression of strong NATO unity. The setting up of these battlegroups also clearly signalled NATO's return to its original task of collective defence.⁸ First established in the Baltic Sea region, the multinational battlegroups turned out

5 Quackenbush, Stephen: *Understanding General Deterrence: Theory and Application*, New York 2015, p. 2.

6 Lim, Darren J./Cooper, Zack: *Reassessing Hedging: The Logic of Alignment in East Asia*, in: *Security Studies* 24 (2015), No. 4, pp. 696–727, DOI: 10.1080/09636412.2015.1103130. (20.11.2015).

7 Musgrave, Paul/Ward, Steven: *The Tripwire Effect: Experimental Evidence Regarding U.S. Public Opinion*, in: *Foreign Policy Analysis* 19 (2023), No. 4, pp. 1–25: p. 2, DOI: 10.1093/fpa/orad017. (24.07.2023).

8 Dahl, Ann-Sofie: *Strategic Challenges in the Baltic Sea Region: Russia, Deterrence, and Reassurance*, Washington DC 2018.

to be a model that has later been adopted in other regions and is an example of innovation that emerges from transformation processes.

While exploring deterrence and how it functions has attracted substantial scholarly attention, the cooperative deterrence model implemented in the Baltic Sea region stands out due to the number of militarily deployed nations present on the ground. The arrival of a few thousand allied soldiers did little to alter the overall balance of power in the region. Even after catastrophic losses in Ukraine, the military balance still favours Russia.⁹ However, the fact that a diverse group of NATO countries are physically present across the whole of NATO's eastern flank increases the likelihood that in the event of an external attack on a frontline NATO country, other allied nations would be immediately drawn into a direct conflict.¹⁰ As explained by long-serving Estonian diplomat Jonatan Vseviiov, the format of this deployment is such that an external aggressor, by aiming at Estonia, would simultaneously aim at a British soldier or a French lieutenant.¹¹ In this sense, the risk is spread more equally among other NATO allies. A similar explanation has been provided by the British commander of the battlegroup in Estonia: »In order for Russia to get to Tallinn or Riga or Vilnius, it would have to go through a multinational NATO battlegroup, which would draw those NATO countries into a conflict«.¹²

On balance, it must be noted that some scholarly studies have cast doubt on the strategic utility of these types of limited-size multinational deployments. For instance, Blankenship and Lin-Greenberg's work¹³ questions the intrinsic strategic value of placing small contingents of foreign-deployed forces on allied territories. Likewise, Reiter and Poast have warned that undersized tripwire-force deployments, like the ones in the Baltics, do not necessarily

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- 9 Charap, Samuel/Priebe, Miranda: Will Putin Stop at Ukraine? That's the Wrong Question, in: *The Washington Quarterly* 47 (2024), No. 3, pp. 143–159; p. 145, DOI: 10.1080/0163660X.2024.2398319. (18.09.2024).
 - 10 Luik, Jüri and Praks, Henrik: Boosting the Deterrent Effect of Allied Enhanced Forward Presence, International Centre for Defence and Security, 2017, p. 8, icds.ee/wp-content/uploads/2017/ICDS_Policy_Paper_Boosting_the_Deterrent_Effect_of_Allied_eFP.pdf (11.03.2025).
 - 11 Vseviiov, Jonatan: Crossing North 5: An Army of One, in University of Washington, 22.02.2023 www.scandinavian.washington.edu/crossing-north-5-army-one (11.03.2025).
 - 12 Cliffe, Jeremy: The new Iron Curtain, in: *The New Statesman*, 30.03.2022, www.newstatesman.com/world/europe/ukraine/2022/03/how-europe-is-entering-a-dark-new-age-of-division?s=03 (10.03.2025).
 - 13 Blankenship, Brian/Lin-Greenberg, Eric: Trivial Tripwires? Military Capabilities and Alliance Reassurance. *Security Studies* 31 (2022), No. 1, pp. 92–117.

generate credible deterrence.¹⁴ However, given that allied governments would have had great difficulties convincing their populations about the need to replicate massive Cold War-era deployments in the Baltic region, the eFP concept presented a viable middle road between no forward-based forces at all and a massive build-up involving tens of thousands of troops.

This particular deployment model is favoured among host nation populations. For instance, according to a 2022 national survey conducted in Latvia, its residents felt most assured with multinational NATO forces in the country rather than deployments of individual national militaries.¹⁵ What is more, scholarly studies show that allied »boots on the ground« in the Baltics have a positive impact on citizens' willingness to fight and defend their country.¹⁶

That said, the multinational nature of these deployments has certainly posed some challenges for NATO's military planners, as deployed nations can differ significantly in terms of their equipment, strategic culture, and spoken language, risking fragmented answers to various tasks and challenges. NATO's own history of deploying multinational units suggests that various collective action problems can arise during such missions.¹⁷ One way to »iron them out« and reach a more harmonised approach is to engage in routine military exercises. While military drills serve multiple objectives, such as assuring a partner nation and deterring an adversary, they are also important platforms for sharpening interoperability. As one NATO commander explained the rationale behind allied military exercises: »We need to get familiar with each other. We need to know about each other's strengths and weaknesses.«¹⁸ Regarding the eFP deployments, military exercises have been organised regularly

14 Reiter, Dan/Poast, Paul: The Truth About Tripwires: Why Small Force Deployments Do Not Deter Aggression, in: Texas National Security Review 4 (2021), No. 3, pp. 33–53, DOI: 10.26153/tsw/13989. (02.06.2021).

15 Banka, Andris/Bussmann, Margit: Canada is a big deal here: The eFP battlegroup and host nation public opinion, in: International Journal: Canada's Journal of Global Policy Analysis 79 (2024), No. 2, pp. 192–211: p. 207, DOI: 10.1177/00207020241255998. (23.05.2024).

16 Rostoks, Toms/Mieriņa, Inta: NATO's reassurance and the willingness to defend one's country: survey evidence from Latvia, in: European Security, (2024), pp. 1–22, DOI: 10.1080/09662839.2024.2434087. (30.12.2024).

17 Coops, Cees M./Szvircsev Tresch, Tibor: Cultural Challenges in Military Operations, Rome: NATO Defense College, 2007; Giegerich, Bastian/von Hlatky, Stéfanie: Experiences May Vary: NATO and Cultural Interoperability in Afghanistan, in: Armed Forces & Society 46 (2020), No. 3, pp. 495–516, DOI: 10.1177/0095327X19875. (08.07.2024).

18 Von Sandrart, Jürgen-Joachim: Baltic Bullwork: Ready and Reinforced, in: Globsec, 07.06.2023, www.globsec.org/what-we-do/podcasts/twitter-space-baltic-bullwork-ready-and-reinforced (11.03.2025).

to ensure adequate »gelling« of the various nations.¹⁹ While the eFP concept had at first been tailored solely for the needs of the Baltic Sea region, it is notable that after Russia's full-scale invasion of Ukraine in 2022, NATO decided to replicate it in other allied territories. Four additional multinational battlegroups have been set up in Bulgaria, Hungary, Romania, and Slovakia. Thus, one can argue that a »multinational experiment«, first tried out in the Baltic Sea region, underlines the innovative character of transformation and was seen as good enough to be instituted elsewhere.

Germany: Strengthening Its Baltic Presence

Another development that supports the greater regional harmonisation thesis is Germany's growing involvement in the Baltic Sea region security landscape. Germany has participated in the military exercises in the region and also stepped up its involvement in the number of exercises held in the region, as did the other eFP lead nations (see Graph 1). While the »light« multinational troop presence was initially seen as a sufficient deterrent, Russia's gruelling war in Ukraine, with its emphasis on mass in the armed forces,²⁰ required a rethinking of this assumption. In light of this, political leaders of the so-called eastern flank countries pleaded for urgent augmentation of NATO troop presence. Speaking before an audience in Berlin in 2022, then-Estonian Prime Minister Kaja Kallas argued that NATO's posture in the Baltic Sea region needed a substantial change, with significantly more combat-ready troops stationed.²¹ Latvian and Lithuanian political leadership reiterated the same

19 Rostoks, Toms/Lanoszka, Alexander: Success Assured? Appraising the Canadian-Led Enhanced Forward Presence Battlegroup in Latvia, Macdonald-Laurier Institute, 2024, p. 17, macdonaldlaurier.ca/wp-content/uploads/2024/03/20240314_Canada-in-Latvia-RostoksLanoszka_PAPER-v5-FINAL.pdf (11.03.2025); Banka, Andris/Bussmann, Margit: Uncomfortable neighbors: NATO, Russia and the shifting logic of military exercises in the Baltics, in: *Defence Studies*, 23 (2023), No. 1, pp. 1–24, DOI: <https://doi.org/10.1080/14702436.2022.2089657> (10.03.2025).

20 Bury, Patrick: The End of the All-Volunteer Force: Or How I Learned to Stop Worrying about Recruitment and Love Selective Conscription, in: *The RUSI Journal* 169 (2024), No.7, pp. 1–9, DOI: <https://doi.org/10.1080/03071847.2024.2432820> (10.03.2025).

21 Kallas, Kaja: 16th Berlin Speech on Freedom by Kaja Kallas, Prime Minister of Estonia, Republic of Estonia Government, 25.04.2022, www.valitsus.ee/en/news/16th-berlin-speech-freedom-kaja-kallas-prime-minister-estonia?s=03 (11.03.2025).

message.²² These calls were answered during the 2022 NATO Madrid Summit. The declaration of the summit promised the scaling up of allied presence. The multinational battle groups deployed in Poland and the Baltic states were promised to be gradually turned into brigade-sized formations, thus reaching around 5,000 troops in each country.²³

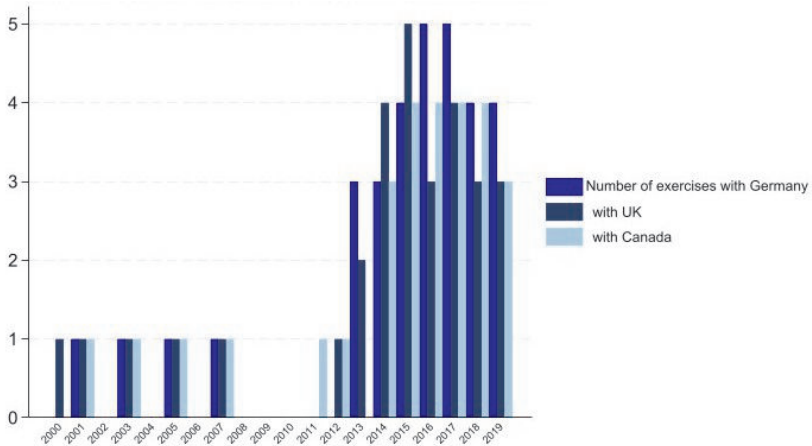


Figure 1: NATO exercises with eFP lead nations.

Among eFP framework nations deployed in the Baltics, Germany has led the way, delivering on its promise to increase its regional military footprint significantly. Initially, German officials had signalled that some of the assigned troops for its Lithuania mission would be primarily based in Germany, with the option of swift movement of forces in times of crisis. However, after intense intra-alliance bargaining with the Lithuanian government, Berlin committed to permanently deploying around 5000 Bundeswehr troops. This decision marked a historic milestone, representing the first permanent deployment of German troops beyond the country's borders since World War II. As expressed by then-Lithuania's foreign minister, this deployment is a unique undertaking for both sides. »It is a change for them. In the post-war era,

22 Grady, John: Baltic Presidents: »Forward Defense« Needed to Deter Russia, in: USNI News, 30.03.2022, www.news.usni.org/2022/03/30/baltic-presidents-forward-defense-needed-to-deter-russia (11.03.2025).

23 NATO: Madrid Summit Declaration, 29. 06. 2022, http://www.nato.int/cps/en/natohq/official_texts_196951.htm (03.05.2025).

Germany has never had a permanent presence outside its country. It is a change for us. We never had a contingent of that size in Lithuania. It is a big thing», he acknowledged.²⁴ German officials have similarly emphasised the historic nature of this deployment.²⁵ According to the state secretary at Germany's Federal Ministry of Defence, military presence in Lithuania »brings the German *Zeitenwende* into life«.²⁶ The permanence of this deployment, as opposed to a rotational one, introduces its own set of challenges but also offers opportunities to deepen and significantly expand German-Lithuanian ties. It is estimated that around a third of the soldiers intend to arrive with families. This means the Lithuanian state must ensure supporting infrastructure like German-speaking kindergartens, schools, and medical facilities to meet their needs. The German-Lithuanian agreement, signed in September 2024, notes that Lithuania will ensure the establishment of a military postal service, a German radio station, driving schools, and military medical facilities.²⁷ The construction needs for both military and civilian infrastructure remain substantial. This will likely lead to many debates about cost-sharing arrangements between Berlin and Vilnius.

That said, a permanent German presence in the country also allows Lithuania to draw itself closer to Europe's leading economic power. Indeed, Lithuanian officials have argued that this military deployment opens up numerous avenues to strengthen links with Germany in areas such as business, education, science, and culture. In the words of the former Lithuanian foreign minister, Germany's troop presence »paves the way for Lithuania-Germany to take relations to a qualitatively new level—that of a strategic partnership.«²⁸ Some of the developments attest that this is indeed where this relationship might be headed. According to the German ambassador to Lithuania, the

24 Landsbergis, Gabrieliū: Will the Baltics be next?, in: Monocle: The Foreign Desk Podcast, Episode 541, 11.05.2024, www.monocle.com/radio/shows/the-foreign-desk/541/ (11.03.2025).

25 Pistorius, Boris: Steadfast, Capable, and Ready: Germany's Security Renaissance and Transatlantic Defense, in: American-German Institute, 13.05.2024, www.americangermaninstitute.org/events/2024/05/steadfast-capable-and-ready-germanys-security-renaissance-and-transatlantic-defense/ (11.03.2025).

26 Zilonaitė, Greta/Venckūnas, Vilmantas: »Historic moment«: Lithuania starts construction for hosting German brigade, in: LRT, 19.08.2024, www.lrt.lt/en/news-in-english/19/2341766/historic-moment-lithuania-starts-construction-for-hosting-german-brigade (11.03.2025).

27 Bundeswehr: Bundeswehrbrigade in Litauen: Fragen und Antworten, 11.01.2024, www.bundeswehr.de/de/aktuelles/meldungen/bundeswehrbrigade-litauen-fragen-antworten-5725804?s=03 (10.03.2025); Stankevičius, Augustas: Vilnius, Berlin sign pact on German brigade troops' rights in Lithuania, in: LRT, 13.09.2024, www.lrt.lt/en/news-in-english/19/2359447/vilnius-berlin-sign-pact-on-german-brigade-troops-rights-in-lithuania (11.03.2025).

28 Landsbergis, Gabrieliū, Will the Baltics be next?

German-Baltic Chamber of Commerce has already added 40 new members in 2024²⁹. Some of Germany's largest companies, like Commerzbank and Rheinmetall, have set up shop mainly due to increased German military presence in the country.³⁰ While a more nuanced study of this topic is in order, these dynamics appear to fit the scholarly literature, which argues that foreign troop deployments boost trade and economic growth in the host state.³¹

Germany's more assertive security role appears to be appreciated by the Baltic public. In 2020, Lithuanian residents were asked to name Lithuania's most important strategic partners. The US and Germany came on top of this polling.³² A similar survey carried out by a Lithuanian opinion research company in late 2022 revealed that Lithuanians had the most favourable opinion of Poland (90 %), followed by Germany (82 %).³³ Moreover, Germany's regional presence is also seen as benefiting neighbouring Latvia. According to Latvia's President, German deployment to Lithuania has also improved Latvia's security outlook.³⁴ The Latvian public is also appreciative and hopeful regarding Germany's future role in the region. While Berlin has received much criticism internationally, a nationally representative survey in late 2022 revealed that Latvians rank Germany as the most important European securi-

29 Beniusis, Vaidots: German Ambassador: We Must be ready because Putin will definitely not give us extra time, in: 15 Min, 21.01.2025, www.15min.lt/naujiena/aktualu/lietuva/vokietijos-ambasadorius-turime-buti-pasiruose-nes-putinas-tikrai-nesuteiks-papildomo-laiko-56-2380496 (10.03.2025).

30 BNS: Commerzbank opens representative office in Vilnius, in: LRT, 17.12.2024, www.lrt.lt/en/news-in-english/19/2441202/commerzbank-opens-representative-office-in-vilnius (10.03.2025); Gosselin-Malo, Elisabeth: Rheinmetall to ramp up Baltic presence with Lithuania munitions plant, in: Defense News, 17.04.2024, www.defensenews.com/global/europe/2024/04/17/rheinmetall-to-ramp-up-baltic-presence-with-lithuania-munitions-plant/ (11.03.2025).

31 Jones, Garrett/Kane, Tim: US troops and foreign economic growth, in: Defence and Peace Economics 23 (2012), pp. 225–249, DOI: 10.1080/10242694.2011.585043. (08.07.2024); Heo, Uk/Ye, Min: U.S. Military Deployment and Host-Nation Economic Growth, in: Armed Forces & Society 45(2017), No. 2, pp. 234–267, DOI: 10.1177/0095327X177382. (08.07.2024).

32 Ministry of National Defence of Lithuania: Poll reveals a growing trust in the Lithuanian Armed Forces and professional service and a particularly firm support to NATO membership, 25.01.2020, www.kam.lt/en/poll-reveals-a-growing-trust-in-the-lithuanian-armed-forces-and-professional-service-and-a-particularly-firm-support-to-nato-membership/ (11.03.2025).

33 Pankūnas, Gytis: Survey shows Lithuanians have abysmal opinion of Russia, favour Poland and Germany, in: LRT, 02.01.2023, www.lrt.lt/en/news-in-english/19/1856830/survey-shows-lithuanians-have-abysmal-opinion-of-russia-favour-poland-and-germany (11.03.2025).

34 Fritz, Philipp: Müssen einsehen, dass unsere Asylpolitik aus den 50er- und 60er-Jahren stammt, in: Welt, 05.10.2023, www.welt.de/politik/ausland/plus247790692/EU-Muessen-ein-sehen-dass-unsere-Asylpolitik-aus-den-50er-und-60er-Jahren-stammt.html (11.03.2025).

ty partner and would like it to assume more of a leadership role in security matters, but the public also appreciates a political and economic relationship with Germany.³⁵

Institutional Harmonisation: Adding the Nordic Link

Over the years, the Baltic Sea region has undergone extensive institutional transformations whereby countries sought to join or stay out of organisations like the EU and NATO. One glaring institutional fragmentation in the geopolitical map of the Baltic Sea region was Finland's and Sweden's non-aligned status. As argued by Ann-Sofie Dahl, Finland and Sweden being outside of NATO complicated the alliance's Baltic Sea regional contingency planning.³⁶ However, it must also be emphasised that as NATO non-members, these two Nordic nations went a long way in streamlining their militaries to be in sync with NATO procedures and standards. They routinely participated in NATO-led exercises, which, over the years, grew in operational and command complexity.³⁷ A key function of exercises is to intensify military-to-military links and sharpen interoperability.³⁸ While nominally non-aligned, Helsinki and Stockholm purposefully sought to become highly interoperable with NATO nations.

According to Anna Wieslander, a Swedish political scientist, over the last decade, Sweden's armed forces, anticipating that public opinion may one day shift in favour of seeking NATO membership, had actively sought ways to become compatible with allied militaries. »Sweden streamlined its air force, switching terminology from Swedish to English all the way through the ranks and changing altitude measurements from metric to the imperial system«, she accounted for some of the implemented policies.³⁹

35 Banka, Andris et al.: *Allies That Matter: Elite versus Public Opinion in Latvia*, in: *Lithuanian Annual Strategic Review* 21 (2023), pp. 207–214, DOI: 10.47459/lasr.2023.21.7. (10.03.2025).

36 Dahl, Ann-Sofie: *Strategic Challenges*.

37 Elgin Kjellström, Katherine/Lanoszka, Alexander: *Sweden, Finland, and the Meaning of Alliance Membership*, in: *Texas National Security Review* 6 (2023), No. 2, pp. 33–56; p. 45, DOI: 10.26153/tsw/46144. (18.09.2024).

38 Wolfley, Kyle J.: *Military Statecraft and the Use of Multinational Exercises in World Politics*, in: *Foreign Policy Analysis* 17 (2021), No. 2, pp. 1–24, DOI: 10.1093/fpa/oraa022. (29.01.2021).

39 Rasmussen, Sune: *Sweden, Finland's About-Face on NATO Membership Was Years in the Making*, in: *The Wall Street Journal*, 08.06.2023, www.wsj.com/articles/sweden-finlands-about-face-on-nato-membership-was-years-in-the-making-8b86c324 (11.03.2025).

Indeed, our collected data on NATO military exercises in the Baltic Sea and in the Baltic states, 2001–2019,⁴⁰ illustrate just how frequently Finland and Sweden participated in NATO military manoeuvres (Graph 1). The two Nordic neutrals have been part of NATO drills long before the threat from Russia re-emerged to centre stage, and the size and frequency of exercises increased in 2014. Both joined NATO's Partnership for Peace program as early as it was established in 1994, which provided both countries with the opportunity to develop interoperability with NATO forces. What is more, both countries participated in NATO missions in Bosnia, Kosovo and Afghanistan.⁴¹ However, they do not always participate in tandem. While Finland participated on a regular basis, Sweden did not join exercises in the region during most of the 2000s, with the exception of the Baltops exercises.

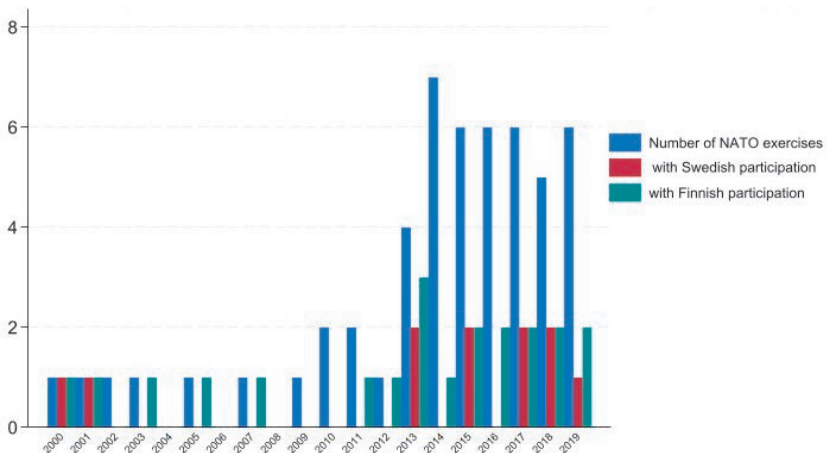


Figure 2: NATO exercises in the Baltic states and the Baltic Sea (without Baltops)

The Baltops is an annual maritime exercise in the Baltic Sea that has been led by the US since 1971 and which includes non-NATO countries. For many years, Russia was a regular participant and Baltops was one of the rare venues for confidence-building where NATO and Russian navies practiced side by side. Since 2014, Baltops, like other NATO exercise series, has moved again

40 Banka/Bussmann: Uncomfortable neighbors.

41 Von Hlatky, Stefanie/Fortmann, Michel: NATO enlargement and the failure of the cooperative security mindset, in: *International Politics* 57, (2020), pp. 554–572, DOI: 10.1057/s41311-020-00240-w. (30.12.2024).

towards a logic of deterrence and assurance of the Baltic allies.⁴² Scrutinising the participants of Baltops provides us with additional interesting insights regarding the transformation of the security landscape. In Table 1, we list, in addition to participating NATO members, the non-NATO participants since 2001. Taking part in exercises prior facilitated NATO accession for the three Baltic states and even more so for the two Nordic countries. Although non-aligned, their intense links and interactions with NATO reach far back and years of joint exercises have enhanced interoperability.

Table 1. Participating states in the annual Baltops exercises

Year	NATO participants	Non-NATO participants
2001	Canada, Denmark, France, Germany, Netherlands, Poland, UK	Estonia, Latvia, Lithuania, Finland, Sweden, Russia
2002	Denmark, Germany, Poland, UK, US	Estonia, Latvia, Lithuania, Finland, Sweden, Russia
2003	Denmark, France, Germany, Norway, Poland, UK, US	Estonia, Latvia, Lithuania, Finland, Sweden, Russia
2004	Canada, Denmark, Estonia, France, Germany, Latvia, Lithuania, Netherlands, Norway, Poland, US	Sweden, Russia
2005	Denmark, Germany, Poland, Latvia, Lithuania, Estonia, UK, US	Finland, Sweden, Russia
2006	Denmark, Estonia, Latvia, Lithuania, Poland, Germany, US, UK	Finland, Sweden, Russia
2007	Denmark, Germany, Netherlands, Lithuania, Latvia, France, Poland, US, UK	Sweden, Russia
2008	Denmark, Estonia, France, Germany, Latvia, Lithuania, Norway, Poland, UK, US	Finland, Sweden, Russia
2009	Denmark, Germany, France, Latvia, Lithuania, Poland, Netherlands, US, UK	Finland, Sweden
2010	Belgium, Denmark, Estonia, France, Germany, Latvia, Lithuania, Poland, US	Finland, Sweden, Russia
2011	Belgium, Denmark, Estonia, France, Germany, Latvia, Lithuania, Netherlands, Poland, US	Sweden, Russia, Georgia
2012	Denmark, Estonia, France, Germany, Latvia, Lithuania, Netherlands, Poland, US,	Sweden, Russia, Georgia,
2013	Estonia, Denmark, Latvia, Poland, Lithuania, Netherlands, France, Germany, US	Finland, Sweden, Russia, Georgia
2014	Denmark, Estonia, France, Germany, Latvia, Lithuania, Netherlands, Poland, UK, US	Finland, Sweden, Georgia
2015	Denmark, Estonia, France, Germany, Latvia, Lithuania, Netherlands, Norway, Poland, Turkey, UK, US	Sweden, Georgia
2016	Belgium, Denmark, Estonia, France, Germany, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Spain, UK, US	Finland, Sweden

⁴² Banka/Bussmann: Uncomfortable neighbors.

Year	NATO participants	Non-NATO participants
2017	Belgium, Denmark, Estonia, France, Germany, Latvia, Lithuania, Netherlands, Norway, Poland, UK, US	Finland, Sweden
2018	Belgium, Denmark, France, Germany, Latvia, Lithuania, Netherlands, Norway, Poland, Romania, Spain, Turkey, UK, US	Finland, Sweden
2019	Denmark, Estonia, France, Germany, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Romania, Spain, Turkey, UK, US	Finland, Sweden

This suggests that in both Finland and Sweden, political and military elites deliberately maintained flexibility by keeping all options open. Especially since 2014, Sweden and Finland increased efforts to tighten links with NATO through agreements that provide a legal framework for NATO deployment and participation in a program that allows for an accelerated NATO accession if needed.⁴³ Throughout the post-Cold War period, Finnish public opinion had been stable in its opposition to joining NATO, and even right before the 2022 Russian invasion of Ukraine, most Finns still favoured military nonalignment. This stance transformed literally overnight to a large majority in favour of NATO membership. Public opinion was now in line with the foreign policy elite that had been advocating accession for quite some time. The transformed opinion polls facilitated the application process for the government.⁴⁴ Years of intensive training with NATO allies enabled Helsinki and Stockholm to transition to full NATO member status swiftly. As one retired Swedish chief of joint operations noted, »Swedish public likely didn't understand the full depth of the country's relationship with NATO.«⁴⁵ Similarly, the former Finnish chief of defence underscored: »When the decision to apply for membership was made, I think the public, and also the political leadership, was surprised that Finland was so ready.«⁴⁶ According to Tuomas Forsberg, the outcome was a logical consequence of their closely developed ties with NATO in the post-Cold War era.⁴⁷

43 Von Hlatky/Fortmann: NATO enlargement.

44 Forsberg, Tuomas: Bottom-up foreign policy? Finland, NATO and public opinion, in: *Scandinavian Political Studies* 47 (2024), No. 3, pp. 283–307, DOI: 10.1111/1467-9477.12273. (08.07.2024). Pesu, Matti/Iso-Markku, Tuomas: Insufficiency of informal alignment: Why did Finland choose formal NATO membership?, in: *International Affairs* 100 (2024), No. 2, pp. 569–588, DOI: 10.1093/ia/iaae006. (04.03.2024).

45 Rasmussen, Sune: Sweden, Finland's About-Face on NATO Was Years in the Making.

46 *ibid.*

47 Forsberg, Tuomas: Finland and Sweden's Road to NATO, in: *Current History* 122 (2023), No. 842, pp. 89–94, DOI: 10.1525/curh.2023.122.842.89. (01.03.2023).

Finnish and Swedish NATO accession and thus further harmonisation in the security architecture certainly improve the defensibility outlook of the three Baltic countries. Due to their geographic location, these Nordic nations are well-placed to become essential regional security contributors. As Estonia's defence forces commander articulated, Finnish and Swedish NATO membership has given Estonia a »new angle« to solve its security questions.⁴⁸ Commenting on this development, another senior Estonian diplomat explained that Finnish and Swedish non-alignment meant there was always a question mark about their reaction during a possible militarised crisis. As he put it: »Military plans can hardly be built on what-if caveats.«⁴⁹ This has now changed. »Swedish and Finnish NATO membership,« he further explains, »opened new doors and new channels to coordinate the planning and execution of military operations.« In sum, their membership undoubtedly redraws the security map in ways that favour NATO's smallest states, the three Baltic countries.⁵⁰

The two NATO newcomers have wasted no time in making active contributions to regional defence. After recurrent suspected sabotage of undersea cables, Finland and Sweden, for instance, have stepped up ship monitoring in the Baltic Sea. These types of hybrid attacks have further prompted the intensification of minilateral groupings within NATO. In January 2025, the Heads of State or Governments of Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, and Sweden met in Helsinki to address growing threats to pipelines and undersea cables in the Baltic Sea.⁵¹ Afterward, NATO launched a new military initiative called »Baltic Sentry«, which committed more allied assets such as frigates, maritime patrol aircraft, and naval drones to monitor the Baltic waters.⁵² Initiatives of this nature attest that the countries

48 Bath, Alison: Russia looms large as NATO allies meet for major Baltic naval exercise, in: Stars and Stripes, 05.06.2023, www.stripes.com/theaters/europe/2023-06-05/russia-nato-finl-and-baltops-10331886.html (10.03.2025).

49 Prikk, Kristjan: NATO at 75: Estonia's Perspective, in: The Eastern Front Podcast, 21.05.2024, www.aei.org/podcast/nato-at-75-estonias-perspective-with-amb-kristjan-prikk/ (11.03.2025).

50 Banka, Andris: Asmus strategic vision makes a comeback: Finnish-Swedish role in defending the Baltics, in: Nordic Review of International Studies 3 (2024), pp. 72–80: p. 75, nris.journal.fi/article/view/144599 (23.05.2024).

51 President of the Republic of Finland: Joint Statement of the Baltic Sea NATO Allies Summit, 14.01.2025, www.presidentti.fi/en/joint-statement-of-the-baltic-sea-nato-allies-summit/ (11.03.2025).

52 NATO: NATO launches 'Baltic Sentry' to increase critical infrastructure security, 14.01.2025, www.nato.int/cps/en/natohq/news_232122.htm (11.03.2025).

in the Baltic Sea region, working under NATO's flag, are tightening their security relations even further. In this context, another noteworthy event has been the Swedish deployment of 600 troops to join the Canadian-led multinational brigade in Latvia, its first-ever deployment to another NATO member state.⁵³ The discussed material attests that NATO's newest members, Finland and Sweden, are already actively contributing to regional and the alliance's collective defence.

Still Fragmented: Military Infrastructure

Previous material attests that the transformation spaces and processes in the Baltic Sea region have trended towards more harmonisation. Transnational cooperation and harmonisation have also considerably advanced with regard to critical infrastructure in the energy sector and its security implications (see Chapter Kalis/Becker). With greater convergence of threat perceptions among NATO partners, they have undertaken various initiatives to strengthen their defence posture. However, one area where we can still observe a great deal of fragmentation is in relation to military infrastructure. Differences run along the line between states once part of the Soviet Union and those in the West. Although two decades have already passed since the Baltic countries joined the EU and NATO, their roads and railway lines remain generally incompatible with those of other alliance partners. Budginaite-Froehly bluntly states the facts when she writes that this part of Europe today is »better connected to Russia and Belarus through their railway infrastructure than to their Western allies.«⁵⁴ As such, they have not managed to fully reverse 50 years of the Soviet era, during which infrastructure was tailored to match standards used in the rest of the Soviet states. The most visible element of incompatibility relates to the railway gauge, which fits the Russian standard but cannot be reconciled with the one in use in Europe.

During more peaceful times in the early 2000s, when relations with Moscow were reasonably stable, the Baltic governments even boasted about their excellent railway connections with Russia and Central Asian republics.

53 Swedish Armed Forces: Historic Swedish force arrives in Latvia, 18.01.2025, www.forsvarsmahten.se/en/news/2025/01/historic-swedish-force-arrives-in-latvia/ (11.03.2025).

54 Budginaite-Froehly, Justina: Baltic Defense: Getting New Rail Links Back on Track, in: CEPA, 16.07.2024, www.cepa.org/article/baltic-defense-getting-new-rail-links-back-on-track/ (10.03.2025).

Western states used the route that started at Riga Port via Russia to supply NATO and US forces in Afghanistan.⁵⁵ As relations with Russia deteriorated, those same railway connections were now viewed in an entirely different light, not as nodes ensuring greater commerce but as structures that could assist external actors to swiftly make territorial inroads during militarised crises. While military infrastructure in the Baltic Sea region encompasses many different elements, such as roads, bridges, airports, ports, and other critical infrastructure, in the view of military planners, the railroad remains key in ensuring the swift movement of military hardware and personnel. According to historian Hal Brands, a network of railways in this part of the world has historically been the decisive factor in battlefield victories and geopolitical revolutions.⁵⁶ The Russian 2022 war in Ukraine was a stark reminder of this fact. Following Moscow's war of aggression, Ukraine's national railway company assumed immense strategic importance. As Edwards writes, the railroad enabled the nation at war to »ferry troops to the front lines and refugees away from them. It transported hundreds of diplomatic delegations to Kyiv.«⁵⁷

This fact has not been lost on the Baltic governments, who acknowledged the inadequacy of the current military infrastructure. On a political level, all three Baltic nations have committed to improving mobility, framing it as a strategic necessity. In this context, one of the most promising projects has been *Rail Baltica*. This multi-billion initiative, connecting the Baltics with their Western partners, is by far the largest rail infrastructure project in the history of the Baltic states. While serving civilian needs, the project has been pitched with a clear military dimension in mind. As the implementing body of this extensive project notes: »Military mobility, the rapid and efficient movement of troops and equipment, is crucial for the region's defence readiness. *Rail Baltica's* high-speed rail infrastructure is planned to accommodate heavy military equipment, such as tanks and armoured vehicles, which are difficult

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- 55 Kuchins, A. C./Sanderson, T. M.: The Northern Distribution Network and Afghanistan, Center for Strategic & International Studies, 2010, p. 17, [csis-website-prod.s3.amazonaws.com/s3fs-public/legacy_files/files/publication/091229_Kuchins_NDNandAfghan_Web.pdf](https://www.csis.org/website-prod/s3.amazonaws.com/s3fs-public/legacy_files/files/publication/091229_Kuchins_NDNandAfghan_Web.pdf) (11.03.2025).
 - 56 Brands, Hal: *The Eurasian Century: Hot Wars, Cold Wars, and the Making of the Modern World*, New York 2025, p. 25.
 - 57 Edwards, Maxim: Ukraine Lays Its Tracks to Europe, in: *Foreign Policy*, 04.07.2024, www.foreignpolicy.com/2024/07/04/ukraine-trains-railways-transit-war-russia-europe/ (11.03.2025).

to transport by road.«⁵⁸ Opinion polls conducted in all three Baltic countries further indicate that citizens recognise the military value that this project would add. In Lithuania, 78 % agree that *Rail Baltica* is essential for the conduct of effective NATO operations, while in Latvia and Estonia, around 60 % of people share this view.⁵⁹

Despite the high importance accorded to this project, implementation has been hindered by political controversies, rising inflation, and accusations of project mismanagement. As a result, it has been postponed by years, with some even questioning whether the Baltic states can carry it through. A former US Army commander in Europe, Ben Hodges, who has been one of the most vocal voices in advocating the need for improved military mobility in the region, has harshly criticised Baltic governments. »I am really surprised that *Rail Baltica* is still unfinished,« he said in an interview.⁶⁰ In his view, while some aspects of military mobility have improved, it would still take weeks for ground forces to arrive in the Baltic region from Western Europe. »Moving forces in a short time from Bavaria to Lithuania, for example, is still a challenge,« he added. European Commission, which is involved in funding the construction of this project, has sternly warned lawmakers that the project needs to be finalised by 2030.⁶¹ Criticism has also come from Poland, whose media have warned that the slow Baltic countries' implementation of mobility projects endangers NATO's collective security.⁶² Currently, the West-East logistical connections remain poor and largely incompatible, thus hampering Allied ability to swiftly transport military equipment and personnel to NATO's eastern flank.⁶³

58 Rail Baltica: Rail Baltica plays a crucial role in enhancing military mobility across the Baltics, 20.08.2024, www.railbaltica.org/rail-baltica-plays-a-crucial-role-in-enhancing-military-mobility-across-the-baltics/ (11.03.2025).

59 LSM: Survey: Baltic residents see Rail Baltica's military importance, in: LSM, 01.02.2025, eng.lsm.lv/article/economy/transport/31.01.2025-survey-baltic-residents-see-rail-balticas-military-importance.a585939/ (11.03.2025).

60 BNS: Former force commander discusses Rail Baltica from military perspective, 04.11.2024, www.balticnews.com/former-force-commander-discusses-rail-baltica-from-military-perspective/ (10.03.2025).

61 ERR: European Commission: Rail Baltica must be ready by 2030, 08.02.2024, news.err.ee/1609246662/european-commission-rail-baltica-must-be-ready-by-2030 (11.03.2025).

62 Vilikanskytė, Milda: »Endangering NATO security: Poland slams Baltics' slow modernisation of Via Baltica, 10.08.2024, www.lrt.lt/en/news-in-english/19/2379017/endangering-nato-security-poland-slams-baltics-slow-modernisation-of-via-baltica (11.03.2025).

63 Hodges, Ben et al.: Until Something Moves: Reinforcing the Baltic Region in Crisis and War, in: International Centre for Defence and Security, www.icds.ee/until-something-moves-reinforcing-the-baltic-region-in-crisis-and-war/ (11.03.2025).

Beyond the Baltic states, another layer of complications relates to the fact that a diverging set of mobility rules guides individual countries in the region. EU officials have often invoked the concept of »military Schengen« to advocate simplifying regulations when allied militaries cross national borders. Given the heightened tensions in the region, some improvements have been made. In January 2024, Germany, the Netherlands, and Poland signed an agreement to create a military transport corridor connecting their countries.⁶⁴ In late November 2024, Nordic nations—Sweden, Norway, Denmark, Finland, and Iceland—followed suit and signed a letter of intent to create military mobility corridors.⁶⁵ While encouraging, these initiatives alone still do not ensure smooth military mobility to all relevant actors. According to one French general, considerable administrative red tape keeps cross-border troop movement relatively slow. »There’s a war in Ukraine, but customs officials explain that you don’t have the right tonnage per axle and that your tanks aren’t allowed to cross Germany,« the General publicly raised his objections.⁶⁶ On the highest political level, the European Council has reiterated the salience of military mobility for European security and defence.⁶⁷ Improvements, however, have been slow and fragmented.⁶⁸ On this issue, the European continent has not yet achieved cross-border movement harmonisation.

Conclusion

The countries in the Baltic Sea region experienced multiple, fragmented transformation processes that eventually led to a more cohesive security landscape. Despite the complex historical and geopolitical context and the escalation of the threat situation, the region has moved towards more harmonisation. The external threat from Russia led to more internal coherence among the

64 Vohra, Anchal: The »Military Schengen« Era Is Here, in: Foreign Policy, 04.03.2024, www.foreignpolicy.com/2024/03/04/europe-military-autonomy-nato-schengen/ (11.03.2025).

65 Wass, Sanne: Nordic Nations Agree to Establish Military Mobility Corridors, in: Bloomberg, 21.11.2024, www.bloomberg.com/news/articles/2024-11-21/nordic-nations-agree-to-establish-military-mobility-corridors (11.03.2025).

66 Kayali, Laura: Europe’s ability to deter Putin hampered by ‘unbelievable’ red tape: French general, in: Politico, 05.08.2024, www.politico.eu/article/french-general-army-mobility-military-troop-movements-exercise-red-tape-russia-ukraine-war/ (11.03.2025).

67 Council of the European Union: Council Conclusions on EU Security and Defence, 2024, p. 19, data.consilium.europa.eu/doc/document/ST-9225-2024-INIT/en/pdf (11.03.2025).

68 Hartmann, Jannik: Military Mobility, in: DGAP Policy Brief 10, German Council on Foreign Relations, 2024, DOI: 10.60823/DGAP-24-40850-en. (19.06.2024).

democratic littoral states in terms of threat perception as well as policy approaches. The countries responded largely in a unified manner to the Russian aggression, relying on deterrence through cooperation as a core element. An intensified cooperation in joint military exercises and NATO's deployment of multilateral battlegroups is an expression of this strategy of cooperative deterrence. Expectations towards Germany as a more active security provider also converge with the new role and responsibility it assumes in the region, especially with its commitment to establish a permanent military base in Lithuania. The most vivid expressions of harmonisation are Sweden and Finland's accession to NATO, which means that all democratic littoral states in the region are now members of the transatlantic alliance and the European Union. As Oliver Moody contends in his book on the Baltic Sea region, this geopolitical area has incrementally transformed from being once a »sea of confusion« into one of the most coherent parts of Europe.⁶⁹

While generally we can observe, to a large extent, a harmonisation in the security architecture, a better integration of fragmented critical infrastructures remains a costly challenge for the future. Connecting the Baltic states further to their Western and Northern neighbours is important with regard to better military defence strategies as well as for fostering closer economic ties. Here, we see the important potential for collaboration between the EU and NATO. While the European Union is responsible for allocating funds and implementing laws to modernize infrastructure and enhance its compatibility, NATO officials should also actively contribute their expertise on specific military requirements. Military mobility could therefore serve as a key bridging issue between the EU and NATO, encouraging closer collaboration between these two large organisations.

In conclusion, it is worth mentioning that another important element of uncertainty has to do with the future role of the United States. Most countries in the Baltic Sea region take a position that is highly favourable to a strong transatlantic presence rather than striving for an alternative European security architecture. But what happens if Washington suddenly seeks to significantly reduce its commitments in Europe, or even exit the transatlantic alliance altogether? Such a scenario could place significant strain on the broader EU and potentially reignite processes of fragmentation. In other words, the transformational processes in the Baltic Sea region never grind to a halt but

69 Moody, Oliver: *Baltic: The Future of Europe*, London 2025, p. 6.

are continuously facing new challenges, evolving, and adapting. Only time will reveal the direction the Baltic Sea region will take.

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Assembling the Fragments

Towards a Transnational Understanding of Energy Security in the Baltic Sea Region?

Introduction

The Baltic Sea region is increasingly the focus of global attention in recent years. This is particularly true with regard to European and transatlantic security policy, not least in view of the Russian invasion of Ukraine and the ensuing energy and geopolitical effects in the Baltic Sea region and beyond. However, the Baltic Sea has been the subject of scientific research and the scene of national and geopolitical energy debates even before the outbreak of war and the onset of the energy crisis. The extensive research into the NordStream Pipelines 1 and 2 is but one example. These pipelines, which run as maritime infrastructures through the Baltic Sea and thus past several countries and their maritime zones in the Baltic Sea region, were a showcase for diverging national energy and geopolitics in the region, particularly in relation to Russia. The diverging perceptions of and policies on the NordStream pipelines were exemplary for the fragmentation of the energy transformation in the Baltic Sea region into national energy transition and energy security policies.

In fact, studies show the region's outstanding potential regarding a sustainable energy transformation. Some scholars even emphasise the technical potential for regional climate neutrality well before the European target horizon

1 This chapter is based on previous research by the authors. This concerns Kalis, Michael (ed.): *The Energy Trilemma in the Baltic Sea Region—Security, Equity and the Environment*, London 2024; Becker, Marie: *KRITIS-Dachgesetz ohne Fundament*, in: *Infrastrukturrecht* 11–12 (2024), pp. 270–273; id.: *Transposing EU-legislation on critical infrastructure protection legal implementation performance in the Baltic Sea region*, in: *International Journal of Critical Infrastructure Protection* 50 (2025), 100781, <https://doi.org/10.1016/j.ijcip.2025.100781>, and Becker, Marie/Kalis, Michael: *Blurred Lines: The Role of Security and Non-Security Actors in the Energy Landscape*, in: *Energy Highlights* (2026), No. 21, pp. 41–45, www.enseccoe.org/publications/energy-highlights-no-21/ (19.02.2026). The research cited above was updated for this chapter and re-evaluated in the context of the research question at hand.

of 2045.² At the same time, individual countries in the Baltic Sea region have shown themselves to be flagships of a successful energy transition policy over long periods of time according to the observations of the World Energy Council.³ The Council also attests that the region as a whole has successfully overcome the energy crisis following the Russian war of aggression.⁴ Despite these and other regional and transnational success stories the region is characterised by a multi-speed and multi-pathway transformation,⁵ as highlighted not least in the different national energy transition policies and energy sources used.⁶

However, an increasing securitisation of energy policies in the region may result in a likewise increased harmonisation of energy policies among national states. In fact, following the Russian invasion of Ukraine, the onset of the energy crisis and, not least, the acts of sabotage on the Nord Stream pipelines in the Baltic Sea region, an increasing securitisation became apparent.⁷ In numerous international agreements, the countries bordering the Baltic Sea region emphasise their energy transition ambitions and the protection of

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- 2 Child, Michael/Bogdanov, Dimitrii/Breyer, Christian: The Role of Storage Technologies for the Transition to a 100 % Renewable Energy System in Europe, in: *Energy Procedia* 155 (2018), pp. 44–60.
 - 3 World Energy Council: *Evolving with Resilience and Justice—World Energy Trilemma 2024*, 2024, www.worldenergy.org/assets/downloads/World_Energy_Trilemma_2024_Full_Report.pdf?v=1713253987 (24.05.2024); World Energy Council: *World Energy Trilemma Index 2022*, 2022, p. 22, www.worldenergy.org/assets/downloads/World_Energy_Trilemma_Index_2022.pdf?v=1669839605 (24.05.2024); cf. IEA: *Denmark 2023*, www.iea.org/reports/denmark-2023 (28.05.2024).
 - 4 World Energy Council: *Evolving with Resilience and Justice*, p. 7, 14.
 - 5 Cf. De La Esperanza Mata Pérez, Maria/Scholten, Daniel/Smith Stegen, Karen: *The Multi-Speed Energy Transition in Europe: Opportunities and Challenges for EU Energy Security*, in: *Energy Strategy Reviews* 26 (2019), pp. 1–6, <https://doi.org/10.1016/j.esr.2019.100415>; cf. Slakaityte, Veronika/Surwillo, Izabela/Berling, Trine V.: *Energy Security in the Baltic Sea Region—Transition within Geopolitical Constraints—Danish Institute for International Studies Report*, 2022, pure.diiis.dk/ws/files/10998512/Energy_security_in_the_Baltic_Sea_Region_DIIS_Report_2022_08.pdf (29.05.2024).
 - 6 Cf. De la Esperanza Mata Pérez/Scholten/Stegen: *Multi-Speed Energy Transition*; cf. Slakaityte/Surwillo/Berling: *Energy Security in the Baltic Sea Region*.
 - 7 Cf. World Energy Council: *Evolving with Resilience and Justice*, p. 7, 14; cf. Surwillo, Izabela/Slakaityte, Veronika: *Energy Crisis at the Baltic Sea—Divergent National Paths Toward a Common Green Future*, in: Pundziute-Gallois, Emilija/Serry, Arnaud (eds.): *Permacrisis & Logistics: From Assessment to Foresight*, Caen 2023; Slakaityte/Surwillo/Berling: *Energy Security in the Baltic Sea Region*; cf. Kalis, Michael: *Energy Trilemma—Concept and Context in the Baltic Sea Region*, in: id. (ed.): *The Energy Trilemma in the Baltic Sea Region—Security, Equity and the Environment*, London 2024a, pp. 21–43, <https://doi.org/10.4324/9781003479178>.

common energy transition infrastructures.⁸ With its RePowerEU plan (COM (2022), 230), the European Union is also focusing on combining energy security and energy transition in the form of decarbonisation. Agreements between the EU and NATO on joint efforts to protect critical infrastructures as the backbone of Europe's and the region's energy transition (Joint Declaration EU-NATO 2023), as well as the new directive on the resilience of critical entities (Directive (EU) 2022/2557), are an expression of the aforementioned increasing securitisation and a changed understanding of energy security. This emerging energy security and energy transition policy in the Baltic Sea region is representative of an increasing harmonisation of energy transformation in the region under the umbrella of security.

Against this background, the developments of the energy transition and the understanding of energy security in the Baltic Sea region are analysed. In doing so, this chapter asks whether and to what extent a development from fragmentation to harmonisation of the energy transformation is taking place in the Baltic Sea region.

The Baltic Sea Region—A Focal Point of Fragmented Transformation

The Baltic Sea region is affected by extensive and numerous transformations, with the energy transformation—albeit significant and prominent—being but one phenomenon.⁹ Although transformation research has recently shown a clear focus on sustainability transformation and thus also on the energy or green transition as part of this,¹⁰ one must not ignore the various transformations in different contexts that might be intertwined with the sustainability transformation. This becomes particularly evident when turning to the ongoing

8 The Baltic Sea Energy Security Summit: Marienberg Declaration, 2022. www.regeringen.dk/media/11544/the-marienberg-declaration-_300822.pdf; WindEurope: Baltic Sea countries pledge closer collaboration to secure critical offshore energy infrastructure, 10.04.2024, windeurope.org/news/baltic-sea-countries-pledge-closer-collaboration-to-secure-critical-off-shore-energy-infrastructure/ (27.01.2026).

