

Research Notes Letter

Vol. 5, issue 1, 2022



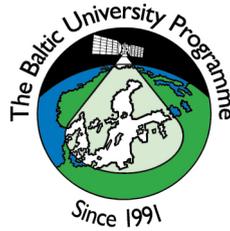
*Research & Innovation for
a sustainable Baltic Sea Region*



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We publish the Research Notes Letter three times per year and disseminate it in the BUP, reaching thousands of colleagues. The Research Notes Letter highlights abstracts on recent publications relating to the Baltic Sea Region and our ten BUP Themes. We promote research from [our participating universities](#). The abstracts presented in the Research Notes Letter are accompanied by information on authors, information on their affiliation, keywords, citation and a link to the full paper.

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Editor

Adam Söderberg

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Climate change and the governance of the Baltic Sea environment

Authors: Savitri Jetoo¹, Nina Tynkkynen¹, Marko Joas¹, Magnus Hellström¹, Conny Sjöqvist¹, Anna Törnroos¹

Affiliation: 1) Åbo Akademi University

Type of publication: Article peer review



Abstract:

This article expands the discussion of Baltic Sea environmental governance by examining the implications of climate change on governance. It scrutinizes the physical challenges posed by climate change and analyses how the existing governing system can meet these challenges. The findings indicate that the present governing system is limited and cannot capture future changes and feedback effects. Therefore, this article recommends that multiple governance approaches should be explored. Management practices should be cross-sectoral and flexible, based both on the recognition of past experiences and all types of knowledge, including scientific but also local. Further interdisciplinary research can guide this process.

Citation:

Jetoo, S., Tynkkynen, N., Joas, M., Hellström, M., Sjöqvist, C., & Törnroos, A. (2022). Climate change and the governance of the Baltic Sea environment. *Journal of Baltic Studies*, 53(1), 65-84. <https://doi.org/10.1080/01629778.2021.1989472>

Stakeholder analysis in sustainable forest management: an application in the Yavoriv region (Ukraine)

Authors: Oksana Pelyukh¹, Vasyl Lavnyy¹, Alessandro Paletto², David Troxler³

Affiliation: 1) Ukrainian National Forestry University, 2) Research Centre for Forestry and Wood, 3) Bern University of Applied Sciences

Type of publication: Article peer review



Abstract:

In Ukraine, the timber volume harvested from sanitary cuttings is increasing, while the state of national forests is decreasing. These trends have focused the attention of public authorities and increased public debate on the role of forests for society. A forest policy reform process needs to build on a sound understanding of the relevant stakeholders, their mutual relationships and interests in the forestry sector. In this paper, a stakeholder analysis based on a network theoretical approach was implemented in a case study in Ukraine (Yavoriv region) to support the forest policy reform process. The study is based on experts' opinions and was structured in three stages: identification of the experts; questionnaire survey and identification of local stakeholders; classification of stakeholders. The results identified 15 stakeholders thus distributed: (1) eight stakeholders belong to the ecological coalition and seven to the economic coalition; (2) three are key stakeholders, four primary stakeholders, and eight secondary stakeholders. The proposed method of stakeholder analysis is aimed to balance the number of stakeholders from each coalition to include all interests at stake in the participatory process. The stakeholder analysis marks the first step in the implementation of sustainable forest management in the Yavoriv region and could serve as a model for the other Ukrainian regions.

Citation:

Pelyukh, O., Lavnyy, V., Paletto, A., & Troxler, D. (2021). Stakeholder analysis in sustainable forest management: An application in the Yavoriv region (Ukraine). *Forest Policy and Economics*, 131, 102561. <https://doi.org/10.1016/j.forpol.2021.102561>

The Role of Incumbent Actors in Sustainability Transitions: A Case of LITHUANIA

Author: Joana Ramanauskaitė¹

Affiliation: 1) Kaunas University of Technology

Type of publication: Article peer review



Abstract:

To explore what roles incumbent actors take in sustainability transitions, this paper investigates the current situation in the scientific literature, which reveals a shift from opponents to promoters and the case of a post-Soviet transitioning economy that is exemplified by examining five sustainability-oriented incumbent actors in Lithuania. A single case study design is selected as a methodological approach, illustrated by empirical data from interviews and secondary sources (corporate websites and sustainability reports). These examples provide insights on the initiatives the organisations that are already interested in sustainability take to promote sustainability ideas and be active members of the transition themselves, supporting the contemporary view of incumbents as agents of sustainable transitions.