9 Kalis: Energy Trilemma, 2024a; Karimi, Farid/Rodi, Michael: Energy Transition in the Baltic Sea Region—Understanding Stakeholder Engagement and Community Acceptance, Abingdon 2022.

10 Cf. Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen (WB-GU): Welt im Wandel—Gesellschaftsvertrag für eine Große Transformation, 2011, www.wbgu.de/fileadmin/user_upload/wbgu/publikationen/hauptgutachten/hg2011/pdf/wbgu_jg2011.pdf (01.01.2025); Wittmayer, Julia/Hölscher, Katharina: Transformationsforschung—Definitionen, Ansätze, Methoden, 2017, www.umweltbundesamt.de/sites/default/files/medien/1410/publikationen/2017-11-08_texte_103-2017_transformationsforschung.pdf (01.01.2025).

ing transformation of the security architecture within the region and beyond (see Chapter Banka/Bussmann).

Given this background, it comes as no surprise that the Baltic Sea region is examined in the context of a fragmented transformation.¹¹ Here, fragmentation refers to both the fragmentation into a multitude of transformations and the fragmentation within transformations. The energy transformation makes such fragmentation particularly evident.

On the one hand, the energy transformation is characterised by a fundamentally concurrent objective of decarbonisation and ultimately climate neutrality of the energy systems in the nation states and the region. On the other hand, however, the energy transition policies are fragmenting into a multitude of divergent sub-targets, principles and measures, as a glance at the different energy sources and their role in the energy transition reveals. The coal phase-out and the nuclear phase-out on the one hand and the uptake of Liquified Natural Gas (LNG), nuclear energy and carbon capture and storage technologies (CCS) on the other are only prominent fragments of these diverging transformation paths.¹² The divergences are also clearly shown in the context of transnational, transregional energy relations, and the infrastructure projects such as the NordStream pipelines.

Assembling the Fragments?—From Fragmented Transformation to Harmonisation Through the Prism of Energy Security

However, it may well be that precisely this view of transnational and transregional infrastructure projects and cooperation can ultimately show a change from a fragmented to an increasingly harmonised energy transformation in the region.¹³ Indeed, numerous transnational collaborations and infrastructure projects can be observed in the region, not least in the aftermath and in the context of the Russian war of aggression and the subsequent energy crisis.¹⁴ Accordingly, the question arises as to whether a harmonisation of

11 IFZO: Fragmented Transformations, 2024, ifzo.uni-greifswald.de/en/projects/fragmented-transformations/ (28.05.2024).

12 Cf. Surwillo/Slakaityte: Energy Crisis at the Baltic Sea; Slakaityte/Surwillo/Berling: Energy Security in the Baltic Sea Region; cf. Kalis: Energy Trilemma, 2024a.

13 Cf. Kalis: Energy Trilemma, 2024a.

14 Cf. Surwillo/Slakaityte: Energy Crisis at the Baltic Sea; Slakaityte/Surwillo/Berling: Energy Security in the Baltic Sea Region; cf. Kalis, Michael: Unravelling the Gordian Knot? The Energy Trilemma in the Baltic Sea Region in an Age of Transition, in: id. (ed.): The Energy

the previously fragmented transformation (here energy transformation) in the Baltic Sea region can be recognised in the course of an ongoing securitisation.

Against this background and with this guiding question in mind, this chapter examines fragments of the fragmented energy transformation under the prism of energy security for potential harmonisation effects in the region. Focusing on energy infrastructures and elaborating on a changing understanding of energy security, the chapter looks at past perspectives, current developments and trends of a potentially harmonised energy transformation in the Baltic Sea region.

Fragmentation and Fragments of Energy Transformation in the Baltic Sea Region

The energy transformation in the Baltic Sea region appears, *prima facie*, to be pursuing a largely similar goal, regardless of the large number of states and actors involved. Although not all states in the Baltic Sea region are members of the European Union, with Norway and Russia being exceptions, as parties to the Paris Agreement, they too are pursuing the goal of holding global warming well below 2 degrees Celsius. An essential part of this goal is the energy transformation and here the decarbonisation towards climate neutrality (cf. COM (2019), 640).

For the European Union and its member states, and thus also for Germany, Denmark, Sweden, Poland, Estonia, Lithuania, Latvia and Finland, the obligation to achieve climate neutrality and the associated energy transformation arises from European secondary law like the European Climate Change Act, Art. 2 Regulation (EU) 2021/1119. In addition, the listed states are parties of the Paris Agreement and have enacted national climate protection legislation and introduced national climate targets.

However, the transformation path towards the essentially identical goal of climate neutrality and the energy transformation shows significant variance.¹⁵ The energy transition policies in the Baltic Sea region and the European member states in the wider region certainly show overlaps, convergence and some synergies.¹⁶ However, they are characterised by significant differences

Trilemma in the Baltic Sea Region—Security, Equity and the Environment, London 2024b, pp. 271–283, <https://doi.org/10.4324/9781003479178>.

15 Cf. De la Esperanza Mata Pérez/Scholten/Stegen: Multi-Speed Energy Transition; cf. Slakaityte/Surwillo/Berling: Energy Security in the Baltic Sea Region.

16 Cf. Saurer, Johannes: Rechtsvergleichende Betrachtungen zur Energiewende, in: *Jahrbuch des öffentlichen Rechts der Gegenwart* (2016), Bd. 64, pp. 411–430.

rooted in the historical, geographical and socio-economic differences between the states, among other things.¹⁷ A comprehensive legal and political comparison cannot and should not be made here; rather, it is sufficient to briefly mention and refer to the evidence of different energy transition policies and their backgrounds.

The divergences in the energy mix and national priorities are particularly striking. For example, Germany has decided to phase out coal and nuclear power, while other countries in the region, such as Sweden, Finland and Estonia, continue to rely on nuclear energy.¹⁸ The Baltic states also had to overcome specific transformation challenges, such as decoupling from Russian power grids, due to their geopolitical situation and historical ties to the Russian energy system. Overall, the Baltic Sea region is an example of a multi-speed and multi-pathway transformation of energy supply,¹⁹ a phenomenon which is evidence of the fragmented energy transformation. This fragmentation within the Baltic Sea region and the energy transition policies of its littoral states and beyond becomes particularly evident when looking at transnational and transregional energy infrastructures such as the Nord-Stream 1 and 2 pipelines.²⁰ And yet, although previously being highlighted as a focal point on divergent perceptions of energy security and energy transition policies within the Baltic Sea region the NordStream pipelines are—without any evaluative assessment—a phenomenon of transnational cooperation.²¹ In fact, it is this phenomenon of transnational cooperation increasingly evident in transnational infrastructure projects such as the European Hydrogen Backbone (see Chapter Kalis) that may lead to an increasing harmonisation of energy transition policies within the Baltic Sea region. Next to the increase of transnational projects and infrastructures this can be analysed when looking at the joint and national policies towards these infrastructures and their resilience in the context of energy security.

17 Cf. De la Esperanza Mata Pérez/Scholten/Stegen: Multi-Speed Energy Transition; cf. Slakaityte/Surwillo/Berling: Energy Security in the Baltic Sea Region; cf. Kalis: Energy Trilemma in the Baltic Sea Region, 2024.

18 Cf. Surwillo/Slakaityte: Energy Crisis at the Baltic Sea; Slakaityte/Surwillo/Berling: Energy Security in the Baltic Sea Region; cf. Kalis: Energy Trilemma, 2024a.

19 Cf. De la Esperanza Mata Pérez/Scholten/Stegen: Multi-Speed Energy Transition; cf. Kalis: Energy Trilemma in the Baltic Sea Region, 2024.

20 Cf. Shagina, Maria/Westphal, Kirsten: Nord Stream 2 and the Energy Security Dilemma, in: SWP Comment 46 (2021), www.swp-berlin.org/publications/products/comments/2021C46_NordStream2.pdf.

21 Cf. *ibid.*

Transnationalism and Energy Security in the Baltic Sea Region After the Russian Aggression in Ukraine

Transnationalism in the Baltic Sea Region

Transnational cooperation is by no means a novelty within the Baltic Sea region. Rather, the region is characterised by increasing and ongoing energy market integration and harmonisation, regardless of national energy transition policies and existing divergences within them, at least within the European Union and its member states.

This integration process and transnational cooperation is particularly evident with regard to the Baltic states and the market integration of these. Under the flagship of the BEMIP, the Baltic energy integration plan, an integration of the energy sector was initiated. This integration is evident, among other things, from power lines, frequencies, etc., but also from gas pipelines such as the GIPL (Gas Interconnection Poland-Lithuania) and the Baltic Interconnector. In fact, it was precisely these interconnectors and the transnational cooperation behind them that helped to successfully overcome the European energy crisis and Russian interventions, for example in the form of cut-offs in Finland.²²

If transnational cooperation, whether successful or unsuccessful, is seen as a characteristic of the energy transformation in the Baltic Sea region,²³ it must be noted that recently this very characteristic, this supporting pillar of national and regional energy transition policies, has been the focus of change. The acts of sabotage against maritime pipelines in the Baltic Sea region, in addition to the Russian war of aggression in Ukraine, further hybrid and cyber warfare actions and other security threats in the region, have contributed to a changed understanding of energy security and its importance within the energy transformation.

22 Surwillo/Slakaityte: Energy Crisis at the Baltic Sea; Slakaityte/Surwillo/Berling: Energy Security in the Baltic Sea Region; cf. Kalis: Unravelling the Gordian Knot?.

23 Cf. Kalis: Unravelling the Gordian Knot?.

Energy Security in the Baltic Sea Region

Energy security is a concept of many dimensions, even more—context-dependent—definitions,²⁴ and associated with an accordingly diverse set of possible tactics and measures that may work towards its achievement. From the perspective of NATO and its member states, the concept had its first major appearance on the geopolitical stage in the context of the Yom Kippur War of 1973, in which energy exports were used as a bargaining chip resulting in an oil price crisis in the United States and many Western European countries.²⁵ The International Energy Agency (IEA) founded in the aftermath (1974) consequently focused its energy security efforts on the dimensions of availability (i.e., uninterrupted sufficient supply) and affordability (price level and stability) mainly of oil. This focus on (oil) security of supply has remained prevalent in energy security debates and policies ever since.²⁶ The World Energy Council for instance still speaks of energy security as »the nation's capacity to meet current and future energy demand reliably, withstand and bounce back swiftly from system shocks with minimal disruption to supplies«.²⁷

Just like the concept itself, the instruments for ensuring energy security had, until recently, remained largely static. Informed by the experiences of 1973, diversification (both of sources and in terms of energy mix) and energy efficiency were usually emphasised in order to reduce delicate dependencies—an approach, that is still central to the European strategy (RePowerEU, COM (2022), 230). In principle, this also applies to the Baltic Sea region. Especially in the Nordics, however, national approaches have further prioritised stockpiling, owing to specific vulnerabilities emanating from seclusion and extreme

24 Sovacool, Benjamin K./Saunders, Harry: Competing Policy Packages and the Complexity of Energy Security, in: *Energy Elsevier* 67 (2014), pp. 641–651, <https://doi.org/10.1016/j.energy.2014.01.039>; Kruyt, Bert/van Vuuren, D.P./de Vries, H.J.M./Groenenberg, H: Indicators for Energy Security, in: *Energy Policy* 37 (2009), No. 6, pp. 2166–2181, [econpapers.repec.org/RePEc:eee:enepol:v:37:y:2009:i:6:p:2166-2181](https://www.econpapers.repec.org/RePEc:eee:enepol:v:37:y:2009:i:6:p:2166-2181).

25 Cf. Deese, David: Energy—Economics, Politics, and Security, in: *International Security* 4 (1979), No. 3, pp. 140–153, <https://doi.org/10.2307/2756902>.

26 Cf. *ibid.*, p. 140; Orttung, Robert/Perovic, Jeronim: Energy Security, in: Cavelti, Myriam D./Mauer, Victor (eds.): *The Routledge Handbook of Security Studies*, New York 2009, pp. 211–220: p. 211; Corner, Adam/Venables, Dan/Spence, Alexa/Poortinga, Wouter/ Demski, Christina/Pidgeon, Nick: Nuclear Power, Climate Change and Energy Security: Exploring British Public Attitudes, in: *Energy Policy* 39 (2011), No. 9, pp. 4823–4833; Novikau, Aliaksandr: Energy Security in Security Studies—A Systematic Review of Twenty Years of Literature, in: *Central European Journal of International and Security Studies* 17 (2022), No. 3, pp. 34–64, <https://doi.org/10.51870/PDDC2102>.

27 World Energy Council: *World Energy Trilemma Index 2022*, p. 5.

weather. Furthermore, based on the historical development of the region, system integration and transnational cooperation have always constituted a central part of energy security policies.²⁸ In fact, following the World Energy Council, it has been through (timely) system integration and transnational cooperation that the national states within the Baltic Sea region managed to cope with the energy crisis during the year 2023–2024.²⁹

New Momentum Towards Transnationalism and Energy Security

In the wake of perceived and realised security threats in the Baltic Sea region, an increasing momentum for securitisation and transnational cooperation can be observed. This becomes evident in the context of political agreements such as the Marienburg Declaration and the Vilnius Declaration.

However, transnational cooperation is equally evident, for example with regard to LNG projects between Finland and Estonia, ongoing plans for the Bornholm energy island, and large-scale hydrogen transformation projects in the region as part of the European Hydrogen Backbone. All these examples are not only characterised by a transnational component and a fundamental adherence to European and regional energy transformation goals, but also by an undeniable focus on energy security. However, energy security is no longer seen solely in the context of security of supply, but also in the context of new security threats.³⁰ In addition to a changed understanding of energy security towards resilience, as the World Energy Council already emphasised in 2020,³¹ this brings further actors and mandates for action into the energy transformation, especially in the Baltic Sea region. This becomes clear in the increasing role of NATO in ensuring the resilience of critical energy infrastructures in the region.

Overall, the region is increasingly focusing on energy security. This raises the question of whether, through the prism of energy security and resilience, an increasing harmonisation and thus an overcoming of existing fragmenta-

28 Cf. Slakaityte/Surwillo/Berling: Energy Security in the Baltic Sea Region; Kalis: Energy Trilemma, 2024a.

29 Cf. World Energy Council: Evolving with Resilience and Justice, p. 7, 14.

30 *ibid.*, p. 11.

31 World Energy Council: World Energy Trilemma Index 2020, 2020, www.worldenergy.org/assets/downloads/World_Energy_Trilemma_Index_2020_-_REPORT.pdf?v=1602261628 (25.05.2024).

tion in regional energy transition policy can be seen. This question will be explored in the last paragraph focussing on critical infrastructures.

Harmonising Energy Transformation Through Transnational Energy Security?—The Case of Critical Infrastructure

Similar to the rest of Europe, strategic approaches to achieving and maintaining energy security of supply in the Baltic Sea region used to pay only little attention on the protection of critical infrastructure (CIP), rather focusing on diversification, stockpiling and redundancies (cf. RePowerEU, COM (2022), 230).³² More generally, coherent and overarching national approaches to CIP remained scarce,³³ oftentimes situating the matter either in the context of national security³⁴ or of civil protection.³⁵ While the latter has proved amenable to transnational cooperation,³⁶ it lacks the security focus that would allow for responding to, for example, the growing salience of hybrid threats.³⁷ On the flipside, regarding CIP through the lens of national security may obstruct transnational cooperation. Indeed, scholars have noted on multiple occasions the intractable reluctance by states to share authority on CIP, as a policy field in close vicinity to questions of national security and sovereignty.³⁸ Lacking

32 Cf. Slakaityte/Surwillo/Berling: Energy Security in the Baltic Sea Region; Kalis: The Energy Trilemma in the Baltic Sea Region, 2024.

33 The German CIP-strategy of 2009 constituting a rare example.

34 See for example the *National Security Act* used as a basis for the implementation of EU Directive 2008/114/EC (see below) by Latvia.

35 See for example Estonia's Emergency Act, used as a basis for the implementation of EU Directive 2008/114/EC (see below) as well as the transposition measures notified by Finland (see eur-lex.europa.eu/legal-content/EN/NIM/?uri=CELEX:32008L0114).

36 See for example the EU's explicit mandate based on Article 196 of the Treaty on the Functioning of the European Union (TFEU) and the civil protection-focused mandate of the most prominent macro-regional organisation, the Council of the Baltic Sea States.

37 Westgaard, Katrine: The Baltic Sea Region—A Laboratory for Overcoming European Security Challenges, Carnegie Endowment for International Peace, 12.21.2023, carnegieendowment.org/research/2023/12/the-baltic-sea-region-a-laboratory-for-overcoming-european-security-challenges?lang=en (09.12.2024).

38 Pursiainen, Christer: The Challenges for European Critical Infrastructure Protection, in: *Journal of European Integration* 31 (2009), No. 6, pp. 721–739, <https://doi.org/10.1080/07036330903199846>; Hegemann, Hendrik/Kahl, Martin: Security governance and the limits of depoliticisation—EU policies to protect critical infrastructures and prevent radicalization, in: *Journal of International Relations and Development* 21 (2018), No. 3, pp. 552–579, <https://doi.org/10.1057/s41268-016-0078-5>; Cassotta, Sandra/Sidortsov, Roman/Pursiainen, Christer/ Goodsie, Michael Evan: Cyber Threats, Harsh Environment and the European High North (EHN) in a Human Security and Multi-Level Regulatory Global Dimension: Which

a transnational framework, national approaches to CIP (including strategies, vocabulary, methodologies etc.) were left to develop freely and in accordance with the specific geopolitical contexts, administrative and political traditions, climatic and geographical conditions and so forth.³⁹ As a result, the region's overall perspective on CIP, for a long time, remained peripheral and highly fragmented.⁴⁰

A first concerted effort to change this took place at European Union level in form of the European Programme for Critical Infrastructure Protection (EPCIP) and, most importantly, *Directive 2008/114/EC of 8 December 2008 on the identification and designation of European critical infrastructures and the assessment of the need to improve their protection* (ECI Directive). With only very modest ambitions for a truly supranational approach to CIP, one of the ECI Directive's primary aims was to generate a common understanding and language for the very concept of critical infrastructure and to raise awareness of the transnational relevance of protecting particularly important ones (European critical infrastructures).⁴¹ Despite these modest goals, however, the ECI Directive's impact remained severely limited.⁴² While some Baltic Sea region states neatly transposed the ECI Directive into national law (e.g., Poland, Denmark), others' transpositions turned out fragmentary at best (e.g., Germany, Sweden) with the Baltic countries completing transposition, but failing to integrate the European approach with their pre-existing national concepts (»vital services«, »objects of state importance«) and systems of classification.⁴³ In the end, a patchwork of European and national approaches, concepts and ideas was left, doing little to facilitate cooperation, to lay the

Framework Applicable to Critical Infrastructures under »Exceptionally Critical Infrastructure Conditions« (ECIC)?, in: *Beijing Law Review* 10 (2019), No. 2, pp. 317–360. <https://doi.org/10.4236/blr.2019.102020>; Boin, Arjen/Busuioc, Madalina/Groenleer, Martijn: Building European Union capacity to manage transboundary crises: Network or lead-agency model?, in: *Regulation and Governance* 8 (2014), No. 4, pp. 418–436, <https://doi.org/10.1111/rego.12035>; Raik, Kristi: Renaissance of realism, a new stage of Europeanization, or both? Estonia, Finland and EU foreign policy, in: *Cooperation and Conflict* 50 (2015), No. 4, pp. 440–456, <https://doi.org/10.1177/0010836714560033>.

39 Cf. Pursiainen, Christer/Lindblom, Patrick/Francke, Per (eds.): *Towards a Baltic Sea Region Strategy in Critical Infrastructure Protection*, Nordregio Report (5), Stockholm 2007.

40 *ibid.*, see also Becker: Transposing EU-legislation.

41 Cf. EY and RAND Europe: *Evaluation study of Council Directive 2008/114 on the identification and designation of European critical infrastructures and the assessment of the need to improve their protection*. Final report, 2019, op.europa.eu/en/publication-detail/-/publication/118dcd3d-b041-11ea-bb7a-01aa75ed71a1/language-en (01.01.2025).

42 *ibid.*; Becker: Transposing EU-legislation.

43 *ibid.*

basis for supranational governance or to strengthen the protection of infrastructures of transnational importance.⁴⁴ Here, the attachment to national traditions and the national monopoly over a policy field so closely tied to security and sovereignty trumped the objective need for a transnational approach, grounded in the growing interdependence and interconnectedness of energy systems and other vital services, and the associated growing risk of cascading failures.⁴⁵ Strikingly, even Finland and Sweden, otherwise known for they mostly impeccable transposition of European law, in this case, resisted.⁴⁶

With effect from October 2024, the ECI Directive was replaced by *Directive (EU) 2022/2557 of 14 December 2022 on the resilience of critical entities* (CER Directive). With high hopes placed on it,⁴⁷ it now remains to be seen, whether the CER Directive can succeed where its predecessor could not. On the one hand, it exhibits a much stronger supranational ambition, upgrading the Commission's role and competences and laying many more and much more detailed obligations upon member states.⁴⁸ It thus appears unlikely that national governments should now be willing to accept this further reaching interference in their national security business. Nor have national background conditions changed decisively: for example, Finland and Sweden still have a long way to go, while for the Baltics this is not the case.

On the other hand, however, the geopolitical environment has changed drastically.⁴⁹ With Russia's invasion of Crimea, its subsequent war of aggression against Ukraine and the accompanying proliferation of the weaponisation of energy imports and the targeted (hybrid) warfare against energy infrastructure, the need for resilient energy infrastructure is now more salient than ever.⁵⁰ At the same time, recent acts of sabotage against transnational cables and pipelines in the Baltic Sea have highlighted the challenge's transnational dimension, underlined not least by NATO's growing involvement.⁵¹

44 *ibid.*

45 OECD: Good governance for critical infrastructure resilience, in: OECD Reviews of Risk Management, Paris 2019, <https://doi.org/10.1787/02f0e5a0-en>; Pursiainen, Christer/Kytömaa, Eero: From European critical infrastructure protection to the resilience of European critical entities: what does it mean?, in: Sustainable and Resilient Infrastructure 8 (2022) (supl), pp. 85–101. <https://doi.org/10.1080/23789689.2022.2128562>.

46 Becker: Transposing EU-legislation.

47 Pursiainen/Kytömaa: From European critical infrastructure protection.

48 *ibid.*

49 See e.g., Westgaard: The Baltic Sea Region.

50 *ibid.*

51 Cf. Becker, Marie/Kalis, Michael: All hands on deck? Transforming the energy security landscape in the Baltic Sea Region, in: Energy Highlights (2024).

Furthermore, the approach adopted by the CER Directive might well attract a more favourable assessment by the Nordic states than the ECI Directive did—owing to its twofold re-focusing away from the protection of individual infrastructures and towards the resilience of entities providing vital services (hereby also further converging with the Estonian approach).⁵² This shift in emphasis has even been argued to represent a convergence of the European approach with the Nordic model, portraying the Baltic Sea region as a pioneer of change.⁵³

It is too early to get a definitive answer on how the CER Directive has or has not driven harmonisation in CIP in the Baltic Sea region's energy sector—especially as only Estonia and Lithuania have notified transposition measures so far.⁵⁴ We can, however, begin to observe some tendencies. The Lithuanian transposition stays close to the Directive's original text, adopting the concept of »critical entity« at its core, including the identification of European critical entities.⁵⁵ This contrasts with the country's transposition of the ECI Directive, where it had introduced the term *critical infrastructure* largely pro forma and else resorted back to its established list of objects of state importance.⁵⁶ While the Estonian transposition stays well away from a literal transposition of the CER Directive's text and preserves its national approach centred on vital services,⁵⁷ the adjusted focus of the Directive itself does much to reduce friction between Estonian and European law. Suddenly, the addition of the concept of the vital service *provider* suffices to essentially match the Directive. A further piece of evidence, though potentially fleeting, is the latest draft of the German transposition in form of the *KRITIS Dachgesetz*. Though the imminent change in German government will likely lead to a more or less far-reaching revision of the document, one can already state with good confi-

52 Pursiainen/Kytömaa: From European critical infrastructure protection; Becker: Transposing EU-legislation.

53 Pursiainen, Christer: Critical infrastructure resilience—A Nordic model in the making?, in: International Journal of Disaster Risk Reduction 27 (2018), pp. 632–641, <https://doi.org/10.1016/j.ijdrr.2017.08.006>.

54 See eur-lex.europa.eu/legal-content/EN/NIM/?uri=CELEX:32022L2557.

55 See the amendment to the Lithuanian *Crisis Management and Civil Protection Act* of November 7, 2024, accessible at www.e-tar.lt/portal/lt/legalAct/94aa4950a2611efa605b9842742bf37.

56 Becker: Transposing EU-legislation.

57 See for example the central Estonian Act amending the Emergency Act and other acts related thereto of September 25, 2024, accessible at www.riigiteataja.ee/akt/108102024001.

dence that the transposition, though late, will turn out much more complete and more accurate than its barely existing counterpart for the ECI Directive.⁵⁸

While these puzzle pieces allow for cautious optimism, the fact that six out of eight Baltic Sea region countries have missed the implementation deadline by already five months (and counting), should not be made light of. If not for a lack of will on part of national governments, this delay constitutes at least evidence of substantial hurdles that the transposition of the CER Directive—and the associated harmonisation of CIP—is encountering on the national level. Furthermore, while the focus on resilience has emerged as the prevalent approach across relevant actors in the Baltic Sea region, including NATO, the EU's conceptual innovation of *critical entity* has, so far, not found much resonance elsewhere. Even in EU-NATO collaborations (such as the joint taskforce) on the matter, the focus on critical infrastructure has proved quite sticky.⁵⁹

Finally, one, if not *the*, central challenge of CIP remains to be solved on the national level: the so-called public–private dilemma.⁶⁰ With a state ultimately responsible for the security of supply of vital services, including energy, and an energy sector largely in the hand of private operators and owners, tensions are inevitable. Where profit-oriented firms would determine the extent of resilience measures on the basis of cost-benefit calculations, the state would rather opt for maximum resilience in the service of national security, economic and societal welfare.⁶¹ How this gap is addressed—through hard regulation and enforcement (possibly at the cost of efficiency and economic competitiveness), self-regulation, incentives, state funds or even active involvement of military and law enforcement—remains unclear in many countries and will likely end up diverging across the region, as, here too,

58 The draft can be accessed at www.bmi.bund.de/SharedDocs/gesetzgebungsverfahren/DE/KRITIS-DachG.html; Becker: Transposing EU-legislation.

59 See for example the task force's final assessment report from 2023, well after the publication of the CER Directive, accessible at commission.europa.eu/system/files/2023-06/EU-NATO_Final%20Assessment%20Report%20Digital.pdf.

60 Dunn-Cavelty, Myriam/Suter, Manuel: Public–Private Partnerships are no silver bullet—An expanded governance model for Critical Infrastructure Protection, in: *International Journal of Critical Infrastructure Protection* 2 (2009), No. 4, pp. 179–187.

61 See for example Dunn-Cavelty/Suter: Public–Private Partnerships; Pusiainen/Kytömaa: From European critical infrastructure protection; Bueger, Christian/Liebetrau, Tobias: Critical maritime infrastructure protection—What's the trouble?, in: *Marine Policy* 155 (2023), p. 105772, <https://doi.org/10.1016/j.marpol.2023.105772>; Fritzon, Åsa/Ljungkvist, Kristin/Boin, Arjen/Rhinard, Mark: Protecting Europe's Critical Infrastructures: Problems and Prospects, in: *Journal of Contingencies and Crisis Management* 15 (2007), No. 1, pp. 30–41, <https://doi.org/10.1111/j.1468-5973.2007.00502.x>.

frame conditions (degree of privatisation and liberalisation, strength of security culture in the private sector etc.) and experiences vary significantly.⁶² While Finland has had marked success with its approach relying on collaboration and self-regulation,⁶³ Germany is still struggling to negotiate the challenge.⁶⁴ While Latvia and Estonia made the connection between CIP and the role of the military already in their transposition of the ECI Directive, most other countries have yet to make much-needed decisions in this regard.⁶⁵ With hybrid threats and wartime scenarios as an increasingly central consideration, the role of civil preparedness, closely tied also to the concept of »total defence«,⁶⁶ as found in Finland and the Baltic states,⁶⁷ will also further grow in importance, but has, so far, no counterpart in countries such as Germany.

In conclusion, while first efforts to harmonise CIP in the Baltic Sea region's energy sector yielded all but no results, the changing geopolitical environment and the EU's pivot towards a resilience- and vital service-based approach seem to indeed drive harmonisation. In fact, the extensive experience with issues of civil preparedness and societal resilience held throughout the Baltic Sea region makes the region a pioneer of change on the matter—a gold mine of expertise from which the rest of the EU might yet learn. Nonetheless, the speed and decisiveness with which different states move to fit their national frameworks to a common one, continues to vary—also in the Baltic Sea region—leaving the fragments of the past clearly visible and yet to be mended.

Assembling the Fragments?

The energy transition in the Baltic Sea region has long been marked by fragmentation, shaped by national priorities, administrative traditions, and geopolitical considerations. However, the increasing prominence of energy security—exacerbated by Russia's aggression in Ukraine, hybrid threats, and

62 Becker: Transposing EU-legislation.

63 OECD: Good governance for critical infrastructure resilience.

64 Becker, Marie: KRITIS-Dachgesetz ohne Fundament.

65 Becker: Transposing EU-legislation.

66 See for example regarding Sweden Lukasik, Stephen J./Goodman, Seymour E./Longhurst, David W.: Protecting critical infrastructure against cyber-attack, Oxford 2003.

67 Pursiainen/Lindblom/Francke (eds.): Towards a Baltic Sea Region Strategy in Critical Infrastructure Protection; Wither, James Kenneth: Back to the future? Nordic total defence concepts, in: Defence Studies 20 (2020), No. 1, pp. 61–81, <https://doi.org/10.1080/14702436.2020.1718498>; Kuczyńska-Zonik, Aleksandra: Boosting civic aspects of defence in the Baltic states, in: Publishing series IEŠ Policy Papers 3 (2023), No. 41, pp. 41–59.

infrastructure sabotage—has introduced a new momentum toward transnationalism and regional cooperation. This chapter has explored whether this shift in focus towards energy security, resilience, and CIP is fostering greater harmonisation in the Baltic Sea region's energy transition policy.

One of the key takeaways from this analysis is that transnational cooperation is not a novelty in the Baltic Sea region but has become a crucial factor in ensuring energy security. The integration of the Baltic energy markets under the BEMIP framework, the development of interconnectors such as GIPL and the Baltic Interconnector, and LNG projects between Finland and Estonia demonstrate that cross-border collaboration has been instrumental in mitigating the energy crisis and reducing dependence on Russian energy sources. However, the security dimension of energy policy has gained newfound importance, prompting further institutional and strategic adaptations.

Energy security in the region is undergoing a conceptual transformation. While traditionally framed around diversification, stockpiling, and efficiency, recent events have underscored the need for resilience against external threats, including cyber warfare, hybrid attacks, and direct sabotage. NATO's increasing involvement in securing critical energy infrastructure reflects this changing landscape, suggesting a closer alignment between energy policy and defence strategies.

The case of CIP illustrates both progress and persistent challenges in harmonising energy security policies across the region. The previous European Programme for Critical Infrastructure Protection EPCIP and the ECI Directive failed to achieve substantial integration, as national security concerns limited transnational cooperation. However, the new CER Directive offers a renewed opportunity for alignment, focusing on resilience and the protection of vital service providers rather than individual infrastructures. Early indicators from Lithuania and Estonia suggest a growing convergence with European frameworks, yet delayed transpositions by most Baltic Sea region states highlight ongoing hurdles to full regional integration.

Despite the promising trajectory toward harmonisation, significant divergences remain. National traditions, geopolitical contexts, and administrative structures continue to shape distinct approaches to energy security. The public–private dilemma further complicates matters, as different states navigate varying levels of privatisation and state intervention in securing energy infrastructure.

In conclusion, while the Baltic Sea region is witnessing a shift toward greater harmonisation in energy security policies, the process remains incomplete. The region has emerged as a pioneer in resilience-based approaches to

CIP, offering valuable lessons for the broader EU. However, fragmentation persists, with national differences in governance structures, implementation speeds, and security cultures still evident. The future of energy security and transition in the Baltic Sea region will likely depend on continued political commitment, deeper institutional integration, and the ability to balance national sovereignty concerns with the pressing need for transnational cooperation in an increasingly volatile geopolitical environment.

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Harmonisation Through Hydrogen?

With the New Energy Carrier Towards a New Harmonised Energy Transition Policy in the Baltic Sea Region

Introduction: The Role of Hydrogen in the Baltic Sea Region's Energy Transition

Hydrogen has increasingly been recognised as a crucial pillar of Europe's energy transition (COM (2016) 860), particularly in enabling sector coupling and advancing decarbonisation efforts (COM (2020) 301). In response, the European Union and numerous member states have outlined national strategies and roadmaps to accelerate the development of a hydrogen economy.² Within this broader framework, the Baltic Sea region has emerged as a focal point, hosting both major hydrogen producers and consumers in the evolving European energy landscape.³

Beyond its environmental benefits, hydrogen has gained new strategic significance in light of the geopolitical shifts following Russia's invasion of Ukraine (COM (2022) 230).⁴ As European energy policies increasingly reflect

1 This chapter is based on previous research by the author, Kalis, Michael (ed.): *The Energy Trilemma in the Baltic Sea Region—Security, Equity and the Environment*, London 2024. The research cited above was updated for this chapter and re-evaluated in the context of the research question at hand.

2 Cheng, Wenting/Lee, Sora: *How Green Are the National Hydrogen Strategies?*, in: *Sustainability* 14 (2022), No. 3, 1930, <https://doi.org/10.3390/su14031930>; Koneczna, Renata/Cader, Justyna: *Hydrogen in the Strategies of the European Union Member States*, in: *Mineral Resources Management* 37 (2021), No. 3, pp. 53–74, DEHEMA Acatech (ed.): *Comparative Analysis of International Hydrogen Strategies, Country Analysis 2023*, www.wasserstoff-komp.ass.de/fileadmin/user_upload/img/news-und-media/dokumente/2023_e_H2_Laenderanalyse.pdf (24.05.2024).

3 Cf. DEHEMA: *Comparative Analysis of International Hydrogen Strategies*; Ludwig Bölkow Systemtechnik (LBST)/World Energy Council: *International Hydrogen Strategies*, 2020, www.weltenergieerat.de/wp-content/uploads/2020/10/WEC_H2_Strategies_finalreport.pdf (24.05.2024); IEA: *Global Hydrogen Review 2023*, 2023, iea.blob.core.windows.net/assets/ecdfc3bb-d212-4a4c-9ff7-6ce5b1e19cef/GlobalHydrogenReview2023.pdf (24.05.2024); Koneczna/Cader: *Hydrogen in the Strategies of the European Union Member States*.

4 See also IRENA: *Geopolitics of the Energy Transformation—The Hydrogen Factor*, 2022, www.irena.org/-/media/Files/IRENA/Agency/Publication/2022/Jan/IRENA_Geopolitics_Hydrogen_2022.pdf (24.05.2024); Carlson, Ewa Lazarczyk/Pickford, Kit/Nyga-Łukaszewska, Honorata: *Green Hydrogen and an Evolving Concept of Energy Security—Challenges and*

concerns over security and diversification,⁵ hydrogen is now viewed as both a climate solution and a tool for reducing reliance on fossil fuel imports. This shift is evident in the EU's REPowerEU plan (COM (2022) 230), which explicitly integrates hydrogen into both its decarbonisation and energy security agendas.

As momentum builds behind hydrogen initiatives, the Baltic Sea region is witnessing an expansion of transnational projects aimed at strengthening regional hydrogen infrastructure.⁶ Key developments include hydrogen clusters and valleys in Finland and Estonia, partnerships between Denmark's Bornholm Energy Island and Germany's Lubmin port, and large-scale infrastructure initiatives such as the Baltic Sea Corridor and the Nordic Hydrogen Corridor. These projects align with broader European efforts, including the European Hydrogen Backbone, to create an interconnected hydrogen economy. Given its strategic location and growing hydrogen-related activities, the Baltic Sea region has the potential to emerge as a key driver of Europe's hydrogen future.

While these initiatives reflect progress toward a hydrogen-based energy system, they also raise questions about policy coherence and integration across national borders. With European and regional hydrogen policies advancing at different paces, the extent to which these efforts contribute to a harmonised energy transition remains an open question. Looking at the fragment of the emerging hydrogen economy in the Baltic Sea region, using the Hydrogen Trilemma⁷ and thus applying the concept of the Energy Trilemma, the following article examines different perspectives and policies in the Baltic Sea region on the way to a joint and harmonised regional hydrogen economy.

Comparisons, in: *Renewable Energy* 219 (2023), No. 1, <https://doi.org/10.1016/j.renene.2023.119410>.

- 5 World Energy Council: *Evolving with Resilience and Justice—World Energy Trilemma 2024*, www.worldenergy.org/assets/downloads/World_Energy_Trilemma_2024_Full_Report.pdf?v=1713253987 (24.05.2024); Surwillo, Izabela/Slakaityte, Veronika: *Energy Crisis at the Baltic Sea—Divergent National Paths Toward a Common Green Future*, in: Pundziute-Gallois, Emilija/Serry, Arnaud (eds.): *Permacrisis & Logistics—From Assessment to Foresight*, Caen 2023; Slakaityte, Veronika/Surwillo, Izabella/Berling, Trine V.: *Energy Security in the Baltic Sea Region—Transition within Geopolitical Constraints—Danish Institute for International Studies Report*, pure.diiis.dk/ws/files/10998512/Energy_security_in_the_Baltic_Sea_Region_DIIS_Report_2022_08.pdf (24.05.2024).

- 6 Cf. Kalis, Michael: *Clean, Green, Sustainable? Hydrogen and the Energy Trilemma in the Baltic Sea Region*, in: id. (ed.): *The Energy Trilemma in the Baltic Sea Region—Security, Equity and the Environment*, London 2024, <https://doi.org/10.4324/9781003479178>.

- 7 *ibid.*

Hydrogen is increasingly seen as a fundamental element for advancing the European energy transition (COM (2016), 860). Its significance lies not only in its function within sector coupling (the integration and coordination of different energy sources and sectors), which facilitates the integration of electrified and molecular energy supply (COM (2020), 301, 1), but also in its potential as a transportable and storable energy carrier that can support the use of renewable energy sources, which are often volatile (COM (2020), 301, 1; COM (2019), 640). As a chemical energy carrier, hydrogen serves as the foundation for producing synthetic hydrocarbons or can be utilised directly as an energy source in various sectors (COM (2020), 301; COM (2019), 640). It is also considered crucial for achieving climate neutrality within the EU (COM (2020), 301, 1). Furthermore, hydrogen holds a prominent place in the realisation of the European Green Deal (COM (2019), 640), the Commission's primary strategic document driving the EU's transition to a climate-neutral and green economy. To further this vision, many EU member states and the EU itself have developed national strategies or roadmaps aimed at building a hydrogen economy.⁸ Such strategies are also being pursued worldwide,⁹ contributing to the anticipated emergence of a global hydrogen economy.¹⁰ Despite variations in the specifics of these strategies,¹¹ the overarching objective remains the same: the establishment and scaling up of hydrogen production at the European or national level.¹²

However, hydrogen and the emerging hydrogen economy are not only seen as vital components for a future energy system based on renewable sources

8 Cheng/Lee: How Green Are the National Hydrogen Strategies?; Koneczna/Cader: Hydrogen in the Strategies of the European Union Member States; DECHEMA: Comparative Analysis of International Hydrogen Strategies.

9 DECHEMA: Comparative Analysis of International Hydrogen Strategies; LBST/World Energy Council: International Hydrogen Strategies; IEA: Global Hydrogen Review 2023.

10 IEA: Global Hydrogen Review 2023; Nallapaneni, Anuraag/Kshirsagar, Soham: Global Hydrogen Economy and Hydrogen Strategy Overview, in: Jaiswal-Nagar, Deepshikha/Dixit, Viney/Devasahayam, Sheila (eds.): Towards Hydrogen Infrastructure, Oxford 2024, pp. 59–74; Ball, Michael/Wietschel, Martin: The Hydrogen Economy—Opportunities and Challenges, Cambridge 2009.

11 DECHEMA: Comparative Analysis of International Hydrogen Strategies; LBST/World Energy Council: International Hydrogen Strategies; IEA: Global Hydrogen Review 2023; Cheng/Lee: How Green Are the National Hydrogen Strategies?; Koneczna/Cader: Hydrogen in the Strategies of the European Union Member States.

12 DECHEMA: Comparative Analysis of International Hydrogen Strategies; LBST/World Energy Council: International Hydrogen Strategies; IEA: Global Hydrogen Review 2023; Cheng/Lee: How Green Are the National Hydrogen Strategies?; Koneczna/Cader: Hydrogen in the Strategies of the European Union Member States.

(COM (2020), 301; COM (2020), 299). The role of hydrogen is also frequently highlighted in discussions about energy security, diversification, and the reliable supply of fuels and energy (COM (2022), 230).¹³ In particular, following the Russian invasion of Ukraine, the hydrogen economy has been emphasised as crucial, not only in Europe but also in the Baltic Sea region (COM (2022), 230).

Given hydrogen's key role in the energy landscape, some describe it as the »new oil«,¹⁴ while others consider it the »holy grail« of the energy transition.¹⁵ While there is ongoing debate regarding hydrogen demand,¹⁶ its source—often referred to as the »hydrogen rainbow«¹⁷—and the design of an appropriate regulatory framework,¹⁸ a general consensus exists: hydrogen is integral

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- 13 See also IRENA: Geopolitics of the Energy Transformation; Carlson/ Pickford/Nyga-Lukaszewska: Green Hydrogen and an Evolving Concept of Energy Security.
 - 14 Van de Graaf, Thijs/Overland, Indra/Scholten, Daniel/Westphal, Kirsten: The New Oil? The Geopolitics and International Governance of Hydrogen, in: *Energy Research & Social Science* 70 (2020), <https://doi.org/10.1016/j.erss.2020.101667>.
 - 15 Winebrake, James: Hype or Holy Grail? The Future of Hydrogen in Transportation, in: *Strategic Planning for Energy and the Environment* 22 (2002), No. 2, pp. 20–34, <https://doi.org/10.1080/10485230209509610>; Scita, Rossana/Raimondi, Pier Paolo/Noussan, Michel: Green Hydrogen—The Holy Grail of Decarbonisation? An Analysis of the Technical and Geopolitical Implications of the Future Hydrogen Economy, FEEM Working Paper No. 13.2020, <http://dx.doi.org/10.2139/ssrn.3709789>.
 - 16 Riemer, Matia/Zheng, Lin/Eckstein, Johannes/Wietschel Martin/ Pieton, Natalia/Kunze, Robert: Future Hydrogen Demand: A Cross-Sectoral, Global Meta-Analysis, HYPAT Working Paper 04/2022, www.hypat.de/hypat-wAssets/docs/new/publications/HYPAT_Working_Paper_04_2022_Future_hydrogen_demand.pdf (24.05.2024); Merten, Frank/Scholz, Alexander: Meta-Analysis of the Costs of and Demand for Hydrogen in the Transformation to a Carbon-Neutral Economy, Wuppertal 2023, epub.wupperinst.org/frontdoor/deliver/index/docId/8417/file/8417_Hydrogen.pdf (24.05.2024).
 - 17 Arcos, Jose M. Marin/Santos, Diogo M.F.: The Hydrogen Color Spectrum—Techno-Economic Analysis of the Available Technologies for Hydrogen Production, in: *Gases* 3 (2023), No. 1, pp. 25–46, <https://doi.org/10.3390/gases3010002>; Nationaler Wasserstoffrat (NWR): Classification of Different Paths to Hydrogen Production (»Hydrogen Rainbow«), www.wasserstoffrat.de/fileadmin/wasserstoffrat/media/Dokumente/EN/2022-04-01_NWR-Information_Paper_Hydrogen_Rainbow.pdf (24.05.2024).
 - 18 HydrogenEurope: Hydrogen Europe Position Paper A Regulatory Framework Fit for a European Hydrogen Market, 2022, hydrogeneurope.eu/wp-content/uploads/2022/06/220609-A-regulatory-framework-fit-for-a-European-h2-market-Final-2.pdf (24.05.2024); Ringsgwandl, Lena Maria/Schaffert, Johannes/Brücken, Nils/Albus, Rolf/Görner, Klaus: Current Legislative Framework for Green Hydrogen Production by Electrolysis Plants in Germany, in: *Energies* 15 (2022), No. 5, <https://doi.org/10.3390/en15051786>; Dolci, Francesco/Thomas, Denis/Hilliard, Samantha/Fúnez Guerra, Carlos/Hancke, Ragnhild/Ito, Hiroshi/Jegoux, Mathilde/ Kreeft, Gijs/Leaver, Jonathan/Newborough, Marcus/Proost, Joris: Incentives and Legal Barriers for Power-to-Hydrogen Pathways—An International Snapshot, in: *International Journal of Hydrogen Energy* 44 (2019), No. 23, pp. 11394–11401; Fleming, Ruven:

to the development of the EU's future integrated energy systems, making it a crucial element for the success of the European energy transition.

Hydrogen in the Baltic Sea Region—Yet Another Fragment of a Fragmented Energy Transformation?

And yet, considering the national hydrogen strategies, which diverge at least in their specifics and details, and taking into account the different energy transition policies within the European member states, the question arises as to whether and how hydrogen fits into this picture of targeted, harmonised yet fragmented energy transition policies. Following this, one might ask whether hydrogen will be yet another fragment of an already fragmented energy transformation.

Hydrogen in National Strategies Among the Baltic Sea Region—Multi-Speed and Multi-Pathways of Energy Transformation

The Baltic Sea region's energy transition is marked by a diverse range of national policies, reflecting different speeds and pathways toward hydrogen adoption. While a common understanding exists regarding hydrogen's role as an energy carrier and a key driver of decarbonisation, distinct national strategies reveal variations in both implementation timelines and technological approaches.

By 2023, almost all countries in the Baltic Sea region had introduced a hydrogen strategy or an equivalent policy framework.¹⁹ Despite significant

Clean or Renewable—Hydrogen and Power-to-Gas in EU Energy Law, in: Journal of Energy & Natural Resources Law 39 (2019), No. 1, pp. 43–63, <https://doi.org/10.1080/02646811.2020.17953829>.

- 19 BMWi: Die Nationale Wasserstoffstrategie, 2020, www.bmbf.de/SharedDocs/Downloads/files/die-nationale-wasserstoffstrategie.pdf?__blob=publicationFile&v=2 (24.05.2024); BMWK: Fortschreibung der Nationalen Wasserstoffstrategie, 2023, www.bmbf.de/SharedDocs/Downloads/de/2023/230726-fortschreibung-nws.pdf?__blob=publicationFile&v=1 (24.05.2024); Poland: Polish Hydrogen Strategy Until 2030 with an Outlook Until 2040—Summary, 2021, www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwil_NPfnZSGAxUyQvEDHZVeCf0QFnoECA4QAQ&url=https%3A%2F%2Fwww.gov.pl%2Fattachement%2F06213bb3-64d3-4ca8-afbe-2e50dadfa2dc&u sg=AOvVaw3-5frKu0DKcDVmQ-UiVmtx&opi=89978449 (24.05.2024); Estonia: Estonian Hydrogen Roadmap, 2023, kliimaministeerium.ee/sites/default/files/documents/2023-07/Estonian%20hydrogen%20roadmap%20ENG.pdf (24.05.2024); Norway: The Norwegian

differences in their energy mixes and broader transition policies, these nations broadly recognise hydrogen's strategic importance for their national energy futures and the region as a whole.²⁰

Germany considers hydrogen integral to sector coupling and essential for completing its energy transition.²¹ Finland and Denmark, meanwhile, aim to establish themselves as frontrunners in hydrogen production and exports within both the European Union and the Baltic Sea region.²² Sweden, lacking an extensive gas network, is prioritising the development of a national hydrogen infrastructure and focusing on its application in achieving a fossil-free industrial sector.²³ Norway links hydrogen development to its existing gas infrastructure and CO₂ storage capabilities, envisioning itself as a key player in low-carbon hydrogen production through carbon capture and storage.²⁴ Poland similarly emphasises industrial hydrogen use, incorporating carbon capture technologies into its strategy.²⁵ In contrast, Estonia, Lithuania, and Latvia, though lacking substantial hydrogen production or demand at present, are laying the groundwork for a future hydrogen economy.²⁶

Regional cooperation plays a pivotal role in shaping the hydrogen economy across the Baltic Sea. This is evident in efforts to establish priority corridors²⁷

Government's Hydrogen Strategy—Towards a Low Emission Society, 2020, www.regjerin.gen.no/contentassets/40026db2148e41eda8e3792d259efb6b/y-0127e.pdf (24.05.2024); Denmark: The Government's Strategy for Power-to-X, 2021, www.en.kefm.dk/Media/637788859015138974/PtX%20strategi_ENG3.pdf (24.05.2024); Finland: National Hydrogen Roadmap for Finland, 2020, www.businessfinland.fi/4abb35/globalassets/finnish-customers/02-build-your-network/bioeconomy-cleantech/alykas-energia/bf_national_hydrogen_roadmap_2020.pdf (24.05.2024); Sweden: Strategy for Fossil Free Competitiveness—Hydrogen, 2020, fossilfritt.se/wp-content/uploads/2021/01/Hydrogen_strategy_for-_fossil_free_competitiveness_ENG.pdf (24.05.2024).

20 BMWi: Die Nationale Wasserstoffstrategie; BMWK: Fortschreibung der Nationalen Wasserstoffstrategie; Poland: Polish Hydrogen Strategy Until 2030; Estonia: Estonian Hydrogen Roadmap; Norway: The Norwegian Government's Hydrogen Strategy; Denmark: The Government's Strategy for Power-to-X; Finland: National Hydrogen Roadmap; Sweden: Strategy for Fossil Free Competitiveness.

21 BMWi: Die Nationale Wasserstoffstrategie, p. 4.

22 Finland: Government Resolution on Hydrogen, 2023, julkaisut.valtioneuvosto.fi/bitstream/handle/10024/164746/VN_2023_19.pdf?sequence=1&isAllowed=y (24.05.2024), p. 11; Denmark: The Government's Strategy for Power-to-X, p. 52.

23 Sweden: Strategy for Fossil Free Competitiveness, p. 7.

24 Norway: The Norwegian Government's Hydrogen Strategy, p. 48.

25 Poland: Polish Hydrogen Strategy Until 2030, p. 2.

26 Estonia: Estonian Hydrogen Roadmap, p. 7.

27 BMWK: Fortschreibung der Nationalen Wasserstoffstrategie, p. 17.

and expand gas infrastructure²⁸. Norway's engagement in regional hydrogen initiatives further underscores the collaborative approach being taken.²⁹

These varying national strategies highlight the Baltic Sea region's energy transition as a multi-speed, multi-pathway process, where different countries pursue hydrogen adoption at their own pace and according to their distinct energy landscapes.

The Hydrogen Trilemma in the Baltic Sea Region

The categorisation of hydrogen as a key element of the energy transition, even as a »holy grail«,³⁰ is also an expression of its importance for the energy trilemma. It seems that hydrogen is expected to make a significant contribution on the path to an integrated energy system and the necessary balance among energy equity, environmental sustainability, and energy security. Hydrogen is not only seen in connection with the decarbonisation of the energy system.³¹ Rather, the energy policies in the EU and the member states following the Russian war of aggression in Ukraine and the energy crisis have shown that hydrogen is in the portfolio of energy security policies in the context of diversification and domestic, resilient energy supply.³² Some even go beyond this and speak of hydrogen as the decisive tool for untying the Gordian knot of the energy trilemma.³³ Following these assumptions and expectations, hydrogen would not only be a mere fragment of the energy transformation but a key or tool respectively to resolve existing conflicts in the ongoing transformation. If these expectations proved right, hydrogen would very well encompass the potential to harmonise the diverging energy transition policies among the EU and the Baltic Sea region.

28 Finland: Government Resolution on Hydrogen, p. 8; Sweden: Strategy for Fossil Free Competitiveness, p. 7; Denmark: The Government's Strategy for Power-to-X, p. 52.

29 Norway: The Norwegian Government's Hydrogen Strategy, p. 50; Estonia: Estonian Hydrogen Roadmap, p. 14.

30 Cf. Winebrake: Hype or Holy Grail?; Scita/Raimondi/Noussan: Green Hydrogen.

31 Cf. Cheng/Lee: How Green Are the National Hydrogen Strategies?; Carlson/Pickford/Nyga-Lukaszewska: Green Hydrogen and an Evolving Concept of Energy Security.

32 Carlson/Pickford/Nyga-Lukaszewska: Green Hydrogen and an Evolving Concept of Energy Security.

33 IEA: The Future of Hydrogen—Seizing Today's Opportunities, 2019, [iea.blob.core.windows.net/assets/9e3a3493-b9a6-4b7d-b499-7ca48e357561/The_Future_of_Hydrogen.pdf](https://www.iea.blob.core.windows.net/assets/9e3a3493-b9a6-4b7d-b499-7ca48e357561/The_Future_of_Hydrogen.pdf) (24.05.2024).

However, it should not be underestimated that hydrogen itself can be part of the energy trilemma.³⁴ Irrespective of the instrumental importance of hydrogen in the energy policies of the EU and the Baltic Sea region and thus in overcoming the energy trilemma, hydrogen itself is subject to the challenges of balancing security, sustainability, and justice.³⁵ In fact, hydrogen finds itself in a duplex situation within the concept of the energy trilemma. On the one hand, hydrogen policies and hydrogen law must be analysed as a component of energy policies under the concept of the energy trilemma and considering the question of resolving the dilemma situation. On the other hand, however, individual elements of the hydrogen policy itself must be examined in light of the requirements of the energy trilemma. This creates a situation that can be aptly described as the »hydrogen trilemma«.³⁶ The hydrogen trilemma describes the challenge for policy and lawmakers to balance seemingly contradictory interests of energy security, energy justice and environmental sustainability on the path to a sustainable hydrogen economy. It is precisely under this framework of the hydrogen trilemma that hydrogen's participation in the sometimes-erratic pathways of the ongoing energy transformation becomes evident. In other words, changes in the overall energy transformation, reorientation of priorities, external and internal impacts or shocks will affect energy transition policies and hydrogen policies likewise. Following this it is not hydrogen per se, which is leading to harmonising energy transition policies, and yet hydrogen may very well be an indicator of or key component

34 Cf. Hong, Sanghyun/Kim, Eunsung/Jeong, Saerok: Evaluating the Sustainability of the Hydrogen Economy Using Multi-Criteria Decision-Making Analysis in Korea, in: *Renewable Energy* 204 (2023), p. 485–492, <https://doi.org/10.1016/j.renene.2023.01.037>.

35 Chew, Yick Eu/Cheng, Xin Hui/Minh Loy, Adrian Chun/Shen How, Bing/Andiappan, Viknesh: Beyond the Colours of Hydrogen: Opportunities for Process Systems Engineering in Hydrogen Economy, in: *Process Integration and Optimization for Sustainability* 7 (2023), p. 941–950; Cheng/Lee: How Green Are the National Hydrogen Strategies?; Cailard, Amandine/Yeganyan, Rudolf/Cannone, Carla/Plazas-Niño, Fernando/Howells, Mark: A Critical Analysis of Morocco's Green Hydrogen Roadmap—A Modelling Approach to Assess Country Readiness from the Energy Trilemma Perspective, in: *Climate* 11 (2023), <https://doi.org/10.33774/coe-2024-5srcs>; Carlson/Pickford/Nyga-Łukaszewska: Green Hydrogen and an Evolving Concept of Energy Security; Piria, Raffaele/Honnen, Jens/Pfluger, Benjamin/Ueckerdt, Falko/Odenweller, Adrian: Ariadne-Analysis—Securing Hydrogen Imports for Germany: Import Needs, Risks and Strategies on the Way to Climate Neutrality, 2022, ariadneprojekt.de/media/2022/03/Ariadne-Analysis_Securing-hydrogen-imports_February2022.pdf (24.05.2024); cf. Ansari, Dawud/Maria Pepe, Jacopo: Toward a Hydrogen Import Strategy for Germany and the EU, in: *SWP Working Paper—Research Division Global Issues* (2023), No. 1, www.swp-berlin.org/publications/products/arbeitspapiere/Ansari_Pepe_2023_Hydrogen_Import_Strategy_WP.pdf (24.05.2024).

36 Cf. Kalis: Clean, Green, Sustainable?.

in such a process of harmonisation. This becomes particularly evident when looking at the increasing securitisation within the EU and the Baltic Sea region, which not only but also affects the energy transition policies.

New Momentum Towards Hydrogen?—Transnational Cooperation and Energy Security

In February 2022, Russia launched its ongoing attack on Ukraine in violation of international law. The Russian aggression and subsequent sanctions as well as unilateral measures, particularly by states in the Baltic Sea region, led to further geopolitical tensions. Based on the role of Russia in European imports of fossil fuels and existing dependencies in the Baltic Sea region on Russian oil and gas, the conflict began to spread from the mere catchment area of the region to the energy policies of its littoral states. While some states initially maintained energy relations with Russia,³⁷ Russia faced accusations of energy weaponisation,³⁸ leading some states to restrict or even break off energy relations with Russia.³⁹

On August 5, 2022, the EU adopted the regulation known as the Gas Emergency Plan to coordinate measures to reduce gas demand within the EU and to ensure the Union's security of gas supply, Regulation (EU) 2022/1369. The EU was preparing for the gas and energy crisis with the voluntary reduction in demand by the member states, Art. 3 Regulation (EU) 2022/1369, and the option of mandatory demand reduction, Art. 5 (1) Regulation (EU) 2022/1369, in the event of a so-called Union alert by the council.

In addition to these urgent emergency measures to reduce demand by the EU and its member states to avert an energy crisis, a forward-looking picture of increasing energy resilience emerged (COM (2022), 230). Emphasising the need for energy security while continuing the energy transition, the commission published its REPowerEU plan, which places energy supply,

37 Slakaityte/Surwillo/Berling: Energy Security in the Baltic Sea Region.

38 Cf. LaBelle, Michael: Energy as a Weapon of War—Lessons from 50 Years of Energy Interdependence, in: *Global Policy* 14 (2023), No. 3, pp. 531–547; Hartvig, Áron Dénes/Kiss-Dobronyi, Bence/Kotek, Péter/Takácsné Tóth, Borbála/Gutzianas, Ioannis/Zsombor Zareczky, András: The Economic and Energy Security Implications of the Russian Energy Weapon, in: *Energy* 294 (2024), <https://doi.org/10.1016/j.energy.2024.130972>; Mikulska, Anna/Finley, Mark: Asymmetric Interdependence and Wielding the Energy Weapon: Russia and the EU Post Russian Invasion of Ukraine, in: *Current Sustainable Renewable Energy Reports* 11 (2024), pp. 39–44, <https://doi.org/10.1007/s40518-024-00234-9>.

39 Slakaityte/ Surwillo/Berling: Energy Security in the Baltic Sea Region.

diversification, energy savings, and the accelerated expansion of renewable energies at the centre of its further energy security and energy transition policy (COM (2022), 230). Hydrogen plays a multiple role in the REPowerEU plan, both in the development of a secure energy supply through renewable energies in Europe and in the secure import of renewable energy sources from other EU countries (COM (2022), 230). In addition to the buzzword of diversification, the focus is on accelerating the development of a European hydrogen economy (SWD (2022), 230).

Indeed, following the Russian aggression and the energy crisis one can observe an ongoing securitisation of energy policies, including hydrogen. This securitisation that applies to energy policy as a whole and thus a shift of narrative from primary sustainability towards energy security⁴⁰ might prove to create a new momentum towards hydrogen within the Baltic Sea region.

In fact, these recent developments in the European, regional, and national hydrogen economies indicating a shift in focus are already visible within hydrogen strategies. Initially, the movement was centred on producing greenhouse gas-free hydrogen; however, there is now an increasing emphasis on scaling up hydrogen production and meeting economic requirements. This evolving approach has been described as a »scale-first, green-later« strategy,⁴¹ especially in the Baltic Sea region. National hydrogen strategies also reflect this trend.⁴²

This shift prioritises energy security over sustainability. The »scale-first, green-later« approach reveals a potential distortion of the energy trilemma or hydrogen trilemma introduced above, where energy security is emphasised at the expense of sustainability and energy justice. In the Baltic Sea region and the broader EU, the ramp-up of hydrogen infrastructure and the prioritisation of energy security raise critical questions about the sustainability of the hydrogen economy and whether it can achieve its long-term objectives. However, this phenomenon of securitisation in combination with ongoing hydrogen efforts may very well lead to a harmonisation on energy transition and hydrogen policies.

40 Cf. Loewe, Martha/Quittkat, Christine/Knodt, Michèle/Ott, Ingrid: The Impact of the Russian War Against Ukraine on the German Hydrogen Discourse, in: Sustainability 16 (2024), No. 2, <https://doi.org/10.3390/su16020773>.

41 Cheng/Lee: How Green Are the National Hydrogen Strategies?.

42 *ibid.*

Hydrogen—Diversifying and Securing Energy Transformation in the Baltic Sea Region

Not only is hydrogen part of the European RePowerEU plan as both, a diversifying and decarbonising energy carrier, but hydrogen also takes on a key role in multilateral and unilateral measures taken by states in the Baltic Sea region. The Marienborg Declaration places hydrogen and the green energy transition in the Baltic Sea region in the context of energy security and diversification.⁴³ With the Baltic Energy Security Summit and the Berlin Declaration on Baltic Offshore Wind by the Council of the Baltic Sea States, the national states within the Baltic Sea region emphasised their joint ambition towards national and European independence from Russian energy while boosting the green energy transition through cooperation within the region. The EU and individual member states and neighbours of the Baltic Sea region have also increased their hydrogen ambitions following the Russian war of aggression.⁴⁴ Germany, for example, adapted its existing national hydrogen strategy from 2020⁴⁵ and in 2023 doubled its national hydrogen ambitions from 5 GW of domestic electrolysis capacity to 10 GW.⁴⁶ Estonia's hydrogen roadmap also recognises a need for accelerated implementation of mature energy projects, speaking of a limited time frame to maximum transition from imported fossil natural gas to local renewable energy, explicitly including the introduction of a hydrogen market in Estonia and the region.⁴⁷ In its government resolution following the already existing hydrogen roadmap,⁴⁸ Finland also considers the recent crisis to be an indicator of the need for a stronger self-sufficient energy supply, including hydrogen.⁴⁹ These and other observations indicate a new momentum for hydrogen since the energy crisis and the Russian war of aggression. At the same time, there is a securitisation that applies to energy policy as a whole and thus a shift of narrative from primary sustainability towards energy security.⁵⁰

43 The Baltic Sea Energy Security Summit: Marienborg Declaration, 2022, www.regeringen.dk/media/11544/the-marienborg-declaration-_300822.pdf (24.05.2024).

44 IEA: Northwest European Hydrogen Monitor, 2024, iea.blob.core.windows.net/assets/b8ba8ad3-fl35-4002-9e21-b8cbd213fb36/NorthwestEuropeanHydrogenMonitor2024.pdf (24.05.2024).

45 BMWi: Die Nationale Wasserstoffstrategie.

46 BMWK: Fortschreibung der Nationalen Wasserstoffstrategie.

47 Estonia: Estonian Hydrogen Roadmap, p. 8.

48 Finland: National Hydrogen Roadmap.

49 Finland: Government Resolution on Hydrogen, p. 8.

50 Cf. Loewe/Quittkat/Knodt/Ott: The Impact of the Russian War Against Ukraine.

Hydrogen in Transnational Cooperation—Joint Declarations and Visions Towards the Hydrogen Economy in the Baltic Sea Region

In addition to these efforts towards energy security on national and transnational level we can observe several significant projects of transnational cooperation within the Baltic Sea. Looking at these projects from a regional perspective one might speak of the vision of a regional and harmonised hydrogen economy.

Next to individual projects of varying scale and scope, the Baltic Sea Hydrogen Collector stands out. It aims to create an offshore hydrogen pipeline infrastructure in the Baltic Sea region to secure energy supply for the Baltic Sea region and Europe. The large-scale project operated by the Finnish and Swedish gas network operators *Gasgrid* and *Nordion* with other partners is now part of the European Projects of Common Interests (C (2023) 7930). Back in 2013, the EU introduced the so-called Union's list of projects of common interest with the Regulation (EU) 347/2013 on guidelines for trans-European energy infrastructure. These are significant European infrastructure projects that are intended to help the Union achieve its energy and climate targets. One year after the revision of the regulation (cf. Regulation (EU) 2022/869), the Baltic Sea Hydrogen Collector was added to the list of projects of common interest alongside the Nordic-Baltic Hydrogen Corridor and other projects.

The Baltic Sea Hydrogen Collector project also joins one of two flagship projects under REPowerEU and the Clean Hydrogen Partnership. The Clean Hydrogen Partnership is investing 105.4 million euros in nine hydrogen valleys across Europe, including the Baltic Sea H2 in Finland and Estonia, which is outstanding in terms of funding and scale.⁵¹ The largest European Hydrogen Valley adds to other infrastructure projects under the Baltic Energy Market Interconnection Plan Hydrogen (BEMIP Hydrogen). The BEMIP Hydrogen initiatives focus on promoting hydrogen interconnectivity in the Baltic Sea region, linking Sweden, Finland, Estonia, Latvia, Lithuania, Poland, and Germany. One of the most important projects within this framework is the Nordic Hydrogen Route—Bothnian Bay. The Nordic-Baltic Hydrogen Corridor initiative takes a broad approach and will connect Finland, Estonia,

51 Cf. Clean Hydrogen Partnership: REPowering the EU with Hydrogen Valleys: Clean Hydrogen Partnerships invests EUR 105.4 million for funding 9 Hydrogen Valleys across Europe, 31.01.2023, www.clean-hydrogen.europa.eu/media/news/repowering-eu-hydrogen-valleys-clean-hydrogen-partnership-invests-eur-1054-million-funding-9-2023-01-31_en (24.05.2024).

Latvia, Lithuania, Poland, and Germany, creating a comprehensive hydrogen network in the Baltic Sea region. This far-reaching project will enable the efficient transport of hydrogen across national borders, promote regional cooperation, and support the widespread introduction of this clean energy source.

Together, these BEMIP Hydrogen initiatives, transnational cooperation, and projects as well as the national hydrogen strategies add up to a picture that shows the special role of hydrogen in the Baltic Sea region and the region's energy transition. Although a comparable document to the Esbjerg Declaration (2022), which declares the North Sea to be the future »powerhouse« for wind energy and hydrogen in the EU, is missing for the Baltic Sea region, even this brief insight reveals an agenda of no less significance that spans the entire region of the Baltic Sea and its littoral states. Although a joint vision for hydrogen within the Baltic Sea region has not yet been officially formalised in a single document, these fragments of hydrogen policies, projects and collaborations before and after the Russian aggression at least testify to the development of a joint and harmonised future hydrogen economy in the region.

Harmonisation Through Hydrogen?

The various efforts and national strategies surrounding hydrogen development in the Baltic Sea region not only highlight the region's commitment to the energy transition and energy security, but they also raise the question of whether hydrogen can indeed foster harmonisation of energy policy across the region. The diversity of national interests, technological maturity levels, and historical dependencies presents a challenge. In particular, the different political objectives related to hydrogen—ranging from decarbonising industry to promoting hydrogen as an export commodity—could make achieving regional consensus more difficult.

Nevertheless, the growing transnational cooperation seen in projects such as the Baltic Sea Hydrogen Collector and the Nordic-Baltic Hydrogen Corridor indicates that hydrogen could indeed serve as a catalyst for regional cooperation and harmonisation. If national strategies can be integrated and cross-border infrastructure developed, hydrogen could become a cornerstone of energy policy in the Baltic Sea region.

The increasing importance of hydrogen for energy security—especially following the geopolitical tensions caused by the Russian war—amplifies the need for a coordinated regional response. Hydrogen could help reduce

dependence on fossil fuels and diversify the region's energy supply. However, to achieve this, regulatory, financial, and technical standards need to be harmonised across national borders.

In conclusion, hydrogen is undoubtedly a key player in the energy transition within the Baltic Sea region. Whether it can also contribute to the harmonisation of energy policy depends on the willingness of states to reconcile their national interests in favour of a shared, common regional goal and policy.

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Fragmented Transformation

Innovation is the Answer for Healthcare Services in the Baltic Sea Region

Introduction

Innovation is the key to understanding the process of transformation from one system regime to another. An innovation is often the cause of a disturbance that requires the system to adapt. Due to an innovation, the existing processes and structures do not suit the new reality and have to be adapted in a complex transformation process, often resulting in a crisis. Adapting and adopting the innovation or creating other innovations is the appropriate response and solution to enable the system to return to a new equilibrium and overcome the crisis. This transformation process has been extensively described for commodities,¹ but rarely for health innovations.²

The terms ›innovation‹ and ›innovative‹ are widely used buzzwords in many different fields, including healthcare. However, to date there is no comprehensive and generally accepted definition of innovation,³ and different disciplines apply slightly different concepts. Schumpeter was one of the first economists to recognise the importance of innovation for any economic system.⁴ He described innovation as any change in the mode of production, the manufacture of new products, the structure of the firm or the entry into a new market, and as the »creative destruction« that underlies all progress in a market system.⁵

It should be noted that innovation is not the same as invention. While invention describes the first appearance of a new idea or product, innovation

1 E.g., Rogers, E. M.: *Diffusion of innovations*, New York 2003; Hauschildt, J.: *Dimensionen der Innovation*. Berlin/Heidelberg 2015.

2 E.g., Flessa, S./Marschall, P.: *Individualized Medicine: From Potential to Macro-Innovation*, in: Fischer, T./Langanke, P./Marschall, P./ Michl, S. (eds.): *Individualized medicine: ethical, economical and historical perspectives*, Heidelberg/New York/Dordrecht/London: 2015, pp. 253–271.

3 Cf. Hauschildt, J./Salomo, S./Schultz, C./Kock, A.: *Innovationsmanagement*, München 2016.

4 Cf. Verspagen, B.: *Innovation and economic growth*, in: Fagerberg, J./Mowery, D. C./Nelson, R.R. (eds.): *The Oxford Handbook of Innovation*, Oxford 2005, pp. 487–513.

5 Cf. Schumpeter, J.: *Theorie der wirtschaftlichen Entwicklung*, Berlin 1934.

can be seen as the first commercial implementation of a new idea as well as the economic optimisation of knowledge use.⁶ Consequently, some authors define innovation as the successful introduction of a new product on a market,⁷ but this might be a somewhat limited approach regarding healthcare innovations.

Although invention and innovation can be distinguished, they cannot be completely separated, as a free market ensures that an invention has the opportunity to demonstrate its potential to become a new standard. However, this does not guarantee that it will ultimately succeed.⁸ It is possible to distinguish between invention as the development of ideas and the first technical realisation (e.g., a prototype),⁹ and innovation as a more comprehensive process that starts with new ideas and ends with successful acceptance by potential users.¹⁰ However, the two concepts are inextricably linked.

In healthcare, innovation is the source of every improvement in the quality of services and quality of life, but also a constant challenge to existing healthcare providers and systems.¹¹ Progress in medicine requires new technologies, procedures or organisational forms. Typical examples are new drugs, implants, equipment, surgical techniques or systems of care (such as palliative medicine as an innovative form of care). We are not overstating the fact that the tremendous increase in quality and length of life over the past 100 years can be attributed to innovations in healthcare, hygiene and nutrition. Innovations are revolutionising prevention,¹² diagnosis,¹³ therapy,¹⁴ rehabilita-

6 Cf. Vahs, D./Brem, A.: *Innovationsmanagement: Von der Idee zur erfolgreichen Vermarktung*, Stuttgart 2015.

7 Cf. Feldman, M. P.: *The geography of innovation*, Boston 1994.

8 Cf. Nelson, R. R.: *An evolutionary theory of economic change*, Boston 1985.

9 Cf. Corsten, H./Gössinger, R./Müller-Seitz, G./Schneider, H.: *Grundlagen des Technologie- und Innovationsmanagements*, München 2017.

10 Cf. Trott, P.: *Innovation management and new product development*, Harlow, Essex 2012.

11 Cf. Löschner, U./Fleßa, S.: (2022). *Essentials of Innovation Theory for Medical Devices*, in: Boccatto, C./Cerutti, S./Vienken, V. (eds.): *Medical Devices: Improving Health Care Through a Multidisciplinary Approach*, Berlin/Heidelberg 2022, pp. 35–51.

12 E.g., Mathieu, E./Ritchie, H./Rodés-Guirao, L./Appel, C./Gavrilov, D./Giattino, C./Hasell, J./Macdonald, B./Dattani, S./Beltekian, D./Ortiz-Ospina, E./Roser, M.: *COVID-19 Pandemic, 2022*, ourworldindata.org/coronavirus (03.01.2022).

13 E.g., Hosny, A./Parmar, C./Quackenbush, J./Schwartz, L. H./H. J. Aerts, H. J.: *Artificial intelligence in radiology*, in: *Nature Reviews Cancer* 18 (2018), No. 8, pp. 500–510.

14 E.g., Lu, D.-Y./Lu, T./Che, J./Yarla, N.: *Individualized cancer therapy, what is the next generation*, in: *EC Cancer* 2 (2018), No. 6, pp. 286–297.

tion¹⁵ and even palliative care¹⁶. For example, stem cell transplants enable us to cure previously fatal cancers,¹⁷ and gene therapeutic drugs target diseases which, as of recently, were considered a ›death sentence‹ (e.g., spinal muscular atrophy).¹⁸ Most citizens would agree that increasingly more innovation in healthcare is welcome to improve the quality of life and save the lives of patients suffering from diseases which we still cannot heal to this day.

At the same time, innovation challenges existing solutions and systems and therefore faces resistance within the established system. The high cost of innovation, the need to learn new techniques and change existing systems, in addition to the fear of anything new—all these factors act as barriers to innovation. The invention might seem fascinating to experts, but there is no guarantee that it will ever be successful and become a new standard solution. In reality, numerous promising ideas or products fail to succeed because they cannot overcome the obstacles in their way. In the best-case scenario, they might survive in a small niche with limited relevance, but in some cases great ideas, products or processes just disappear although they seem very promising. From an external perspective, it remains a ›miracle‹ why the adoption of innovations is frequently not smooth and rather fragmented.

In this chapter we want to model the innovation adoption process in order to identify the factors that influence the successful adoption of an innovation. Based on this model, we can analyse the conditions for a smooth and rapid diffusion of an innovation and the resulting transformation process. At the same time, the model highlights the barriers and bottlenecks that hinder the adoption process and lead to fragmented transformation when systems or individuals have different characteristics of innovativeness. The relevance of the model is then demonstrated using three case studies. The chapter

15 E.g., Yuan, F./Klavon, E./Liu, Z./Lopez, R. P./Zhao, X.: A systematic review of robotic rehabilitation for cognitive training, in: *Frontiers in Robotics and AI* 8 (2021), 605715.

16 E.g., Dunleavy, L./Preston, N./Bajwah, S./Bradshaw, A./Cripps, R./Fraser, L. K./Maddocks, M./Hocaoglu, M./Murtagh, F. E./Oluyase, A. O.: ›Necessity is the mother of invention‹: Specialist palliative care service innovation and practice change in response to COVID-19. Results from a multinational survey (CovPall), in: *Palliative Medicine* 35 (2021), No. 5, pp. 814–829.

17 Cf. Meehan, K. R./Areman, E. M./Ericson, S. G./Matias, C./Seifeldin, R./Schulman, K.: Mobilization, collection, and processing of autologous peripheral blood stem cells: development of a clinical process with associated costs, in: *Journal of hematotherapy & stem cell research* 9 (2000), No. 5, pp. 767–771.

18 Cf. Ogbonmide, T./Rathore, R./Rangrej, S. B./Hutchinson, S./Lewis, M./Ojilere, S./Carvalho, V./Kelly, I.: Gene therapy for spinal muscular atrophy (SMA): A review of current challenges and safety considerations for onasemnogene abeparvovec (Zolgensma), in: *Cureus* 15 (2023), No. 3, <https://doi.org/10.7759/cureus.36197>.

concludes with some reflections on the underlying factors that influence the fragmentation of transformation.

Modelling the Adoption of Innovations

In this section we present an innovation adoption model that can be used to describe monotonous, erratic and fragmented transformation processes in healthcare to understand how transformation processes depend on economic, cultural and individual characteristics. Innovation theory provides the main framework for understanding transformation processes.¹⁹

Transformation

Any change requires energy and creates uncertainty. Consequently, an open system has an inclination to return to its steady state equilibrium and avoid change, i.e., open systems are usually homeostatic and averse to transformation.²⁰ Only when the differences between the goals and outcomes of the system increase to a level that the structures cannot be maintained and the fundamental targets cannot be achieved will the system react and adjust its structure. Otherwise, homeostasis will lead to the extinction of the system. Under the assumption that the environment changes frequently, systems are under constant pressure to change although they would prefer to stabilise. Under the pressure of change, they will only survive if they can expand beyond their original structures and processes. Figure 1 to Figure 3 display potential transformation processes.

The system is originally in a stable equilibrium. It fulfils its function within its environment and can absorb minor internal or external disturbances (synchronous system regime). However, if these disturbances (perturbations) become so strong that they cannot be absorbed within the existing structures, the system can shift smoothly into a new regime. If this transition occurs

19 The innovation adoption model was originally developed to analyse the adoption process of primary healthcare innovation (cf. Fleßa, S.: *Gesundheitsreformen in Entwicklungsländern: eine kritische Analyse aus Sicht der kirchlichen Entwicklungshilfe*, Frankfurt am Main 2002). It was amended and applied to other innovations, e.g., Flessa, S./Huebner, C.: *Innovations in Health Care—A Conceptual Framework*, in: *International Journal of Environmental Research and Public Health* 18 (2021), No. 19, 10026.

20 Cf. Ritter, W.: *Allgemeine Wirtschaftsgeographie. Eine systemtheoretisch orientierte Einführung*. München 2001.

gradually through a series of incremental changes without major crises, it is referred to as a monotonous transformation (see Figure 1). In reality, however, the system often cannot transform smoothly. Instead, it fluctuates until it reaches a bifurcation point, at which it becomes clear that the system will never be the same again. Often, the system will find a new equilibrium adapted to the new environment, which is usually set at a higher energy level. Due to the unpredictable and oscillating nature of this development, it can be termed an erratic transformation (see Figure 2).

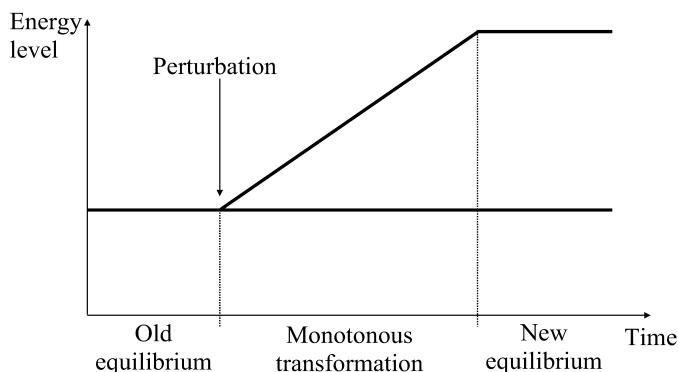


Figure 1: Monotonous transformation²¹

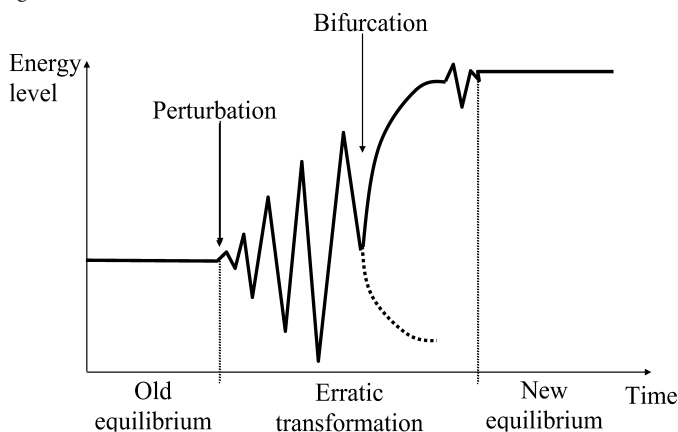


Figure 2: Erratic transformation²²

21 Source own, based on Ritter: Allgemeine Wirtschaftsgeographie.

22 Source own, based on ibid.

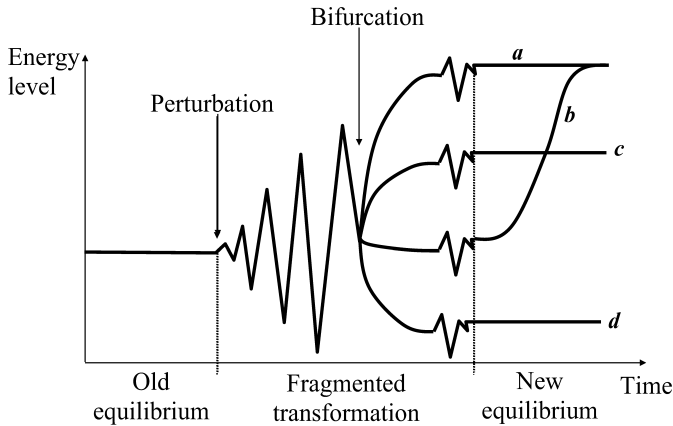


Figure 3: Fragmented transformation²³

At the bifurcation point, the system requires a new solution, i.e., an innovation. Nevertheless, different settings may not have the same ability and willingness to adopt this innovation. Some systems will adopt the innovation rapidly leading to an early and high penetration of the old system regime by the innovation and a new equilibrium on a high energy level (see course of curve »a« in Figure 3). Other systems will finally reach the same high energy level, but it takes longer (see course of curve »b« in Figure 3), while the innovation adoption might face barriers resulting in a limited adoption either at a higher (see course of curve »c« in Figure 3) or even at a lower energy level than the old system regime (see course of curve »d« in Figure 3). In reality, some may be faster or stronger in adoption of an innovation. This leads to uneven developments in different settings, regions or niches which can be referred to as fragmented transformation, leading to different levels of innovation and energy in different environments.

One reason for fragmented transformation is the diverging strength of the micro- and meso-structure of a system. Changes in the environment are initially absorbed by the microstructure (e.g., personnel, patients etc.). The meso-structure gets involved if the *disturbances* become so strong that the micro-structure are unable to manage them. And only if the meso-structure cannot absorb the fluctuations will they be passed on to the macro-structure, i.e., the economic or political system. For instance, if a problem cannot be

²³ Source own, based on ibid.

solved by the interaction between a patient and his doctor, a hospital or the entire healthcare system have to respond. If that approach seems to be ineffective, the legislation and other sectors will have get involved in solving the problem. A stable meso-structure can withstand quite a lot of pressure, but if the necessary changes are blocked by the macro-structure, the meso-structure may become inflexible or even fragile.

The development of new structures and functions of systems requires a steady flow of energy. Social systems are based on the energy source of human creativity to adapt the systems. It is through creativity that people develop innovations to respond to and survive changes in the environment. Thus, innovations are the basis for the survival of open systems, and their evolution is the condition for survival. However, innovations are also the cause of disturbances. In a dynamic economy, an innovation will flourish the innovative company, but challenge other organisations based on the old standard technology, i.e., innovation usually means »creative destruction«.²⁴ One organisation solves its challenges by innovating, and others are driven into crisis by that very innovation. Thus, the crisis-affected organisation requires further creativity and innovation to respond to the crisis and develop another innovation, which then becomes the new standard and causes another crisis for other organisations.

Innovation Adoption

While a monotonous transformation is rather unlikely, the capability and willingness to adopt an innovation determines whether the transformation is erratic or fragmented. Figure 4 exhibits a model of the adoption of a healthcare innovation. It assumes that a new idea, paradigm, product, service, or technology was invented elsewhere and has evolved to the point where an organisation or any other system could adopt and implement it. The model answers the question of what has to happen in order for this innovation from outside to become an accepted innovation from inside the organisation.

Promoters are the core of the model. They can be called key persons or champions who determine whether an innovation will be supported, accepted, hindered or destroyed.²⁵ Frequently, an innovation requires four

24 Schumpeter: Theorie der wirtschaftlichen Entwicklung.

25 Cf. Witte, E.: Organisation für Innovationsentscheidungen: Das Promotoren-Modell, Göttingen 1973.

different types of promoters in order to become a new standard. Firstly, expert promoters contribute to overcoming the barrier of lacking know-how.²⁶ They know ›how things work‹, they understand the innovation and see its perspectives.²⁷ Secondly, the power promoter helps to overcome the barrier of unwillingness. They decide to introduce the innovation into the organisation and to allocate sufficient resources to the adaption and development process.²⁸ Their role also includes breaking resistance within the organisation due to their position of power.

Thirdly, the administrative promotor overcomes the administrative hurdles.²⁹ It can happen, that a power promotor supports the innovation, but routines, data protection laws and insufficient resources prohibit the implementation. Fourthly, some authors call for a relationship promoter constantly looking for innovation seedlings from outside that might be relevant for the organisation³⁰ in order to overcome obstacles caused by inadequate or misguided communication between the organisation, customers and other stakeholders.³¹

Promoters are only able and willing to support the adoption of an innovation if they perceive system deficiencies. There is no need to risk an innovation if everybody is satisfied with the current solution. Only if the existing system solution is dysfunctional, promoters will dare to incur the costs of an alternative. However, the normal reaction to a dysfunctional system is not to change it completely, but to improve the old standard. Thus, potential promoters will first attempt to ›repair‹ the existing solution instead of adopting a completely new alternative. They search for compensation mechanisms, such as improving the design, reducing the factor costs, or simply reducing their own expectations. Managers tend to keep the existing solution, even

26 Cf. Gemünden, H. G./Salomo, S./Hölzle, K.: Role models for radical innovations in times of open innovation, in: *Creativity and innovation management* 16 (2007), No. 4, pp. 408–421.

27 Cf. Goduscheit, R. C.: Innovation promoters—A multiple case study, in: *Industrial Marketing Management* 43 (2014), No. 3, pp. 525–534.

28 Cf. Hauschildt/Salomo/Schultz/Kock: *Innovationsmanagement*.

29 Cf. Hausschildt, J./Chakrabati, A.: Arbeitsteilung im Innovationsmanagement—Forschungsergebnisse, Kriterien und Modelle, in: *Zeitschrift Führung+Organisation* 57 (1988), pp. 378–388.

30 Cf. Hauschildt, J./Schewe, G.: Gatekeeper and process promotor: key persons in agile and innovative organizations, in: *International Journal of Agile Management Systems* 2 (2000), No. 2, pp. 96–103; Gemünden/Salomo/Hölzle: Role models for radical innovations in times of open innovation.

31 Cf. Walter, A.: *Der Beziehungspromotor: Ein personaler Gestaltungsansatz für erfolgreiches Relationship Marketing*, Wiesbaden 1998.

32 Source: own, based on Fleßa: *Gesundheitsreformen in Entwicklungsländern*.

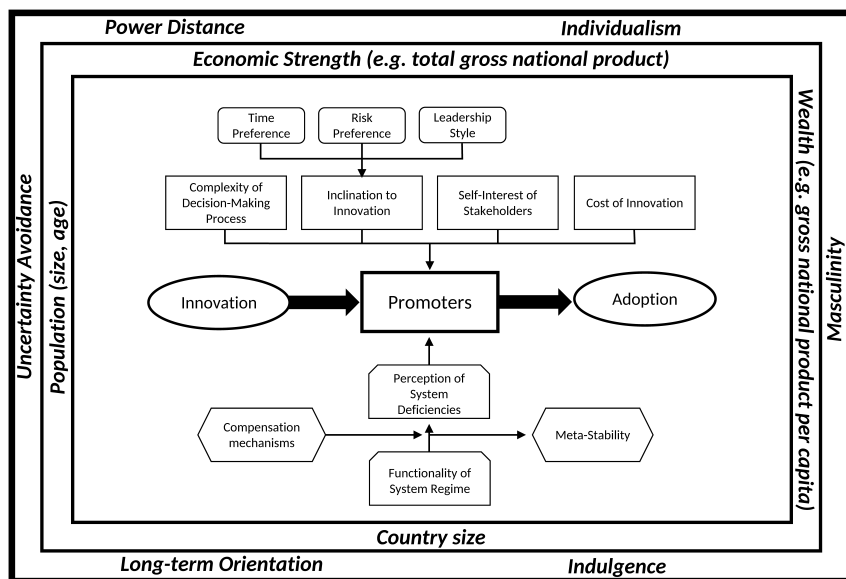


Figure 4: Model of adoption of a healthcare innovation³²

if this requires financial and temporal resources. The consequence is an artificially stabilised solution, which can only exist as long as the managers are willing to protect it. However, the stability of the system is artificial, it is meta-stable.³³ Unless managers shield the old solution from the pressures of dysfunction, it will collapse. Consequently, the adoption process is frequently not monotonous, but revolutionary or erratic. For an extended period of time, there may be no noticeable changes. Then suddenly the organisation accepts an innovation like a leap to a higher level. Consequently, the transformation is rarely monotonous but erratic or fragmented.

In addition, complexity, cost, innovation inclination and self-interest of promoters determine the willingness and ability of the manager to adopt an innovation. The more complex an innovation is, the less likely and rapidly it will be adopted. Hence, an innovation that involves many subsystems and processes will require more explanation. In addition, the costs of the innovation are crucial for the likelihood and speed of adopting it. It is important to note that term cost covers much more than only financial expenditure, but also includes the costs of reduced productivity during the transformation

33 Cf. Ritter: Allgemeine Wirtschaftsgeographie.

of the old to the new system, the negative consequences of the limited intellectual performance of managers who concentrate on the new methodology, and the political costs in the sense of resistance against the innovation (even co-workers going on strike against it).³⁴

Furthermore, inclination of promoters and other stakeholders towards innovation determines likelihood and speed of adoption. This inclination is shaped by three factors, i.e., time preference, risk preference and the leadership style within the organisations. The time preference is an expression of the value of future.³⁵ The risk preference expresses the perception of risks by the decision-maker (averse, neutral, and seeking). The leadership style is also relevant for the adoption process. The more the style is based on obedience and strict task fulfilment, the smaller is the space for innovation. Consequently, a person with a low time preference and a low-risk adversity, who works in an organisation with a coaching and fostering leadership style, has a high likelihood of becoming promoter.³⁶

Finally, stakeholders will reject innovations that challenge their own self-interest.³⁷ We need solutions that bring a win-win situation without leaving important stakeholders as losers of the transformation process. Otherwise, they will reject or slow-down the adoption of the innovation.

Consequently, the adoption of an innovation into an organisation and into a complete system is a highly complex process that involves a broad set of stakeholders and influence factors. Promoters of different settings (such as enterprises, branches, countries) will have different personalities and diverging characteristics leading to different speed and rigor of adopting the innovation. The consequence is a different adoption speed with pioneers (high speed) and laggards (low speed). At the same time, the penetration will be different. While some will accept the innovation completely, others will keep the old standard solution and employ the innovation only for certain niches. As a result, speed and penetration define the fragmentation of the adoption and the transformation process.

Based on this model we can conclude that excellent ideas, technologies or products do not necessarily find supporters. Main barriers are a missing

34 Cf. Fleßa, S.: *Grundzüge der Krankenhausbetriebslehre*, München 2014.

35 Cf. Rogers: *Diffusion of innovations*.

36 Cf. Fleßa: *Grundzüge der Krankenhausbetriebslehre*; Vahs/Brem: *Innovationsmanagement*; Hauschildt/Salomo/Schultz/Kock: *Innovationsmanagement*.

37 Cf. Heyen, N. B./Reiß, T.: *Das Gesundheitswesen aus Innovationssystemperspektive: Acht Thesen und Handlungsmöglichkeiten: Teil 1*, in: *Sozialer Fortschritt* 63 (2014), pp. 245–252.

perception of the dysfunctionality of the existing system, a compensation mechanism so that deficiencies within the existing solution can be partially remedied, high costs of the conversion, harm to a powerful influence group or simply a lack of promoters. In these cases, the innovation might only be adopted in a small niche. Here it can mature and get rid of ›teething troubles‹ so that it becomes a potential³⁸ or an innovation seedling³⁹ which might be of relevance when the old standard solution becomes more and more obsolete. Then, the seedling is ready for complete takeover, and under the increasing pressure on the dysfunctional old solution, the likelihood increases that the new solution becomes the new standard.⁴⁰

Figure 4 shows that the model centres on this adoption process. The Figure sets this adoption process in a framework of two layers that determine the influencing factors and thus drive the speed and penetration depth of innovation adoption. The first layer are the traditional variables of economics, such as gross national product (NGP), NGP per capita (p.c.), size of the country as well as demography (size and age structure of the population). Beyond these economic statistics, the outer level shows the cultural dimensions which might have an influence on the diffusion of innovations. Based on the six dimensions of national culture of Hofstede,⁴¹ Figure 4 shows that the adoption process depends on these dimensions of national culture, i.e., power distance, individualism, masculinity (today sometimes described as the motivation towards achievement and success), uncertainty avoidance, long-term orientation and indulgence versus restraints.⁴² It is essential to recognise that these variables influence the innovation adoption, but they are not the result of economic processes but cultural values of a society or nation beyond the scope of traditional economics. As these values might differ from culture to culture (or nation to nation), innovation adoption might be fragmentary.

Overall, transformation unfolds over a diachronic phase. Due to the erratic nature of the adoption process, the respective transformation of the system in

38 Cf. Dopfer, K.: *Elemente einer Evolutionsökonomik: Prozess, Struktur und Phasenübergänge*, Berlin 1990.

39 Cf. Ritter: *Allgemeine Wirtschaftsgeographie*.

40 Cf. Auffermann, S./Staudt, E.: *Der Innovationsprozess im Unternehmen—eine erste Analyse des derzeitigen Stands der Forschung*, Bochum 1999.

41 Cf. Hofstede, G.: *Culture and organizations*, in: *International Studies of Management & Organization* 10 (1980), No. 4, pp. 15–41, <https://doi.org/10.1080/00208825.1980.11656300>; id.: *Culture's Recent Consequences: Using Dimension Scores in Theory and Research*, in: *International Journal of Cross Cultural Management* 1 (2001), No. 1, pp. 11–30.

42 Cf. Hofstede, G./Hofstede, G. J./Minkov, M.: *Cultures and organizations: Software of the mind*, New York 2005.

a new system regime is rarely monotonous. Instead, the system oscillates, and older innovation seedlings might give the direction of transformation. The speed and rigour of adoption of the innovation will differ between settings leading to fragmented transformation. The more the adoption depends on public financing and national regulations, the more national borders determine the speed and penetration. In addition, dimensions of national culture might play a major role in the explanation of fragmented transformation and different speed and level of adoption.

In healthcare, one would expect that life-saving and quality-of-life-producing innovations would be adopted everywhere and in high speed. This would theoretically result in a homogenous healthcare space. However, in reality healthcare innovations are not equally implemented worldwide. It is obvious that financial capabilities will make a difference. But even between countries of similar economic development, we perceive great differences. The model of Figure 4 might help to determine the underlying causes of this fragmented transformation.

Case Studies

Digital Health

In this section, we analyse the factors determining the implementation of digital health in different countries. Unfortunately, a Digital-Health-Index has not been calculated for all countries of the Baltic Sea region so that we have to include other countries in this analysis. The main question is whether the factors shown in Figure 4 determine the digital health index.

Digital health is the deployment of information and communication technologies in the healthcare sector.⁴³ The technology and concepts can be easily imported into any country, so that one would expect that digital health had diffused to all countries at least within the European Union or the Baltic Sea region to a similar extend. However, this is not actually the case. In 2018, the Bertelsmann Foundation published a Digital-Health-Index that includes different dimensions of digital health, i.e., infrastructure (e.g., nationwide patient identification number, technical data infrastructure), legal framework (e.g., data protection regulation, data security), institutionalisation (e.g., national

43 Cf. European Commission: eHealth: Digital health and care, 2021, ec.europa.eu/health/ehealth/home_en (01.07.2021).

digital health organisation, standards, financing) and specific applications (e.g., digital patient records, e-prescription, video consultations, health information, health research).⁴⁴ Table 1 exhibits the Digital-Health-Index (DHI) of 13 selected OECD-countries for which the DHI as well as the dimensions of national culture of Hofstede exist. Although these countries are roughly on the same development level, they have quite different indices. This calls for an explanation.

Table 1: Digital-Health-Index, economic variables and Hofstede dimensions of national culture⁴⁵

Country Name	DHI	GNI p.c. PPP (current int. \$)	GNI, PPP (million current int.\$)	Population density (people/km ²)	Population, total	Land area (km ²)	Power Distance	Individualism	Masculinity	Uncertainty Avoidance	Long-term Orientation	Indulgence
Denmark	72.47	79,390	472,114	146.4	5,946,952	40,000	18	74	16	23	35	70
Estonia	81.92	47,350	64,686	31.1	1,366,188	42,750	40	60	30	80	82	16
Germany	30.02	72,110	6,092,387	238.1	84,482,267	349,390	35	67	66	65	83	40
Poland	28.52	47,380	1,738,300	123.3	36,685,849	306,100	68	60	64	93	38	29
Sweden	68.26	72,990	769,090	25.6	10,536,632	407,284	31	71	5	29	53	78
Australia	57.31	66,260	1,764,943	3.3	26,638,544	7,692,020	38	90	61	51	21	71
Belgium	54.67	71,990	851,159	382.6	11,822,592	30,280	65	75	54	94	882	52
France	31.61	62,130	4,235,079	123.8	68,170,228	547,557	68	71	43	86	63	48
Italy	55.81	58,650	3,446,469	200.0	58,761,146	295,717	50	76	70	75	61	30
Netherlands	66.05	77,750	1,390,099	520.7	17,879,488	33,670	38	80	14	53	67	68
Portugal	67.19	47,850	503,638	113.1	10,525,347	91,606	63	27	31	99	28	33
Spain	71.36	52,420	2,535,604	94.9	48,373,336	499,733	57	51	42	86	48	44
United Kingdom	69.98	58,140	3,974,003	277.0	68,350,000	241,930	35	89	66	35	51	69
Correlation	-0.012	-0.61	-0.08	-0.60	-0.05	-0.46	-0.06	-0.54	-0.36	-0.07	0.21	
p-value	0.95	0.03	0.79	0.03	0.86	0.11	0.85	0.06	0.23	0.83	0.49	

It is obvious that the adoption of the Digital Health innovation is very different in these countries. The DHI of Poland is 28.52 while the respective index of Estonia is 81.92. Table 1 shows that the economic, demographic and cultural

44 Cf. Bertelsmann Stiftung: #SmartHealthSystems, 2021, www.bertelsmann-stiftung.de/de/unsere-projekte/der-digitale-patient/projektthemen/smarthealthsystems#c1203567 (01.07.2021).