Citation:

Ramanauskaitė, J. (2021). The Role of Incumbent Actors in Sustainability Transitions: A Case of LITHUANIA. *Sustainability* 2021, 13, 12877. <https://doi.org/10.3390/su132212877>

Trends in the Environmental Conditions, Climate Change and Human Health in the Southern Region of Ukraine

Authors: Viktor Karamushka¹, Svitlana Boychenko^{1,2}, Tetyana Kuchma^{1,3}, Olena Zabarna^{1,4}

Affiliation: 1) Kaunas University of Technology, 2) S. I. Subbotin Institute of Geophysics of the NAS of Ukraine, 3) Institute of Agroecology and Natural Management, 4) University of Versailles Saint-Quentin-en-Yvelines

Type of publication: Article peer review



Abstract:

The Kherson, Mykolaiv, Odesa, and Zaporizhzhia oblasts, being adjusted to the coasts of the Black and Azov Seas, are located in the steppe zone and constitute the southern region of Ukraine. The environmental parameters and health indicators of the population of the region are sensitive to the impact of natural (e.g., climate change) and anthropogenic processes. An analysis of satellite remote sensing data (NOAA NDVI time series) for the assessment of vegetation condition demonstrates an increase in frequency and duration of drought events in the region during the last few decades. It may have a relation to climate change processes. Data analysis of local meteorological observations over the past 100 years proved alterations of some bioclimatic indexes. The Equivalent Effective Temperature (IEET) increases in winter and summer (due to the increasing repeatability of high anomalous temperatures) and remains stable in spring and autumn seasons. The increasing number and variability of climate anomalies can provoke an increase in cardiovascular and some other diseases in the local population. At the same time, an analysis of the statistical data of health indicators of the population (such as morbidity of digestion, breathing, and the endocrine and circulatory systems) shows a tendency to decrease morbidity (contrary to the indicators of the mountain regions' population, which have higher values of life expectancy). Interrelations between environmental, climate change, and population health indicators in the Black Sea region are being discussed.

Citation:

Karamushka, V., Boychenko, S., Kuchma, T., & Zabarna, O. (2022). Trends in the Environmental Conditions, Climate Change and Human Health in the Southern Region of Ukraine. *Sustainability* 2022, 14, 5664. <https://doi.org/10.3390/su14095664>

Removal of Petroleum Hydrocarbons from Brackish Water by Natural and Modified Sorbents

Authors: Tatjana Paulauskiene¹, Jochen Uebe¹, Zilvinas Kryzevicius¹, Valeriia Kaskova¹, Marija Katarzyte¹, Donata Overlingė¹

Affiliation: 1) Klaipeda University

Type of publication: Article peer review



Abstract:

Crude oil and petroleum products made from it are increasingly being extracted and consumed worldwide as an important energy source. During necessary transportation, e.g., by tanker, an oil spill might occur, which leads to water pollution by oil. One of the methods of cleaning up oil spills is to use sorbents, preferably made from natural materials. This study evaluates the remediation efficiency of brackish water polluted with crude oil, marine diesel oil (MDO) and lubricating oil. The experiment was performed with three different sorbents (straw, straw modified with methoxytrimethylsilanes (MTMS) and wood chip shavings) and without them. The evaporation loss and the dissolved and sorbed fractions of oil were measured by gas chromatography (GC) to evaluate remediation efficiency. Hydrophobization made the natural sorbents buoyant for the duration of the experiment, with only a slight increase in the maximum sorption capacity. The sorbents increased the evaporation of the oils and also of the water, reduced the proportion of the oil dissolved in water and retained the sorbed proportion for the lubricating oil and partly for the MDO, to such an extent that it could not be extracted entirely even after a 60-min extraction time.