45 Source: Bertelsmann Stiftung: #SmartHealthSystems; Hofstede Insights: Compare Countries, 2024, hi.hofstede-insights.com (29.05.2024); World Bank: World Development Indicators, 2024, databank.worldbank.org/source/world-development-indicators (30.05.2024).

variables cannot satisfactorily explain the differences in DHI. One would expect that high-income countries (expressed in terms of gross national income per capita) would have more resources to invest in digital health and thus, would be faster to adopt the innovation. However, this is not the case. Instead, the correlation between DHI and the absolute GNI is negative, i.e., wealthier countries perform poorly in digital health, and this correlation is significant.

Surprisingly, population density also has no impact on the DHI. We could expect that countries with a lower population density would benefit more quickly from the advantages of digital health (and in particular telemedicine). Instead, there is a negative correlation between DHI and the population as a whole, i.e., digital health seems to be more evident in countries with smaller populations, suggesting that smaller countries (in population) are more innovative or willing to adopt innovations.

Among the cultural dimensions, power distance and masculinity have a measurable impact on the adoption of digital health technologies. It might be a surprise that a high motivation towards achievement and success (masculinity) has a negative significant ($p = 0.06$) impact on the DHI. High-scorers on DHI (such as Estonia, Netherlands, Denmark) have quite low scores on masculinity, i.e., individual success and aggressive assertiveness are seen as inappropriate while social orientation and teaming are of high esteem. High power distance and low masculinity together could indicate that a participatory leadership style with low hierarchy, free discussion and openness to different arguments as well as the will to be successful as a team, sector or nation are prerequisites for Digital Health. This might be the ›secret‹ of Estonia with a very low power distance and masculinity resulting in an exceptional DHI. However, these variables alone cannot explain why some countries perform well in adopting digital health innovations while others lag behind. In addition, some variables (e.g., size, population, income) cannot be influenced easily and do not provide insights into what the leadership can do to improve the innovation adoption. There must be other variables that grease the adoption process beyond the traditional realm of economics and management. This will be considered in the following section.

Pre-Clinical Emergency Medicine

Emergency medicine is a crucial, pre-institutional phase of the chain of care. It usually starts with an emergency (accident, life-threatening health event) resulting in alerting emergency services. In most cases, they see the patient

in the location of the emergency, make first interventions to stabilise the patient and transport them for further treatment to a healthcare centre and/or hospital.⁴⁶ Emergency medicine will continue in the healthcare institution, but here we would like to focus on the pre-clinical emergency services.

The pre-clinical emergency systems of the countries of the Baltic Sea region are quite diverse. Typical differences are:

Profession and education: Some countries (e.g., Germany) come from a tradition of volunteers working in the emergency field,⁴⁷ while other countries have seen emergency paramedics as a profession for a long time, e.g., Finland. Even Germany with its long tradition of Red Cross, Malteser and Johanniter with a strong focus on volunteers has moved towards the professionalisation of emergency care. This includes a three-year education, but it started much later than, for instance, in Finland. In some countries (e.g., Poland), emergency paramedics have a bachelor's degree specifically for that field, while in other countries (e.g., Germany) the training is still technical (three years after general school leaving certificate).⁴⁸

Authorisation: As a consequence of different professional traditions, the authorisation of paramedical emergency specialists differs. While some countries give almost the same authority to emergency paramedics as to emergency doctors (e.g., endotracheal intubation, pain therapy), other countries limit their rights and require an approbated physician to permit these interventions.⁴⁹

Rescue Concept: Some countries emphasise that the patient should be treated as far as possible at the scene of the emergency to ensure that they arrive at hospital in a stable condition-(»Treat in Street«). Other countries see the main purpose of the emergency unit in transporting the patient as fast as possible to the hospital (»Scoop and Run«).⁵⁰ The consequence is also that no professional emergency physicians are needed to transport the patient, while stabilising the patient before is usually beyond the capability of paramedics.

Role of first responders: The time between the emergency event and the first contact with the medical professionals can be crucial for the patient's survival and potential disability, especially in cases of stroke and heart attack. Some countries invest in

46 Cf. Wankhade, P./Murphy, P.: *Emergency Services Management: A Research Overview*, London 2023.

47 Cf. Seeger, I.: *Ambulante Notfallversorgung in Deutschland: verloren zwischen den Sektoren*, Universität Oldenburg 2019.

48 Cf. Dúason, S./Ericsson, C./Jónsdóttir, H. L./Andersen, J. V./Andersen, T. L.: *European paramedic curriculum—a call for unity in paramedic education on a European level*, in: *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine* 29 (2021), No. 1, 72, <https://doi.org/10.1186/s13049-021-00889-z>.

49 Cf. Tjelmeland, I. B./Masterson, S./Herlitz, J./Wnent, J./Bossart, L./Rosell-Ortiz, F./Alm-Kruse, K./Bein, B./Lilja, G./Gräsner, J.-T.: *Description of Emergency Medical Services, treatment of cardiac arrest patients and cardiac arrest registries in Europe*, in: *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine* 28 (2020), pp. 1–16.

50 Cf. Smith, R. M./Conn, A. K.: *Prehospital care—Scoop and run or stay and play?*, in: *Injury* 40 (2009), 4, pp. S23–S26.

the training of first responders who are able to provide first aid (incl. reanimation) while other countries seem to put less emphasis on their training.⁵¹

Role of airborne rescue: Helicopters are the fastest means of transport for emergency teams, but also the most expensive ones.⁵² In some countries, helicopters are widely used, in other countries this is a rare exception.⁵³ In some countries, emergency helicopters are equipped like intensive care units in order to start treatment while the patient is transported in the helicopter. Other helicopters are simply transport devices for the emergency team or for the patient.⁵⁴

Financing: Countries with a national health service (e.g., Scandinavian countries) usually provide a tax-based line-item budget for the emergency service, while countries with a Social Health Insurance provide the freedom of negotiations between emergency service providers and health insurances. In Germany, for instance, different emergency services compete with each other, and a number of for-profit providers are on the market, while Scandinavian countries usually have state-owned providers as an element for the public administration.⁵⁵

While the differences in the current systems of emergency care are quite relevant for research, this chapter will focus on emergency care innovations in order to analyse whether these innovations are diffusing smoothly and rapidly in the emergency system. As these innovations will almost always have a direct impact on the quality of life of patients and frequently on their survival, one would expect that all countries would adopt these innovations alike.

Unfortunately, very little is documented in the literature about the adoption of pre-clinical emergency innovations in the Baltic Sea region. Consequently, we organised a workshop bringing together emergency experts from all Baltic Sea region countries in Greifswald in March 2023. We provided

51 Cf. Oving, I./Masterson, S./Tjelmeland, I. B./Jonsson, M./Semeraro, F./Ringh, M./Truhlar, A./Cimpoesu, D./Folke, F./Beesems, S. G.: First-response treatment after out-of-hospital cardiac arrest: a survey of current practices across 29 countries in Europe, in: *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine* 27 (2019), pp. 1–20, <https://doi.org/10.1186/s13049-019-0689-0>.

52 Cf. Röper, J./Krohn, M./Fleßa, S./Thies, K.-C.: Costing of helicopter emergency services—a strategic simulation based on the example of a German rural region, in: *Health Economics Review* 10 (2020), pp. 1–15.

53 Cf. Kurola, J./Wangel, M./Uusaro, A./Ruokonen, E.: Paramedic helicopter emergency service in rural Finland—do benefits justify the cost?, in: *Acta anaesthesiologica scandinavica* 46 (2002), No. 7, pp. 779–784.

54 Cf. Jones, A./Donald, M. J./Jansen, J. O.: Evaluation of the provision of helicopter emergency medical services in Europe, in: *Emergency Medicine Journal* 35 (2018), No. 12, pp. 720–725.

55 Cf. World Health Organization. Regional Office for Europe & European Union: Emergency medical services systems in the European Union: report of an assessment project co-ordinated by the World Health Organization, WHO Regional Office for Europe 2008, iris.who.int/handle/10665/107916.

them with innovations in emergency medicine and asked them whether these emergency technologies were

0: not used at all

1: early innovation, not broadly used

2: diffusing innovation, used by many

3: new standard used everywhere and by everybody

In addition, they were given the chance to list additional innovations which were used in their countries. The respective items were taken from the literature and can be seen in Table 2. The majority of innovations seems to be in a rather early stage of development. Merely Finland, Norway, Denmark and Sweden have emergency innovations that have already been adopted to an extent that they have become a new standard. In particular the tele-emergency physician, the electronic prehospital medical record and the mobile stroke unit have been fully established while other countries are not yet familiar with them or have only just begun a few projects.

Table 2: Innovations in Pre-Clinical Emergency Medicine (Source: own).

	Innovation	Germany	Denmark	Poland	Norway	Sweden	Finland	Estonia	Latvia	Lithuania
before emergency treatment	AI for forecasting emergency demand	1	1	1	1	1	0	0	0	0
	AI for recognising cardiac arrest	1	2	1	1	1	0	0	0	0
	Virtual Reality Simulation Training	1	2	1	1	1	1	2	1	0
	First Responder System	2	3	1	2	0	2	2	0	1
during emergency treatment	Tele-Emergency Physician	2	2	1	3	3	3	1	1	1
	Medical Drones	1	1	1	3	0	0	0	0	1
	Electronic Prehospital Medical Record	2	3	1	2	3	3	1	1	0
	Mobile Stroke Unit	1	0	1	3	0	3	1	0	0
additional innovations by countries	Telemonitoring of COPD Patients at home	0	2	0	0	0	0	0	0	0
	Ambulance Data – Mapping Traffic Accidents	0	1	0	0	0	0	0	0	0
	Single IT System for Emergency Ambulances	0	0	0	0	0	0	0	2	0
	Simulation Training Emergency Teams	0	0	0	0	0	0	0	0	2
	Mobile Nurse-Unit	0	0	0	0	0	2	0	0	0
	Drones for search after missing persons	0	0	0	1	0	0	0	0	0
	Pre-Hospital Triage system	0	0	0	2	0	0	0	2	0
	Tele-emergency consultation	0	0	0	3	0	0	0	1	0
	Integrated patient and hospital record	2	0	0	0	0	0	0	1	0
	Digitally Supported QM	2	0	0	0	0	0	0	0	0

Table 3 calculates an EMS-Score for the innovativeness by adding the columns of Table 2. It is obvious that this score is not validated and the results must be interpreted with caution. However, the table shows that the adoption of EMS innovations depends on the wealth of a nation expressed by the GNI p.c. The higher the income per person, the more likely these innovations of emergency will be adopted and become a standard. It seems that the wealth of a nation determines the likelihood of survival in case of emergency. However, all other economic variables do not explain the differences significantly.

From the cultural dimensions, only individualism and indulgence seem to have a significant influence on the adoption of emergency medicine innovations. Individualism (versus collectivism) according to Hofstede describes how much individual behaviour is controlled by the respective group. Entrepreneurs and innovators frequently have to stand alone and fight their innovation to succeed. This might be the reason why a higher score of individualism leads to a better innovation adoption. Indulgence points in a similar direction. It is the degree of freedom which an individual can enjoy to live their own dreams and enjoy life and have fun. The more freedom is granted to entrepreneurs to promote their innovation and the more they can harvest the fruits of this success, the more likely a system will be innovative.

It is noteworthy that the results of Digital Health and Emergency Innovations are not identical. Estonia, for instance, is a ›super star‹ of digital health, but it has not yet translated this championship in the field of emergency medicine. This might be due to the fact that these EMS-innovations are quite resource-intensive. Countries like Estonia may not see it as a priority to invest their comparatively scarce resources in emergency innovations. Beyond the wealth of a nation, it is again likely that there are variables that influence diffusion of the innovation that go beyond the cultural dimensions and traditional economic factors.

Table 3: EMS-Score, economic variables and Hofstede dimensions of national culture.⁵⁶

Country Name		EMS-Score	GNI p. c. PPP (current Int. \$)	GNI, PPP (million current Int. \$)	Population density (people/km ²)	Population, total	Land area (sq. km)	Power Distance	Individualism	Masculinity	Uncertainty Avoidance	Long-term Orientation	Indulgence
Denmark	17	79,390	472,113	146.4	5,946,952	40,000	18	74	16	23	35	70	
Estonia	7	47,350	64,686	31.1	1,366,188	42,750	40	60	30	80	82	16	
Finland	14	64940	362,669	18.2	5,584,264	303,948	33	75	26	59	63	57	
Germany	15	72,110	6,092,387	238.1	84,482,267	349,390	35	67	66	65	83	40	
Latvia	9	41420	77938	30.3	1,881,750	62,230	44	70	9	63	69	13	
Lithuania	5	50100	143,871	44.7	2,871,897	62,610	42	55	19	65	49	16	
Norway	22	108790	600,502	14.8	5,519,594	364,270	31	81	8	50	55	55	
Poland	8	47,380	1,738,300	123.3	36,685,849	306,100	68	60	64	93	38	29	
Sweden	9	72,990	769,090	25.6	10,536,632	407,284	31	71	5	29	53	78	
Correlation	1	0.89	0.22	0.19	0.14	0.38	-0.57	0.86	-0.11	-0.46	-0.07	0.58	
p-value		0.001	0.57	0.63	0.71	0.31	0.11	0.003	0.77	0.21	0.85	0.099	

Vaccination against SARS-Cov-2

The COVID-19 pandemic affected all countries in the Baltic Sea region, but the governments did not respond in the same way. Hence, the pandemic waves caused a difference in incidence and prevalence as well as mortality due to SARS-Cov-2. Figure 5 shows the excess mortality of the target countries between January 2020 and July 2024 (Sweden does not provide data for 2024). The excess mortality refers to the number of deaths from all causes compared to average over previous years (2015–2019).

⁵⁶ Source: Hofstede Insights: Compare Countries; World Bank: World Development Indicators.

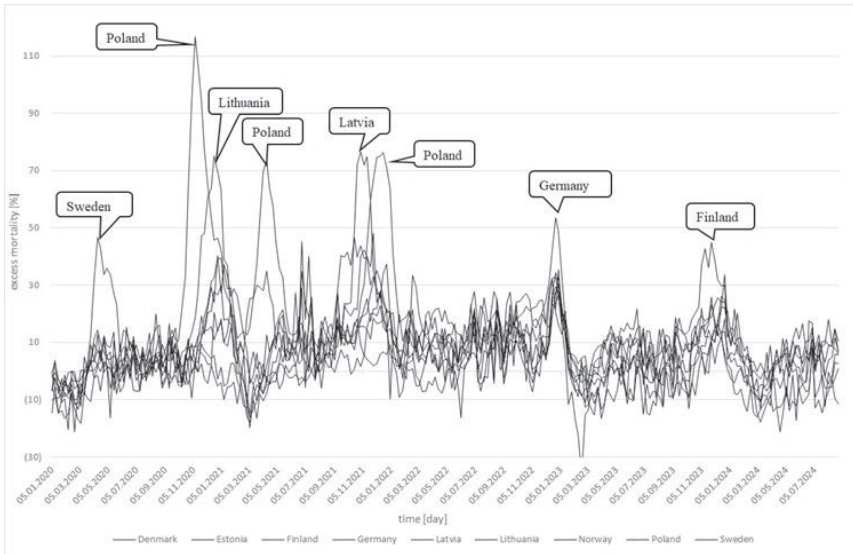


Figure 5: Excess Mortality due to SARS-Cov-2.⁵⁷

Figure 5 shows that all countries had an excess mortality during this period, but some countries had peaks of exceptional mortality in comparison to former years. In the first wave, Sweden attempted a herd immunity strategy and could not protect the elderly resulting in exceptional deaths. In the second wave in winter 2020 and 2021, Poland, Latvia and Lithuania had even higher rates indicating that this wave did not meet adequate public health interventions. Countries that initially performed quite well during the first waves (e.g., Germany and Finland) subsequently relaxed the prevention efforts too early, leading to increased mortality in 2023. Norway and Estonia, on the other hand, maintained a much better situation throughout the period.

⁵⁷ Source: own, based on Our World in Data: Excess Mortality: Deaths from all causes compared to average over previous years, 2024, ourworldindata.org/grapher/excess-mortality-y-p-scores-average-baseline?showSelectionOnlyInTable=1&country=DEU~POL~LTU~LVA~EST~FIN~SWE~NOR~DNK (16.10.2024).

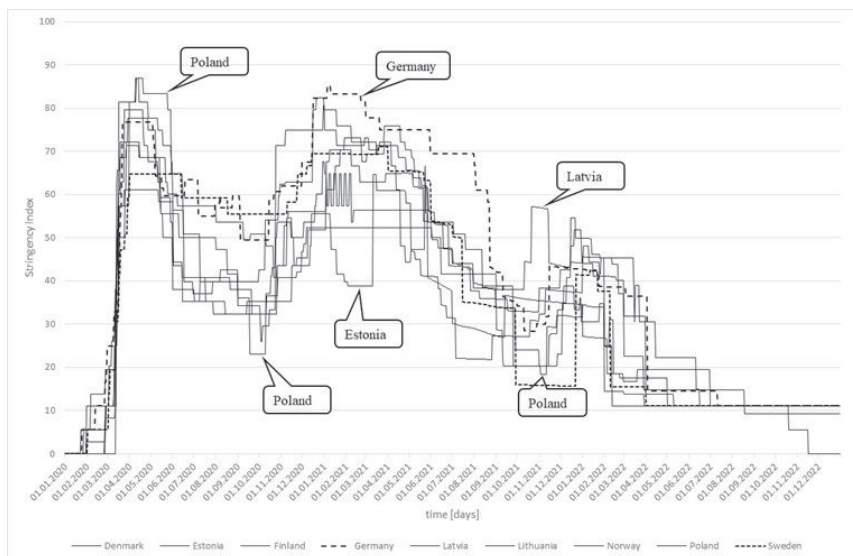


Figure 6: COVID-19 Stringency Index.⁵⁸

Figure 6 shows the Stringency Index which indicates how strictly a government responded to the Corona crisis. It is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans. An index of 0 refers to »no restrictions«, an index of 100 to »all possible restrictions«. It is obvious that the restrictions followed the infection waves, i.e., higher incidences induced higher stringency with a time-gap of one to two months. Countries with a high stringency usually have a lower excess mortality, but several countries that performed quite well during the first or second wave became too lax during the other waves. The rumour that Sweden did not react at all to the Corona threat is untrue, as the maximum stringency index of the countries are rather similar. Sweden had a maximum of 71.13, Latvia of 67.59. Poland reached a maximum of 87.04 during the first wave, Germany of 85.19 (05.01.2021).

One can understand anti-Corona measures as innovation. However, we would like to focus more on the vaccination rates and see vaccinations as the innovation to be adopted. Table 4 and Table 5 exhibit the vaccination

58 Source: own, based on Our World in Data: COVID-19: Stringency Index, 2023, ourworldindata.org/explorers/covid?Metric=Stringency+Index&Interval=Daily&Relative+to+population=false (16.10.2024).

rates (vaccine doses administered per 100 inhabitants) at 31.12.2021. This date was selected as vaccines were available on the European market in sufficient quantity, i.e., differences are likely to be the consequence of different adoption rates of the vaccine innovation.

Table 4: Vaccination Rates.⁵⁹

Country Name	Vaccination Rate
Denmark	201.3
Estonia	133.6
Finland	171.4
Germany	182.5
Latvia	135.5
Lithuania	145.8
Norway	179.1
Poland	122.3
Sweden	168.0

Table 5: Determinants of Vaccination Rate (Source: own).

Country Name	GNI p.c. PPP (current int. \$)	GNI. PPP (million current int.\$)	Population density (people/km ²)	Population. total	Land area (sq. km)	Power Distance	Individualism	Masculinity	Uncertainty Avoidance	Long-term Orientation	Indulgence
Correlation	0.79	0.26	0.32	0.15	0.24	-0.87	0.68	-0.21	-0.80	-0.12	0.78
p-value	0.01	0.49	0.40	0.69	0.21	0.002	0.04	0.58	0.01	0.75	0.01

It is obvious that wealthier countries have a higher vaccination rate (cf. Table 5). This is surprising as it was the goal of the European Union that national wealth would not determine the armamentarium against Covid. No other traditional economic variables have an influence on the vaccination rates. Instead, four cultural values determine the rate. The higher the power dis-

59 Source: Mathieu, E./Ritchie, H./Rodés-Guirao, L./Appel, C./Gavrilov, D./Giattino, C./Hasell, J./Macdonald, B./Dattani, S./Beltekian, D./Ortiz-Ospina, E./Roser, M.: Coronavirus (COVID-19) Vaccinations, 2024, ourworldindata.org/covid-vaccinations (16.10.2024).

tance, the lower is the vaccination rate. One would expect that a high-power distance would result in obedience to the government and thus a higher vaccination rate, but the opposite is true. Among the countries in the Baltic Sea region, in those where higher organisational or political levels commit to working with and persuading the levels below them, the vaccination rate is higher. In addition, individualism determines the vaccination rate. The higher the individualism, the more people will be vaccinated. Furthermore, uncertainty avoidance determines the rate. If people are afraid of the risk of the vaccination and try to avoid this uncertainty, they are less likely to accept the vaccination innovation. Estonia and Poland in particular have very high uncertainty avoidance and rather poor vaccination rates. Finally, indulgence is positively correlated. Denmark is a country where enjoyment and pleasure are embraced, and it has a high vaccination rate.

Even though more factors correlate significantly with the introduction of innovation than in digital health and emergency medicine it is still difficult to explain the innovation process solely on the basis of these economic and cultural parameters. It seems that there is at least one other factor that affects the adoption process. This underlying other factor might be the existence of certain champions of the adoption process—individuals, groups of people or institutions which are pioneers of change or change agencies.

Pioneers of Change and Change Agencies

It is feasible that random events can have a major impact on the innovation adoption. In particular, the ›early adopters‹ may be countries in which the right person occupies the right position at the right time, whereas the laggards may be those in which the wrong person holds the wrong position at the wrong time. The pioneering position of Estonia in the field of digitalisation might be an example for the role of these change agents.

Back in the early 1990s, the then Prime Minister Mart Laar (1992–1994, 1999–2002) coined the slogan ›E-Estonia—the coolest digital society‹, which was subsequently adopted by all his successors. Estonia was already working digitally in many areas of administration before the turn of the millennium and became a role model for other governments and countries. The health-care sector consistently followed from 2004 at the latest.

Figure 7 shows important milestones in the development of this pioneering country.⁶⁰ As early as 2004, the government took the lead by formulating a vision, guidelines and an implementation plan, which was supported by the establishment of an ›Estonian e-health foundation‹. Important digital health instruments (e-prescription, digital health record, communication systems, national patient portal) were implemented consistently and with clear political leadership. Today, almost all citizens have access to digital patient records, e-prescriptions and individualised digital services.

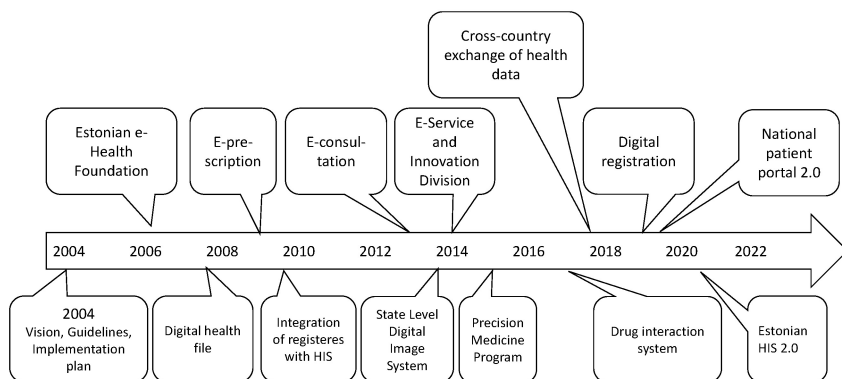


Figure 7: Development of Digital Health in Estonia.⁶¹

In early 2007, Estonia experienced a crisis that did not lead to suspicion of digitalisation, but rather increased efforts.⁶² Following digital attacks on government, parliamentary, media and banking websites (cyberterrorism),

60 Cf. Bittroff, M./Mittelstaedt, G. von: Digitalisierung im Gesundheitswesen: Was wir von Estland lernen können, in: kma—Klinik Management aktuell 24 (2019), No. 9, pp. 54f.; Georgiev, A. A./Shtereva-Tzouni, D.: Development of e-Health in Austria, Bulgaria, Croatia, Estonia and Slovakia, in: Archives of Business Review 8 (2020), No. 4, pp. 155–162, <https://doi.org/10.14738/abr.84.8114>.

61 Source: Thiel, R./Deimel, L./Schmidtman, D./Piesche, K./Hüsing, T./Rennoch, J./Stroetmann, V./Stroetmann, K.: #SmartHealthSystems. Digitalisierungsstrategien im internationalen Vergleich, Bertelsmann Stiftung 2018; Bittroff/Mittelstaedt: Digitalisierung im Gesundheitswesen.

62 Cf. Metsallik, J./Ross, P./Draheim, D./Piho, G.: Ten years of the e-health system in Estonia, CEUR Workshop Proceedings, 2018.

vulnerabilities in the system at the time were analysed in detail and countermeasures were taken. Digital security was even declared a dimension of national defence. It became particularly important that data management was consistently switched to block chain so that data could be better protected.⁶³ Overall, the population's trust in e-Estonia and digital health even increased.⁶⁴ This means that Estonia not only introduced digital health innovations much earlier than other countries, but also achieved a higher level of penetration, with the electronic patient record (EPR) playing a major role. As we have shown in the previous section, Estonia is a small country with a low population density and comparable low national income per capita, but it has the highest Bertelsmann DHI. It has rather high values of power distance and uncertainty avoidance, but otherwise the traditional variables do not detect anything exceptional. It is likely that the right people took the initiative at the right time, developed momentum and made digitalisation ›their baby‹. Thus, the transformation process might depend on these champions who pioneer the innovation adoption. One reason why Germany is a laggard in the field of digital health is that no politician or other opinion leader has ever championed it. The introduction of digital health in Germany is a technocratic process, rather than a matter of personal commitment. As these champions are not available everywhere at the same time, the result is a fragmented transformation process.

However, the existence of champions is insufficient to explain why innovations are adopted earlier in some systems. Firstly, these champions must be given the right to make decisions and influence the entire system, i.e., we need not only expert, but also power promoters in strong institutions. Thus, we require not only change agents, but change agencies. The controversial approach of the Corona policy in Sweden with strong resistance against lockdowns, travel restrictions and face masks for general use is an example.

It was the powerful and rather independent position of the Public Health Agency of Sweden that allowed Nils Anders Tegnell as the state epidemiologist

63 Cf. Aaviksoo, A.: Building blockchain powered trusted digital health services. Estonia, in: *Telehealth and Medicine Today* 5 (2020), No. 1, <https://telehealthandmedicinetoday.com/index.php/journal/article/view/167/219>.

64 Cf. Białczyk, A./Leśniak, G./Nadolny, F./Mrowiec, J./Otałęga, A.: Exploring digital health horizons: a narrative review of e-health innovations in Poland, Spain, Romania and Estonia, in: *Prospects in Pharmaceutical Sciences* 22 (2024), No. 1, pp. 32–37.

to influence the country politics to an extraordinary extent.⁶⁵ The idea of achieving a herd immunity as soon as possible by a strong wave of infections instead of flattening the curve (as most other countries did) was not unique in Sweden. Other scientists and politicians had the same intention (e.g., in Great Britain), but they did not have the power which Tegnell had. Therefore, the role and power of institutions and authorities within a country determine the speed and consistency with which innovations are adopted—for better or for worse.

Secondly, fragmentation will be strong in a situation where the diffusion of an innovation strongly depends on the willingness of the government to permit and finance it. Private innovations (e.g., mobile phone technology) do not depend on national regulation or borders, while healthcare innovations are financed publicly and are subject to many laws. Consequently, the government influence is much higher and the likelihood of fragmented transformation as well.

Thirdly, fragmentation cannot only appear between countries, but also within a country. Federalism has many advantages, but it might also lead to a situation where an innovation is adopted by one state and rejected, delayed or reduced in another state of the same country. German federalism, for instance, might be one reason why some innovations which are readily adopted in one state do not find promoters in another state. The well-known phenomenon of »Not invented here« can reduce the inclination of adopting a well-functional system from another federal state, such as the tele-medicine physician.⁶⁶

In summary, we can conclude that transformation processes depend on economic, cultural and personal characteristics. An analysis that concentrates on economic or cultural values alone might be insufficient to explain the fragmentation in the adoption and transformation processes. Instead, we should emphasise the role of pioneers of change and change agencies as the core of the adoption model. These promoters have grossly been neglected in the field of healthcare innovations. Incorporating them stronger into the theory of dynamic innovation systems might open the floor for fruitful future research.

65 Cf. Jonung, L.: The Constitutional Basis for Sweden's Exceptional Covid-19 Policy, 2020, https://www.martenscentre.eu/wp-content/uploads/2020/09/sweden_final_tl_edit_0.pdf (16.10.2024).

66 Cf. Antons, D.: Das »Not-Invented-Here-Syndrom« in der Forschung und Entwicklung: eine Untersuchung aus Sicht von Innovationsmanagement und Sozialpsychologie, Hamburg 2013.

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Fragmentation of Rural Policy Approaches in the Baltic Sea Region

Introduction

Research on policy mobilities examines how policies, ideas, and practices travel over time and space. This is not the copying of an innovative policy initiative, but the transfer of ideas that have emerged in a specific regional context or locality and are then transferred to another regional context or locality with characteristic social and political conditions. These studies move beyond traditional policy transfer research by emphasising the relational and dynamic nature of policymaking, recognising that policies, ideas, and practices are actively transformed as they circulate in space.

Due to diverging progress in the adaptation of innovative (new) policies, the states of the Baltic Sea region are in different phases of spatial transformation processes. However, most research on the spatial mobility of policy initiatives and ideas focuses on urban policies. We, instead, focus on the rural Baltic Sea region. Furthermore, we address diverse aspects of fragmented policy approaches in the Baltic Sea region with a special focus on the financial system from a rural policy perspective.

Countries surrounding the Baltic Sea are significantly shaped by rurality, compared to other European regions. In this chapter, we aim to clarify how rural areas are defined in the countries bordering the Baltic Sea. Furthermore, common themes of rural policies are identified and analysed. In addition, this chapter focuses on fiscal decentralisation and task responsibilities in the Baltic Sea region. The supply of public infrastructure and services of general interest depends on a critical mass of demand within a given region to ensure accessibility for the population. Demand may be insufficient because of low population density in rural areas and long distances to agglomerations. To examine the role of local governments in different countries of the Baltic Sea region, we distinguish public finance systems and decision-making power by their degree of decentralisation.

Mobility of Policies for Rural Areas

Fragmented Conceptualisations of Spaces

The initial situation in the rural Baltic Sea region is complex, as neither the Baltic Sea region nor the rural are uniformly defined.¹ Rather, it is characterised by diverse spatial constructions and a multitude of policies with varying thematic references. In the following, the Baltic Sea region is defined via the immediate neighbouring states, but without Russia due to data availability. Consequently, the Baltic Sea region consists of the eight countries *Denmark, Sweden, Finland, Estonia, Latvia, Lithuania, Poland and Germany*. The geographical proximity to the Baltic Sea also plays a role and the chapter therefore focuses on the *northern German states* within Germany, especially *Mecklenburg-Western Pomerania*.

Formal definitions of rural or rural areas are communicated via the statistics portals of the respective federal states (Table 1). In Germany, the *Thünen Institute's Landatlas*—which has been developed on behalf of the Federal Ministry of Agriculture, Food and Regional Identity (BMLEH)—is the basis for analytical demarcations.² Sparsely populated rural areas on the one hand and urban centres on the other represent the two poles of settlement structure and land use³ An administratively delimited region (at district level, NUTS 3 in Germany) is more rural the more dispersed the residential development is, the lower the settlement density and the number of inhabitants in the surrounding area, the more land is used for agriculture and forestry and the more remote it is from the centre. The result is an index of rurality. In addition, the regions are differentiated according to their socio-economic situation, taking into account the areas of income, employment, health, education, housing and public services. In this way, it is recognised that rurality can be fundamentally associated with socio-economic risks and opportunities.

In most countries in the Baltic Sea region, population density and population size are the two most important demarcation criteria for rurality, although the threshold values can vary considerably. The degree of rurality

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- 1 Klemeshev, Andrei P./Korneevets, Valentin S./Palmowski, Tadeusz/Studzieniecki, Tomasz/Fedorov, Gennady M.: Approaches to the definition of the Baltic Sea Region, in: *Baltic Region* 9 (2017), No. 4, pp. 4–20, <https://doi.org/10.5922/2079-8555-2017-4-1>.
 - 2 Bundesministerium für Landwirtschaft, Ernährung und Heimat (BMLEH): *Der Thünen-Landatlas: Karten und Daten zu ländlichen Räumen Deutschlands*, karten.landatlas.de (27.02.2026).
 - 3 Küpper, Patrick: *Abgrenzung und Typisierung ländlicher Räume*, Thünen Working Paper 68, Braunschweig 2016.

in Germany (see Table 1), which is the most complex, has a special position in this respect. In the countries of the Baltic Sea region, spatial references are mostly established via administrative or territorial boundaries and/or geographical information systems are used for small-scale operationalisation. It is significant that there are sometimes complementary definitions of rurality used. In Germany, at a regional level, Mecklenburg-Western Pomerania has introduced the concept of ›rural experimentation spaces‹ with special regional needs for action, which were introduced as a new spatial category in the state's 2016 *Spatial Development Programme (Landesraumentwicklungsprogramm)*. At the EU level, LEADER regions have been designed for policy purposes which stands for *Liaison entre actions de développement de l'économie rurale*. Overall, there is no standardised definition of rural or rural areas in the countries of the Baltic Sea region, although similarities between individual countries (e.g., Sweden and Denmark, Finland and Estonia) are shown in Table 1.

Rurality is being standardised in terms of definition at European level despite the heterogeneity of national states. This also forms a possible frame of reference for the Baltic Sea region. EU statistics differentiate between urban and rural regions at NUTS 3 level. Firstly, rural areas are identified on the basis of population patterns, whereby a distinction is made between rural and urban ›clusters‹.⁴ Urban ›clusters‹ are neighbouring 1 km² grid cells with a density of at least 300 inhabitants per km² and at least 5000 inhabitants. Rural areas are defined as residual areas and lie outside urban clusters. The NUTS 3 regions are then differentiated on the basis of the share of rural population: ›predominantly rural‹ with a population share in rural areas of more than 50 %; ›intermediate‹ with a population share in rural areas of between 20 % and 50 %; ›predominantly urban‹ with a population share in rural areas of less than 20 %. Distortions due to extremely small regions are resolved by grouping them into neighbourhoods. Finally, the size of the urban centres is taken into account. For example, a predominantly rural region with an urban centre with more than 200,000 inhabitants, which accounts for at least 25 % of the regional population, is classified as intermediate. An intermediate region with an urban centre with more than 500,000 inhabitants, which accounts for at least 25 % of the regional population, is also classified as predominantly urban (Figure 1).

4 Eurostat: Urban–rural typology, Rural Development. Methodology, ec.europa.eu/eurostat/web/rural-development/methodology (25.07.2023).

Schematic overview defining urban-rural typologies

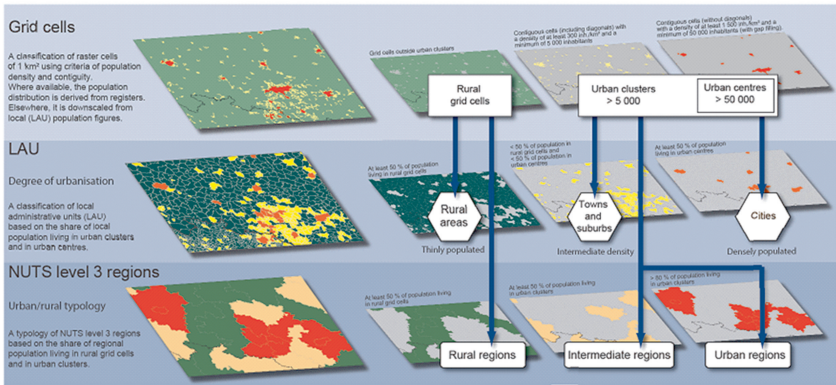


Figure 1: Definitions of rural areas (including the Baltic Sea region, EU level)

Fragmented Conceptualisations of Policies

The *strategic national plans* for the *common European agricultural policy* make it possible to identify rural issues that are the focus of policy in the Baltic Sea region. Rurality is often associated with territoriality as shown in Table 2. In addition, the concept of development is frequently associated with rurality. It is significant that many terms are only used by a few countries. As the documents are heavily edited texts for general external communication, these differences indicate that the countries each set their own thematic priorities, resulting in a variety of topics and contents.

For Germany, a document analysis based on publications by the Federal Ministry of Food and Agriculture (2014 to 2020) produces meaningful *word clouds*.⁵ Figure 2 shows results in German language as published. Examples are shown for the year 2020 (Figure 2a) and overall (Figure 2b). The enormous variety of topics in the respective year and the enormous dynamics of the content over the years (cross-sectional and longitudinal analysis) become clear. If the multitude of words and topics is reduced to the words that occur in all years, recurring words are noticeable on the one hand (e.g., ›Landwirtschaft [agriculture]‹, ›ländlich [rural]‹, ›Entwicklung [development]‹, ›Er-

5 Lisdat, Clemens/Tamásy, Christine: Mobilität von Politiken für ländliche Räume im Ostseeraum, IFZO-Policy Brief 2023/1, Greifswald 2023, ifzo.uni-greifswald.de/wissenstransfer/policy-briefs/ (25.01.2026).

Fragmentation of Task Responsibilities: Public Service Provision

Rural areas in the Baltic Sea region are facing challenges in supplying public infrastructure and services of general interest. Providing them efficiently depends on a critical mass of demand within a given region to ensure accessibility for the population. In rural-peripheral regions, demand is often insufficient because of low population density or long distances to agglomerations. These characteristics are commonly found in all countries of the Baltic Sea region, albeit to varying degrees.

In the following, we are using the example of public service provision in rural areas as an example for fragmentation of task responsibilities and financial resources among different government levels (central and local). Infrastructure and services for education, social and health care as well as recreation, sports and cultural entities need to be provided to a certain degree in all regions. It is already stated in the literature that the provision of services of general interest has a positive impact on local welfare.⁶ These services of general interest are offered at the local level and the different models to finance them are analysed with a focus on challenges in rural areas. These challenges arise, in particular, because of an insufficient number of users in each location as a result of low population densities and scattered settlement patterns.

To examine the role of local governments in different countries of the Baltic Sea region, we distinguish public finance systems and decision-making power by their degree of decentralisation. More centralised states seem to be more efficient in supplying infrastructure and services in administrative terms. Nevertheless, decentralisation may lead to a better supply of public goods in all kinds of regions because municipalities know their citizens' preferences best (*fiscal federalism*⁷).

Levels of decentralisation differ among the countries of the Baltic Sea region. As a result, different levels of the government and administrative

6 Zekun Li/Shenjing He/Shiliang Su/Guie Li/Fei Chen: Public Services Equalization in Urbanizing China: Indicators, Spatiotemporal Dynamics and Implications on Regional Economic Disparities, in: Social Indicators Research. An International and Interdisciplinary Journal for Quality-of-Life Measurement 152 (2020), No. 1, pp. 1–65, DOI: 10.1007/s11205–020–02405–9; Li, Ling/Zhang, Xueli /Chen, Yuan/Wu, Guobin/Liu, Bingsheng: Equity analysis of public service delivery among regions from temporal and spatial perspectives, in: Regional Studies 57 (2022), No. 5, pp. 935–945, <https://doi.org/10.1080/00343404.2022.2110228>.

7 Oates, Wallace E.: Fiscal Federalism, New York 1972; id.: An Essay on Fiscal Federalism, in: Journal of Economic Literature 37 (1999), No. 3, pp. 1120–1149, DOI: 10.1257/jel.37.3.1120.

branches are responsible for providing services and infrastructure of general interest. We are primarily interested in the fiscal and administrative decentralisation of states. In general, the more influence the local level has over its own budget, the more it is considered decentralised.

Centralised governments combine budget and administrative powers at the state level and can make the same public goods and infrastructure available everywhere. Cost efficiency arises when economies of scale can be utilised.⁸ As a consequence, in terms of public goods, shrinking costs due to one-size-fits-all solutions and high user numbers. Additionally, spill over effects and free riders can be reduced⁹, because subnational administrative borders are less important. In contrast, when a local government provides goods and infrastructure in and for its own jurisdiction, it cannot exclude users from other cities and municipalities. These users (free-riders) are not taxpayers in the municipality's jurisdiction. Therefore, negative effects like cost disadvantages could arise for the municipality which provides the public infrastructure. It is assumed that negative effects are bigger, if municipalities with fewer inhabitants are providing infrastructures for a comparatively higher share of external users¹⁰, which is often the case in rural regions. As already mentioned initially, in rural regions, public infrastructure and services need to be provided for a smaller number of users, and cost efficiency should not be the only criteria for it.

According to the *fiscal federalism* theory, public services should be *decentralised* to the lowest possible level for reasons of efficiency.¹¹ The administration at the local level knows the specific conditions and can take citizens' preferences into account more easily than central governments for the best-tailored solutions. Therefore, decentralisation is expected to result in a better supply of public goods¹², while centralised states face higher transaction and administrative costs.¹³ States in which fiscal decentralisation is practiced are probably more efficient, as they can respond better to local differences. In an

8 Shani, Ron/Reingewertz, Yaniv/ Vigoda-Gadot, Eran: Regional governments in the rural space: the effectiveness of dual-tier regional councils, in: *Regional Studies* 57 (2022), No. 9, pp. 1816–1831, <https://doi.org/10.1080/00343404.2022.2153825>.

9 *ibid.*

10 Zimmermann, Horst/Döring, Thomas: *Kommunal Finanzen: Eine Einführung in die finanzwissenschaftliche Analyse der kommunalen Finanzwirtschaft*, Berlin 2019.

11 Oates: *Fiscal Federalism*; *id.*: *An Essay on Fiscal Federalism*.

12 *ibid.*

13 Martinez-Vazquez, Jorge/McNab, Robert M.: Fiscal Decentralization and Economic Growth, in: *World Development* 31 (2003), No. 9, pp. 1597–1616, [https://doi.org/10.1016/S0305-750X\(03\)00109-8](https://doi.org/10.1016/S0305-750X(03)00109-8).

empirical study on the effects of decentralisation on municipal budgets for Israel, it has been shown that a regional policy with its own financial administration was able to increase its revenues compared to centrally-administered municipalities¹⁴. If administrative decentralisation is accompanied by fiscal decentralisation, municipal decision-making sovereignty is significantly increased. Additionally, regional competition between municipalities is sparked, which can lead to economic welfare benefits.¹⁵

Decentralisation among the Baltic Sea Region States

Germany is the only federal state among the countries of the Baltic Sea region, which means the intermediate level (*Bundesländer*) are autonomous state levels with their own legislative and executive powers.¹⁶ All the other countries are unitary states, organised more or less on a decentralised basis.¹⁷ The smallest units with self-government are the municipalities. In Germany, there are around 10,700 municipalities,¹⁸ whereas the other Baltic Sea States have between 60 (Lithuania) and 2478 (Poland) local units.¹⁹

Figure 3 shows the overall decentralisation score from zero to three, measured by the *European Committee of the Regions*. The score includes the political, administrative, and fiscal (autonomy) dimensions of decentralisation. It considers many data, like share of local expenses and revenues in the total government budget, as well as documents about the administrative structure and political representation of regional and local authorities at the national level. A score of three means that the sub-national levels have a high impact in all dimensions. Due to its federal system, Germany has the highest score. Although Latvia has lower values in terms of fiscal decentralisation (expenditure and revenues), it shares a similarly high score with Germany. The high level of decentralisation in Latvia is owed to high political decentralisation. In Latvia,

14 Tan, Evrim/Avshalom-Uster, Anna: How does asymmetric decentralization affect local fiscal performance?, in: *Regional Studies* 55 (2021), No. 6, pp. 1071–1083, <https://doi.org/10.1080/00343404.2020.1861241>.

15 *ibid.*

16 Zimmermann/Döring: *Kommunal финанzen*.

17 European Committee of the Regions: Division of Powers, <portal.cor.europa.eu/division-powers/Pages/default.aspx> (25.07.2023).

18 Statistisches Bundesamt: *Gemeindeverzeichnis-Informationssystem GV-ISys*, www.destatis.de/DE/Themen/Laender-Regionen/Regionales/Gemeindeverzeichnis/_inhalt.html (25.07.2023).

19 European Committee of the Regions: Division of Powers.

the ability to influence policy making and representation at the national level is quite high. There is also a good legal basis for self-government at the local level.

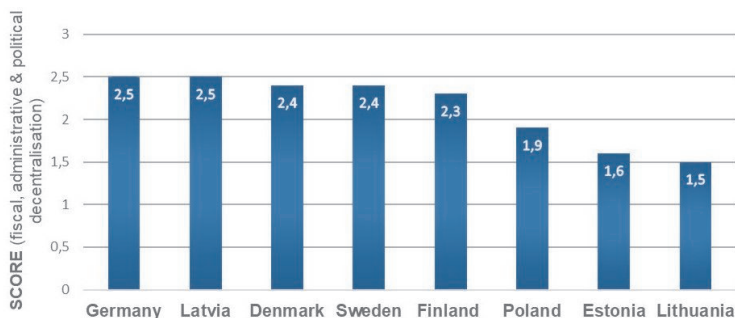


Figure 3: Overall decentralisation scores of countries in the Baltic Sea region. Source: authors' calculation based on European Committee of the Regions: Division of Powers.

Denmark and Sweden have lower political decentralisation values, but in terms of administrative and fiscal decentralisation they perform well. In Denmark, local government expenditures account for 62 % of total government expenditures. Sweden and Finland have quite a high local revenue autonomy. Besides Germany, Finland is the only country with legislative powers on sub-national levels.²⁰ In addition, 51 % of the income of Finnish municipalities are local taxes and 21 % of charges and fees apply to local services.²¹ That means, local welfare is strongly connected to local public infrastructure and services.

Poland and the other two Baltic states possess significantly lower decentralisation scores. Poland started its devolution process in 1990 with the reestablishment of municipalities. In 1999, major reforms in providing public infrastructure (esp. education and health care) and local administration were introduced.²² Especially in rural regions in the Western parts of Poland, municipalities developed well in terms of local economic activities.²³ Since then,

20 *ibid.*

21 *ibid.*

22 Brzezinski, Michal/Myck, Michal/Najsztub, Mateusz: Sharing the gains of transition: Evaluating changes in income inequality and redistribution in Poland using combined survey and tax return data, in: *European Journal of Political Economy* 73 (2022), 102121, <https://doi.org/10.1016/j.ejpoleco.2021.102121>.

23 Freier, Ronny/Myck, Michal/Najsztub, Mateusz: Lights along the frontier: convergence of economic activity in the proximity of the Polish–German border, 1992–

Poland has a solid legal basis for self-government, but less fiscal autonomy. After Poland was on a path towards democratisation and decentralisation for many years, it was found that Poland has experienced a »democratic backsliding« since 2016.²⁴

Among the states of the Baltic Sea region, Estonia and Lithuania have shown the least progress in terms of devolution. The main reason for their low score is the small share of overall subnational expenditures and revenues compared to the total government budget. Nevertheless, they perform well in political (shared rank 2) decentralisation, especially with the »ability of subnational entities to influence policymaking«. ²⁵ Additionally, Estonia has high competence in administrative decentralisation (rank 2 among all *EU* states). Estonia (in 2017) and Latvia (in 2009) abolished the regional (intermediate) level of government and empowered the municipalities.²⁶

Task Responsibilities on Local Levels

Local competencies for different tasks show a rather homogenous picture for many tasks. Figure 4 shows the local competencies in providing different public infrastructure and services. The higher the score, the greater the influence of the municipalities and the less intervention from the central level. It is notable that even in Germany, a federal country, only social tasks and public health are fully in the hands of local authorities. The German districts (>Kreise<) as the superior municipal level are responsible for health care and social security.

2012, in: *Applied Economics* 53 (2021), No. 36, pp. 4245–4262, <https://doi.org/10.1080/00036846.2021.1898534>.

24 Brzezinski/Myck/Najstüb: Sharing the gains of transition.

25 European Committee of the Regions: Division of Powers.

26 *ibid.*

Fragmentation of Rural Policy Approaches in the Baltic Sea Region

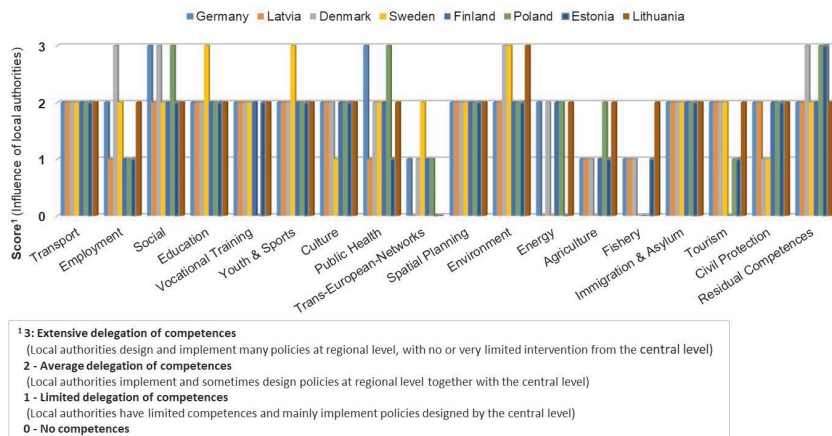


Figure 4: Decentralisation of responsibilities for specific tasks in countries of the Baltic Sea region. Source: authors' calculation based on European Committee of the Regions: Division of Powers.

Also, in Poland, the tasks of public health and social care are delegated extensively to the municipalities. In Denmark, the local level has full responsibility for employment, social, environmental, and residual public tasks. Swedish municipalities, in comparison, focus on education, youth/sports, and the environment. Latvia, which has the same decentralisation score as Germany, has no local competences without any intervention possibilities from the central government. The same is true for Finland.

Transport and spatial planning are tasks on the local level everywhere, but not without intervention from the central government. In contrast to that, trans-European networks, agriculture, and fisheries are quite often not delegated to municipalities. A probable reason for that is that these tasks have nationwide implications and are therefore better placed at the central level.

Summary and Conclusions

To summarise, rurality is not uniformly defined in the countries of the Baltic Sea region resulting in fragmented conceptualisations of rural spaces. Despite the stated national heterogeneity, a standardised definition of rurality exists at the European level as a kind of reference framework for the countries of the Baltic Sea region. There is a fragmentation of policies in the countries of the Baltic Sea region with varying thematic references in the context of 'agriculture and rural areas'. For empirical analyses of rural transformation processes

in the Baltic Sea region, the results suggest multiscale policy network analyses which are place-based and actor-centred.

The degree of decentralisation is strongly connected to the responsibility for providing public infrastructure and services at a local level, i.e., municipalities or intermediate sub-national levels. A literature review revealed the advantages of decentralised states in comparison to more centralised states. Particularly rural regions can benefit from decentralisation because local actors know their citizens' preferences best. However, the allocation of financial resources needs to be ensured in rural regions, which often have a smaller tax base and higher costs for public services and infrastructure because of a lower population density.

Within the Baltic Sea region, Germany is the most decentralised country. However, most of the other countries have quite high decentralisation indices, too. Decentralised structures can have different dimensions: Latvia, Estonia, and Lithuania have quite high political decentralisation scores, whereas Denmark has a high fiscal decentralisation score, for example. When different tasks are analysed in more detail, tasks that are exclusively fulfilled by the municipalities differ among the considered states. Most of the tasks are minimum implemented and fulfilled by local and central levels in cooperation. Some countries, like the Baltic states (Latvia, Estonia, and Lithuania), are still on a path towards more decentralised structures. Nevertheless, some tasks with nationwide consequences are still better placed at the central level.

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Table 1: Definitions of rural areas in the Baltic Sea region (national level)

Definitions of rural areas in the Baltic Sea region								
Country	Denmark	Sweden	Finland	Estonia	Latvia	Lithuania	Poland	Germany
Reference	Built-Up Areas (Distance between buildings: not more than 200 meters)	Built-up and developed land (land occupied by buildings and associated land)	Grid cells: 250 x 250 m	Grid cells: 500 x 500 m administrative classification	Territorial division and administrative management	Administrative Territories	Administrative division	Thünen classification (administrative: County regions)
Categories	Regions of the capital, cities and towns, rural areas	Urban areas, localities, small localities	Classification of grid cells	Urban, small urban, rural	Cities, towns, rural areas	Urban and rural residential areas	Legally recognised status as a city	Two poles: sparsely populated rural areas and urban agglomerations
Differentiation	Urban area	Rural area	Small localities	Urban	Rural areas (sparsely populated areas)	Urban areas	Urban and rural <i>gminas</i> or areas	Five characteristics of rurality:
	Towns 200 less than 999 inhabitants Cities from 1000 inhabitants	At least 200 inhabitants	Agglomerations with more than 15,000 residents	Population of at least 5000, density of more than 1000 people per km ²	At least 500 inhabitants	Cities	Villages Urban ban-Rural	1 Loose residential development
						Built-up area	Compactly built-up area	2 Low settlement density
						Population of more than 3000 persons	Number of residents ranging from 500 to 3000	3 High proportion of agricultural and forestry area
						More than two thirds work in industry, production or social infrastructure	More than half ment types	4 Peripheral location to large centres
						Or historically conditioned status		5 Small number of inhabitants in the surrounding area

Source: Own survey based on country-specific information; except for Germany, taken from state statistics portals (as of 2023)

Source: Own survey based on country-specific information; except for Germany, taken from state statistics portals (as of 2023)

Table 2: Document analysis—Agriculture and Rural Areas Policy (EU level)

Topics by country in the Baltic Sea region										
Categorisation according to specification: rural (word according to rural)		GER	DEN	SWE	FIN	EST	LAT	LTU	POL	Sum
Development	Development Interventions	0	0	0	1	0	0	0	0	1
	Development Programme	0	1	0	0	0	2	0	1	4
	Development Budget and Funding	0	0	0	1	1	2	1	0	5
	Development	6	6	6	5	6	6	6	6	47
Population and Settlement	Population	0	1	1	1	1	1	0	0	5
	Settlements	0	0	0	0	0	0	1	0	1
Geographical	Area	6	8	8	11	6	8	9	11	67
	Region	2	0	1	0	0	1	0	0	4
Economical	Businesses and Enterprises	2	0	1	2	2	1	0	0	8
	Economies	1	1	1	0	1	0	1	0	5
	Jobs	0	0	0	0	1	0	0	0	1
Implementation	Strategy	0	1	0	0	0	0	0	0	1
	Conditions	1	0	0	0	0	0	0	0	1
	Actors	1	0	0	0	0	0	0	0	1
		19	18	18	21	18	21	18	18	151
Source: Own survey based on national strategy papers on the Common Agricultural Policy (as of 2023)										

Source: Own survey based on national strategy papers on the Common Agricultural Policy (as of 2023)

Policy Spaces for Rural Development in the Baltic Sea Region

Introduction

In the following chapter we discuss policy spaces for rural development, with a special focus on the European Union and the Baltic Sea region in particular. The term policy space in general refers to the room for manoeuvre that decision-makers (e.g., supra-national and national governments) have to design and implement policy measures for rural development. Of interest is the EU strategic vision for rural areas—with a special focus on the Baltic member states—and the policies that financially underpin it. Among them, the self-described »most successful policy tool for community-led local development« is the LEADER methodology, first introduced in the 1990s and by now having become an integral part of the EU policy for rural areas.¹ While the relevant literature is rich, there is less research linking this methodological instrument to its spatial arrangement.

The chapter explores the construction of spatial arrangements within the LEADER methodology in Baltic Sea EU member states. It starts with a short overview of approaches to rural areas and local self-government. It then discusses the main EU instrument for rural development and its spatial manifestation across the Baltic Sea region in the 2021–2027 Programming Period. It is shown that the construction of such policy-specific entities does not follow a detectable logic that would support a unitary perspective to the macro-region.

Rural Areas and Local Transformation

The literature on rural development is extensive and so are the attempts towards a single, universal definition of what a rural area *actually* is.² Policy bodies in the European Union have also approached the rural in different ways over the last decades, using diverse spatial units. A first argument of this

1 EU CAP NETWORK: LEADER/CLLD, eu-cap-network.ec.europa.eu/networking/leader_en (23.02.2026).

2 On the mental representations of the 'rural' in European research cf. Arora-Jonsson, S./McAraevey, R.: From Crisis to Sustainability: The Politics of Knowledge Production on Ru-

chapter is that such designations are important, because they are associated to discourses and facilitate or obstruct ways of thinking *about* the rural, which in turn inform policy objectives and anticipations *for* the rural. In addition to being subject to theoretical constructs, the rural territories of the EU Member States are also areas for which a broad range of tools and financing instruments have become available. Similar to spatial constructs, those instruments are also subject to change, on the basis of factors such as policy expertise and evaluation, academic literature and, of course, the political forces that influence the design of said policies.

Thus, EU rural policies and consequent territorial constructs such as the NUTS levels³ are thoroughly interlinked. For example, when the EU's Long-term vision for rural areas 2040 (LTVR 2040) advocates for place-based approaches, such approaches are implicitly interconnected to spatial units and the policy instruments involved. Among such instruments, the one most closely associated to a place-based approach for rural areas has been the LEADER methodology.⁴ This instrument was first introduced in the 1990s to promote bottom-up policies for rural development. These policies have been associated with specially designated areas, the LEADER regions. This raises the question of how these areas are formed within the EU member states in a macro-region. This question is topical, at a time when EU financing instruments find their place in or intersect with territorial arrangement of fiscal policies and administrative transformations in states with different approaches to local self-governance.

In general, policies for rural areas are linked to the spatial organisation of local administration. The latter has also undergone significant transformation and policy reforms over the last decades, with a key objective having been decentralisation, i.e., the division of functions between central and local governments, based on the principle of subsidiarity. Decentralisation reforms in the EU and the Baltic Sea region member states have mostly aimed at amalgamation⁵ and the reduction of the number of municipalities.

ral Europe, in: *Sociologia Ruralis* 63 (2023), No. 3, pp. 771–792, DOI: 10.1111/soru.12446. (23.01.2026).

3 Nomenclature of Territorial Units for Statistics (in French: *Nomenclature des Unités Territoriales Statistiques*).

4 LEADER stands for *Liaison Entre Actions de Développement de l'Économie Rurale*.

5 Territorial amalgamation into an enlarged local government unit is often considered as an ›archetypal‹ public administration reform (cf. Kuhlmann, S./Bouckaert, G. (eds.): *Local Public Sector Reforms in Times of Crisis. National Trajectories and International Comparisons*, London 2016) that improves the quality and effectiveness of public services, economies

While amalgamation reforms have taken place mostly in Central and Eastern Europe, different types of territorial and decentralisation reforms have been applied across all EU countries.

The different forms of local self-government across the Baltic Sea region correspond to different state structures and institutional setups as well as to local contexts: For example, local self-government in Sweden has been historically uninterrupted and dates back to the municipal reforms of 1862 and 1971. This stability has resulted in local municipalities enjoying fiscal and political autonomy in the present, with Sweden having the highest degree of decentralisation in the EU. Self-government in Poland on the other hand has been subject to fragmentation along changing borders and political regimes. In the 1990s, Poland proceeded with radical decentralisation reforms that saw the municipality turning once again into the main self-government unit, now backed by the principles of subsidiarity and complementarity. As a result, by the 2010s Poland's position in the local autonomy index was very high. However, in recent years there has been a slow move towards re-centralisation and it has generally been acknowledged that significant barriers in achieving *true* local self-government in Poland persist.

In the EU member states of the Baltic Sea region, national spatial planning systems have also undergone significant transformations, with strategic frameworks becoming very popular at the turn of the century as they facilitated functions related to multi-level governance, public-private partnerships, resource allocation and investment in infrastructure and service.⁶ Nonetheless, it has also become common ground that policies should be differentiated according to local circumstances and the realities of spatial diversity. In terms of EU policy this is well expressed in the Territorial Agenda 2030 which advocates for place-based policy responses to territorial challenges and a

of scale and a targeted allocation of increased resources (cf. Steiner, R./Kaiser, C./Tapscott, C./Navarro, C.: Is local always better? Strengths and limitations of local governance for service delivery, in: *International Journal of Public Sector Management* 31 (2018), No. 4, pp. 394–409, <https://doi.org/10.1108/IJPSM-05-2018-226>; Tavares, A.: Municipal Amalgamations and Their Effects: A Literature Review, in: *Miscellanea Geographica* 22 (2018), No. 1, pp. 5–15, <https://doi.org/10.2478/mgrsd-2018-0005>; OECD: *Regional Outlook 2016. Productive Regions for Inclusive Societies*, OECD Publishing, Paris 2016, www.oecd.org/en/publications/oecd-regional-outlook-2016_9789264260245-en.html (14.05.2024); Swianiewicz, P./Gendźwiłł, A./Houlberg, K./Klausen, J. E.: *Municipal Territorial Reforms of the 21st Century in Europe*, London 2002, <https://doi.org/10.4324/9781003022589>).

- 6 Murray, M./Neill, W.: Strategic Spatial Planning in Berlin–Brandenburg: A Requiem for Balanced Development?, in: *Planning Practice & Research* 26 (2011), No. 1, pp. 107–121, p. 107, DOI: 10.1080/02697459.2011.542067. (08.06.2024).

stronger uptake of EU territorial instruments⁷ by sub-national authorities and citizens. Many such instruments are specifically crafted to address the needs and potential of rural areas.

The EU Perspectives to Rural Spaces

The fact that the EU policies towards rural areas have undergone significant transformation becomes clear when discussing the conceptual, thematic and political changes of the Common Agricultural Policy (CAP) and the EU Cohesion Policy: Established in 1958 in the context of the European Coal and Steel Community (ECSC) the CAP initially aimed at increasing agricultural productivity and securing the food base of the ECSC member states. In the following decades and while the EU was transforming, first into a supranational political entity with the 1993 Maastricht Treaty and then into an international legal juridical entity with the 2009 Lisbon Treaty, the CAP also changed significantly. In this context, a rich discussion has unfolded about how to make best use of the EU instruments for rural development.

In the previous decades, the CAP and Cohesion Policy had taken two main paths⁸: Initially, both academic literature and policy favoured *exogenous* approaches, whereby rural areas were viewed as requiring external inputs in funding. This later changed, with the literature stressing the need for solutions to be found within, whereby the rural areas may build on their territorial capital, through *endogenous* and *neo-endogenous* approaches.⁹ Due to the limited human, social and institutional capital of many rural regions, neo-endogenous development, which incorporates support from state or EU sources, gradually became the preferred approach. This change is also related to the fact that

7 Pertoldi, M./Fioretti, C./Guzzo, F./Testori, G./De Bruijn, M./Ferry, M./Kah, S./Servillo, L. A./Windisch, S. (eds.): Handbook of Territorial and Local Development Strategies, Publications Office of the European Union, 2022, DOI: 10.2760/57919. (26.11.2024).

8 Illustratively described as constituting »legacy effects« (cf. Copus, A./Dax, T.: ESCAPE. European Shrinking Rural Areas: Challenges, Actions and Perspectives for Territorial Governance. Final Report—Annex 1, Policy Background, ESPON 2020, www.archive.espon.eu/escape (06.05.2024)).

9 Endogenous development has three main characteristics: (1) localities can effect change in their favour, rather than be resigned to being victims of external political and economic forces; (2) economic and other development activity is reoriented to maximise the retention of benefits within the local territory by exploiting local physical and human capital; and (3) local development is focused on the needs, capacities and perspectives of local people (cf. Ray, C.: Neo-Endogenous Rural Development in the EU, in: Cloke, P./Marsden, T./Mooney, P. (eds.): The Handbook of Rural Studies, London 2006, pp. 278–291, p. 278).

the tools and instruments for rural development have evolved and the degree of flexibility accorded to each member state in how to combine them has increased. However, and despite their abundance, the coherence, strategy and longevity of such rural policy instruments has been absent or questionable.¹⁰ In that context the neo-endogenous approach is also undergoing transformation while regional disparities persist.

Indeed, there is nothing special in the EU having regional disparities. What makes the EU unique »is the sheer volume of financial and institutional resources that are devoted to regional development« as well as »a strong focus on—some might even argue, an obsession with—cohesion«.¹¹ An availability of resources alone does not predicate successful outcomes, indeed. Studies, for example, have shown that the increased use of repayable financial instruments hardly reaches the disadvantaged areas these instruments are designed for, because the logic behind such instruments includes avoiding the effort, risk and costs that are associated with putting them into practice in disadvantaged areas.¹² Other complications stem from the delineation of an area subject to intervention. For instance, the concept of a *less developed region* (any NUTS-2 region with a per capita GDP below 75 % of the EU average) lies at the heart of the EU Cohesion Policy. However, impoverished rural areas situated within NUTS-2 regions where a relatively wealthy city raises the per capita GDP have no access to funding. Such examples show that substantial conceptual and methodological challenges with regard to disadvantaged and rural areas remain.¹³

Territorial cohesion nonetheless remains at the core of the EU Cohesion Policy and was strengthened in the 2021–2027 Programming Period. This is also evident in the emphasis on a *harmonious* development of EU Member States and regions, as per the Treaty on the Functioning of the European Union (TFEU), with an additional emphasis on support to the less favoured regions. Among them are rural areas (or ›other than urban‹ areas). The EU

10 ESPON: ESCAPE. European Shrinking Rural Areas: Challenges, Actions and Perspectives for Territorial Governance. Final report, ESPON 2020, www.archive.espon.eu/escape (13.11.2024), pp. 4f.

11 Farole, T./Goga, S./Ionescu-Heroiu, M.: Rethinking Lagging Regions. Using Cohesion Policy to Deliver on the Potential of Europe's Regions, World Bank Report on the European Union, Washington DC 2018, www.worldbank.org/en/region/eca/publication/rethinking-lagging-regions (19.09.2024), p. 34.

12 ESPON: Financial Instruments and Territorial Cohesion. Final Report, ESPON 2019, www.archive.espon.eu/financial-instruments (13.11.2024), p. 13.

13 ESPON: ESCAPE. Final Report, p. 43.

Rural Action Plan also aims at fostering innovative businesses, quality jobs and new skills, ensuring better infrastructure and services, as well as sustainable agriculture. A range of concepts and plans aim at the promotion of sectors other than the traditional rural ones. Finally, and with regard to the design and implementation of the above by the local and regional governance bodies, the Policy Objective »Europe closer to citizens« puts forth integrated territorial development strategies and local development strategies and requires that they shall follow a place-based, integrated, multi-stakeholder approach.¹⁴ The bottom-up element is especially important for generating the local development strategy. Central to that is the *community-led local development* (CLLD) approach, the continuation of the earlier LEADER method.

In Search of an EU Policy Space

As discussed above, with the publication of the LTVR 2040 the European Commission defined a vision for rural areas and communities that includes stronger, connected, resilient and prosperous rural areas and communities. The CAP and the Cohesion Policy, complemented by a wide range of funds, financially underpin these goals. The LEADER/CLLD method, the self-declared »most successful policy tool for community-led local development« methodologically underpins these goals.¹⁵ This tool began as an area-based development approach, in which local partnerships, an integrated multi-sectoral strategy, innovation, networking and cooperation are constitutive elements.

The LEADER approach was introduced in the 1990s to address the challenges of rural regions across the EU. It initially developed as an experiment, wherein bottom-up approaches in disadvantaged rural areas were financially supported, generating processes which were closely linked to community development and cohesion at the local level. Three decades later, the scope of the LEADER approach has developed into an integral part of the EU rural policy. A significant expansion in its thematic focus has also taken place, while relevant literature is now substantial.¹⁶ A parallel development at the EU level,

14 Pertoldi et.al.: Handbook of Territorial and Local Development Strategies.

15 EU CAP NETWORK: LEADER/CLLD, eu-cap-network.ec.europa.eu/networking/leader_en.

16 Cf. Chatzichristos, G./Perimenis, A.: Evaluating the social added value of LEADER: Evidence from a marginalized rural region, in: Journal of Rural Studies 94 (2022), pp. 366–374; Johansson, J./Holmquist, M.: LEADER and rural development policy—What's the problem

starting with the 2014–2020 Programming Period, was that all EU member states and regions were requested to adopt integrated policy approaches to territorial development. With regard to the rural areas, this was concretised in the addition, to the LEADER approach, of the CLLD tool.

The CLLD extended LEADER's outreach to a wider range of measures and territories, which had up to then been considered ›non-rural‹ and thus excluded from funding: Starting with the 2014–2020 period, towns with a population not exceeding a certain size, as well as areas bordering to the administrative limits of large cities could now make use of the LEADER/CLLD method. Few countries used this option then but with the 2021–2027 Programming Period the scope of this measure expanded. Under the LEADER/CLLD method, Local Action Groups (LAGs) are formulated. The LAG, a partnership of local public, private, and community representatives, becomes then responsible for the implementation of LEADER/CLLD in a respective area. These areas are usually created by bringing together a number of small administrative units. Being the spatial arrangement of the LEADER/CLLD approach, the LAG is a tailored deliberative polity.¹⁷

Another key change between the 2007–2013 and 2014–2020 Programming Periods has been the opening up of the previous LEADER approach to other ESI funds: The CLLD projects can be supported by a single European Structural and Investment (ESI) fund or by a combination of any of the four eligible funds: the European Agricultural Fund for Rural Development (EAFRD), the European Maritime and Fisheries Fund (EMFF), the European Social Fund (ESF) and the European Regional Development Fund (ERDF). With the addition of the fisheries areas for example, the Fisheries Local Action Groups (FLAGs) were constituted as special types of LAGs. Thereby the LEADER approach underwent a significant upgrade from a rural development niche to an integrated local development initiative. The possibilities that opened up in 2014 for using or combining different EU funds within a single strategy allowed the LAGs to better concentrate and respond to

represented to be?, in: *Journal of Rural Studies* (2024), No. 108, 103287, DOI: 10.1016/j.jrurstud.2024.103287. (23.01.2026); Shucksmith, M./Brooks, E./Madanipour, A.: LEADER and Spatial Justice, in: *Sociologia Ruralis* 61 (2021), No. 2, pp. 322–334, <https://doi.org/10.1111/soru.12334>.

17 Servillo, L.: Tailored polities in the shadow of the state's hierarchy. The CLLD implementation and a future research agenda, in: *European Planning Studies* 27 (2019), No. 4, pp. 678–698, DOI: 10.1080/09654313.2019.1569595. (23.09.2024).

the local needs of the respective areas.¹⁸ But LEADER regions are still the main policy focus despite the existence of multiple funding sources, while the implementation of LEADER/ CLLD is different in individual EU Member States.¹⁹

The LEADER/CLLD approach has so far become a terrain of experimentation with an enormous outreach, insofar as the early forms of LEADER are considered: The method is utilised in either process-focused or sector- or theme-focused purposes. Process-focused purposes include innovation, knowledge exchange, governance, stakeholder and civil engagement. Sector- or theme-focused purposes range from supporting local entrepreneurship, food processing, artisanship, thematic tourism, natural and cultural heritage projects, small-scale public services, as well as shortened value chains, local food pacts, job creation, up to social services such as immigrant integration, support for youth, groups in social exclusion.²⁰ So far, a common critique with regard to project funding, which also touches upon the function of the CLLD, concerns a lack of continuity in funding which results in the fragmentation of project development and implementation. The discussion about the need for long-term perspectives that integrate targeted EU and domestic policies is indeed topical, with regard to the post-2027 Programming Period. Already following the experience of the 2014–2020 period it was suggested to upscale the LEADER approach to allow local and regional stakeholders more space and financial autonomy to manage larger sums of EU funds,²¹ basically aiming to tackle the widespread observations about persistent bureaucracy barriers, administrative complexity and delays in the implementation of LEADER/CLLD projects.

In any case, the LAG applies the LEADER/ CLLD approach in a given territory which is ›rural in character‹ and covers a clearly defined area. Local actors that form these LAGs are tasked with the design and implementation of strategies following the LEADER/CLLD method. At the beginning of an EU funding period, a strategy which defines objectives and fields of action has to be developed. With this strategy, a designated LEADER region can

18 Kah, S./Martinós, H./Budzych-Tabor, U.: CLLD in the 2014–2020 EU Programming Period: An Innovative Framework for Local Development, in: *World 4* (2023), No. 1, pp. 122–139, DOI: 10.3390/world4010009, (23.01.2026), p. 135.

19 Servillo, L./De Bruijn, M.: From LEADER to CLLD: The Adoption of the New Fund Opportunities and of Their Local Development Options, in: *European Structural and Investment Funds Journal* 6 (2018), No. 3, pp. 223–233.

20 Kah/Martinós/Budzych-Tabor: CLLD in the 2014–2020 EU Programming Period, p. 132.

21 ESPON: ESCAPE. Final Report, p. 43.

apply for funding in the respective regional administration or national state. In summary, a LAG can thus be described as a policy space, as it constitutes a »governance arrangement of stakeholders [...] which has the capacity to mobilise funding resources«. ²² In this context, it is worth taking a step back and observing how these LEADER regions were designated to fulfil a »policy space« function, particularly in the Baltic Sea region.

Locating the EU Policy Space in the Rural Baltic Sea Region

Different EU member states in the Baltic Sea region have implemented different approaches to the LEADER/CLLD method, ranging from the single-funding model to more ambitious approaches that seek to make use of a broader mix of funding resources. ²³ The designated LAG territories in the eight countries reflect each country's logic of organising the territory into administrative units and its approach to local self-governance. The arrangement of NUTS subdivisions already shows the diversity of the macro-region: The three Baltic states and Denmark are single NUTS-1 areas; Finland is practically one too. ²⁴ Sweden consists of three NUTS-1 areas. Germany has arranged its 16 Federal States into 16 NUTS-1 areas, while Poland's 16 voivodeships are arranged into seven NUTS-1 areas (Fig.1).

That the existing territorial organisation in the Baltic Sea region is far from balanced is obvious, considering the great differences in size and population between the countries. But this allows to refer again to domestic approaches to local self-government: In countries such as Germany and Poland, the national state is different from the regions, while in others these levels overlap. Another line of fragmentation across the Baltic Sea region can be drawn along traditions of self-governance, with Poland offering a case of recent radical reform amidst the background of historical fragmentation, whereas Sweden boasts a historically uninterrupted development and a stable self-government setting today. This fragmentation can be expected to feature in the current designation of LEADER regions as well.

22 Palonen, K.: Four Times of Politics: Policy, Polity, Politicking, and Politicization, in: *Alternatives: Global, Local, Political* 28 (2003), No. 2, pp. 171–186, DOI: 10.1177/030437540302800202. (23.06.2024).

23 Kah/MArtinos/Budzych-Tabor: CLLD in the 2014–2020 EU Programming Period, p. 125.

24 Mainland Finland is one NUTS-1 area. The autonomous Åland islands constitute a separate, second NUTS-1 area, but this division reflects the legal status of Åland rather than other features.

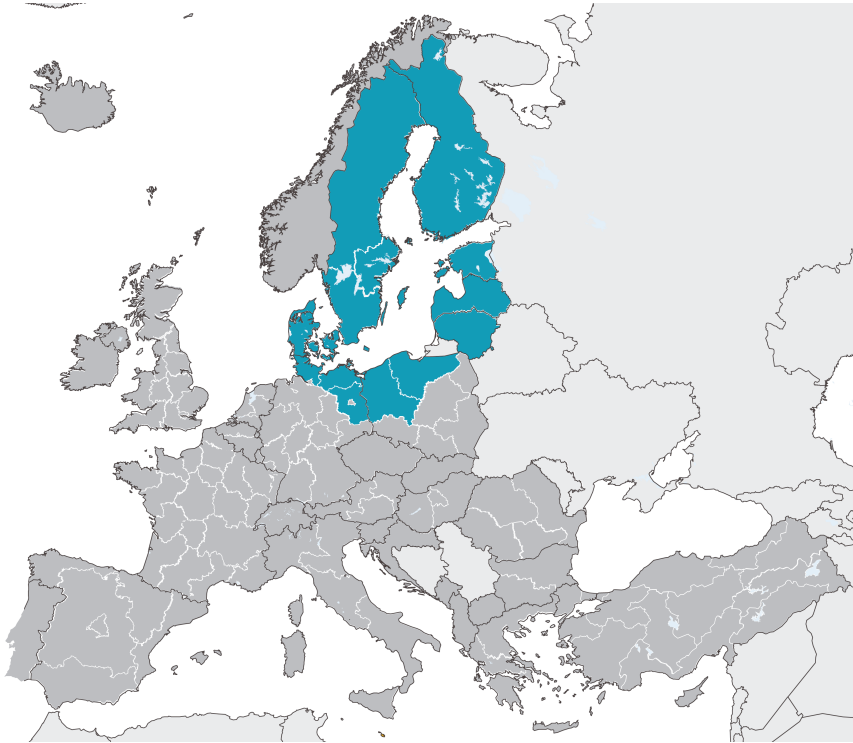


Figure 1: NUTS-I areas in the Baltic Sea region

In order to sketch the designated LAG territories, the basic features of size, population and population density were acquired. Information for each LAG territory across the eight countries was obtained in several ways, since there is no common European approach on the availability of this information to the general public. A methodological question arose with regard to Germany and Poland, the two most populous countries which also host hundreds of LAGs. Moreover, parts of these countries, such as Bavaria in Germany or Malopolska in Poland, do not share much with the historical or geographical features of the Baltic Sea region. The question of which LAG areas may be associated with the Baltic Sea thus inevitably became a question of where to draw the line and how to define the Baltic Sea region. Although this exercise in defining a region is debatable, including all German and Polish LAG territories into the analysis would skew the results and not allow a meaningful discussion about the Baltic Sea. This was initially solved by selecting the two German and the

two Polish NUTS-1 level regions that face the Baltic Sea, which allowed a fairly unified view to the macro-region.

The information on the surface and population of the German LAGs is available on single LEADER websites and the DVS (*Deutsche Vernetzungsstelle Ländliche Räume*).²⁵ The two Baltic German NUTS-1 level regions, i.e., the states of Mecklenburg-Vorpommern and Schleswig-Holstein, containing a total of 36 LAGs, were considered.²⁶ For Poland, the data is available by the governmental organisation National Rural Network²⁷ and the Ministry of Agriculture and Rural Development. For the 2021–2027 Programming Period, changes to LAG designation in Poland came as a result of the establishment of distinct FLAGs. As mentioned, the two NUTS-1 level regions along the Baltic Sea coast, *Północno-Zachodni* and *Północny* and the six voivodeships they contain were initially used. However, this results into a total of 104 LAGs. The inclusion of such a large number of LAGs would still skew the cross-country analysis in favour of Poland. It was thus decided to only proceed with the three coastal voivodeships: the West Pomeranian (*zachodniopomorskie*), Warmia-Masurian (*warmińsko-mazurskie*) and Pomeranian (*pomorskie*). The 38 LAGs in these three voivodeships were included in the analysis. Data on the 26 Danish LAGs was provided by the Agency for Planning and Rural Development.²⁸ A specificity here is the formation of a single island-LAG area, which does not correspond to a continuous surface but to the sum of the area of all Danish islands. Data on the 37 Latvian LAGs was provided by the Latvian Rural Forum²⁹ and on the 26 Estonian LAGs by the Ministry of Regional Affairs and the Estonian Leader Union.³⁰ It was, however, not possible to obtain official data on the 49 Lithuanian LAGs. The Lithuanian LAG Network³¹ works with the municipal unit since, with the exception of

25 DVS: LEADER-Regionen, www.dvs-gap-netzwerk.de/dorf-region/leader/neue-leader-regionen-ab-2023/ (05.11.2024).

26 Mecklenburg-Vorpommern/Ministerium für Klimaschutz, Landwirtschaft, ländliche Räume und Umwelt: LEADER in Mecklenburg-Vorpommern, www.regierung-mv.de/Landesregierung/lm/Laendliche-Raume/Leader/ (23–02.2026).

27 Krajowa Sieć Obszarów Wiejskich: Mapa Lokalnych Grup Działania, ksow.pl/baza-danych/lgd-2014-2020/mapa (23.02.2026).

28 Plan- og Landdistriktsstyrelsen: Mission og vision, www.plst.dk/om-styrelsen/mission-og-vision- (23.02.2026). The Agency uses data from the Danish Statistical Bureau (cf. www.statistikbanken.dk/ARE207, www.statistikbanken.dk/BY2).

29 Latvijas Lauku forums, laukuforums.lv/lv/ (05.11.2024).

30 Eesti Leader Liit, leaderliit.eu/ (23.02.2026).

31 LR valstybė: Vietos veiklos grupių tinklas/VVG tinklas, [www.lrvalstybe.lt/savivaldybes](http://lrvalstybe.lt/savivaldybes) for size of municipalities (05.11.2024).

seven large municipal units³², each municipal unit in Lithuania is designated as a LAG area. The LAG is thus constituted by the municipal unit minus any city with more than 6000 inhabitants within it.³³ With regard to the two larger Scandinavian countries, data on the 40 Swedish LAGs was provided by the Swedish Board of Agriculture³⁴ at the Ministry of Agriculture. Finally, information on the 42 Finnish LAGs was obtained through communication with a government official who represents the Finnish LEADER network in EU level. The information was compiled to provide an overview of how the LEADER regions are spatially structured in the countries of the macro-region.

Germany

The LEADER regions in the northern states of Mecklenburg-Vorpommern and Schleswig-Holstein have, on average, similar populations and different sizes (area): The area of the average LEADER region in Mecklenburg-Vorpommern is 1620 sq.km, while the average area in Schleswig-Holstein is 694 sq.km. This results in a sharp difference in population density. Schleswig-Holstein has an average population density of 161 inhabitants per square kilometre, while Mecklenburg-Vorpommern has only 50. These differences, however, reflect not just differences among federal states. Indeed, the five most densely populated LEADER regions in the entire Baltic Sea region are all located in Schleswig-Holstein. As such, Schleswig-Holstein can be described as hosting the main outliers in terms of population density in the Baltic Sea macro-region.

Poland

The LEADER regions of the three selected voivodeships (Warmia-Masuria, Pomerania and West Pomerania) are, in contrast, fairly homogeneous. The average population of the region is approximately 78,350 people in Warmia-Masuria, 71,350 in Pomerania and 65,100 in West Pomerania. The size of regions in these voivodeships is also fairly mixed but without significant deviations:

32 The term *savivaldybes* stands for the municipality, while any large city is called *miasto savivaldybes*.

33 Calculations were made based on the website www.paramakaimui.lt/, and the Local Development Strategy of each LAG.

34 Jordbruksverket, jordbruksverket.se/ (23.02.2026).

None is smaller than 500 sq.km or larger than 3530 sq.km. A balanced distribution is reflected in density: With the exception of a few densely populated cases in Pomerania, LEADER regions in the three voivodeships have a density ranging from 20 to 60 inhabitants per sq.km, with a total average being almost identical to Mecklenburg-Vorpommern in northern Germany.

Denmark

The arrangement of the 26 Danish LAGs stands between the small, densely inhabited cases of Schleswig-Holstein on the one hand and the larger, sparsely inhabited ones in Mecklenburg-Vorpommern or Poland on the other: With the exception of the very thinly populated archipelago (Småøerne) and two regions with almost 200,000 inhabitants, the population of the remaining 23 Danish regions ranges between 50,000 and 150,000. The average size is 1282 sq.km, right between Schleswig-Holstein (694) and Mecklenburg-Vorpommern (1620). In terms of density, Danish LEADER regions are quite diverse and range from 23 to 182 inhabitants per sq.km.

Sweden

Sweden is a distinct case, as it hosts some of the largest and most populous LEADER regions: With a size of almost 60,000 sq.km, Lapland LEADER has the size of a Baltic country or a large German federal state. Several others exceed 30,000 sq.km and, in any case, most Swedish regions are larger than the largest of any other country in the macro-region, with the exception of Finland. On the flipside, it is worth noting that Sweden demonstrates some of the lowest population densities in the Baltic Sea region: Seven regions have a population density below 5 persons/sq.km. Moving southwards however, Swedish LEADER regions are comparatively populous: Indeed, Sweden's three most populous regions (Sydost, Nordvästra Skåne/ Mittskåne and Östra Skåne) are the most populous in the entire Baltic Sea region.

Latvia

With an average size of 1946 sq.km, the size of the 33 regions in Latvia is very similar to that of Poland, Denmark and Germany. Almost identical to what happens in the Polish voivodeships, no region in Latvia is smaller

than 440 sq.km or larger than 3600 sq.km. This, however, is the only shared feature: with the exception of four cases with populations similar to designated regions in the above-mentioned countries, all other Latvian regions are significantly underpopulated. As a result, their average population density (22.1 persons/sq.km) is very close to that of Sweden (20.0 persons/sq.km). However, Sweden features a few extremely sparsely populated cases which distort the country's average, while in Latvia almost all regions are sparsely populated, with few exceptions located close to the Riga agglomeration.

Estonia

The features in Estonia are very similar to those of Latvia. With an average size of 1649 sq.km, regions in Estonia are similar to those of other countries. The population here is, however, significantly smaller, with only four LEADER regions having a total population matching those of other countries. As in Latvia, the combination of a comparatively average size and small population results in sparsely populated regions, with an average density of 15.6 persons per sq.km at the national level.

Lithuania

The case of Lithuania is similar to the two other Baltic states. Lithuania has slightly smaller designated regions, averaging 1292 sq.km. In relation to the entire Baltic Sea region, this size is very close to the average found in Schleswig-Holstein. But the number of inhabitants in the average region in Schleswig-Holstein is over 80,000 while in Lithuania it is less than 20,000. Thus, and again similar to Estonia and Latvia, Lithuanian regions have a low population density (15.3 persons/sq.km).

Finland

The case of Finland is very similar to Sweden, in both absolute terms and in the logic of designation: A single vast LEADER space is designated in the North (Lapland, 53,261 sq.km). Of the remaining 52 regions, many are still much larger than those in the Southern Baltic Sea region or the three Baltic states. Similar to Sweden, half of Finnish regions are as populous as those in the Southern Baltic Sea region, while the rest are equally populous

to the regions found in the three Baltic states. Overall, Finland has an average density of 10.5 persons/sq.km, the smallest among all states in the Baltic Sea. This is not surprising, considering that 13 Finnish regions have a population density of less than five inhabitants per square kilometre.

Applying a Spatial Lens

The description of the basic characteristics of LEADER regions at country level is followed by an initial attempt to apply a spatial perspective. This first grouping of countries within the Baltic Sea macro-region uses its main three features: Area, Population and Density.

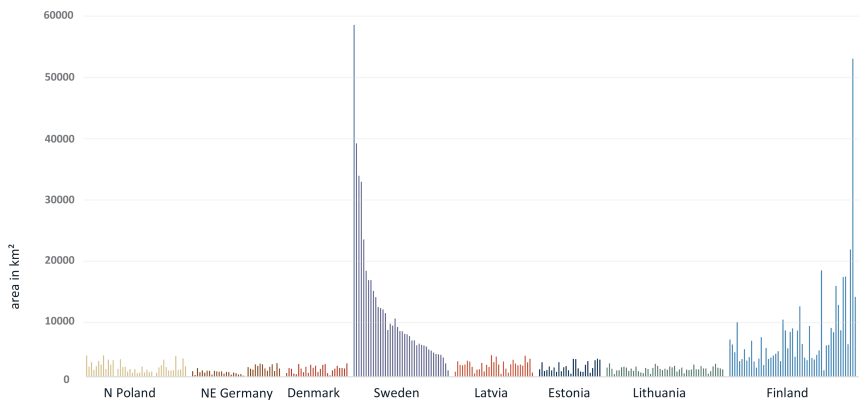


Figure 2: Area size of LEADER regions

Area size: Distinct logic in Sweden and Finland, opposed to all others (Fig.2)

LEADER regions in the three Baltic countries, Denmark and the studied parts of Germany and Poland have a size of 100 to 3500 sq.km, with the vast majority being in the 500 to 2000 sq.km. size-range. An outlier is the state of Schleswig-Holstein with slightly smaller regions.

Sweden and Finland have adopted a completely different approach. The average size of a Swedish LEADER region is over 10,000 sq.km, with only three out of 40 being smaller than 3500 sq.km. Similar features are observed in Finland.

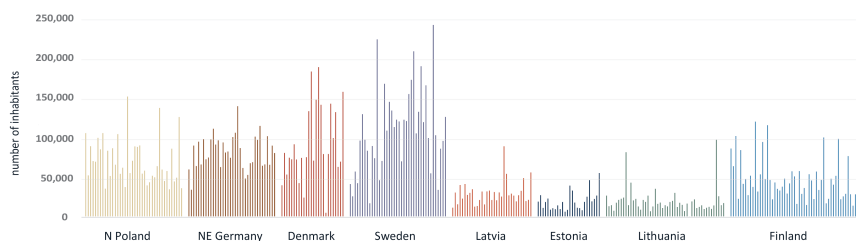


Figure 3: Population size in LEADER regions

Population size: A small but observable division along an East-West line (Fig.3)

The three Baltic states have, by far, the least populated regions in the entire Baltic Sea macro-region.

Among the other five countries, the Swedish regions are comparably uneven, with several outliers in both lows and highs. Here one can clearly see the effect of geography and climate with very low population densities in northern Sweden, and densities in southern Sweden comparable to the ones found along the Southern Baltic Sea coast.

With respect to the population pattern, the picture is mixed in Finland, with an average close to the selected Polish voivodeships. However, with the exception of ten highly populated regions that match those in Schleswig-Holstein, the population of all other Finnish cases is low and very close to those in Latvia.

This corresponds to the population pattern across the Baltic Sea region: A few highly populated LEADER regions tend to raise the country average. Most of them, however, correspond to peri-urban and suburban areas, e.g., in Lithuania (two highly populated, four medium populated), Estonia (three/three) and Latvia (one/three).

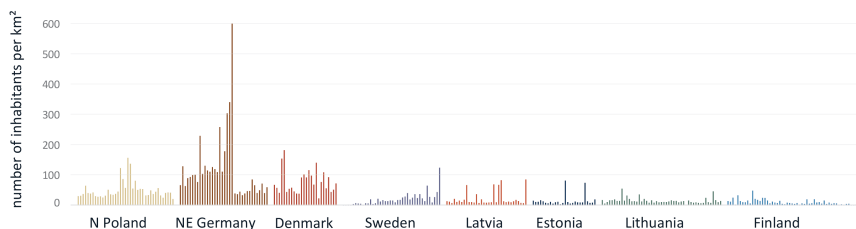


Figure 4: Population density in LEADER regions

Density: Three different groups (Fig.4)

The federal state of Schleswig-Holstein stands on its own. Here, even the least densely populated LEADER region has a higher density than the Baltic Sea average and, likewise, Schleswig-Holstein's average region has substantially higher density than any single case in the Baltic Sea macro-region.

Mecklenburg-Vorpommern, Northern Poland and Denmark: Here densities range from 20 to 180 persons per sq.km, but the distribution is rather even in the middles, and there are not many extremes in either highs or lows. Within this group Denmark has slightly higher densities, while regions in Northern Poland and Mecklenburg-Vorpommern are very similar to each other.

Sweden, Finland and the Baltic states have very low densities. Few exceptions that match group 2 can be found only in peri-urban areas in these countries. The proximity to an urban centre explains why these are exceptions. The average region has a population density of 20.0 (Sweden), 22.1 (Latvia), 18.3 (Estonia) 15.3 (Lithuania) and 10.5 (Finland).

Conclusions

The LEADER/CLLD approach has become an established policy instrument in different EU funds and different types of areas. It has clearly demonstrated contextual flexibility and adaptability. The CAP's multiple funds (EAFRD, ESIF, ERDF, ESF) also seem to complement each other well. However, EU-wide studies on LEADER/CLLD uptake make it hard to draw general conclusions about its impact, as there is great variability in how each state makes use of the multiple funds.³⁵ Moreover, the form the LEADER/CLLD approach will take after the 2021–2027 funding period is unclear.

Against this background, this chapter assessed the transformation of approaches to rural development as evidenced in the construction of policy-specific entities. To do so, the EU-wide lens was removed from the discussion about LEADER/CLLD, in order to see how its spatial expression has been constituted across the Baltic Sea macro-region, assuming the discovery of shared features that would allow a more coherent view to LEADER/CLLD from a regional perspective. The spatial features of the *ad hoc* policy space of

35 European Commission: Study on funding for EU rural areas—Final report, 2024, DOI: 10.2762/901111. (19.01.2025).

the LAG, and its basic features in the eight countries in the macro-region have been discussed. It was shown that LEADER regions have been constructed as policy spaces in varying ways in the different countries.

It has been demonstrated that no unitary Baltic Sea approach can be detected. Similarities exist though and allow suggesting a proto-grouping (such as Scandinavian, Baltic, Central European). Variance can be observed in relation to size (area), population and density. This overview facilitates the comparison in a regional level, allowing to extract conclusions on the extent of transformation against the background of the current EU policies towards harmonisation and cohesion. The chapter shows that while LEADER/CLLD is a unitary methodology, the spatial units to which it is applied diverge widely and not only *among* but also *within* countries. This sets the basis for further research on the continuities and fragmentation of fund allocation and distribution in the current and the post-2027 Programming Periods under a macro-regional lens.

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The Potential of Regional Ocean Literacy for Transforming Public Engagement in Marine Conservation

Threat Perception and Place Attachment at the German Baltic Sea Coast

Regional Ocean Literacy at the Baltic Sea

The Baltic Sea, one of the world's largest semi-enclosed brackish water systems, is ecologically unique and socioeconomically vital for its neighbouring regions.¹ Surrounded by nine countries, it encompasses a diverse range of political, economic and cultural contexts. The Baltic Sea serves as a living laboratory for understanding the challenges of shared marine governance and the historically and currently fragmented processes of transformation. Spanning approximately 420,000 square kilometres, the Baltic Sea is heavily impacted by surrounding human activities, from dense urbanisation and overexploitation of resources, to nutrient runoff from agriculture, chemical discharges from industry, and intensified maritime traffic.² Over the past decades, the region has faced increasing environmental degradation manifested through eutrophication, biodiversity loss, the influx of hazardous substances, and habitat destruction.³ Due to its unique geographic location and limited water

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- 1 HELCOM: State of the Baltic Sea. Third HELCOM Holistic Assessment 2016–2021, in: Baltic Sea Environment Proceedings n°194, Helsinki 2023, helcom.fi/post_type_publ/holas3_obs (18.07.2025); Bundesministerium für Umwelt, Naturschutz, nukleare Sicherheit und Verbraucherschutz (BMUV): Zustand Der Deutschen Ostseegewässer 2024. Aktualisierung Der Anfangsbewertung Nach § 45c, Der Beschreibung Des Guten Zustands Der Meeresgewässer Nach § 45d Und Der Festlegung von Zielen Nach § 45e Des Wasser- Haushaltsgesetzes Zur Umsetzung Der Meeresstrategie-Rahmenrichtlinie. Bund/Länder-Arbeitsgemeinschaft Nord- Und Ostsee (BLANO), Bonn 2024, mitglieder.meeresschutz.info/de/berichte/zustandsbewertungen-art8-10.html?file=files/meeresschutz/berichte/art8910/zyklus2024/Zustandsbericht_Ostsee_2024.pdf (18.07.2025); Snoeijs-Leijonmalm, Pauline/Schubert, Hendrik/Radziejewska, Teresa (eds.): Biological Oceanography of the Baltic Sea, Dordrecht 2017.
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exchange, water renewal is particularly slow, taking up to 40 years.⁴ This leads to a prolonged circulation of hazardous substances, which further threatens its ecological balance, resulting in declining water quality, loss of biodiversity, and disruption of vital ecosystems.⁵ The pressures are further intensified by the accelerating impacts of climate change, creating a complex web of interdependent socio-ecological challenges.⁶

Despite decades of regional cooperation under frameworks like the HELCOM Baltic Sea Action Plan, environmental indicators continue to reflect slow or stagnant progress.⁷ While top-down governance remains a critical tool for the implementation of marine conservation measures, its effectiveness can be limited when social support is lacking or measures are subject to changing political and economic agendas.⁸ This raises fundamental questions about the sufficiency of predominantly top-down governance models to achieve long-term, resilient socio-ecological transformations. It is becoming increasingly acknowledged that effective marine governance requires more than regulatory mechanisms or technological interventions, it requires deeper societal engagement, especially at the regional level.⁹ In this context, regional ocean literacy emerges as a transformative approach that sheds light on various socio-psychological determinants of the human-ocean relationship, such as awareness or place attachment. This promises a more bottom-up approach to environmental governance that takes into account fragmented regional

4 Snoeijis-Leijonmalm/Schubert/Radziejewska: Biological Oceanography of the Baltic Sea; Reckermann et al.: Human Impacts and Their Interactions in the Baltic Sea Region; Stigebrandt, A.: Physical Oceanography of the Baltic Sea, in: Wulff, Fredrik V./Rahm, Lars A./Larsson, Per. (eds): A Systems Analysis of the Baltic Sea. Ecological Studies, vol 148, Berlin, Heidelberg 2001, DOI: 10.1007/978-3-662-04453-7_2.

5 HELCOM: State of the Baltic Sea.

6 *ibid.*; Bundesministerium für Umwelt, Naturschutz, nukleare Sicherheit und Verbraucherschutz (BMUV): Zustand Der Deutschen Ostseegewässer 2024.

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contexts.¹⁰ In turn, at the national and international levels, it may increase confidence and support for top-down action.

Given the escalating challenges marine environments face, ocean literacy has emerged as a key focus within the UN Decade of Ocean Science for Sustainable Development (2021–2030). Ocean literacy is generally understood as recognising the mutual relationship between humans and the ocean—how the ocean affects us, and how we impact it.¹¹ The concept was originally developed as a pedagogical framework in school curricula to promote understanding of the interrelationship between humans and the oceans among young students. Today, however, it has evolved into a broader tool for social transformation in educational and governmental practice as well as in academia.¹² It has evolved beyond knowledge alone to include dimensions such as emotional connection, access and experience, trust and transparency, as well as ocean-friendly behaviours.¹³ This holistic approach frames ocean literacy as a form of environmental citizenship.¹⁴ Ocean literacy now includes the aim to support meaningful behavioural and institutional change at both the individual and collective levels. In a review, Stoll-Kleemann (2019) synthesised factors influencing behaviour change and ocean literacy. She proposed extending Kollmuss and Agyeman's pro-environmental behaviour model into a conceptual framework for ocean-related sustainable behaviours, incorporating both internal (e.g., emotions and values) and external (e.g., politico-economic and socio-cultural) factors as essential for enabling change.¹⁵

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- 10 Weiand, Laura et al.: Advancing Ocean Governance in Marine Regions Through Stakeholder Dialogue Processes, in *Frontiers in Marine Science* 8 (2021), DOI: 10.3389/fmars.2021.645576. (08.01.2026); Schlüter, Maja/Lindkvist, Emilie/Basurto, Xavier: The Interplay between Top-down Interventions and Bottom-up Self-Organization Shapes Opportunities for Transforming Self-Governance in Small-Scale Fisheries, in: *Marine Policy* 128 (2021), 104485, DOI: 10.1016/j.marpol.2021.104485. (08.01.2026).
 - 11 Cava, Francesca et al.: Science Content and Standards for Oceans Literacy: An Ocean Literacy Update, in: National Geographic Society (2005).
 - 12 Ryabinin, Vladimir et al.: The UN Decade of Ocean Science for Sustainable Development, in: *Frontiers in Marine Science* 6 (2019), DOI: 10.3389/fmars.2019.00470. (08.01.2026).
 - 13 McKinley, E./Burdon, D./Shellock, R.J.: The Evolution of Ocean Literacy: A New Framework for the United Nations Ocean Decade and Beyond, in: *Marine Pollution Bulletin* 186 (2023), 114467, DOI: 10.1016/j.marpolbul.2022.114467.
 - 14 Stocco, Silvia/Rocca, Lorena: Place-Based Education for Ocean Literacy: Fostering Ocean Literacy and Place Attachment through Short Film, in: *J-READING Journal of Research and Didactics in Geography* 2 (2024), www.j-reading.org/index.php/geography/article/view/413 (18.12.2024).
 - 15 Stoll-Kleemann, Susanne: Feasible Options for Behavior Change Toward More Effective Ocean Literacy: A Systematic Review, in: *Frontiers in Marine Science* 6 (2019), 273, DOI: 10.3389/fmars.2019.00273. (28.05.2019).

Overall, ocean literacy is being acknowledged as a catalyst for transformative change aimed at achieving more sustainable and resilient ocean systems among diverse stakeholders.¹⁶ The concept further encompasses the need to embed ocean understanding within local contexts, emotional landscapes, and cultural narratives.¹⁷ This regional turn in ocean literacy seems particularly relevant in areas like the German Baltic Sea coast, where identity, memory, and socio-political developments deeply influence perceptions of and relationships with the marine environment.

Just like the assumption of regional differences in ocean literacy, it may further be assumed that interactions within a region vary between different stakeholder groups. Examples of such stakeholder groups include residents and visitors of a coastal region. Examining how these groups attach meaning to the sea, assess its value, and interpret ecological risks may provide important insights into their levels of awareness, concern, and potential for engagement. Moreover, their interactions may be shaped by different perceptions, experiences, and emotional connections, which can lead to fragmented or even conflicting views of the sea's value and vulnerability, potentially hindering shared visions and coherent policy-making.¹⁸ Considering such differences, through lenses like threat perception or place attachment, could reveal important insights for more inclusive marine governance. Thus, a regionally grounded approach to ocean literacy, which accounts for emotional and cultural dimensions beyond just knowledge and attitudes, may offer a way to integrate diverse perspectives and foster more context-sensitive and accepted strategies and interventions for marine stewardship.¹⁹

In this chapter, we examine how regional ocean literacy can help uncover the underlying fragmentation in how different actors, in this case residents and visitors of the German Baltic Sea coast, perceive and relate to the Baltic Sea. Building on Demmler and Stoll-Kleemann's (2025) findings about public perceptions of marine threats at the Baltic Sea, we explore the interplay

16 IOC-UNESCO: A New Blue Curriculum—A toolkit for policy-makers, in: IOC Manuals and Guides, No. 90. Paris 2022, DOI: 10.25607/OBP-1882.

17 Cavas, Bulent et al.: Research Trends and Content Analysis of Ocean Literacy Studies between 2017 and 2021, in: *Frontiers in Marine Science* 10 (2023), DOI: 10.3389/fmars.2023.1200181. (08.01.2026); Schwerdtner Máñez, Kathleen/Stoll-Kleemann, Susanne/Rozwadowski, Helen M.: Ocean Literacies: The Promise of Regional Approaches Integrating Ocean Histories and Psychologies, in: *Frontiers in Marine Science* 10 (2023), 1178061, DOI: 10.3389/fmars.2023.1178061. (08.01.2026).

18 Steinberg, Philip E.: *The Social Construction of the Ocean*, Cambridge 2001; Schwerdtner Máñez/Stoll-Kleemann/Rozwadowski: *Ocean Literacies*.

19 *ibid.*

between these threat perceptions and local place attachment on the Island of Rügen and the Greifswalder Bodden.²⁰ By integrating the two dimensions, we aim to deepen the discussion on their interrelation and enhance the implications for conservation initiatives, public engagement strategies and a socio-ecological transformation in general. We argue that regional ocean literacy, here conceptualised as ›Baltic Sea Literacy‹, offers valuable insights for addressing persistent governance challenges in the region, supporting more targeted, participatory, and context-sensitive approaches to marine protection along the German Baltic Sea coast. This may allow for the emergence of more socially robust, culturally embedded, and ultimately more effective marine conservation pathways in the Baltic Sea region.

Baltic Sea Literacy: Understanding Threat Perception and Personal Connection

A fundamental socio-ecological transformation in our relationship with the Baltic Sea is urgently needed.²¹ Adapting the concept of ocean literacy to the regional context of the Baltic Sea may offer a valuable framework for understanding the diverse ways in which people relate to the marine environment. A regional Baltic Sea literacy approach could represent a crucial step toward guiding the region onto a more sustainable trajectory that responds to the pressing ecological challenges facing the Baltic Sea.

A critical starting point for this transformation lies in deepening our understanding of how the public perceives and connects with the Baltic Sea, its ecosystems, and the environmental threats it faces. To this end, we conducted a series of face-to-face surveys between August 3rd and September 10th 2024 with a sample of 628 participants on the Island of Rügen and in the Greifswalder Bodden. These surveys formed part of a broader investigation into regional ocean literacy across two European sea basins: the Baltic Sea and the Mediterranean Sea. The present study focused on residents and visitors as key stakeholders who interact directly and frequently with the marine and coastal environment, and who are therefore considered particularly valu-

20 Demmler, Rebecca A./Stoll-Kleemann, Susanne: Understanding Public Perceptions of Marine Threats: Awareness and Concern among Residents and Visitors of the German Baltic Sea Coast, in: *Frontiers in Marine Science* 12 (2025), DOI: 10.3389/fmars.2025.1596331. (13.06.2025).

21 HELCOM: State of the Baltic Sea.

able for perception-based research.²² In addition to examining environmental threat perceptions and place attachment, the survey also addressed further core dimensions of ocean literacy such as knowledge, attitudes, emotions, and behaviours. However, due to space constraints, this chapter concentrates on the concepts of threat perception and place attachment. Threat perception was assessed using items on concern about threats, awareness of specific threats, and evaluations of the current ecological state, as well as an open-ended question regarding known sources of threats, as described in detail by Demmler and Stoll-Kleemann (2025).²³ Place attachment was measured using a four-item Likert scale adapted from Buchan et al. (2024),²⁴ a closed-ended question asking participants to identify their favourite sea, and a follow-up open-ended question for those who selected the Baltic Sea, asking about the reasons for their preference. The data were analysed using descriptive statistics and inductive content analyses, employing MAXQDA 24 and SPSS version 30.

From Threat Perception to Transformative Engagement

Despite growing recognition of the role public perception plays in advancing ocean literacy and marine conservation, empirical research on the topic remains scarce. Although public perceptions of marine threats have been explored in several European coastal and marine contexts, the Baltic Sea region remains notably understudied. However, highlighting the geographical variability in how marine environments are perceived, Lucrezi (2022) emphasises the importance of national-level studies for capturing diverse societal perspectives across spatial scales.²⁵

In response to the call for more nation- and region-specific research, our findings (Demmler and Stoll-Kleemann, 2025) offered the first empirical insights into threat perceptions among a Baltic Sea sample from the Island

22 Jefferson, R.L. et al.: Public Perceptions of the UK Marine Environment, in: *Marine Policy* 43 (2014), pp. 327–337, DOI: 10.1016/j.marpol.2013.07.004. (08.01.2026).

23 Demmler/Stoll-Kleemann: Understanding Public Perceptions of Marine Threats.

24 Buchan, P.M./Evans, L.S./ Pieraccini M.: Thalassophilia and Marine Identity: Drivers of »Thick« Marine Citizenship, in *Journal of Environmental Management* 352 (2024), 120111, <https://doi.org/10.1016/j.jenvman.2024.120111>.

25 Lucrezi, Serena: Public Perceptions of Marine Environmental Issues: A Case Study of Coastal Recreational Users in Italy, in *Journal of Coastal Conservation* 26 (2022), No. 26, 52, DOI: 10.1007/s11852-022-00900-4. (08.01.2026).

of Rügen and the Greifswalder Bodden. We found that residents and visitors exhibited high levels of self-reported awareness and concern regarding pollution levels in the Baltic Sea.²⁶ However, this expressed awareness did not necessarily reflect an exact or in-depth understanding of the ecological threats facing the region. On average, participants did not recognise the severely degraded ecological status of the Baltic Sea, nor did they consistently identify the most pressing environmental threats.²⁷ Figure 1 shows that visible and tangible forms of pollution, particularly plastic litter, microplastics, and illegal waste disposal, emerged as the most frequently mentioned concerns, followed by industrial pollutants such as oil spills.²⁸ These accounted for 41.52 % of all responses, echoing broader European trends in which highly visible pollution like litter and plastic dominates public environmental awareness.²⁹ Unlike samples in other European coastal regions, however, respondents in the Baltic Sea region identified eutrophication as a major threat, signalling a growing awareness of nutrient-related issues such as algal blooms and oxygen depletion. This may indicate a potential effectiveness of communication strategies on this issue. Conversely, more complex, abstract, or less visible threats, such as habitat degradation, climate change, or underwater noise, were rarely mentioned.³⁰ This disparity aligns with previous European and global research, which shows a consistent tendency for the public to focus on prominent,

26 Demmler/Stoll-Kleemann: Understanding Public Perceptions of Marine Threats.

27 *ibid.*

28 *ibid.*

29 Gelcich, Stefan et al.: Public Awareness, Concerns, and Priorities about Anthropogenic Impacts on Marine Environments, in: *Proceedings of the National Academy of Sciences* 111 (2014), No. 42, pp. 15042–15047, DOI: 10.1073/pnas.1417344111. (08.01.2026); Potts, Tavis et al.: Who Cares? European Attitudes towards Marine and Coastal Environments, in: *Marine Policy* 72 (2016), pp. 59–66, DOI: 10.1016/j.marpol.2016.06.012. (08.01.2026); Buckley, Paul J. et al.: Ten Thousand Voices on Marine Climate Change in Europe: Different Perceptions among Demographic Groups and Nationalities, in: *Frontiers in Marine Science* 4 (2017), DOI: 10.3389/fmars.2017.00206. (08.01.2026); Lotze, Heike K. et al.: Public Perceptions of Marine Threats and Protection from around the World, in: *Ocean & Coastal Management* 152 (2018), pp. 14–22, DOI: 10.1016/j.ocecoaman.2017.11.004. (08.01.2026); Gkargkavouzi, Anastasia/Paraskevopoulos, Stefanos/Matsiori, Steriani: Public Perceptions of the Marine Environment and Behavioral Intentions to Preserve It: The Case of Three Coastal Cities in Greece, in: *Marine Policy* 111 (2020), 103727, DOI: 10.1016/j.marpol.2019.103727. (08.01.2026); Lucrezi: Public Perceptions of Marine Environmental Issues; Garcia-Bustos, Victor: Conservation Attitudes and Perceived Biodiversity Among Divers on the Spanish Mediterranean Coast: Insights from Local Ecological Knowledge, in: *Oceans* 6 (2025), No. 1, 4, DOI: 10.3390/oceans6010004. (08.01.2025).

30 Demmler/Stoll-Kleemann: Understanding Public Perceptions of Marine Threats.

tangible, immediate issues while overlooking diffuse, invisible, or long-term threats.

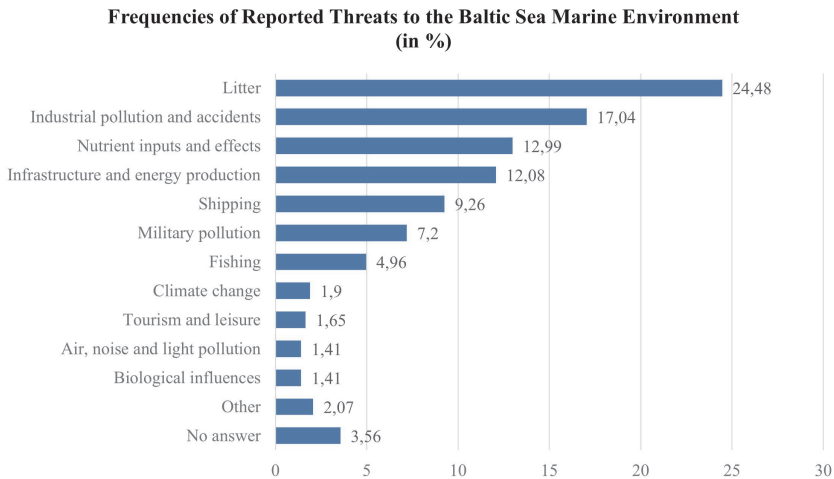


Figure 1: Distribution of the Frequencies of the Types of Pollution in the Baltic Sea mentioned by the Participants. Source: Demmler and Stoll-Kleemann, 2025. Note: $N = 524$.

These findings may point to the potentially significant impact of public discourse and media coverage in shaping environmental awareness and concern.³¹ Highly visible threats such as plastic pollution or oil spills are frequently sensationalised, generating attention and reinforcing public concern, while more complex or less photogenic issues receive minimal coverage. While this may indicate some effectiveness of media coverage of environmental threats, it may also suggest shortcomings in science-media communication and a lack of nuanced representation of the full spectrum of environmental risks.³² The resulting misalignment between scientific assessments and public understanding may contribute to misconceptions and incomplete knowledge, which in turn can hinder sustainable behavioural choices.

Understanding public perceptions of environmental threats can serve as a valuable tool for advancing regional ocean literacy, as such insights reveal

31 Stoll-Kleemann, Susanne/Nicolai, Susanne/Franikowski, Philipp: Exploring the Moral Challenges of Confronting High-Carbon-Emitting Behavior: The Role of Emotions and Media Coverage, in: Sustainability 14 (2022), No. 10, 5742, DOI: 10.3390/su14105742. (10.05.2022).

32 Demmler/Stoll-Kleemann: Understanding Public Perceptions of Marine Threats.

not only how information is received and disseminated, but also which issues resonate most with the public at specific moments and in particular contexts—highlighting what matters to people. In our study (Demmler and Stoll-Kleemann, 2025), participants frequently referred to locally significant concerns at the given time of the survey, such as the legacy of military contamination or the controversial LNG terminal construction in Mukran. These references highlight the embeddedness of environmental awareness within local narratives and broader socio-political contexts. Therefore, we propose that effective Baltic-Sea-literacy-strategies should be rooted in the lived experiences, cultural histories, and emotional geographies of the coastal communities, while at the same time acknowledging the broader geopolitical and economic systems that shape the region or even countries.³³

The emphasis on localised interpretations of environmental threats is consistent with findings suggesting that individuals may rather act on perceived threats, which are influenced by socio-cultural and psychological factors, than scientifically measured risks.³⁴ For regional environmental governance to be effective, scientific and societal understandings of ecological threats must be brought into closer alignment. Ultimately, exploring public perceptions of marine threats is not just about describing what people are aware of. It helps to identify important touch points for promoting behaviour change and designing more effective marine preservation strategies. A regional ocean literacy framework that is attuned to public perceptions can help tailor communication strategies, enhance the legitimacy of governance measures, and foster greater civic engagement and trust in marine stewardship. In the socio-ecological context of the Baltic Sea, where historical legacies, geopolitical tensions, and institutional distrust intersect with environmental fragility, such an approach seems essential. To protect the Baltic Sea effectively, regional ocean literacy should be both locally attuned and scientifically grounded.

33 *ibid.*

34 Van der Linden, Sander: The Social-Psychological Determinants of Climate Change Risk Perceptions: Towards a Comprehensive Model, in: *Journal of Environmental Psychology* 41 (2015), pp. 112–24, DOI: 10.1016/j.jenvp.2014.11.012. (08.01.2026); Zeng, Jingjing/Jian, Meiquan/Yuan, Meng: Environmental Risk Perception, Risk Culture, and Pro-Environmental Behavior, in: *International Journal of Environmental Research and Public Health* 17 (2020), No. 5, 1750, DOI: 10.3390/ijerph17051750. (08.01.2026); Sun, Yingying/Han, Ziqiang: Climate Change Risk Perception in Taiwan: Correlation with Individual and Societal Factors, in: *International Journal of Environmental Research and Public Health* 15 (2018), No. 1, 91, DOI: 10.3390/ijerph15010091. (08.01.2026).

Place Attachment—Emotional Connections and Environmental Values of the Baltic Sea

Ocean literacy and environmental engagement are not solely rooted in cognitive processes; it is also profoundly affective. However, there is a lack of research on what people value and what fosters their connection to place. As a result, concepts such as place attachment are underutilised as potential motivators for adaptation to environmental challenges, especially in the marine context.³⁵ The concept of place attachment, extensively studied across disciplines such as environmental psychology, human geography, and sociology, offers a compelling lens for understanding this emotional dimension of human-environment relations.³⁶ While definitions of place attachment vary, they commonly describe it as an emotional bond individuals form with a specific place, encompassing affective, cognitive, and behavioural components that reflect both personal and collective meanings, connections, and interactions associated with that place.³⁷ Researchers such as Devine-Wright (2013), Giuliani (2003), and Low and Altman (1992) describe place attachment as a positive emotional connection to a meaningful location.³⁸ These attachments often carry symbolic significance and are influenced by cultural, social, and psychological factors. Stocco and Rocca (2024) emphasise that place attachment is not only emotional but also shaped by shared understandings and

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- 35 Amundsen, Helene: Place Attachment as a Driver of Adaptation in Coastal Communities in Northern Norway, in: *Local Environment* 20 (2015), No. 3, pp. 257–276, DOI: 10.1080/13549839.2013.838751. (08.01.2026).
 - 36 Dang, Lisa/Weiss, Jan: Evidence on the Relationship between Place Attachment and Behavioural Intentions between 2010 and 2021: A Systematic Literature Review, in: *Sustainability* 13 (2021), No. 23, 13138, DOI: 10.3390/su132313138. (08.01.2026); Scannell, Leila/Gifford, Robert: Defining Place Attachment: A Tripartite Organizing Framework, in: *Journal of Environmental Psychology* 30 (2010), No. 1, pp. 1–10, DOI: 10.1016/j.jenvp.2009.09.006. (08.01.2026).
 - 37 Vaske, Jerry J./Kobrin, Katherine C.: Place Attachment and Environmentally Responsible Behavior, in: *The Journal of Environmental Education* 32 (2001), No. 4, pp. 16–21, DOI: 10.1080/00958960109598658; Devine-Wright, Patrick: Think Global, Act Local? The Relevance of Place Attachments and Place Identities in a Climate Changed World, in: *Global Environmental Change* 23 (2013), No. 1, pp. 61–69, DOI: 10.1016/j.gloenvcha.2012.08.003. (08.01.2026); Scannell/Gifford: Defining Place Attachment; Low, S.M./Altman, I.: Place Attachment. In: Altman, I., Low, S.M. (eds): *Place Attachment. Human Behavior and Environment*, vol 12, Boston, MA 1992, pp. 1–12.
 - 38 Devine-Wright: Think Global, Act Local?; Giuliani, Maria Vittoria: Theory of Attachment and Place Attachment, in: Bonnes, Mirilja/Lee, Terence/Bonaiuto, Marino (eds.): *Psychological Theories for Environmental Issues*, Aldershot 2003, pp. 137–170; Low/Altman: *Place Attachment*.

social meanings.³⁹ Scannell and Gifford (2010) propose a three-dimensional framework for understanding place attachment, highlighting the roles of the individual or group experiencing the attachment (person), the mental and emotional processes involved (affect, cognition, behaviour), and the characteristics of the place itself.⁴⁰ Research on place attachment in a marine context expands this view by framing place as a network of relationships rather than a fixed location.⁴¹

These perspectives highlight place as dynamic and socially constructed, emphasising how attachment is shaped by broader contexts of community, history, and interaction. The multiple dimensions of place attachment underscore its complexity and variability across individuals and groups. In marine environments like the Baltic Sea, this complexity is amplified by the diversity of stakeholder groups, each holding distinct values, uses, and experiences of the Baltic Sea as a place. Place attachment in this context can be fragmented or even conflicting, reflecting differing cultural, professional, or personal relationships to the sea. Understanding the diverse meanings people attach to marine places can enable more empathetic and context-sensitive marine policies by integrating the various attachments that shape people's attitudes and behaviours into conservation and communication efforts.

In this vein, various studies have found that place attachment has a positive influence on environmental awareness and behaviour, as people are more likely to care for places to which they feel connected.⁴² Strong emotional

39 Stocco/Rocca: Place-Based Education for Ocean Literacy.

40 Scannell/Gifford: Defining Place Attachment.

41 Buchan, Pamela M. et al.: Marine Citizenship: The Right to Participate in the Transformation of the Human-Ocean Relationship for Sustainability, in: *Plos one* 18 (2023), No. 3, pp. 1–23, DOI: 10.1371/journal.pone.0280518. (08.01.2026).

42 Dang/Weiss: Evidence on the Relationship between Place Attachment and Behavioral Intentions between 2010 and 2021; Ramkissoon, Haywantee/Smith, Liam David Graham/Weiler, Betty: Testing the Dimensionality of Place Attachment and Its Relationships with Place Satisfaction and Pro-Environmental Behaviours: A Structural Equation Modelling Approach, in: *Tourism Management* 36 (2013), pp. 552–566, DOI: 10.1016/j.tourman.2012.09.003. (08.01.2026); Ramkissoon, Haywantee/Smith, Liam David Graham/Weiler, Betty: Relationships between Place Attachment, Place Satisfaction and pro-Environmental Behaviour in an Australian National Park, in: *Journal of Sustainable Tourism* 21 (2013), No. 3, pp. 434–457, DOI: 10.1080/09669582.2012.708042. (08.01.2026); Ramkissoon, Haywantee/Betty, Weiler/Smith, Liam David Graham: Place Attachment, Place Satisfaction and pro-Environmental Behaviour: A Comparative Assessment of Multiple Regression and Structural Equation Modelling, in: *Journal of Policy Research in Tourism, Leisure and Events* 5 (2013), No. 3, pp. 215–32, DOI: 10.1080/19407963.2013.776371. (08.01.2026); Chow, Alice S. Y. et al.: The Impacts of Place Attachment on Environmentally Responsible Behavioral Intention and Satisfaction of Chinese Nature-Based Tourists, in: *Sustainability* 11 (2019), No. 20, 5585, DOI:

ties are found to heighten risk perception and motivate adaptive action. For instance, Amundsen (2015) showed that in Norwegian coastal communities, place attachment fosters proactive responses to social and environmental change.⁴³ Marine environments also provide cultural ecosystem services, like recreation, aesthetic enjoyment, and identity, which can further reinforce attachment. Ahtiainen et al. (2019) found that these cultural values significantly influence how people relate to marine areas like the Baltic Sea, shaping well-being and stewardship attitudes.⁴⁴ Moreover, recent work by Diamond et al. (2024) introduces the concept of ›Coastal Place Attachment‹, showing that emotional ties to the ocean enhance well-being and influence views on coastal access. ›Coastal Place Attachment‹, they argue, should inform more inclusive and community-sensitive coastal management approaches.⁴⁵ Stocco and Rocca (2024) further show how place-based education, such as the use of short films focused on local marine contexts, can foster both ocean literacy and emotional connection.⁴⁶ Their study highlights how educational practices rooted in specific regions help participants develop a sense of belonging and care, which are essential for regional ocean literacy and environmental responsibility. Drawing upon this earlier research and employing a regional ocean literacy framework analogous to that utilised in Baltic Sea studies, face-to-face interviews were also conducted at the Mediterranean Sea coast, encompassing 405 residents and visitors. In this comparative study, Demmler and Kleemann (2025) found that local residents exhibited statistically significant heightened awareness and slightly higher concern regarding marine pollution in comparison to visitors.⁴⁷ This suggests that place attachment may

10.3390/su1205585. (08.01.2026); Lee, Dukjae/Lee, Ju-Hyoung: A Structural Relationship between Place Attachment and Intention to Conserve Landscapes—a Case Study of Harz National Park in Germany, in: *Journal of Mountain Science* 14 (2017), No. 5, pp. 998–1007, DOI: 10.1007/s11629-017-4366-3. (08.01.2026).

43 Amundsen: Place Attachment as a Driver of Adaptation in Coastal Communities in Northern Norway.

44 Ahtiainen, Heini et al.: Cultural Ecosystem Services Provided by the Baltic Sea Marine Environment, in: *Ambio* 48 (2019), No. 11, pp. 1350–1361, DOI: 10.1007/s13280-019-01239-1. (08.01.2026).

45 Diamond, Emily/Urbanski, Kaitlin/Melva, Treviño: »The Ocean Is a Part of Me«: The Importance of Coastal Place Attachment to Well-Being and Implications for Coastal Access Management, in: *Coastal Management* 52 (2024), No. 4–5, pp. 215–233, DOI: 10.1080/08920753.2024.2406745. (03.10.2024).

46 Stocco/Rocca: Place-Based Education for Ocean Literacy.

47 Demmler, Rebecca A./Kleemann, Susanne (2025). Exploring ocean literacy at the French Mediterranean coast: Information seeking, knowledge, awareness and concern about threats

enhance certain dimensions of regional ocean literacy, with stronger local ties potentially fostering deeper awareness and emotional engagement.

In the case of the Baltic Sea sample in this chapter, the empirical data from our study reveal that residents and visitors to the Island of Rügen and the Greifswalder Bodden possess a moderate to high average level of place attachment ($M = 4.21$ on a six-point Likert scale). Content analysis of qualitative responses, displayed in Figure 2, further elucidates the depth of these connections, with emotional bonding and habitual ties emerging as dominant themes.

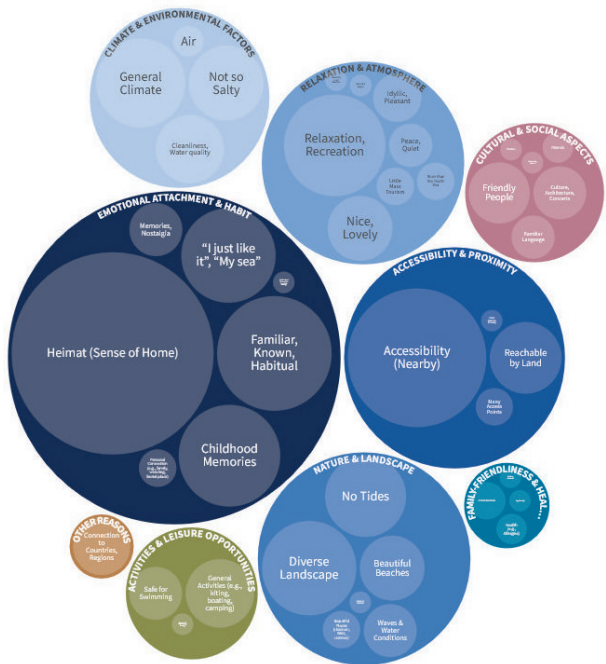


Figure 2: Perceived Attributes Contributing to the Baltic Sea's Popularity: A Frequency-Based Visual Content Analysis. The size of each circle reflects the frequency of mentions. $N = 264$, total mentions = 416.

Emotional attachment and habits, mainly ›Heimat‹ (a sense of home and nostalgia) along with themes of familiarity and childhood memories or personal

among residents and visitors in Port-Cros National Park. ERDKUNDE, 79 (2025), No. 3/4, pp. 289–312, <https://doi.org/10.3112/erdkunde.2025.03.08>.

and professional connections (166 mentions), highlight the role of autobiographical memory in shaping affective attachments to the Baltic Sea among both residents and visitors.⁴⁸ This form of place attachment may reflect the Baltic Sea's unique historical context as the only proximate ocean basin accessible to individuals from the former GDR. As such, the sea held a special role as a recreational destination for citizens of East Germany and the Soviet Union. Functional aspects, such as *accessibility and proximity* (52 mentions), alongside the aesthetic and restorative qualities of the *nature and landscape* of the Baltic environment (52 mentions), further illustrate the multifaceted nature of people's attachment to the region. These elements underscore the Baltic Sea's role in providing valuable environmental ecosystem services on an individual level.⁴⁹ They also show the importance of the Baltic Sea's geographical location as one of only two ocean basins with relatively short coast lines in Germany. Additionally, the participants emphasised the *recreational and atmospheric* effects of the region, described as peaceful and idyllic (48 mentions), as well as the *favourable environmental and climatic conditions* (41 mentions), *cultural and social aspects* (22 mentions), and *activities and leisure opportunities* (17 mentions). Minor aspects included *family friendliness and health* and *other* (14 mentions). These environmental and cultural ecosystem functions underline the Baltic Sea as more than just a geographical space. They reveal its role as a meaningful setting for relaxation, regeneration, and well-being. The consistent appreciation of these qualities underscores the high symbolic and experiential value the marine environment holds for both residents and visitors. In sum, 64.4 % of the participants ($N = 410$) named the Baltic Sea as their favourite ocean, most commonly citing autobiographical reasons, functional aspects and environmental services for well-being. This high level of affective attachment reflects not only personal but also symbolic, historical, and environmental relationships with the Baltic Sea, resonating with Buchan et al.'s (2023)⁵⁰ conceptualisation of place as a network of relationships rather than a fixed location. Such emotional geographies may present powerful, yet underutilised, opportunities for fostering marine stewardship and pro-environmental behaviours.

However, the affective dimension of place attachment also entails certain vulnerabilities. Emotional connections to place may provoke resistance to en-

48 Low/Altman: Place Attachment.

49 Ahtaiainen et al.: Cultural Ecosystem Services Provided by the Baltic Sea Marine Environment.

50 Buchan et al.: Marine Citizenship.

vironmental change, particularly when landscapes of personal significance are perceived as threatened or changed. Strategies for Baltic Sea literacy, therefore, should strike a balance, leveraging emotional bonds to inspire stewardship while fostering adaptive capacities for change. Integrating cultural narratives, local knowledge, and participatory approaches into marine education may enrich emotional connections and promote resilient environmental behaviours. Ultimately, a place-based ocean literacy that embraces both emotional resonance and critical awareness may be most effective in cultivating long-term, sustainable relationships with the sea.

Implications for a Regional Ocean Literacy for Public Engagement in Marine Preservation

Returning to our guiding question of how regional ocean literacy can help uncover and address the fragmented ways in which residents and visitors perceive and relate to the Baltic Sea, this final section synthesises our empirical findings. It explores the implications for more inclusive public engagement and context-sensitive marine preservation strategies along the German Baltic Sea coast.

The identified gap between perceived and actual ecological threats in the Baltic Sea region calls for more effective and context-sensitive science communication. Public concern is currently skewed toward highly visible threats while less tangible or more complex issues receive limited attention. This misalignment may hinder informed engagement and may further constrain support for comprehensive marine protection measures. Therefore, Baltic Sea literacy initiatives may need to expand beyond merely disseminating information. Instead, they could aim to translate complex scientific knowledge into meaningful narratives that resonate with the lived experiences and values of different audiences, particularly those with direct emotional, autobiographical, and cultural ties to the region.⁵¹

Participants frequently described the sea as a place of peace, recreation, and well-being, while recurring references to a feeling of home, familiarity, and childhood memories reveal deep-rooted attachments shaped by both personal and collective histories. These affective bonds may offer significant strategic potential to inform, engage, mobilise, and sustain public commitment to marine protection at the Baltic Sea. This emotional dimension is not merely

51 Demmler/Stoll-Kleemann: Understanding Public Perceptions of Marine Threats.

anecdotal; it may also be a powerful motivator for action. As Amundsen (2015) has argued, place attachment may be more effective in driving conservation behaviours than abstract communication about ecological threats,⁵² precisely because it builds on what people already know, care about, and feel at risk of losing. Emotional and experiential connections may offer a more personally relevant pathway to environmental concern than distant or generalised messages.⁵³ In this context, communication strategies can benefit from actively highlighting the personal meanings that people associate with a healthy ocean, such as tranquillity, vitality, and leisure. Emotional storytelling formats that connect environmental threats to daily life, like vanishing beachscapes or memories of childhood summers, may transform vague concern into a sense of personal urgency and responsibility. However, since negative emotions like fear can lead to anxiety and passivity, tapping into negative emotions should be used with care and accompanied by suggestions on how to mitigate the threats.⁵⁴

The recurrent references to ›Heimat‹ and childhood memories also highlight the role of autobiographical memory as a key component of ocean literacy. These connections could be purposefully incorporated into outreach formats, such as participatory exhibitions, digital storytelling, or intergenerational workshops that invite residents and visitors to share their ›Baltic Sea stories‹. Such approaches may help bridge temporal and emotional gaps between past experiences and present environmental challenges, fostering long-term identification with marine protection goals. As Schwerdtner Máñez et al. (2023)⁵⁵ suggest, regional ocean literacy frameworks may need to account

52 Amundsen: Place Attachment as a Driver of Adaptation in Coastal Communities in Northern Norway.

53 Stoll-Kleemann/Nicolai/Franikowski: Exploring the Moral Challenges of Confronting High-Carbon-Emitting Behavior; Stoll-Kleemann: Feasible Options for Behavior Change Toward More Effective Ocean Literacy; Stoll-Kleemann, Susanne/O’Riordan, Tim: Revisiting the Psychology of Denial Concerning Low-Carbon Behaviors: From Moral Disengagement to Generating Social Change, in Sustainability 12 (2020), No. 3, 935, DOI: 10.3390/sul2030935. (08.01.2026).

54 Bissing-Olson, Megan J./Fielding, Kelly S./Lyer, Aarti: Experiences of Pride, Not Guilt, Predict pro-Environmental Behavior When pro-Environmental Descriptive Norms Are More Positive, in: Journal of Environmental Psychology 45 (2016), pp. 145–153, DOI: 10.1016/j.jenvp.2016.01.001. (08.01.2026); Norgren, Andrea (SEI)/Moss, Ellie (Moss & Mollusk Consulting): Reducing Plastic Pollution: Campaigns That Work, www.campaignthatwork.org/ (13.01.2025).

55 Schwerdtner Máñez/Stoll-Kleemann/Rozwadowski: Ocean Literacies; Kleemann, S. Eine humanökologische Sicht auf die Mensch-Meer Beziehung im 21. Jahrhundert in sechs Thesen, in: Simon, K.-H./Deutsche Gesellschaft für Humanökologie (eds.): Mit Human-

for socio-cultural, historical, and economic contexts to enable a more situated and science-informed understanding of marine issues.

In addition, this personalised approach to ocean literacy may also require translation into participatory planning and monitoring practices. The inclusion of citizen-generated data or the use of community-based ›Perception Experts‹, as proposed by Beyerl et al. (2016),⁵⁶ could play a vital role in this. These facilitators, proposed to be trained to identify and represent local knowledge and emotional perspectives, could mediate between policy design and lived experience. By mobilising people's diverse emotional and functional ties to the Baltic Sea coast, as demonstrated by our research on the Island of Rügen and the Greifswalder Bodden, such roles may help translate abstract conservation goals into community-driven action. Incorporating stakeholder perceptions as valid forms of environmental knowledge, not just anecdotes, may further help democratise decision-making and foster trust in information sources and political decision-making processes. As research shows, trust in environmental governance is essential for public engagement, especially when institutions aim to encourage behavioural change.⁵⁷

Finally, to effectively support such transformations, ocean literacy strategies may consider adapting and expanding their communication platforms. As Schwerdtner Máñez et al. (2022) and Kopke et al. (2019) suggest, this can entail diversifying communication formats and channels, especially by creatively using social media and participatory tools, to reach and engage broader audiences, particularly younger, digitally connected demographics.⁵⁸

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56 Beyerl, Katharina/Putz, Oliver/Breckwoldt, Annette: The Role of Perceptions for Community-Based Marine Resource Management, in: *Frontiers in Marine Science* 3 (2016), DOI: 10.3389/fmars.2016.00238. (08.01.2026).

57 Gelcich et al.: Public Awareness, Concerns, and Priorities about Anthropogenic Impacts on Marine Environments; Hofman, Karen/Hughes, Karen/Walters, Gabrielle: Effective Conservation Behaviours for Protecting Marine Environments: The Views of the Experts, in: *Journal of Sustainable Tourism* 28 (2020), pp. 1–19, DOI: 10.1080/09669582.2020.1741597. (08.01.2026); Hogg, Katie et al.: Perceptions of Threats Facing Cabo de Palos-Islas Hormigas MPA and Potential Solutions, in: *Coastal Management* 46 (2018), pp. 58–74, DOI: 10.1080/08920753.2018.1405330. (08.01.2026); Soares, Joana et al.: Public Views on Plastic Pollution: Knowledge, Perceived Impacts, and pro-Environmental Behaviours, in: *Journal of Hazardous Materials* 412 (2021), 125227, DOI: 10.1016/j.jhazmat.2021.125227. (08.01.2026).

58 Schwerdtner Máñez/Stoll-Kleemann/Rozwadowski: Ocean Literacies; Kopke, Kathrin/Black, Jeffrey/Dozier, Amy: Stepping Out of the Ivory Tower for Ocean Literacy, in: *Frontiers in Marine Science* 6 (2019), No. 60, pp. 1–13, DOI: 10.3389/fmars.2019.00060. (08.01.2026).

In summary, we propose that regional ocean literacies, in this case Baltic Sea literacy, be understood and designed not just as a top-down educational task, but as a collaborative process that combines ecological understanding with emotional resonance, historical depth, and community-based meaning. Informing the public about the state of the Baltic Sea and its broad environmental threats remains essential, especially given ongoing knowledge gaps. However, conservation strategies may be more effective when they also engage with the personal and cultural dimensions of the sea. Incorporating personal memories, and symbolic or health-related values may strengthen public engagement. Transparent communication along diverse channels, inclusive planning, and sensitivity to community values are crucial to this process. Consequently, such strategies could foster long-term public engagement in marine conservation rooted in both threat awareness and place attachment.

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Transforming Gold in the Baltic Sea Region—From Raw Material to Cultural Heritage*

The so-called Hiddensee Hoard, a gold treasure of exceptional quality attributed to tenth-century Denmark, testifies to the great artistry of Viking-age goldsmith work (Fig. 1). The hoard, which was found on the northern German island of Hiddensee in the late nineteenth century, has a total weight of ca. 600 g. It consists of sixteen pieces of jewellery, including a neck ring (Ø ca. 13,5 cm), a disk brooch (Ø ca. 8 cm), six large and four smaller cross-shaped pendants (H ca. 6/5 cm) and four small rectangular pendants (H ca. 2 cm).¹



Figure 1: Hiddensee Hoard, 10th c., Stralsund Museum (LAKD M-V, Landesarchäologie, photo: Sabine Suhr)

* This contribution draws on research conducted for our digital exhibition Viking Gold. Treasure politics since 1800 (www.vikinggold.org), which was launched in November 2024. The exhibition was developed within the framework of a research project in cooperation with the Stralsund Museum (2021–2025), in which outreach—both in schools (cf. Dolezalek/Fries 2023) and within the museum setting—constituted a central objective. The second part of the article is informed by our investigation into modes of communicating art historical research to wider publics. It takes the form of a ›Choose Your Own Adventure‹ narrative.

1 The Hiddensee Hoard was found on the northern-German island of Hiddensee between 1872 and 1874. It is preserved in the Stralsund Museum. See Armbruster, Barbara/Eilbracht, Heidemarie (eds.): Wikingergold auf Hiddensee, Rostock 2010.

The pendants and brooch are ornamented with intricate gold-filigree and granulation, using a complex technique by which small granules of gold are fused with the underlying metal support.² Whoever produced this delicate work must have been an expert well acquainted with the properties of gold. And yet, gold was not mined in the Baltic Sea region—nor indeed was silver.³ Gold- and silversmiths of the Viking Age (ca. 800–1100) thus relied on the transfer to the Baltic Sea region of precious metals that originated from elsewhere.

According to evidence provided by the elemental and isotope analysis of coins and other silver artefacts from archaeological finds, silver was most probably obtained from two major sources: Western Europe—mainly Britain and the Carolingian Empire—and coins from the Abbasid caliphate.⁴ Gold, on the other hand, could have originated from a variety of different mines in Europe and beyond.⁵ Gold mining in Europe was known already in Neolithic times and it reached a first peak during the Roman Empire, with most production sites being located on the Iberian peninsula.⁶ Further sources for gold were located in and around the Alps and in the German regions of Harz and Erzgebirge, for example (Fig. 2).⁷ It is unlikely that gold was transferred to the North in an unprocessed, raw form and refined there. Rather, high quality

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- 2 Eilbracht, Heidemarie: Filigran- und Granulationskunst im wikingischen Norden: Untersuchungen zum Transfer frühmittelalterlicher Gold- und Silberschmiedetechniken zwischen dem Kontinent und Nordeuropa (Zeitschrift für Archäologie des Mittelalters 11), Köln 1999.
 - 3 Eilbracht, Heidemarie: Edelmetallschmuck der Wikingerzeit—Analysen und Interpretationen, in: Armbruster, Barbara/Eilbracht, Heidemarie et al. (eds.): Verborgenes Wissen: Innovation und Transformation feinschmiedetechnischer Entwicklungen im diachronen Vergleich, Berlin 2016, pp. 241–262: p. 255; Merkel, Stephen W.: Provenancing Viking silver: Methodological and theoretical considerations and a case study, in: Kershaw, Jane/Williams, Gareth: Silver, butter, cloth: Monetary and social currencies in the Viking age, Oxford 2019, pp. 206–226.
 - 4 Kershaw, Jane/Merkel, Stephen W.: Silver recycling in the Viking Age: Theoretical and analytical approaches, in: Archaeometry 64, (2022), No. 1, pp. 116–133: p. 120.
 - 5 On gold from Western Africa see for example the catalogue of the groundbreaking exhibition *Caravans of Gold, Fragments in Time: Art, Culture, and Exchange across Medieval Saharan Africa*, Berzock, Kathleen Bickford: Caravans of gold, fragments in time: Art, culture, and exchange across medieval Saharan Africa, Evanston 2019.
 - 6 Lehrberger, Gerhard: The gold deposits of Europe: An overview of the possible metal sources for prehistoric gold objects, in: Morteani, Giulio/Northover, Jeremy P. (eds.), Prehistoric Gold in Europe. Mines, Metallurgy and Manufacture, Dordrecht 1995, pp. 115–144: p. 115.
 - 7 Lehrberger: The gold deposits of Europe, p. 116f.

Scandinavian jewellery would have been made from imported gold objects that were melted down and reused.⁸



Figure 2: Gold in Europe (from: Lehrberger: The gold deposits of Europe, p. 117)

8 Eilbracht: *Edelmetallschmuck der Wikingerzeit*, p. 255; Wicker, Nancy: *Mapping Gold in Motion: Women and Jewelry from Early Medieval Scandinavia*, in: Chapman Hamilton, Tracy/Proctor-Tiffany, Mariah (eds.): *Moving Women Moving Objects (400–1500)*, Leiden 2019, pp. 13–32: p. 19.

Many thousands of kilograms of silver made their way to the Baltic Sea region via trade routes. Finds of an estimated 400,000 silver coins of Near-Eastern provenance,⁹ sometimes broken up into smaller parts as hacksilver, suggest that imported silver was weighed and then used for everyday business transactions.¹⁰ The metal was traded in exchange for desirable commodities such as furs, but presumably also for slaves.¹¹ Unlike silver, imported gold does not appear to have played a role in trade. Gold finds are much rarer than those of silver and they are usually recovered from pure gold deposits, containing undamaged objects.¹² Hackgold, which would hint at a use of gold in trading operations, is uncommon. Rare examples include a hoard discovered in Østre Mose (Western Denmark) and another one in Lackalänga (Sweden).¹³

Analyses carried out on the occasion of Barbara Armbruster and Heidemarie Eilbracht's publication of the Hiddensee Hoard of 2010, have shown that the sixteen items of jewellery have a uniform chemical composition. The alloy is almost entirely gold-based with only minute additional traces of copper, silver and tin.¹⁴ This similarity across the different items suggests that they were most probably conceived as a group and perhaps even made by the same goldsmith.¹⁵ Regrettably, we can no longer identify the source (or indeed sources) used to obtain this very purified gold. Individual gold objects may occasionally have come to the Baltic Sea region as gifts. A ninth-century source, for example, reports that the Andalusian diplomat Al-Ghazāl brought coffers with gifts of clothing and containers to a Viking ruler in 845.¹⁶ Others may have brought along precious metals. However, a large proportion of the gold that was processed in Scandinavia seems to have been acquired through tribute payments and raids: Frankish chronicles note that the Viking leader Ragnar received a ransom of 7000 Frankish pounds of gold and silver after the attack on Paris in 845. Moreover, in 991, an agreement with King Aethelred, following his defeat in the Battle of Maldon, stipulated the payment

9 Gruszczynski, Jacek: *Viking Silver, Hoards and Containers: The Archaeological and Historical Context of Viking-Age Silver Coin Deposits in the Baltic c. 800–1050*, London 2019, p. 1.

10 Gruszczynski: *Viking Silver, Hoards and Containers*.

11 *ibid.*, p. 13.

12 Hårdh, Birgitta: *Silver in the Viking Age. A regional-economic study* (*Acta Archaeologica Lundensia* 28), Stockholm 1996, pp. 160f.

13 Hårdh: *Silver in the Viking Age*.

14 Armbruster/Eilbracht: *Wikingergold auf Hiddensee*, p. 139.

15 *ibid.*, pp. 143f.

16 Allen, William E. D.: *The Poet and the Spae-Wife: An Attempt to reconstruct Al-Ghazal's Embassy to the Vikings*, Dublin 1960, p. 21; Gruszczynski: *Viking Silver, Hoards and Containers*, p. 14.

of 22,000 pounds of silver and gold to the victorious Scandinavians.¹⁷ Gold was thus associated with political power and served a different social purpose to silver. While large amounts of silver were in circulation as currency, gold was reserved for the highest social classes.

Old Norse texts include passages in which Viking-age Scandinavian rulers are said to have distributed golden arm rings as gifts to secure the loyalty of their minions and to consolidate political ties. Owning and displaying gold jewellery could thus have been understood as a sign of allegiance to a specific social group.¹⁸ Beyond the material, style may also have played a role in the early medieval transmission of social meaning through jewellery. Archaeological evidence suggests that women held a special place in these politics of ornament, for example through diplomatic marriages. An example is provided by the disc brooches of the Hiddensee-style, which were worn exclusively by women and can be associated with the Danish realm.¹⁹ Their dissemination is attested in the Baltic Sea region by finds from female burials extending into modern Poland and Russia.²⁰

It is possible, that pieces of jewellery with identifiable regional styles, such as these, may have functioned as markers of identity and of belonging to a social group (Fig. 3). While certainly not many of these objects were made of gold, those who were must have functioned as recognisable symbols of the Scandinavian ruling elite—perhaps not only for their use of the precious material, but also for their style.

In the context of its production and use in the Baltic Sea region, the Hiddensee Hoard thus materially conserves, or even ›embodies‹ the transformation from one or several no more identifiable imported golden artefacts to a group of objects of Scandinavian manufacture, whose material and appearance was associated with the ruling elite. Another transformation—an imma-

17 Gruszczynski: Viking Silver, Hoards and Containers, p. 11.

18 Andrén, Anders: Guld och makt—en tolkning av de skandinaviska guldrakteaternas funktion, in: Fabech, Charlotte/Ringtved, Jytte, Samfundsorganisation og regional variation. Norden i romersk jernalder og folkevandringstid, Århus 1991, pp. 245–256; Wendt, Antje: Viking Age Gold Rings and the Question of »Gefolgschaft«, in: Lund Archaeological Review 13/14 (2008), pp. 75–89; Wendt, Antje: Wikingerzeitliche Goldringe. Eine Fundgruppe ohne Kontext?, in: Gammeltoft, Peder/Hilberg, Volker (eds.): Beretning fra niogtyvende tværfaglige vikingesymposium, Højbjerg 2012, pp. 50–68; Bertram, Marion/Eilbracht, Heidmarie: Der Goldarmring von Hiddensee, in: Acta Praehistorica et Archaeologica 46 (2014), pp. 171–184; p. 179.

19 Armbruster, Barbara: Haithabu und der Hiddenseestil, in: Armbruster, Barbara/Eilbracht, Heidmarie (eds): Wikingergold auf Hiddensee, Rostock 2010, pp. 149–170.

20 *ibid.*



Figure 3: Moulds for jewellery in the ›Hiddensee style‹ found at Haithabu (Source: Wikinger Museum Haithabu Stiftung Schleswig-Holsteinische Landesmuseen)

terial transformation—then occasioned these pieces of high-class jewellery to be laid down as hoards.

Medieval hoarding behaviour is typically explained with reference to political, economic or symbolic reasons.²¹ In times of war or impending conflict, it would have been vital to secure valuables by hiding them in the ground. Sustained periods of economic prosperity, on the other hand, may have encouraged people to hoard their savings. But there is also a possible spiritual dimension to the deposit of hoards, which may well have been intended as offerings. Unlike most silver finds, many gold hoards were recovered from swamps, or found in or near water. They were probably not meant to be retrieved.²² Although the exact circumstances of its recovery remain unknown, this was probably also the case of the Hiddensee Hoard. According to its finders—inhabitants of the island of Hiddensee—the jewellery had been washed on to the beach after the great flood of 1872.²³ However, the occurrence of peat-like particles, which were noted on some of the items after they had been acquired by the Stralsund Museum in 1873 and 1874, rather point to the fact that they could have been deposited or immersed in formerly inaccessible marshland.²⁴ And yet, occasionally one of these medieval hoards resurfaces...

The following story about the transformations—both material and immaterial—that may occur when a gold hoard is found, is an experiment in counterfactual history. It was first published in a more interactive form in the digital exhibition *Viking Gold. Treasure politics since 1800* (www.vikinggold.org), which we launched in November 2024. The narrative scenario is fictitious and does not aim for total coherence. Rather, we chose to meander between different times and locations, in order to touch upon factors such as legislation or shifts of political allegiance that led to an increased awareness of the value of Viking-age gold finds as cultural heritage in the Baltic Sea region. While the storylines are invented, the options presented on the path of the transformation of gold from material asset to cultural heritage are based on historical sources.²⁵ These can be consulted with reference to the notes.

21 Hårdh: Silver in the Viking Age, pp. 146–153; Gruszczynski: Viking Silver, Hoards and Containers, p. 18.

22 Hårdh: Silver in the Viking Age, p. 134.

23 Armbruster/Eilbracht: Wikingergold auf Hiddensee, p. 56.

24 *ibid.*, p. 58.

25 The contents draw upon archival studies carried out for a dissertation by Charlotte Wenke: *Viking-age gold treasure finds as objects of identification in the Baltic Sea Region c. 1800–1989* (Diss., Technische Universität Berlin, 2026).

... Somewhere in the Baltic Sea region in the ninth century: A Scandinavian woman called Thyra buries her gold jewellery. When will her treasure be found?

1. Never – *go to end y*
2. 1755 – *continue reading there*
3. 1834 – *continue reading there*
4. Today – *continue reading there*

1755

Olof, a boy aged fifteen, is ploughing a field on his father's farm in southern Sweden when he finds a plaited golden armring. What should he do with it?

1. Keep it
2. Sell it
3. Hand it in

1. He keeps it for hard times because it looks valuable. He later reburies it so that it won't get lost.

– *go to end y*

2. He sells it to a local goldsmith²⁶ who has offered him a good price so that he can finally buy a draught horse. The goldsmith vaguely remembers that for a few years now, the pastor has regularly announced²⁷ that if you find an object made of gold or silver and hand it in to the royal authorities, you'll get 1/8 more than the price of the metal for it.²⁸ So, he shows it to the pastor. The pastor hands it in to the bailiff and claims the lawful finder's fee. What happens next?

– *continue reading at 3*

26 Cf. the discovery of the Hiddensee Hoard, which attracted official attention after a part of it had been sold to a local goldsmith. The goldsmith sold it to the district president, who then gave it to the director of the local museum in Stralsund. See Armbruster/Eilbracht: *Wikingergold auf Hiddensee*, p. 59.

27 A Swedish royal letter to their Finnish district officials from 1755 addresses the reporting of precious metal finds from the ground. It stipulates that pastors were to declare the current law from their pulpits once a year. See Johann G. Liljegren: *Transcription of »Till landshöfdingarna i Finland, angående Kungörelsens utfärdande om fynd*. Stockholm then 20. Aug. 1755, from: Johan Jusléen: *Samling af Kongl. Majts. Bref, hvilka på inkomna förfrågningar om Lagens rätta förstånd ... utfärdade blifvit*; 1761, p. 410f.«, Stockholm, ATA, Ämbetsarkivet 1, E1:2.

28 Chapter XLVIII: *Om fynd och hittegods, och huru thet bör lysas up*, § 2, in: *Sveriges Rikes Lag Gillad och antagen på Riksdagen Åhr 1734 (1736)*, p. 262, litteraturbanken.se/f%C3%B6rfattare/Anonym/titlar/SverigesRikesLag1734/sida/262/faksimil?storlek=1 (25.02.2025).

3. The jewellery makes its way into the royal collections, which contain costly and curious objects that reflect the vast kingdom. It remains there until the collections are converted into a public museum around 1850.²⁹ One part of the museum is devoted to the history of the Swedish nation.

– *go to end x*

29 Svanberg, Fredrik: *Museer och samlande* (The Museum of National Antiquities, Stockholm. Studies 12), Stockholm 2009, pp. 46f.

1834

Åsa, a Norwegian servant girl, is planting potatoes when she finds several beautifully decorated items of gold jewellery. She shows them to her employers, a farmer and his wife.

1. They sell them locally
2. They take them to the capital
3. They show them to the authorities

1. The pair decide to sell the treasure to the local goldsmith and share the proceeds with Åsa as a reward for her honesty.
 - a. The goldsmith melts the objects down and uses the gold to make modern jewellery.

– go to end v

- b. In the goldsmith's shop, the items are noticed by Krøyer the schoolmaster, who is keenly interested in the history of his country. He realises that the objects are ancient pendants and brooches. Now we don't know if Krøyer is a nationalist or a unionist. As a nationalist he would think that the objects should be placed in the antiquities collection³⁰ at the Norwegian university in order to illustrate the history of Norway. Let's assume that he is a unionist! As a unionist, Krøyer would think Norway should have remained part of Denmark. He gives the treasure to the state collections in Copenhagen.³¹ They tell the history of the Danish nation, to which Norway belonged until 1814. Much later, the Danish national museum decides to return selected finds, including Åsa's treasure, to Norway as a diplomatic gesture.³²

– go to ends w and x

30 On the early history of the collection of Norwegian Antiquities (Oldsaksamlingen) in Oslo see Mikkelsen, Egil: Før Historisk museum. Universitetsmuseenes eldste historie, in: Bergstøl, Jostein/Eek, Ann Christine/Perminow, Arne Aleksej (eds.): Kulturhistorier i sentrum. Historisk museum 100 år, Oslo 2004, pp. 36–59.

31 On the early history of the National Museum of Denmark see Jakobsen, Tove Benedicte in collab. with Holme, Jan and Adamsen, Christian: Birth of a World Museum (Acta Archaeologica 78/1), Oxford 2007.

32 Single objects transferred to Copenhagen during the Danish-Norwegian Union (1380–1814)

2. The landowner's brother knows a merchant named Coninck in the capital Christiania (Oslo) who deals in treasure trove and gives them a good price. Coninck realises that the items are ancient pendants and brooches. He sells them to the state collections in Copenhagen. They tell the history of the Danish nation, to which Norway belonged until 1814. Norway's requests for restitution during the 1920s³³ are unsuccessful. The objects are to remain in the Danish national museum in order to provide a comprehensive picture of Scandinavian prehistory.

– *go to end w*

3. The farmer's wife knows that there is a law dating back before 1814, when Norway was part of Denmark, which declares that abandoned gold and silver belongs to the state.³⁴ They give the treasure to the bailiff, who pays them its material value from the public purse. He passes it on and the state gives the treasure to the antiquities collection in Christiania (Oslo).³⁵ There it is put on display as national cultural property.

– *go to end x*

have returned to Norway, for example the St. Olav's altar frontal, which was given to Nidaros cathedral in Trondheim upon the nine-hundredth anniversary of Olav's death in 1930. See Lidén, Anne: *Olav den helige i medeltida bildkonst. Legendmotiv och attribut*, (Diss., Stockholm University, 1999), Stockholm 1999, p. 31.

- 33 An overview of Norwegian restitution claims towards Danish museums is given by the board of the Norwegian Association of Museums in a proposition to the Norwegian State Department for Church and Education. See *Styret i Norske Museers Landsforbund: Innstilling til Kirkedepartementet om utlevering fra Danmark av norske museumssaker*, Oslo, 20.05.1927, Kulturhistorisk Museum Oslo, Arkiv, fag 13, hylle 7, boks 33: Dansk-norske arkiv- og museumssaken. The proposition includes a long list of objects to be given back to Norway, containing also archaeological finds of gold and silver. Its success would have to be followed up by further research. We are not aware of any studies of Norwegian restitution claims.

- 34 Grieg, Sigurd: *Da staten innløste Hon-skatten i 1834*, in: *Viking. Tidsskrift for norrøn arkeologi* 32, 1968, pp. 112–114.

- 35 The 1834 story was inspired by the discovery and acquisition of the Hoen Hoard kept at the Museum for Cultural History in Oslo. See Mikkelsen, Egil: *The find in its context*, in: *Fuglesang, Signe Horn/Wilson, David M. (eds.): The Hoen hoard. A Viking gold treasure of the ninth century (Acta ad archaeologiam et artium historiam pertinentia XIV)*, Oslo 2006, pp. 29–54: pp. 34f.

Today

Somewhere in the Baltic Sea region, present day: I'm walking across a freshly ploughed field when I spot a gleaming object in the loose soil. It's obvious that the object is very old.

What should I do with it?

1. Keep it
2. Hand it in

1. I keep it for myself and I only show it to special people. What happens next?

a. I keep it in a drawer in my home—indefinitely.³⁶ [This is a bad idea!]

– *go to end v*

b. I sell it online. [Seriously? This is a bad idea!] What happens next? The jewellery could be bought by a wealthy private collector. They would probably lock it in a safe and it would be lost to everyone else.

– *go to end v*

c. I sell it online. An expert might chance upon the online listing and buy the item. Without proper documentation (I just picked it up on a field...), the context of the find remains unclear and the object's past significance cannot be determined. However, the expert hands in the object to the heritage protection authorities.

– *continue reading at 2*

2. I show it to the local museum, who forwards my treasure to the authorities. The archaeologists in charge are excited and I show them where I found

36 The fact that this happens from time to time is exemplified by the story of the largest single Viking Age gold find on the island of Gotland, an arm ring from around the year 1000. Its finder had kept it secretly in his house for 30 years and only revealed its existence on his deathbed, leading his heirs to give it to the local museum. See Östergren, Majvor: En vikingatida guldarmring från Tore i Sundre socken, in: Gotländskt Arkiv, Visby 1997, pp. 243f.

it so that they can study the site. Based on the law and their previous experience, the authorities decide whether an object qualifies as protected cultural heritage. In the assessment, both the materials and the age of objects play a role as well as the opinion of specialised conservators. What do laws say about finds of treasure in the Baltic Sea region?

In Denmark, gold and silver objects found in the earth are always objects of cultural and historical value. They belong to the state.³⁷

In Norway, only archaeological finds dating from before 1537 automatically belong to the state. But other finds can also be categorised as culturally valuable.³⁸

In Germany, each of the 16 states has its own law on the protection of monuments. In Mecklenburg-Western Pomerania, private archaeological finds belong to the state if they are of outstanding scientific value.³⁹

– *go to end z*

37 Museumsloven § 30. Danefæ og danekræ, www.retsinformation.dk/eli/lta/2014/358#P30 (25.02.2025).

38 Lov om kulturminner, Kap. III Løse kulturminner, § 12 Eiendomsretten til løse kulturminner, www.retsinformation.dk/eli/lta/2014/358#P30 (25.02.2025).

39 Denkmalschutzgesetz (DSchG M-V). In der Fassung der Bekanntmachung vom 6. Januar 1998, § 13 Schatzregal, <http://www.landesrecht-mv.de/bsmv/document/jlr-DSchGMVp13> (25.02.2025).

Ends

- v. The early-medieval treasure is lost.
- w. It is exhibited in its own display case as a significant example of Scandinavia's regional heritage.
- x. It is exhibited in its own display case as a significant example of the country's national heritage.
- y. Safe underground, Thyra's treasure survives through the centuries.
- z. What objects do you think should be preserved as cultural heritage for the future?

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Embodied Fragmented Transformations

Recontextualising Contested Heritage Through Colonial Dissonance and the Negotiation of Past–Present Tensions in Monuments

Introduction

Statues stand as tangible markers of the past, yet their presence in the present may reveal the moral valuations that shape collective memory, especially as mythologised narratives of a medieval ›Golden Age‹ collide with the realities of ›colonial‹ legacies. Statues representing historical figures or events, and the ways in which they are interacted with today, inform us about the dynamic interplay between the moral valuation of history, revealing how the past is continuously constructed, reinterpreted and contested. They »serve as selective narratives of the past«,¹ and as elements in the landscape they can »play a significant role in shaping our understanding of the present by generating tangible specific narratives«.² Notably, recent movements for social justice in public discourse demand that we »rethink what belongs in public space and what does not«.³ Historical statues associated with challenging histories are increasingly contested, revealing that the stone in which they are set is »vulnerable to crumbling«.⁴ Such statues therefore become active sites of negotiation, and, consequently, represent a type of ›colonial dissonance‹ in the sense that the historical narratives of a romanticised past conflicts with the lived realities or historical memories of groups of people.

In the following, I explore how this colonial dissonance affects present-day realities and contemporary understandings of the medieval past through se-

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 - 3 Paez/Bowrig/Davis: Balance and de Belalcázar, p. 78.
 - 4 Tinsley, Meghan/Peacock, Chloe/Habib, Sadia/Ramsden-Karelse, Ruth/Younge, Gary: Toppling Statues and Making Space: Prospects for Anti-Racist Cultural Activism, in: *Identities. Global Studies in Culture & Power*, April (2024), pp. 1–19.

lected case studies that examine visualised representations of mythologised history and shared cultural heritage. Using example studies from the extended Baltic Sea region—understood here as a historically entangled space shaped by mobilities, exchanges, religious, and colonial encounters, migration, and power politics—namely, the statue of the ›Apostle of Greenland‹, Hans Egede, in Nuuk, Kalaallit Nunaat (Greenland), and the statue of medieval figure Volodymyr the Great in Kyiv, Ukraine, I explore how these monuments embody fragmented transformations, from being symbols of authority to contested objects of resistance in the restructuring of the moral valuation and authority of medieval history.

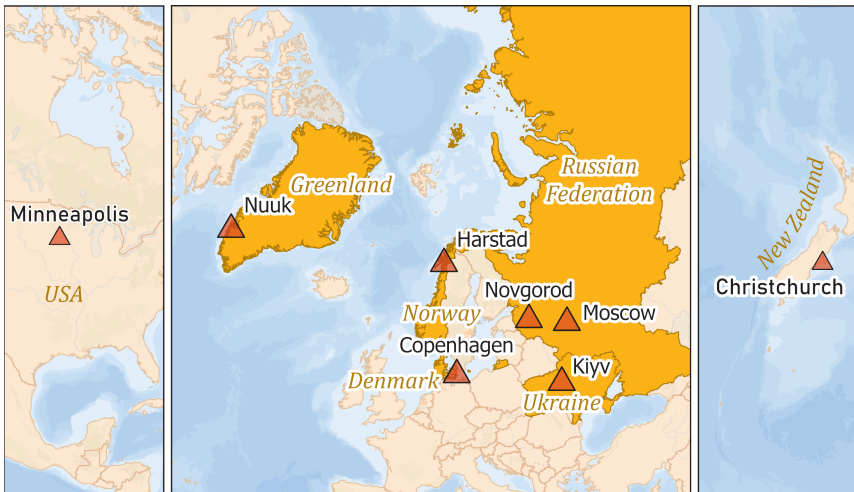


Figure 1: Important locations referred to in the text. Sources: Esri; Garmin International, Inc; U.S. Central Intelligence Agency (The World Factbook); National Geographic Society (Design: B. Bobertz)

Contested Heritage and the Rise and Fall of Statues

Heritage, encompassing both tangible artifacts and intangible cultural practices, is not static but evolves alongside shifting ideologies.⁵ Depending on our own positionality and group experiences, our encounters and evaluations of cultural heritage evolves in tandem with our past and present realities.

5 Liu, Yang/Dupre, Karine/Jin, Xin: A Systematic Review of Literature on Contested Heritage, in: *Current Issues in Tourism* 24 (2021), No. 4: pp. 442–65: p. 442.

Heritage is therefore a dynamic process of continuous meaning-making⁶ and as a product of the present, heritage functions as a medium through which identities and cultural narratives can be negotiated (and re-negotiated).⁷

A central mechanism of colonialism is the dehumanisation of the colonised and the denial of their right to historical narration.⁸ Consequently, heritage becomes a contested space in the struggle over who controls historical narratives and shapes collective memory. In this article, I expand Antony Fiscella's suggested label ›colonial dissonance‹⁹ to encompass the tension that arises when colonial narratives coexist with efforts to resist or reinterpret them. Fiscella derives this term from Leon Festinger's psychological theory of cognitive dissonance, which describes the discomfort caused by conflicting beliefs or behaviours.¹⁰ Similarly, colonial dissonance manifests when settler societies reject or obscure evidence of past and present colonial violence to maintain their self-image as morally good.¹¹ Fiscella defines colonial dissonance as »a collectively cognitive disconnect between societal values and societal realities rooted in racial and economic disparities created by colonialism«. ¹² Here, I elaborate on this concept to also encompass the fragmented transformation of public history narratives when the legitimacy of colonial frameworks is questioned, contradicted and reinterpreted, often by the colonised. As Fiscella notes, colonial dissonance arises in response to structures inherited by colonialism, such as racial hierarchies, land dispossession and institutional biases.¹³ It can therefore be a useful lens for analysing the transformation of

6 Macdonald, Sharon M: *Memorylands: Heritage and Identity in Europe today*, London/New York 2013.

7 Smith, Laurajane: *Uses of Heritage*. London/New York 2006, p. 3.

8 Fanon, Frantz: *The Wretched of the Earth*, translated by Constance Farrington, London 2001 [Reprint].

9 Fiscella, Anthony: (Un)certain responses to colonial dissonance. The Philadelphia Bombing of MOVE and the Unitarian Universalist Association's Right Relationship Team, in: Francis, Matthew/Knott, Kim (eds.): *Minority Religions and Uncertainty*, London/New York 2020, pp. 171–94.

10 Festinger, Leon: *A Theory of Cognitive Dissonance*, Stanford, California 1957, p. 3.

11 Fiscella: *Colonial Dissonance*, p. 173. Here, Fiscella references Stanley Cohen's concept of the »passive bystander effect« (p. 16), citing examples from South Africa and Israel. In these cases, abuses and injustices against native South Africans and Palestinians starkly contrast with these nations' self-perception and public representation as »morally good« (pp. xi, 96): see Cohen, Stanley: *States of Denial: Knowing about Atrocities and Suffering*, Cambridge 2001.

12 *ibid.*, p. 173.

13 *ibid.*, p. 174.

commemorative monuments from symbols of authority to contested objects of resistance.

Meghan Tinsley et al. argue that statues, »by their very nature, curtail the complexity of the past and restrict the imagination«.¹⁴ The murder of George Floyd by Minneapolis police officers in 2020 reignited the global Black Lives Matter movement, sparking renewed confrontations with colonial and racist histories. This included renewed calls for the removal of colonial statues from public spaces, raising questions about which narratives could and should be publicly commemorated.¹⁵ Representation is central to this debate, as statues encode selective memories of history and often gain new meanings as social relations evolve.¹⁶ James Young highlights that monuments are not static relics of the past, but active sites of political and social contestation, and argues that their significance lies not only in their historical relevance but in their role in contemporary history.¹⁷ In this sense, statues do not simply remind us of what occurred, they serve as symbols programming a specific interpretation of history, one that most often reflects the hegemonic narrative upheld by dominant power structures.¹⁸ When statues are challenged, so too is this dominant narrative they represent, and as Reuben Rose-Redwood and Will Patrick assert, this contestation is not an »erasure of history«:

The question of whether colonial statues must fall or remain is not a matter of history alone. It is part of the process of reckoning with the ongoing injustices of settler colonialism in the present in order to work toward decolonizing the future. Removing a statue (...) does not erase history. It serves as a reminder that the future is not cast in stone.¹⁹

In the following, I present two case studies from the extended Baltic Sea region that illustrate ongoing contestation of historical narratives in connection with the medieval past.

14 Tinsley et al.: *Toppling Statues*, p. 14.

15 Atuire, Caesar Alimsinya: Black Lives Matter and the Removal of Racist Statues. Perspectives of an African, in: 21: *Inquiries Into Art, History, and the Visual*. Beiträge zur Kunstgeschichte und Visuellen Kultur 1 (2020), No. 2, pp. 450–467: p. 450.

16 Paez/Bowrig/Davis: *Balance and de Belalcázar*, p. 83.

17 Young, James: *The Texture of Memory: Holocaust Memorials and Meaning*, New Haven, Connecticut 1993, p. 12.

18 Tinsley et al.: *Toppling Statues*, p. 4.

19 Rose-Redwood, Reuben/Patrick, Will: Why Activists are Vandalizing Statues to Colonialism, in *The Conversation*, 17.3.2020, theconversation.com/why-activists-are-vandalizing-statues-to-colonialism-129750 (20.01.2025).

Mythologising the Medieval: Reclaiming Ukrainian Sovereignty from Russian Historical Appropriation

As statues typically embody hegemonic historical narratives upheld by dominant power structures,²⁰ they can become powerful sites of ideological conflict. In Ukraine, this tension is particularly evident in the statues located around Kyiv's public spaces, where their continued presence serves as an act of reclaiming historical narratives from Russian appropriation.²¹ By invoking and mythologising a medieval Ukrainian ›golden age‹, Ukraine actively resists Russian claims of sovereignty and reaffirms a distinct national identity.

Performative public rhetoric, in which an alleged historical connection to Ukraine is used to legitimise Russian aggression, has played a crucial role in justifying both the 2014 annexation of Crimea and the later full-scale invasion of Ukraine from February 2022 onwards. The use of historical narratives as rhetoric in warfare is not uncommon, particularly given that modern territorial claims often are founded in historical narratives. However, when an invading or colonial power, in this case Russia, denies the independent historical identity of the subjugated nation, it »demands an active mythologisation of history«.²²

Russia's historical discourse constructs an image as the rightful ›heir‹ or descendant to Kyivan Rus', a »medieval conglomerate« that controversially laid the foundation for the modern nation-states of Russia, Belarus and Ukraine.²³ This historiographical claim, which frames Russia as culturally and historically superior, is countered by a Ukrainian discourse which seeks to distance itself from both the Russian Federation and the Soviet Union. Christian Raffensperger critiques this binary approach, arguing that the history of medieval Rus is often forced into nationalised ›silos‹, »either Russian or Ukrainian, history read back into time, rather than as a horizontal framework

20 Tinsley et al.: *Toppling Statues*: p. 4.

21 Gabowitsch, Mischa/Homanyuk, Mykola: Responding to Invasion: Toppling Monuments, Building Monuments, in: Gabowitsch, Mischa/Homanyuk, Mykola (eds.): *Monuments and Territory: War Memorials in Russian-Occupied Ukraine*, Budapest 2025, pp. 151–174.

22 Snyder, Timothy: The War in Ukraine is a Colonial War, in: *The New Yorker*, 28.4.2022, www.newyorker.com/news/essay/the-war-in-ukraine-is-a-colonial-war (07.01.2025).

23 Vlasenko, Yegor/Ryan, Brent D: Learning from Decommunization: What Eastern Europe Can Teach Us About Slavery-Related Urban Fallism in the UK and the US, in: *Planning Theory & Practice* 22 (2021), No. 5, pp. 780–86. Raffensperger, Christian: *Reimagining Europe: Kievan Rus' in the Medieval World*, Cambridge 2012, p. 188.

as part of a larger world, however framed.²⁴ This siloed historical framing is particularly evident in the pseudo-historical essay *»Об историческом единстве русских и украинцев«* (On the Historical Unity of Russians and Ukrainians), published by Russian President Vladimir Putin on Kremlin.ru in July 2021.²⁵ The essay, exemplifying historical revisionist tendencies and imperialist propaganda, constructs a narrative of medieval unity to justify Russian colonial ambitions, and was followed by increased Russian military aggression in Ukraine preceding the full-scale invasion in February 2022. Putin asserts that:

Russians, Ukrainians, and Belarusians are all descendants of Ancient Rus, which was the largest state in Europe. Slavic and other tribes across the vast territory—from Ladoga, Novgorod, and Pskov to Kiev [*sic*] and Chernigov—were bound together by one language (which we now refer to as Old Russian), economic ties, the rule of the princes of the Rurik dynasty, and—after the baptism of Rus—the Orthodox faith. The spiritual choice made by St. Vladimir, who was both Prince of Novgorod and Grand Prince of Kiev [*sic*], still largely determines our affinity today.

Here, Putin is constructing an imperialistic narrative that collapses multiple historical complexities into a unified past by portraying Russians, Ukrainians and Belarusians as one, bound by common descent, language, economy and the Orthodox religion. By constructing this myth of shared origins in the *»shared historical and spiritual space«* of Kyivan Rus', Russian colonialism and military aggression are framed as a necessary means of *»restoring«* a supposedly lost medieval *»unity«*. Revisionist history like this is not merely rhetorical, it is also materially inscribed in public spaces, such as statues, that embody and contest competing historical narratives.

Since the collapse of the Soviet Union in 1991, newly independent Eastern Bloc countries, including Ukraine, have engaged in processes of *»decommunisation«*, toppling and removing several monuments that glorified Soviet heroes and Russian imperialist narratives.²⁶ A significant acceleration of this process occurred in Kyiv in December 2013, during the so-called Euromaidan event. The toppling of several Lenin statues symbolised a broader rejection of Russian influence, ultimately culminating in the Revolution of Dignity and an

24 id.: The Place of Rus' in Medieval Europe, in: History Compass 12 (2014), No. 11, pp. 853–865; p. 854.

25 Here in its English translation: en.kremlin.ru/events/president/news/66181 (24.06.2025). Unless otherwise stated, all citations from this text are taken directly from this website.

26 Kuczyńska-Zonik, Aleksandra: Dissonant Heritage. Soviet Monuments in Central and Eastern Europe, in: Mroziak, Agnieszka/Holubec, Stanislav (eds.): Historical Memory of Central and East European Communism, London/New York 2018, pp. 101–121.

increased Ukrainian alignment with Western Europe. It has nevertheless been emphasised, that while many Russian and Soviet-era monuments have been removed, some statues remain; particularly those commemorating figures from Kyivan Rus'.²⁷

One of the most important of these figures is Volodymyr the Great (*Володимѣръ Святославичь*), the prince of Novgorod and Grand Prince of Kyiv who, according to tradition, Christianised the region in 989.²⁸ His legacy remains a crucial point of contemporary Ukrainian identity, exemplified in a speech held by Ukrainian President Volodymyr Zelenskyy on the Day of the Christianisation of Kyivan Rus'-Ukraine [*sic*] on 28 July 2021, where Zelenskyy emphasised Ukraine's direct inheritance from Kyivan Rus', the »mother of our history«:

Ukraine is the successor of one of the most powerful states in medieval Europe. In its capital, which is the capital of modern Ukraine, the history of Christianity in Eastern Europe began, when 1033 years ago Grand Prince Volodymyr of Kyiv christened Kyivan Rus'. Kyivan Rus'-Ukraine.²⁹

Referring to Putin's claims as uttered in his essay published just some weeks prior, where the Russian President refers to, but does not cite, several medieval sources (»including written sources from the twelfth century«), Zelenskyy rejected the need for textual justification, instead calling to the cityscape of Kyiv itself as evidence of the nation's historical sovereignty:

This is not part of our history, this is our history itself. We do not need to prove it with historical treatises, works, or articles. Because our evidence is not on paper, it is in metal and stone. Not in myths and legends, but in our cities and streets.

One such physical piece of »evidence«, is the statue of Volodymyr (*Пам'ятник Володиміру Великому*) which has stood on the banks of the Dnipro River in Kyiv since it was finished in 1853.³⁰ At the time, most of present-day Ukraine, including Kyiv, was under Russian imperial rule, with the statue reflecting imperial narratives. However, following Ukraine's independence in 1991, and the Revolution of Dignity in 2014 with the outbreak of the Russia-Ukrainian

27 Snyder: *The War in Ukraine*.

28 Referred to in Putin's essay as »St. Vladimir«.

29 Here in its English translation: www.president.gov.ua/en/news/ukrayina-kiyivska-rus-1033-z-vernennya-prezidenta-volodimira-69757 (24.06.2025). Unless otherwise stated, all citations from this text are taken directly from this website.

30 Yekelchuk, Serhy: *Symbolic Plasticity and Memorial Environment: The Afterlife of Soviet Monuments in Post-Soviet Kyiv*, in: *Canadian Slavonic Papers/Revue Canadienne des Slavistes* 63 (2021), Nos. 1–2, pp. 207–228: p. 218.

War which saw the occupation and annexation of Crimea and the Donbas War (2014–2015), the statue has come to represent Ukrainian sovereignty.

Amidst the ongoing war, Russia has sought to assert its own historical claim to Volodymyr. Already in 2016 this became clear when a massive statue of the historical figure, in Russian referred to as Vladimir, was erected just outside the Kremlin walls.³¹ This act of historical appropriation formed part of a broader Russian imperial strategy that would later manifest in the full-scale invasion of Ukraine in 2022. The location of the statue in Moscow, rather than Kyiv, represents an attempt to symbolically relocate the heritage of Kyivan Rus' from Ukraine to Russia, claiming ownership of both the Ukrainian past and present.³² The idea that Moscow is the direct and rightful heir to medieval Kyiv and Rus is unsubstantiated. As Christian Raffensperger notes, while Volodymyr's descendants expanded Rus' north-eastward, leading to the establishment of new centres of power such as Vladimir [*sic*], which Moscow was a minor settlement of, it was only generations later that the now capital of Russia gained prominence.³³

In Kyiv today, statues of medieval figures, including Volodymyr, play a crucial role in shaping Ukraine's national historiography. These monuments resist the Russian imperialist narrative that frames Kyiv as the »hearth of the Russian nation«³⁴ and instead integrate Ukraine into European historical and present framework. Amidst ongoing Russian military aggression in its continuing war on Ukraine, Kyiv's medieval statues are now protected from falling bombs by sandbags, scaffolding and tarpaulin,³⁵ demonstrating the fragmented transformation of heritage as historical symbols and simultaneously active sites of resistance of Ukrainian sovereignty.

31 Cohen, Jeremy: Vladimir versus Volodymyr: Conflicting Russian and Ukrainian Application of Rus' Heritage, in: Cultures of History Forum, 25.01.2023, www.cultures-of-history.uni-jena.de/politics/russia/vladimir-versus-volodymyr-conflicting-russian-and-ukrainian-application-of-rus-heritage (30.01.2025).

32 *ibid.*

33 Raffensperger, Christian: Medieval Kherson and Ukraine, History Workshop, 07.03.2022, www.historyworkshop.org.uk/war-military/medieval-kherson-and-ukraine/ (31.01.2025).

34 Snyder, The War in Ukraine.

35 *ibid.* Kyiv City State Administration: Столичні візитівки під захистом: як у Києві продовжують укріплювати відомі пам'ятники (Фото—КМДА, Олексій Самсонов), kyivcity.gov.ua, 28.03.2022, Photographer: Oleksiy Samsonov, kyivcity.gov.ua/photo/stolichni_vizitivki_pid_zakhistom_yak_u_kyievi_prodozhuyut_ukriplyuvati_vidomi_pamyatniki_foto_kmda_oleksiy_samsonov/ (31.01.2025).

Between Myth and Memory: The Colonial Legacy of Hans Egede's Medievalism

In Nuuk, the capital of Kalaallit Nunaat (Greenland), the statue of Hans Egede (otherwise known as the ›apostle of Greenland‹) was covered in red paint, Inuit symbols and the word ›decolonise‹ on the country's national day (21 June) in 2020.³⁶ The staff in Egede's hand, intended to represent a shepherd's crook (evoking images of mission), was altered to represent a slaver's whip. The act had been carried out by anonymous activists, who stated via the Greenlandic artist Aqqalu Berthelsen that their performance had been rooted in the need to »learn the truth of our history«:

It's about time that we stop celebrating colonizers and that we start taking back what is rightfully ours. It's time to decolonize our minds and our country. No colonizer deserves to be on top of a mountain like that. We need to learn the truth of our history.³⁷

The placement of the statue, erected on a hilltop in Nuuk's colonial harbour (›Old Nuuk‹) and overlooking the city, has long been a source of contention. As Daniel Thorleifsen, director of Nunatta Katersugaasivia Allagaateqarfialu (Greenland National Museum & Archives) explains:

The statue of Hans Egede is placed very prominently at the top of a mountain, and it is impossible not to notice it when arriving in Nuuk. For many people, it can be provocative that a missionary, seen as a representative of the colonial power, holds such a dominant position in the cityscape.³⁸

The following week (30 June 2020), a similar protest occurred in Denmark, where the statue of Hans Egede outside *Marmorkirken* (Frederik's Church) in Copenhagen was daubed in red paint, with ›Decolonize‹ sprayed in white and red paint.³⁹ The debate surrounding Hans Egede is not solely about colonial memory, but also the ways in which medieval history is mobilised in

36 Milman, Noa/Doerr, Nicole: Activists' visibility acts of citizenship and media (mis)representation of BLM, in: European Journal of Cultural and Political Sociology 10 (2023), No. 4, pp. 525–551: p. 536.

37 Cited in Milman/Doerr: Activists' visibility acts, p. 536.

38 Cited in: Veirum, Thomas Munk: Historiker: Forståeligt at statue provokerer, in: Sermitsiaq, 23.06.2020, www.sermitsiaq.ag/kultur/historiker-forstaeligt-at-statue-provokerer/207630 (03.02.2025). Translated into English from Danish by author.

39 Statue af missionæren Egede udsat for hærværk i København, in: DR, 30.06.2020, www.dr.dk/nyheder/indland/statue-af-missionaeren-egede-udsat-haervaerk-i-kobenhavn (03.02.2025).

colonialism. This is rooted in the fact that Egede's arrival just outside Nuuk in 1721 was itself inspired by medieval sources.⁴⁰

Hans Poulsen Egede, a Danish-Norwegian priest born in Harstad, Norway, in 1686, came across the historical work *Norrigis Bescripfuelse* by Peder Claussøn Friis published in 1632. The topographic-historiographic work was based on multiple medieval documents relating to Norway, including documents pertaining to the medieval Norse settlements in Greenland.⁴¹ While contact with the Norse settlements in Greenland had been brought to a halt completely after the 1400s, there was still a belief that the settlements were still there.⁴² As such, there was an incentive to convert the settlements, who because of their isolation from the continent, had not converted to Protestantism in the sixteenth century and were seen as unreformed. With his background as a priest, *Norrigis Bescripfuelse* inspired Egede to travel to Greenland to convert the Norse population that was believed to still be present on the island. While there was repeated resistance against Egede's idea, his emphasis on mission mixed with the financial benefits of establishing a colony on strategically located Greenland eventually granted him financial support from merchants in return for trade monopoly on the island.⁴³ When Egede arrived on the western coast just south of present-day Nuuk in June 1721, he found only ruins of Norse culture. Instead, he encountered the Inuit, whom he now sought to convert to Protestantism. The Danish-Norwegian colony was established and became a new economic and missionary project that would since become central to Scandinavian colonial expansion in the Arctic, with this colonial relationship continuing today.

In the diaries and reports by the early missionaries of the eighteenth century, there are descriptions of Greenlandic Inuit myths and stories.⁴⁴ While these narratives are frequently presented to highlight what the missionaries perceived as the pagan beliefs of the indigenous people, they still provide a relatively clear glimpse into some of the key myths within Inuit oral traditions,

40 Jakobsen, Johnny Grandjean Gøgsig/ Lidsmoes, Ivalu Kristine: Kolonial og postkolonial brug af danske stednavne i Grønland: Med et komparativt udsyn til stednavnepraksis i de øvrige dansk-norske kolonier, in: *Namn och bygd* III (2023), pp. 137–162: p. 143.

41 Rix, Robert: *The Vanished Settlers of Greenland: In Search of a Legend and its Legacy*, Cambridge 2023.

42 Wallin Weihe, Hans-Jørgen: Hans Egede, in: *Store norske leksikon* 25.11.2024, snl.no/Hans_Egede (03.02.2025).

43 *ibid.*

44 Thisted, Kirsten: *Greenlandic Oral Traditions: Collection, Reframing and Reinvention*, in: Langgård, Karen/Thisted, Kirsten (eds.): *From Oral Tradition to Rap: Literatures of the Polar North*, Nuuk 2011, pp. 63–107: p. 67.

albeit transcribed and edited. Allegedly, when Egede arrived in Greenland, he asked the Inuit whether they knew what had happened to the Norse. According to a description from 1729, there was no information that could shed light on what happened. However, by 1741, Egede presented a different account; one in which the Inuit oral traditions confirmed what the medieval sources seemed to suggest (according to Egede); that the Norse had been wiped out by the ancestors of the Inuit.⁴⁵ Archaeologist Jette Arneborg has therefore argued that Egede planted the stories about Norse-Inuit conflict into Inuit consciousness, and that these stories represent an eighteenth-century perspective rather than a medieval tradition.⁴⁶ Kirsten Thisted reads these Inuit oral stories instead as an Inuit form of self-expression that contribute to the creation of a national origin mythos which is independent of colonialism: giving them a lead part in history rather than having the role as ›colonised‹.⁴⁷ While these stories are not necessarily medieval tales, they tell us something about the creation of heritage in a time of contestation. Egede's mission in Greenland was rooted in a medievalist vision, yet the Inuit were also generating narratives that constructed their own historical legitimacy, grounded in the medieval. The latter can be seen as early land-claim rhetoric for the Inuit in a narrative of ›reverse colonisation‹, beginning (according to the oral accounts) as early as the late Middle Ages.

Today, the dousing of the statues of Hans Egede has not led to either of them being toppled, moved or removed altogether, but to ongoing debate among Greenlanders. An online and postal vote for the inhabitants of Sermersooq municipality (including Nuuk) about the removal of the statue in Nuuk ran in July 2020, with the results being its continued presence.⁴⁸ Despite this, the act did perhaps trigger the announcement made by Sermersooq municipality that it would not celebrate the anniversary of Egede's landing in 2021 but instead spend money on urban renovations to celebrate the 300th anniversary of the city's founding.⁴⁹ As such, the debate that arose following the dousing can be said to have inspired a new type of memory culture surrounding the arrival of Hans Egede in Nuuk in the early eighteenth century. The 2020 protest was actually not the first time the statue had been targeted: it

45 *ibid.*, p. 78.

46 Arneborg, Jette: Contacts between Eskimos and Norsemen in Greenland, in: Meulengracht Sørensen, Preben/Roesdahl, Else (eds.): *Tolvte tværfaglige Vikingsymposium*, Aarhus 1993, pp. 23–27; p. 27.

47 Thisted; *Greenlandic Oral Traditions*, p. 79.

48 Milman/Doerr: *Activists' visibility acts*, p. 540.

49 *ibid.*

was targeted by paint in the 1970s, again in 2012 and 2015.⁵⁰ Most recently, the statue was tagged with red graffiti in March 2022, with the text »live, laugh, land back«, referring to the land back-campaign which aims to re-establish Indigenous political authority and sovereignty over previously held Indigenous territories.

In Nuuk, Egede's statue enforces a narrative of colonial authority, yet its repeated defacement has transformed it into a focal point for Indigenous resistance. The symbolism of the 2020 activism extended beyond Egede's himself. According to Inuit activist Aka Niviana, the red paint on the statue symbolised the bloodshed in the process of colonialism in Greenland specifically.⁵¹ The addition of the whip can be seen as a challenge to the Danish self-image as a benevolent colonial power.⁵² Simultaneously, the activists had incorporated Inuit cultural heritage onto the statue by including white diagonal and vertical lines, dots and triangles forming a Y-shape, referencing Inuit women's tattoos. Although this incorporation faced some criticism as a misrepresentation of Inuit heritage, others viewed it as a reclaiming of cultural heritage and a vision of a new way of remembrance that emphasised Inuit resilience rather than colonialism.⁵³

Rather than a simple rejection of the legacy of Egede, and Danish colonialism in general, the debates surrounding his statue in Nuuk reflect broader questions about how colonial histories are remembered and reinterpreted. By altering the statue with red paint, references to land-back movements and Inuit symbols, the activists do not just criticise the past or historiography, they actively reshape how this part of Greenlandic history is remembered and offer a new narrative in which the Inuit voices are not overshadowed by those of the colonialism represented by Egede's statue.

50 *ibid.*, p. 536.

51 Hovalt, Daniel: Aktivist om overmalede statuer i Nuuk og København: »For mig handler det ikke om et opgør med danskene«, in: Information, 03.06.2020, www.information.dk/kultur/2020/07/aktivist-overmalede-statuer-nuuk-koebenhavn-handler-opgoer-danskerne#:~:text=Gruppen%20af%20aktivister%20fra%20Nuuk,at%20der%20skal%20ske%20%C3%A6ndringer (05.02.2025).

52 Milman/Doerr: Activists' visibility acts, p. 538.

53 *ibid.*, pp. 536f.

Discussion: Fragmented Transformations and Moral Valuations of History

In Ukraine and in Greenland, statues associated with a medieval ›Golden Age‹, either through the commemoration of medieval figures representing a sovereign Ukrainian past or representing a continued colonial past and present and Indigenous resistance in Greenland, embody fragmented transformations that are deeply intertwined with questions of power, identity, the right to historical narration and geopolitics.⁵⁴

Different uses of the same historical discourse to fulfil different contemporary needs in Ukrainian and Russian rhetorics introduces questions about the significance of statues representing historical events, as well as the validity of this presentation. As presented above, the mythologisation of the medieval past depends on the country presenting it; in Kyiv, Kyivan Rus' is presented as the birthplace of the independent Ukrainian nation through statues of medieval figures that symbolically signify sovereignty and autonomy from Russia.⁵⁵ In the Russian context, the mutual medieval history with Ukraine is emphasised, and importantly, actively revised, in a way that highlights Russian superiority, both historically and in the present, to reject Ukrainian sovereignty and justify Russia's ongoing war in Ukraine.⁵⁶

In Nuuk, the statue of Hans Egede represents a conflicted historical discourse that is interwoven with complex feelings about belonging, land rights, colonialism, and medieval history. Notably, it is not a monument that represents the medieval period itself but raises questions about the reception of me-

54 Donald Trump's 2024–2025 remarks (repeating comments from his previous presidency) on purchasing Greenland underscores enduring imperial ambitions (see Aikman, Ian: Trump Says he Believes US will Get Greenland, in: BBC, 26.01.2025, www.bbc.com/news/articles/crkezj07rzro [18.02.2025]). Trump's statements are further emphasised by Dmitry Peskov, Putin's press secretary, who has reportedly likened this proposal to Russia's annexation of the Ukrainian territories Luhansk, Donetsk, Kherson and Zaporizhzhia in September 2022 (see Van Brugen, Isabel: Russia Draws Parallels Between Trump's Greenland Bid and Ukraine Annexation, in: Newsweek, 09.01.2025, www.newsweek.com/russia-donald-trump-greenland-ukraine-regions-annexed-2012290 [18.02.2025]). Additionally, Trump's recent comments about the war in Ukraine in February 2025, including that Zelenskyy is a ›dictator‹ and that Russia ›holds the cards in any peace talks‹, further demonstrates the complicated and often self-serving nature of the moral valuation of history in global politics, minimising both Greenlandic and Ukrainian sovereignty in the process (see Undheim, Ingeborg/Nordby, Alexander: Norske politikarar reagerer sterkt på Trump-utspel, in: NRK, 19.02.2025, www.nrk.no/norge/reaksjonar-pa-trumps-diktator-utspel-og-retorikk-1.17306710 [20.02.2025]).

55 Gabowitsch/Homanyuk: Responding to Invasion. Snyder: The War in Ukraine.

56 Raffensperger: Reimagining Europe: p. 188. id.: Medieval Kherson.

dieval history both in earlier times and today. Rather than a straightforward rejection of Egede's legacy, Greenlanders remain divided over the statue's continued presence, reflecting in turn the many complexities of decolonisation in its contemporary context.⁵⁷ The reception of Inuit oral stories as representing reverse colonialism, and the continued transformation of the statue of Egede through defacement and activism, introduces a different heritage narrative where the Inuit are not just the ›helpless‹ victim of the past and present that Egede represent, but active participants.

As Tinsley et al. posit, the role of statues in the construction and dissemination of memory and the ability of altered statues and even empty plinths to affect and actively change collective memory »raise questions about the relationship between human agency and material form«.⁵⁸ Statues preserve specific experiences, with the sum of these experiences carrying the possibility to »generate new responses that can raise public awareness«.⁵⁹ In Christchurch, New Zealand, the fragmented transformation of heritage is evident in the addition of two upright *waka* (canoe) sculptures by Ngāi Tahu carver Fayne Robinson in 2019 in Victoria Square Park, opposite the statue of Queen Victoria erected in 1903.⁶⁰ Rather than removing the statue, representing one of the most symbolic colonial figures in New Zealand, the installation, titled *Mana Motuhake* (›self-determination‹), recontextualises the site and fosters dialogue between colonial and Indigenous pasts and presents.⁶¹ This recontextualisation highlights how contested heritage can be transformed into sites of dialogue rather than having to be removed or toppled altogether. This dynamic can also be seen through the transformations of the statue of Egede in Nuuk and the statues representing medieval figures in Kyiv, albeit in different ways.

In Ukraine, statues associated with the Soviet Union or Russia have been toppled, whereas statues of medieval figures in Kyiv, now protected by Russian warfare, have become active sites of resistance as they symbolise a sovereign Ukrainian past and present. Here, reclaiming public space by stretching Ukrainian sovereignty into the medieval past asserts Ukrainian sovereignty and identity against Russian historical appropriation. The statue of Hans Egede in Nuuk represents a complicated colonial past and present

57 Milman/Doerr: Activists' visibility acts.

58 Tinsley et al.: Toppling Statues, p. 5.

59 Paez/Bowrig/Davis: Balance and de Belalcázar, pp. 78f.

60 *ibid.*, p. 83.

61 *ibid.*, p. 84.

and the complexities of decolonisation. The repeated acts of activism changing the appearance and meaning of the statue, through defacement, the addition of Inuit symbols or the transformation of the shepherd's crook to a slaver's whip, has reshaped its meaning and turned it into a powerful symbol of Indigenous resistance. These transformations of heritage underscore how statues are more than just static representations of history, but dynamic sites where the moral valuation of history is constantly recontextualised and renegotiated.

Conclusion

The complexities of contested heritage are manifold, with visualised representations of mythologised medieval history constantly constructed and reconstructed in public history narratives about the past, shaped by shifting power dynamics and moral valuations of history. In this dynamic relationship, the past affects the present as much as the present affects the past. The two case studies discussed here demonstrate how this relationship is manifested through the fragmented transformations of statues, as they transition from symbols of historical authority to contested objects of resistance. This transformation of power distribution reflects broader disruptions in public history narratives, especially in contexts where colonial dissonance is at play. In the two case studies from Greenland and Ukraine, the legitimacy of the dominant historical discourse and colonial frameworks inherent in the physical statues of Hans Egede and Volodymyr is questioned, sometimes contradicted and renegotiated. These transformations remain open-ended as they continue to be shaped by current geopolitical and cultural developments, again reiterating the dynamic nature of heritage as its meanings continue to be negotiated.

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A Spotlight on Topographic Maps in the Baltic Sea Region and Their Path to International Harmonisation

Introduction

During early modern times, some of the greatest and most relevant achievements of cartography occurred in the Baltic Sea region, including outstanding map products like the *Geometrisk upmätning av Pommern 1692–1709* (the Swedish land survey in Pomerania 1692–1709)¹ or geodetic experiments like the *Struve Geodetic Arc*.² Nevertheless, the region marks a typical example of the manifold fragmentations of topographic maps that lasted from the beginning of modern cartography in the 17th century until recent international harmonisation efforts and the availability of satellite-based information for positioning and land cover mapping.

Topographic maps are two-dimensional representations of a land area, representing the location or extent of both natural and human-made features as well as the underlying terrain. From the late 18th century onwards, the production of topographic maps—understood in the sense of systematic, large-scale national cartographic surveys—was primarily carried out by governmental agencies, both military and civilian. These mapping efforts served various purposes, notably military planning as well as fiscal administration.

The aim of this chapter is to highlight topographic maps as an example for the long paths from fragmentation to harmonisation. First, we outline selected important steps along this path from a technical and historical perspective in the context of the Baltic Sea region and Germany in particular. Then, we showcase this development as represented in relevant, historic topographic map products from the Baltic Sea region. We conclude with a look at state-of-the-art provision of historic topographic maps on online geoportals.

1 Baier, Rudolf: Geschichte der Communalstände von Neuorpommern und Rügen. Mit einem Rückblicke auf die ständische Verfassung und Verwaltung der früheren Jahrhunderte, Stralsund 1881, p. 27.

2 UNESCO Word Heritage Convention: Struve Geodetic Arc, whc.unesco.org/en/list/1187/ (30.07.2025).

National and International Harmonisation in Cartography until the Late 19th Century

Technological Progress, International Knowledge Transfer and National Standardisation

Some of the earliest systematic land surveys and map productions were conducted since the second half of the 17th century on Swedish territories, including Livland (today located in Latvia and Estonia) as well as Western-Pomerania (today located in Germany and Poland),³ which were under Swedish control at that time. Although these maps are no map series in the modern sense, they were created with modern techniques employed in all modern map series in the following centuries. But not only that: contrary to the usual practices in European history, where maps were produced by private entities, the Swedish Crown established an education system for land surveyors, issued instructions on which landscape features had to be systematically documented and how they were to be represented on the maps, and sent them to the areas to be mapped on the orders of the government.⁴

In the 17th and 18th centuries, France became the leading nation in geodesy and land surveying, largely due to the work of the *Académie des Sciences*, founded in Paris in 1666. The geodetic framework for this was established by Abbé Jean Picard in 1669/1670. Based on a degree measurement along the Paris meridian using triangulation, he determined the Earth's radius with remarkable precision—even though he still assumed the Earth to be a perfect sphere.⁵ An expedition to Lapland in 1736⁶ is regarded as one of the first international geodetic missions⁷ and produced the first accurate data on

3 Drolshagen, Carl: Die schwedische Landesaufnahme und Hufenmatrikel von Vorpommern als ältester deutscher Kataster I. Beiheft zum 17./38. Jahresbericht der Geographischen Gesellschaft Greifswald, Greifswald 1920; id.: Die schwedische Landesaufnahme und Hufenmatrikel von Vorpommern als ältester deutscher Kataster II. Beiheft zum 40./41. Jahresbericht der Geographischen Gesellschaft Greifswald, Greifswald 1923.

4 Ekstrand, Victor: Samlingar i Landtmäteri—Första samlingen Instruktioner och Bref 1628–1699, Landtmäteri-Kontoret, Stockholm 1901.

5 Torge, Wolfgang: Geschichte der Geodäsie in Deutschland, Berlin/New York 2009, p. 61.

6 Outhier, Reginald: Journal d'un voyage au nord, en 1736. & 1737, Paris 1744.

7 de Maupertius/Camus/Clairaut/le Monnier/Outhier/Celsius: The Figure of the Earth, Determined from Observations Made by Order of the French King, at the Polar Circle, London 1738.

the flattening of the Earth in 1737.⁸ Starting in 1733 under César-François Cassini de Thury (Cassini III), the initial meridian chain was expanded into a nationwide triangulation, which served as the geometric basis for the *Carte géométrique de la France* (1751–1793), produced at a scale of 1:86,400. This was the first topographic and geometric survey of an entire country.⁹ French developments had a significant influence on geodetic practices in other countries. The *École royale du génie* in Mézières, founded in 1748, trained not only French military engineers in surveying and cartography but also officers from Sweden, Russia, and Prussia.¹⁰

The Napoleonic period (1799–1815) also had a major impact on geodesy in the German territories, as Napoleon considered accurate topographic maps essential for military operations. French engineer-geographers carried out systematic triangulation-based surveys in both occupied and allied areas. One example is the survey of the Rhineland,¹¹ which was integrated into the French system.¹² By the late 18th century, several German principalities began their own systematic national surveys. In Saxony, triangulation-based large-scale mapping was initiated in a project from 1780 onward.¹³ In Oldenburg, triangulation was conducted between 1782 and 1798¹⁴ in connection with the Danish network. Other surveys, such as the *Kurhannoversche Landesaufnahme* (1764–1786), still operated at the technical level of the earlier Swedish land survey, relying primarily on plane-table triangulation and lacking a trigonometric framework.

8 Puziene, Ruta: The Struve Geodetic Arc: the development of the triangulation, technical possibilities, and the initiation of the project, in: *History of Geo- and Space Sciences* 10 (2019), No. 2, pp. 269–277, 2019, DOI: 10.5194/hgss-10-269-2019.

9 *ibid.*, p. 273.

10 Dupuit, Jules: Notice sur l'École royale du génie de Mézières (1748–1794), in: *Annales des Ponts et Chaussées* 1862, p. 237 and p. 241.

11 The survey was conducted by Colonel Jean Joseph Tranchot (1752*–1815†, isni.org/isni/0000000083533224) between 1801–1814.

12 Torge, Wolfgang: Der lange Weg der preußischen Landesvermessung: zum 100. Todestag von Oscar Schreiber (1829–1905), in: *ZfV—Zeitschrift für Geodäsie, Geoinformation und Landmanagement* 130 (2005), No. 6, pp. 359–371: p. 360.

13 »Meilenblätter von Sachsen«, Friedrich Ludwig Aster (1732*–1804†, isni.org/isni/000000007830702X).

14 The triangulation was conducted by Georg Christian von Oeder (1728*–1791†, isni.org/isni/0000000122766275).

The Swedish land survey in Pomerania 1692–1709

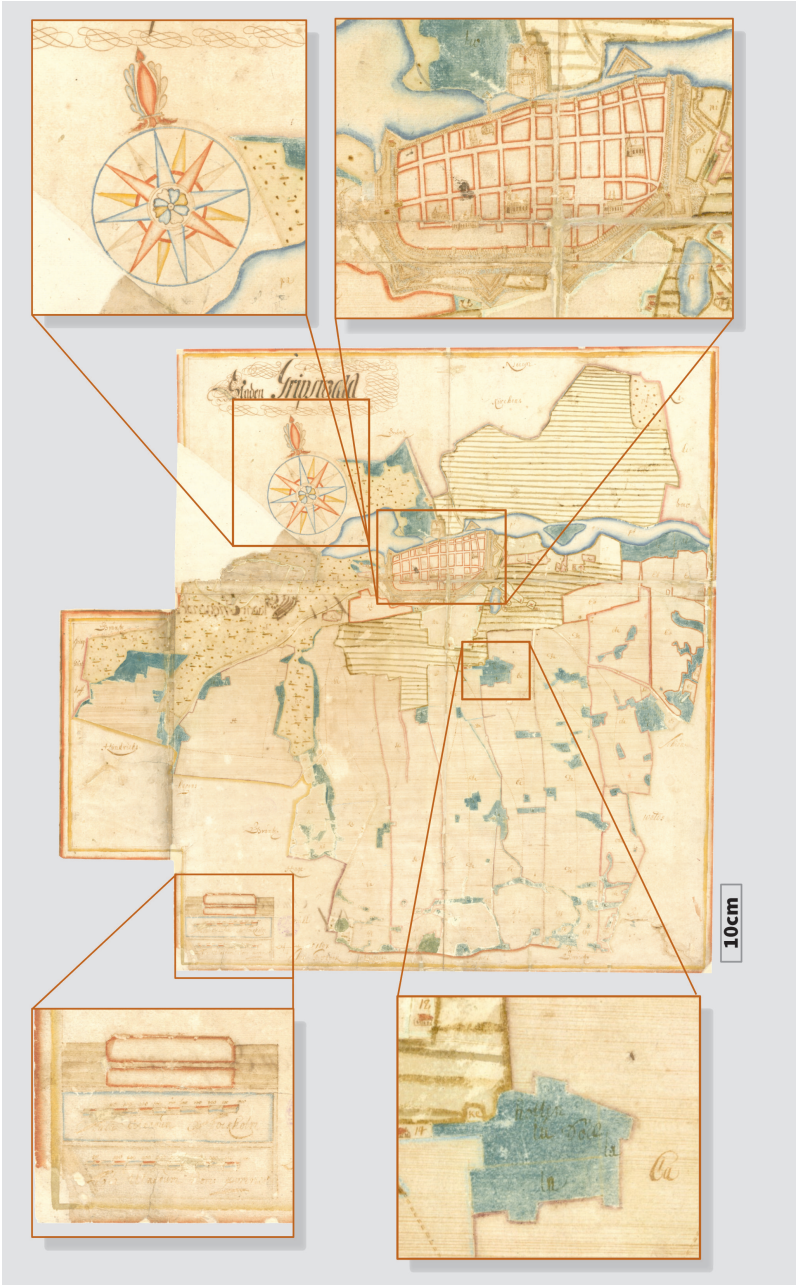
From 1648 to 1815, between the Thirty Years' War and the Congress of Vienna^[1], parts of Pomerania were under Swedish control^[2]. The Swedish Land Survey was initiated under King Charles XI of Sweden (r. 1660–1697) and continued under his successor, King Charles XII (r. 1697–1718). It aimed to systematically record property ownership, the estimated revenue potential of the land, and topographical features in order to improve administrative efficiency and fiscal control. The project was conceptually and organisationally shaped by Carl Gripenhielm (1655–1694), Director of the Swedish Land Survey Office, while field operations in Pomerania were directed by Gunno Eurelius Dahlstierna (1661–1709), who served as inspector of the surveying commission.

The Pomeranian survey is regarded as one of the earliest large-scale cadastral enterprises in Europe, employing triangulation methods. The result was hundreds of maps and accompanying texts, which to this day represent a valuable source for research into early modern settlement structures, land use and socio-economic aspects.

The example shows the map of Greifswald, depicting the city in the upper central part of the image, the Ryck River — shown as the blue-outlined area — flowing from the right side and ending in wetlands in the left section, and extensive fields in the remaining area, accompanied by small meadows indicated by a dark green colour. Forest or woodland is absent. Orientation is provided by a decorative compass rose, and the map scale is presented in a cartouche with scale bars showing distances in Swedish ell and Pomeranian ell.

[1] *As a result of the agreements made at the Congress of Vienna in 1815, Sweden lost its territories in Pomerania.: Klüber, J.L.: Acten des Wiener Congresses in den Jahren 1814 und 1815 - Neunter Band. Hrsg. von Johann Ludwig Klüber. Erlangen, J. J. Palm und Ernst Enke, 1835. S. 275-285,347*

[2] *Since the Peace of Westphalia in 1648, the southern Baltic territories (including Western Pomerania, Wismar, and Bremen-Verden) were legally part of Sweden. Following military defeats in the Great Northern War, Sweden lost most of these possessions. Wismar remained formally under Swedish sovereignty until 1903, although it was pledged to Mecklenburg-Schwerin in 1803 and effectively left Swedish control from that point on.*



Following the Napoleonic Wars, the Prussian geodetic program under Freiherr von Müffling¹⁵ took the French model as its point of reference. The aim was a unified national survey with a trigonometric foundation, connected with the French meridian measurements. Between 1820 and 1876, the *Preußische Urmesstischblätter* at a scale of 1:25,000 were produced—hand-drawn originals intended as base material for later, smaller-scale map series, such as the *Topographische Karte vom Preußischen Staate 1:100,000* (from 1831), a predecessor of the *Karte des Deutschen Reiches 1:100,000*.¹⁶

From 1832 to 1835, Friedrich Wilhelm Bessel¹⁷ and Prussian Lieutenant General Johann Jacob Baeyer¹⁸ conducted a meridian arc measurement in East Prussia, completing Müffling's triangulation and linking it to Russian networks. The coastal survey (1837–1842) and the Danish connection (1839–1841) further extended the network across the Elbe.¹⁹ In contrast to the predominantly nation-state-oriented political thinking of the time, this clearly demonstrates that the goals within the geodetic professional community were more strongly aligned with transnational thinking.

The demand for standardisation was intensified as part of the unification of Germany in 1871. This led to the introduction of the metre as the official unit of length in Germany (1870/1872),²⁰ replacing a wide range of traditional units²¹ and creating a uniform system of measurement across the new nation-state. This step was closely connected to the recommendations of the *Mitteleuropäische Gradmessung* (Central European Arc Measurement) from 1862, an international scientific initiative founded by Baeyer.²² In addition, the *Metre Convention* was signed in Paris in 1875 by 17 nations, including the

15 Friedrich Carl Ferdinand Freiherr von Müffling (1775*–1851†); Gothaisches genealogisches Taschenbuch der freiherrlichen Häuser. Vier und dreißigster Jahrgang, Gotha 1884, p. 579.

16 Staatsbibliothek Berlin: Frühe Landesaufnahmen Preußens und anderer Länder. Quellen und Highlights für die Forschung, kartenhighlights.staatsbibliothek-berlin.de/fruehe-landesaufnahmen-preussens-und-anderer-laender/ (30.07.2025).

17 1784*–1846†, isni.org/isni/0000000108797331.

18 1794*–1885†, isni.org/isni/0000000109046724.

19 Torge: Der lange Weg der preußischen Landesvermessung, p. 362.

20 Proebst, Max: Die Verfassung des Deutschen Reichs vom 16. April 1871 nebst verfassungsrechtlichen Nebengesetzen, Verträgen u. mit Anmerkungen und Sachregister, Nördlingen 1885, p. 27.

21 Boehn, Hubert von: Generalstabsgeschäfte: ein Handbuch für Offiziere aller Waffen, Potsdam 1862, pp. 255–258.

22 Baeyer, Johann Jacob: General-Bericht über den Stand der mitteleuropäischen Gradmessung Ende 1862, Berlin 1862.

Baltic Sea region states of Germany, Denmark, Sweden and Norway, as well as Russia.²³

Despite the high quality of the survey and map production and the trend towards harmonisation of maps as part of movements for national unification, topographic maps still marked a geographically limited endeavour. In 1861, Baeyer suggested the consolidation of all national geodetic triangulation networks into a unified European triangulation network.²⁴ This proposal²⁵ was accepted and ordered by King William of Prussia in the same year.²⁶ One year later, all major German states, such as Bavaria, Saxony, and Hanover, along with nine international countries, including Belgium, Italy, Austria, and Norway, joined this amicable project.

Harmonisation through International Collaboration

More critical was the harmonisation of the geographic coordinate system. While the equator provided a logical reference for defining 0° latitude, agreeing on a prime meridian (0° longitude) proved to be far more complicated (see Table 1). For example, Sweden based its central meridian on the longitude of the Stockholm Observatory, Russia used Pulkovo Observatory, and Prussian (later German) maps referenced Ferro, referring to the Spanish Canarian Island of El Hierro. Although the Ferro meridian had already been in use since the time of Ptolemy, it was Cardinal Richelieu²⁷ who, in 1634, formally adopted it as the reference meridian for France and promoted it as a standard for the broader civilised world.²⁸ It marks the western edge of the ancient Old World and was therefore a useful prime meridian in coordinate systems designed to assign positive values to locations east of it. Maps and the coordinates measured on different prime meridians were hardly, or sometimes simply not, comparable

23 Ris, Friedrich: Zur Geschichte des internationalen Mass- und Gewichtsbüreau's und der neuen Prototype des Meters und des Kilogramms, Bern 1890, pp. 27–29.

24 Baeyer, Johann Jacob: Über die Größe und Figur der Erde. Eine Denkschrift zur Begründung einer mittel-europäischen Gradmessung nebst einer Übersichtskarte, Berlin 1861, p. III.

25 Engel, Ernst: Die mitteleuropäische Gradmessung und die erste allgemeine Conferenz der von den Regierungen der beteiligten Staaten dazu Bevollmächtigten in Berlin vom 15. bis 22. October 1864, in: Zeitschrift des Königlich Preussischen statistischen Bureaus. Band 4, 1864, p. 238.

26 Baeyer, Johann Jacob: Zur Entstehungsgeschichte der europäischen Gradmessung, Berlin 1862], p. 6, urn:nbn:de:bvb:12-bsb10053757–8.

27 Armand-Jean du Plessis, duc de Richelieu (1585*–1642†, [isni.org/isni/00000000069180450](https://www.isni.org/isni/00000000069180450)).

28 Figueras y Pey, D. Josè: Lecciones de geografia astronómica, física y política, Barcelona 1848, p. 51.

between various regions in Europe. This changed fundamentally with the adoption of a common prime meridian. In 1884, delegates from 26 countries, including Germany, Denmark, Sweden–Norway, and Russia, met at the International Meridian Conference in Washington D.C.²⁹ and established the *prime meridian*, passing through the Greenwich Observatory in the United Kingdom, as the initial longitude to be used in a global system of plus/minus 180 degrees to the east and west, respectively. This decision marked a milestone in the harmonisation of European cartography after centuries of fragmentation.

From a technical perspective, the path to more harmonised cartography not only included international agreements and conventions, but also innovation and pioneers of engineering. In particular, there was great uncertainty about the shape of the Earth for a long time. Therefore, French expeditions to Peru and Lapland, also in the second half of the 18th century, were needed to finally prove that the Earth was not a perfect sphere but an ellipsoid that is flattened at the poles.³⁰ While the flattening could be shown, its factor was only vaguely defined. Following this, the Baltic Sea region was home for one of the key advancements towards a more precise description of the ellipsoid. From 1816 to 1852, a multinational project between Russia, Sweden and Norway was performed:³¹ the *Struve Geodetic Arc*³² (Box 2). The resulting estimate of the Earth's radius at the equator deviated only ~160 m from today's satellite-based estimates³³ and the degree of flattening was estimated to be about 0.3393 % (1/294.73) of the Earth radius instead of ~0.3353 % (1/298.26), as estimated by satellite geodesy today.³⁴

29 U.S. Department of State: International Conference Held at Washington for the Purpose of Fixing a Prime Meridian and a Universal Day. October 1884. Protocols of the Proceedings, Washington D.C. 1884.

30 Biot, M.: XIX. Observation relating to the operations determine the Figure of the Earth, in: The Philosophical Magazine 52 (1818), No. 244, pp. 119–131: p. 122, <https://doi.org/10.1080/14786441808652017>.

31 Ersch, J. S./Gruber, J. G.: Allgemeine Encyclopädie der Wissenschaften und Künste in alphabetischer Folge von genannten Schriftstellern bearbeitet und herausgegeben von J. S. Ersch und J. G. Gruber. Mit kupfernen Charten. Erste Section A–G. Siebenundsiebzigster Theil. GRAAGAAS–GRADISCA, Leipzig 1864, p. 21.

32 Petermann, A.: Die Grosse Russisch-Skandinavische Breitengrad-Messung zwischen der Donau-Mündung und dem Nordende Europa's, in: Mittheilungen aus Justus Perthes' Geographischer Anstalt über wichtige neue Erforschungen auf dem Gesamtgebiete der Geographie von Dr A. Petermann, Gotha 1857, pp. 315–321.

33 »a = 6378137 m semimajor axis«; Moritz, H.: Geodetic reference system 1980, in: Bulletin Géodésique 54 (1980), pp. 395–405: p. 402, DOI: 10.1007/BF02521480.

34 »Im = 0,5130741 Toisen«; Rüdigisch, Robert von: Instrumente und Operationen der niederen Vermessungskunst, Cassel 1875, p. 9; »le demi grand-axe de la Terre a = 3272539 toises«; Struve, F. G. W.: Arc du méridien de 25°20' entre le Danube et la Mer Glaciale, mesuré depuis 1816 jusqu'en 1855, St.-Pétersbourg 1860, p. 84.

By the end of the 19th century, the technical basis and first formal international agreements had been established, yet the path towards fully harmonised topographic maps was still long.

The Struve Geodetic Arc



The Struve Geodetic Arc is a geodetic experiment across nowadays ten countries of the Baltic Sea Region. Starting in Fuglenes now district of Hammerfest, Norway, it stretches over 2820 km to Ismajil, Ukraine, at the Black Sea along 26° East (+/- 3°). The precise bearing of locations approximately along a single meridian are basis for estimating the exact size of the Earth and degree at which it is flattened at the poles. Initiated and led by the two astronomers and geodesists Friedrich G. W. Struve, working at Dorpat University (today Tartu, Estonia) and Carl Tenner, one of the founders of Russian geodesy, 265 survey points were precisely triangulated between 1816 and 1855 creating an arc of triangles spanning more than 25° latitude. The Struve Arc marked the longest experiment of its kind by that time and led to estimates that only slightly deviate from today's satellite based measurements. The Struve Geodetic Arc is a World Heritage Site and, beside others, two monuments mark the endpoints in Fuglenes and Stará Nekrasivka.

Source (modified): Struve Geodetic Arc-zoom-en.svg, (2022, June 30), Wikimedia Commons, Retrieved August 7, 2025, from https://commons.wikimedia.org/w/index.php?title=File:Struve_Geodetic_Arc-zoom-en.svg&oldid=669950798 ©CC BY-SA 4.0
photos: Fuglenes by Vesna Vujčić-Lugassy, ©CC BY-SA 3.0 IGO ©UNESCO
Stará Nekrasivka by VileGecko, ©CC BY-SA 4.0

Phases of Harmonisation and Fragmentation in the 20th Century

First Approaches to Pan-European Cooperation in the Early 20th Century

By 1900, the entire Baltic Sea region was comprehensively mapped, albeit through a mosaic of national map series (see Figure 1). The national systems still varied in the selection of landscape features, symbolism, scales, underlying coordinate systems, and geodetic projections (Table 1). Distance and area estimates across map products were impossible, as most maps were based on national coordinate reference systems, which were most accurate in the respective national centres and increasingly distorted towards the border regions. Geodesists across Europe recognised the need to link national triangulation networks across borders to establish a scientifically robust and consistent geodetic framework for the entire continent.

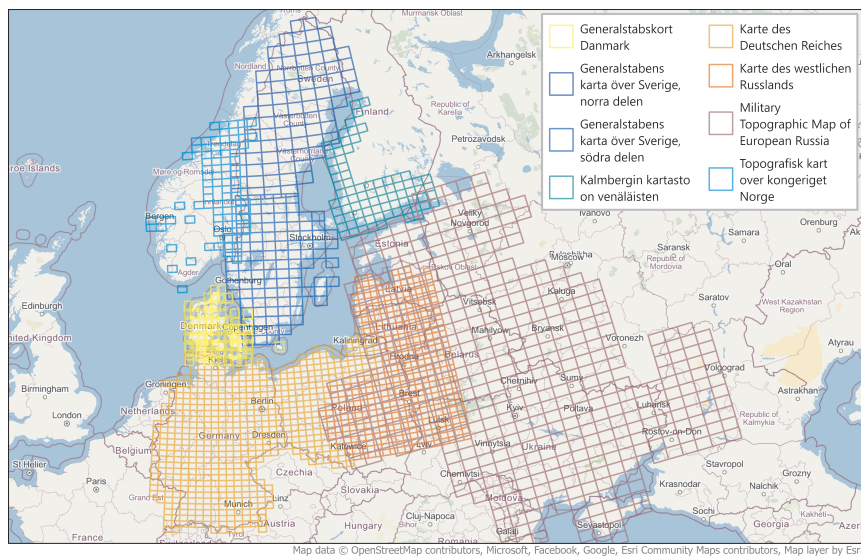


Figure 1: Mosaicked representation of the map sheet indices for different national map series in the Baltic Sea region around the year 1900. While the land area is comprehensively covered, clear differences exist in the underlying projection parameters. (Note: Around 1900, Norway and Russia did not have comprehensive map coverage at a scale of 1:100,000. An (incomplete) map index was compiled from available sheets.)

Table 1: Overview of national map series in the Baltic Sea region around the year 1900 with information on scales, used central meridians and reference systems (based on Alexander Supan 1887³⁵).

Title	Scale	Period	Central Meridian	Reference System
<i>Generalstabens karta över Sverige, norra delen</i> (Finland, Sweden, Norway)	1:200,000	1880–1940	Stockholm	Spén's on Clarke 1880
<i>Generalstabens karta över Sverige, södra delen</i> (Denmark, Norway, Sweden)	1:100,000	1880–1940	Stockholm ³⁶	Lambert conformal conic on Svanbergs's ellipsoid
<i>Generalstabskort Danmark</i> (Denmark, Germany)	1:100,000	1842–1899	Copenhagen	Prussian polyhedral projection, G5 projection on Clarke 1858
<i>Kalmbergin kartasto on venäläisten</i> (Finland, Russia)	1:100,000	1855–1856	(Pulkovo) ³⁷	Bonne projection on Bessel 1841
<i>Karte des Deutschen Reiches</i> (Austria, Belgium, Czechia, Denmark, France, Germany, Lithuania, Netherlands, Poland, Switzerland)	1:100,000	1878–1926	Ferro, partially Greenwich ³⁸	Polyhedral projection
<i>Karte des westlichen Russlands</i> (Estonia, Latvia, Lithuania, Poland, Russia)	1:100,000	1897–1917	Ferro ³⁹	Polyhedral projection
<i>Topografisk kart over kongeriget Norge</i> (Norway, Sweden)	1:100,000	1867–1956	Oslo (Kristiania)	Cassini-Soldner projection
<i>Военно-топографическая карта Европейской России</i> (Military Topographic Map of European Russia) (Belarus, Estonia, Latvia, Lithuania, Moldavia, Poland, Ukraine, Russia)	1:126,000	1846–1917	Pulkovo ⁴⁰ , Paris, Ferro, Warsaw	Bonne projection on Bessel 1841 ⁴¹

A milestone in early international cooperation was the establishment of the Baltic Geodetic Commission (BGK) in 1924. With the participation of Denmark, Germany, Estonia, Finland, Latvia, Lithuania, Poland, and Sweden, the

35 Supan, Alexander: Übersicht der offiziellen topographischen Landesaufnahmen. Geographischer Litteratur-Bericht Nr. 89–92, in: id. (ed.): Dr. A. Petermann's Mittheilungen aus Justus Perthes' Geographischer Anstalt. Band 33, Gotha 1887, p. 23.

36 Mugnier, Clifford J.: Grids & Datums—The Kingdom of Sweden, in: Photogrammetric Engineering & Remote Sensing 88 (2022), No. 5, pp. 289–291: p. 290, DOI: 10.14358/PERS.88.5.289.

37 Although the so called Kalmberg Atlas does not explicitly specify its prime meridian, its origin within the Russian military cartographic framework strongly suggests the use of the Pulkovo meridian as its longitudinal reference. This meridian was standard in Russian topographic works of the 19th century.

38 Reichsamt für Landesaufnahme: Das Reichsamt für Landesaufnahme und seine Kartenwerke, Berlin 1931, p. 68.

39 *ibid.*

40 Haag, Heinrich: Die Geschichte des Nullmeridians, Leipzig 1913, p. 72.

41 k.u.k. Reichskriegsministerium (ed.): Mitteilungen des k.u.k. Militärgeographischen Institutes. XXIV. Band, Wien 1905, p. 203.

BGK initiated an ambitious project: the creation of the so-called ›Baltic Ring‹. The aim was to establish a high-precision, closed chain of first-order triangulation points around the Baltic Sea. This almost 3000 km long polygon network was intended to connect the national networks and create a uniform geodetic base for the entire region.⁴² Although the project could not be completed due to the outbreak of World War II, it laid the foundation for later European networks.⁴³

Military and Technological Transformations

With the beginning of the 20th century, rapid technological innovation opened up new possibilities for land observation and surveying. Aerial photography soon became an important factor, especially for covering more remote areas.⁴⁴ The digitisation of land features from imagery and the use of photogrammetric techniques to derive terrain elevation had significantly simplified the creation and updating of topographic data.⁴⁵ Parallel to this, terrestrial surveying gradually improved due to the increasing accuracy of measuring instruments, yet the major advances towards more harmonised cartography in the 20th century were largely driven by international wars and military demands.

One notable example is the globally used Universal Transverse Mercator (UTM) coordinate system, which likely originated from German military developments around 1943/1944⁴⁶ and may have been independently invented or derived—possibly as a result of knowledge transfer—by the United States Army in the 1940s.⁴⁷ Nevertheless, it was the U.S. Army who adopted and globally established the UTM system in the 1950s. The system provides a global reference

42 Kakkuri, Juhani: The Baltic Geodetic Commission: Its Activities and Publications. Proceedings of the IAG General Assembly, Rio de Janeiro, published by Finnish Geodetic Institute, 1997.

43 Torge, Wolfgang: Geodesy. Third Edition, Berlin/New York 2001, pp. 188f.

44 Collier, Peter: The Impact on Topographic Mapping of Developments in Land and Air Survey: 1900–1939, in: Cartography and Geographic Information Science 29 (2002), No. 3, pp. 155–174, DOI: 10.1559/152304002782008440.

45 Smith, Scot E.: Topographic mapping, in: Sabine Grunwald (ed.): Environmental Soil-Landscape Modeling. Geographic Information Technologies and Pedometrics, Boca Raton/London/New York 2006, pp. 155–182.

46 Buchroithner, Manfred F./Pfahlbusch, René: Geodetic grids in authoritative maps—new findings about the origin of the UTM Grid, in: Cartography and Geographic Information Science 44 (2016), No. 3, pp. 186–200, DOI: 10.1080/15230406.2015.1128851.

47 War Department: Chapter 17—Military Grid Reference System, Section I. Military Grid System, 243. General, in: War Department Technical Manual. Orientation for Artillery, 30 June 1944, Washington 1944, p. 4 and p. 16.

within a conformal metric coordinate system, i.e., a coordinate system in which angles are correctly represented on the map, by using a systematic grid of local projections along central meridians within 6° wide zones. It builds on the work of Gauß⁴⁸ and Krüger⁴⁹ that was adopted by German cartography after 1917.⁵⁰ In the beginning, the UTM system used two ellipsoids in parallel: the 1866 Clarke ellipsoid⁵¹ for the contiguous United States and Alaska, and the Hayford (International) ellipsoid⁵² for the rest of the world. Only several decades later, with the introduction of the Geodetic Reference System 1980 (GRS80),⁵³ a global reference ellipsoid based on satellite geodesy was adopted at the *XVII General Assembly of the International Union of Geodesy and Geophysics* (IUGG) in Canberra, Australia, 1979.⁵⁴ This system has an accuracy that allows its use until present and is (quasi) identical with the World Geodetic System 1984 (WGS84)⁵⁵ which is the standard in satellite navigation.

The Cold War: A Divided Geodetic and Cartographic World

The era of pan-European geodetic cooperation ended abruptly with the division of Europe after 1945. The Baltic Sea became the seam between two hostile military blocs, leading to a complete decoupling of geodetic foundations and map series.

In the Western littoral states (Federal Republic of Germany, Denmark, Norway, with Sweden and Finland as a neutral buffer zone), geodetic unification was driven by NATO for military purposes. The result was the European Datum 1950 (ED50), based on the International Ellipsoid of 1924 (Hayford).⁵⁶ For cartographic representation, the Universal Transverse Mercator (UTM) coor-

48 Johann Carl Friedrich Gauß (1777*-1855†, isni.org/isni/00000000121257962).

49 Johann Heinrich Louis Krüger (1857*-1923†, isni.org/isni/00000000013497395).

50 Reichsamt für Landesaufnahme: Das Reichsamt für Landesaufnahme und seine Kartenwerke, p. 31.

51 Clarke, Alexander Ross: Geodesy, Clarendon Press Series, Oxford 1880, p. 319.

52 Hayford, John F.: The Figure of the Earth and Isostasy from Measurements in the United States. Special publication no. 82, Department of Commerce and Labor Coast and Geodetic Survey, Washington, Government Printing Office 1909, p. 174.

53 Moritz: Geodetic reference system 1980.

54 Melchior, P.: COMPTES RENDUS de la XVII Assemblée Générale de l'U.G.G.I. Canberra, 3–15 décembre 1979, publiés par le Secrétaire Général Paul Melchior, Deuxième partie, 1979, p. 621.

55 Department of Defense: World Geodetic System 1984. Its Definition and Relationship with Local Geodetic Systems, DMA Technical report, DMA TR 8350.2, Second Edition, 1991.

56 Hooijberg, Maarten: Geodetic Surveying and the European Datum, in: id.: Practical Geodesy: Using Computers, Berlin/Heidelberg 2007, pp. 91–105.

dinate system became the standard in the military sphere, enabling standardised, metric positioning across all NATO countries. However, civilian maps of the western Baltic Sea countries often remained stuck in their national systems for a long time, which continued to cause compatibility problems at the borders.⁵⁷ This period thus marked a phase of military standardisation, while civil map fragmentation still persisted.

For the Warsaw Pact region, the Soviet Union established its own strictly centralised and secret geodetic system for its sphere of influence. The German Democratic Republic, Poland, and the Baltic Soviet republics were forcibly integrated into this system. The geodetic basis was System 42 (S-42), internationally known as Pulkovo 1942. This datum referred to the Krassowski Ellipsoid of 1940, calculated in the USSR, which differed significantly in its dimensions from the Hayford ellipsoid. The Gauss–Krüger system was employed as the cartographic projection.⁵⁸ As in the Western Bloc, for civil purposes, each Member State of the Warsaw Pact used its own system.

Bridging Europe: The Post-1990 Geodetic Unification

The fall of the Iron Curtain revealed the full extent of the geodetic division. Creating a unified geodetic basis became a priority to support the political and economic integration of Europe. The driving force behind this unification was the IAG (International Association of Geodesy) sub-commission *EUREF* (European Reference Frame). The goal was to define and realise a unified, high-precision European reference system compatible with global systems like the WGS84 used by GPS. The result was the *European Terrestrial Reference System 1989* (ETRS89).⁵⁹ ETRS89 is based on the global GRS80 ellipsoid and fixed to the stable part of the Eurasian tectonic plate. It is the standard coordinate reference system across EU countries and typically used with UTM projection.⁶⁰ This continental scale initiative was supported by the technological advancements of

57 Iliffe, Jonathan C./Lott, Roger: *Datums and Map Projections: For Remote Sensing, GIS and Surveying*, Dunbeath, UK/Boca Raton, Florida 2008, p. 78.

58 Poder, Knud/Madsen, Frede: *The Connection of the East European countries to EUREF*, in: Gubler, E./Hornik, H. (eds.): *Report on the Symposium of the IAG Subcommittee for Europe (EUREF) held in Ankara, 22–25 May 1996*, EUREF Publication No. 5, 1996, pp. 134–141.

59 Gurtner, W. et al.: *EUREF: The new European Terrestrial Reference Frame*. Proceedings of the 2nd International Symposium on Precise Positioning with the Global Positioning System (GPS '90), Ottawa, Canada 1990.

60 COMMISSION REGULATION (EU) No 1089/2010 of 23 November 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoper-

the satellite era. Global Navigation Satellite System (GNSS), e.g., GPS, GLONASS, BEIDOU, Galileo, allow for highly precise location measurements on the Earth's surface from space. Nowadays, differential measurements combining the satellite-based estimates with correctional signals from fixed receiving stations allow accuracy in the sub-centimetre range even for mobile surveys.⁶¹

A crucial step in integrating the former Eastern Bloc countries was the EUREF-BAL '92 GPS campaign. Led by the Nordic Geodetic Commission (NKG), GPS measurements were carried out at points in the Baltic states, Poland, Germany, and Scandinavia. This campaign built the first precise geodetic bridge across the former system boundary and enabled the transformation of the eastern national networks into ETRS89.⁶² Cooperation was also institutionalised in hydrography through the Baltic Sea Hydrographic Commission (BSHC), which established the Baltic Sea Chart Datum 2000 (BSCD2000) to ensure consistent depth information throughout the Baltic Sea.⁶³ Another continent-wide decision was the adoption of the EU directive establishing the *Infrastructure for Spatial Information in the European Community* (INSPIRE⁶⁴). Its goal is to create a unified geospatial data infrastructure to support environmental policy and related activities. As part of INSPIRE, several geospatial reference data sets are to be produced in a harmonised way across Europe and made freely accessible.

Examples of Fragmentation in Topographic Maps

Several of the milestones on the path from fragmentation to harmonisation in cartography took decades to be implemented. This latency is mostly explained by the low frequencies of comprehensive updating of land surveys before the availability of satellite data. Especially in the 19th century and along the Prussian

ability of spatial data sets and services. Annex I, Section 2.2.1, ANNEX II, Section 1.2, 2010, ELI: data.europa.eu/eli/reg/2010/1089/oj.

61 Petropoulos, George P./Srivastava, Parshant K. (eds.): *GPS and GNSS Technology in Geosciences*, Amsterdam/Oxford/Cambridge, MA 2021, pp. 41–49.

62 Jaworski, L./Kryniski, J./Zielinski, J. B.: EUREF-BAL '92 GPS Observation Campaign, in: Gubler, E./Hornik, H. (eds.): *Report on the Symposium of the IAG Subcommittee for Europe (EUREF) held in Budapest, 17–19 May 1993*, EUREF Publication No. 3, 1993.

63 Schwabe, J. et al.: *The Baltic Sea Chart Datum 2000 (BSCD2000). Implementation of a common reference level in the Baltic Sea*, in: *International Hydrographic Review*, May 2020, pp. 63–83.

64 Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE), 2007, ELI: eur-lex.europa.eu/eli/dir/2007/2/oj.

map series (*Preußische Meßtischblätter*) from the near-Baltic German regions, the slow introduction of new standards and the partly parallel maintenance of systems can be highlighted.

Figure 2 shows a digitised version of the sheet *Hadersleben* of the *Karte des Deutschen Reiches* (Map of the German Empire). The survey was performed in 1877 and the map series released in 1880. The presented edition dates to 1918, when the decision on the Greenwich Prime Meridian⁶⁵ was 34 years old. The coordinate system is still referenced to Ferro; however, the map frame includes the following remark: »Im Gradnetz der Landesaufnahme liegt Greenwich 17°39'57.6" east of Ferro.« (In the graticule of the topographic survey Greenwich lies 17°39'57.6" east of Ferro.)



Figure 2: *Karte des Deutschen Reiches*, sheet 7. Hadersleben, edition from 1918 (B), Ferro as prime meridian was still in use (A). However, a note indicates the position of Greenwich relative to Ferro (C).

Later, both coordinate systems were shown (Figure 3), as displayed in an example from the *Meßtischblatt*, sheet *Greifswald*, survey 1885, corrected in 1920.

⁶⁵ The implementation of the resolutions of the 1884 Meridian Conference was significantly delayed in national practice due to political fragmentation.

The different ways of representing the transition between the systems in sheets from the same map series shows the challenges for cartography to adapt to new standards and to move from fragmented approaches to more harmonised ones.

Similarly, the symbology within maps also developed further and every new advancement led to transition periods. This can best be shown by looking at the techniques used to represent terrain elevation. For several decades, Prussian maps—like those of most other European countries—used hachures (German: *Schraffen*) to depict relative changes in elevation. Modern maps, by contrast, employ contour lines representing locations of equal elevation. In addition to the absolute information within the contour lines, their densities indicate steepness and the convergence or divergence of neighbouring lines represent the local morphology. The transition involved a significant amount of manual labour, meaning that there are some individual maps for which the transition had not been fully completed by the time the new edition was published. Figure 4 highlights such a sharp boundary between the traditional and new approach in a map published in 1888 and edited in 1918.

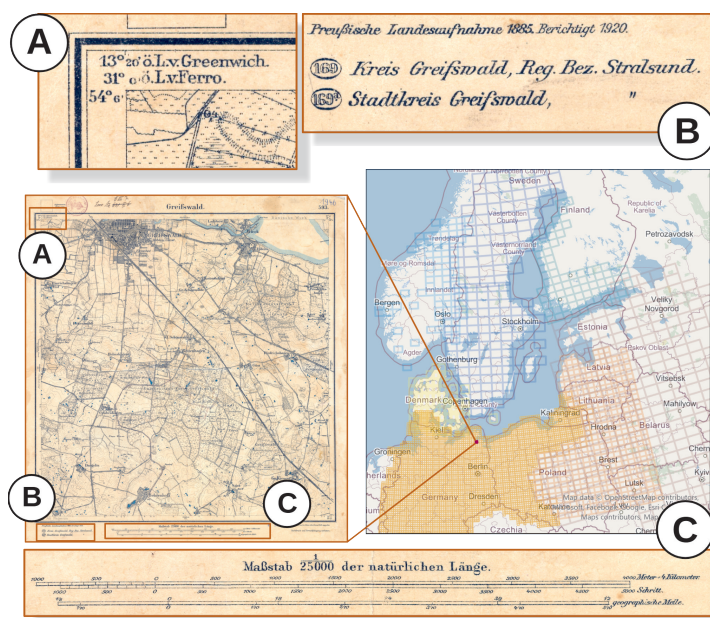


Figure 3: *Mefstischblatt*, sheet 593 (1460). Greifswald, edition from 1920 (B). The map frame shows both prime meridians: Ferro and Greenwich (A). The scale bar shows modern metres and antique length units, which are still in use (C).

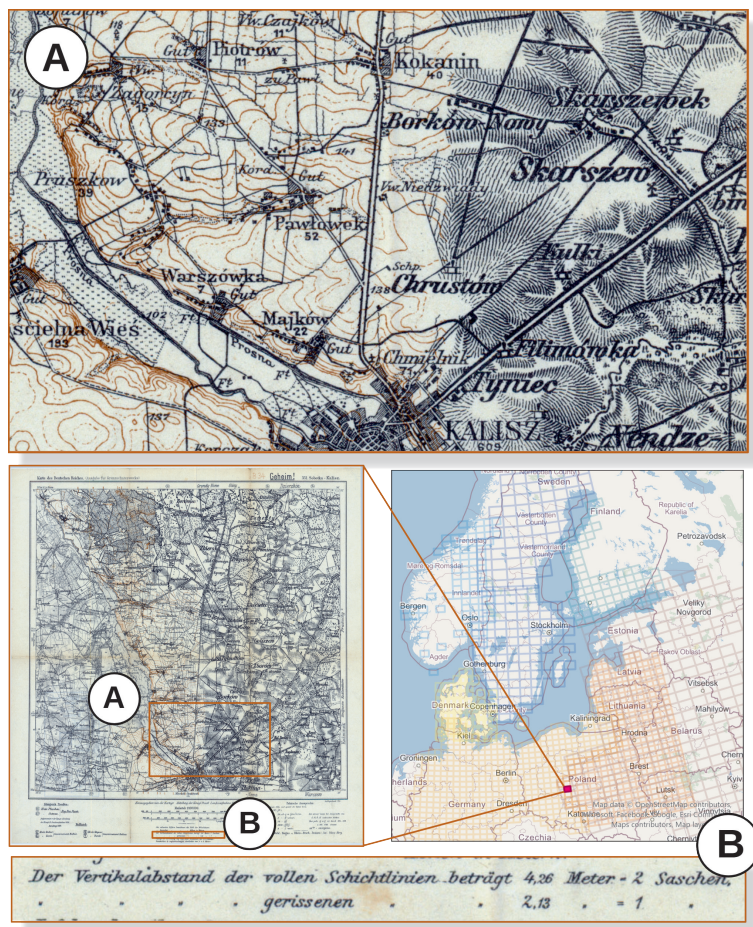


Figure 4: Karte des Deutschen Reiches, sheet 351. Sobotka–Kalisz. The map illustrates the transitional period between the use of outdated hachures and modern contour lines. In some cases, maps were only partially updated, resulting in the coexistence of hachures and contour lines. However, the contour lines still reference old vertical datums, such as the »Saschen« (1 Saschen = 2.13 metres).

Nevertheless, the fact that cartography placed a certain degree of importance on consistency in its products makes the results from different editions more comparable after updates to land survey. This can be seen in Figure 5 highlighting the city of Greifswald and its surroundings in the *Preußisches Meßtischblatt*⁶⁶ (scale 1 : 25,000) as released 1886 and 1940. The high efforts put into early editions

66 Torge: Der lange Weg der preußischen Landesvermessung, p. 361.

allowed the authorities to maintain symbology throughout several decades. Therefore, the different editions appear uniform and the actual changes in topography, which were updated in 1920, can be clearly differentiated, e.g., additional buildings in the city's extension to the south-east.

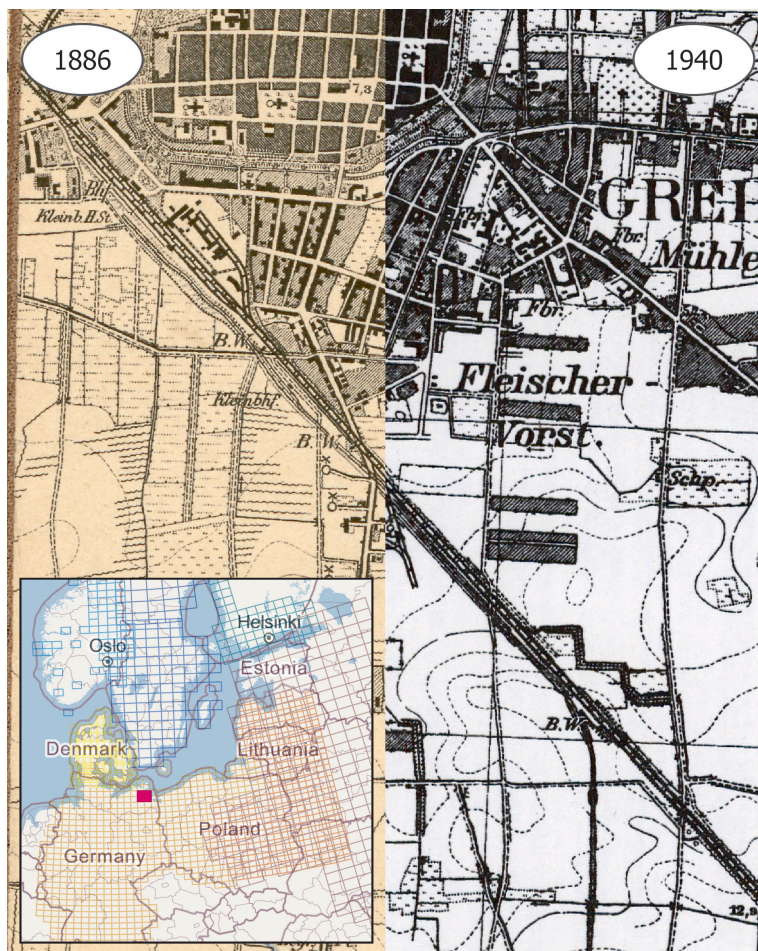


Figure 5: *Preußisches Meßtischblatt*, sheet 1946. Greifswald, edition 1886 (left) and 1940 (right). The development of the city is clearly visible by comparison—assisted by the consistency of symbolisation.

In summary, the examples illustrate the fragmentation of cartographic standards in the 19th century, when numerous national map series were launched in the countries bordering the Baltic Sea. Alongside technical advancements, the

necessity for standardisation of key cartographic conventions was progressively acknowledged and systematically addressed. Nevertheless, the required decisions unfolded over a long period, and even after the introduction of new regulations, it took several decades before they were fully implemented in map production.

Topographic Mapping and Transnational Data Provision in the 21st Century

Surveying and the creation of topographic maps in the 21st century are characterised by a high level of global standardisation. The SI System, global ellipsoids and internationally coordinated and harmonised satellite measurements mark the basis for information transfer across national boundaries. Although the coordinate reference systems may still differ, especially between countries on different continents, the digital age and GRS80/WGS84 as underlying, fully defined ellipsoids allow for an on-the-fly translation between standards. Web-based and interactive maps have become a major source for sharing spatial information. Via so-called *geoportals*, administrative topographic information is shared, to an increasing extent free-of-charge.⁶⁷ Parallel to this, community-based, free and open-source products, such as Open Street Map (OSM),⁶⁸ are becoming increasingly important in many areas of application, for example in maps for humanitarian missions.⁶⁹ They are organised transnationally and are often the most up-to-date,⁷⁰ and therefore replace official topographic maps in many respects. Moreover, topographic information is complemented by frequently updated information on land cover or land use derived from Earth observation satellite imagery, for example within the European Union's Copernicus Land Monitoring Service programme.

Geoportals are also increasingly being used to share scientific results or data products that may be used for scientific analyses. One example of such

67 European Commission: European legislation on open data, digital-strategy.ec.europa.eu/en/policies/legislation-open-data (09.03.2026).

68 OpenStreetMap, www.openstreetmap.org.

69 McGowan, Bethany Sherise: OpenStreetMap mapathons support critical data and visual literacy instruction, in: *Journal of the Medical Library Association* 108 (2020), No. 4, p. 649f., DOI: 10.5195/jmla.2020.1070.

70 Neis, Pascal/Zielstra, Dennis: Recent Developments and Future Trends in Volunteered Geographic Information Research: The Case of OpenStreetMap, in: *Future Internet* 6 (2014), No. 1, pp. 76–106, DOI: 10.3390/fi6010076; Borkowska, Sylwia/Bielecka, Elżbieta/Pokonieczny, Krzysztof: Comparison of Land Cover Categorical Data Stored in OSM and Authoritative Topographic Data, in: *Applied Sciences* 13 (2023), No. 13, 7525, DOI: 10.3390/app13137525.

geoportals is the IFZO Baltic Sea Region Geoportal.⁷¹ It gives users access to georeferenced compilations of digitised historic maps for selected time frames (e.g., Figure 1) or to results from multi-year mappings based on Earth observation data, like the *Baltic Sea Region Land Cover Plus* products.⁷² This way, regular updates on e.g., forest dieback or regrowth, peatland restoration or urban expansion are provided for the Baltic Sea region from region-wide harmonised data and models. Although such products do not achieve the geometric accuracy needed for official topographic maps, their regular updating and e.g., annual coverage of transnational regions, substitute information that was traditionally taken from topographic maps.

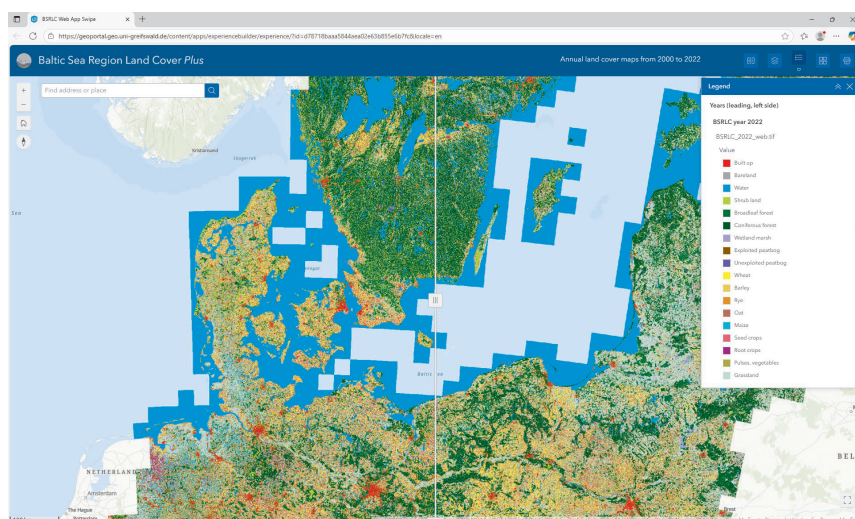


Figure 6: The BSRLC+ is presented as an interactive web map within the IFZO Geoportal. The application includes standard tools such as a map legend, distance measurement, location search, and a swipe tool for comparing land cover between two different years.

After more than three centuries of topographic map creation, a long way has been travelled towards complete international harmonisation in the field of topographic cartography. The state of technical development, international standards and digital data management capabilities no longer pose challenges

71 Interdisciplinary Centre for Baltic Sea Region Research (IFZO): IFZO Geoportal, ifzo-gis.g eo.uni-greifswald.de.

72 Pham, V.-D. et al.: BSRLC+: An annual land cover dataset for the Baltic Sea Region with crop types and peat bogs at 30 m from 2000 to 2022 (1.0) [Data set], Zenodo, 2024, DOI: 10.5281/zenodo.10653871.

for transnational map products. Nevertheless, administrative topographic information remains under national authority (and, in the case of Germany, even under state-level authority). This last step towards harmonisation at EU-level, and thus for most of the Baltic Sea region, requires only the will and consent of the member states. At the same time, thematic maps are already provided at the EU-level for an increasing number of fields and with steadily higher levels of detail, temporal frequency and mapping accuracy. Against the background of this process and the parallel development of community-based products, it seems only a matter of time before national topographic maps will be replaced by EU-wide (or even more expansive) initiatives for providing topographic information.

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