Citation:

Paulauskiene, T., Uebe, J., Kryzevicius, Z., Kaskova, V., Katarzyte, M., & Overlingė, D. (2022). Removal of Petroleum Hydrocarbons from Brackish Water by Natural and Modified Sorbents. *Journal of Marine Science and Engineering* 2022, 10, 597. <https://doi.org/10.3390/jmse10050597>

Routing Deployment of CC(U)S in the Baltic Sea Region

Authors: Monika Ivandic¹, Alla Shogenova², Farid Karimi³, Adam Wójcicki⁴, Kazbulat Shogenov²

Affiliation: 1) Uppsala University, 2) Tallinn University of Technology, 3) Novia University of Applied Sciences, 4) Polish Geological Institute – National Research Institute

Type of publication: Conference paper



Abstract:

Much potential exists in the Baltic Sea region (BSR) regarding CC(U)S and at least on the research side, there has been a steady stream of activities over the years. Potential storage sites are localized in the Baltic Basin within several countries such as Sweden, Latvia, Lithuania, Poland and Russia. However, the BSR is still lagging behind in deploying a large-scale CC(U)S due to the national policy and regulatory frameworks which create unfavorable conditions for the technology, as well as the low public awareness and acceptability in most of the countries in the region. Consequently, CO₂ injection is forbidden in Lithuania, CO₂ storage on an industrial scale is banned in Estonia, Latvia and Finland and some federal states of Germany, while in Denmark, Poland and Sweden is permitted with limitations. However, it should also be noted that some positive developments and attitudes towards CC(U)S have also taken place recently in some of the BSR countries. This paper provides an overview of the current CC(U)S status and development in the BSR.

Citation:

Ivandic, M., Shogenova, A., Karimi, F., Wójcicki, A., & Shogenov, K. (2021). Routing Deployment of CC (U) S in the Baltic Sea Region. In *TCCS–11. CO₂ Capture, Transport and Storage. Trondheim 22nd–23rd June 2021. Short Papers from the 11th International Trondheim CCS Conference*. SINTEF Academic Press.

https://www.sintefbok.no/book/index/1299/tccs11_co2_capture_transport_and_storage_trondheim_22nd23rd_june_2021

Response of Long-Tailed Duck (*Clangula hyemalis*) to the Change in the Main Prey Availability in Its Baltic Wintering Ground

Authors: Paola Forni¹, Darius Daunys¹, Julius Morkūnas¹

Affiliation: 1) Klaipeda University

Type of publication: Article peer review



Abstract:

The long-tailed duck (*Clangula hyemalis*) is a vulnerable and declining species wintering in the Baltic Sea. The introduction of the invasive fish, the round goby (*Neogobius melanostomus*), dramatically impacted the benthic macrofauna in hard-bottom habitats, while no significant changes occurred in soft-bottom benthic macrofauna. Therefore, we aimed to assess the extent to which the diet of long-tailed ducks changed in two different bottom types. We analysed the stomach content of 251 long-tailed ducks bycaught in gillnets from 2016 to 2020 in hard- and soft-bottom habitats and compared these results with those published by Žydelis and Ruškyte (2005). The results show that the long-tailed duck experienced a change in diet in hard-bottom habitats, shifting from the blue mussel to *Hediste diversicolor*, barnacles, and fish. In soft-bottom habitats, their diet remained similar over time and was based on *H. diversicolor*, a few bivalve species, and *Saduria entomon*. There was no evidence of significant differences in diet between sex or age. Despite the abovementioned changes in diet, the average body condition of the species did not change over time or between habitats. This confirms that long-tailed ducks have high feeding flexibility and quick species response to changes in prey availability, as they are capable of shifting their diet to new prey.

Citation:

Forni, P., Morkūnas, J., & Daunys, D. (2022). Response of Long-Tailed Duck (*Clangula hyemalis*) to the Change in the Main Prey Availability in Its Baltic Wintering Ground. *Animals*, 12(3), 355. <https://doi.org/10.3390/ani12030355>

A roadmap for a Plastisphere

Author: Agnieszka Dabrowska¹

Affiliation: 1) University of Warsaw

Type of publication: Article peer review



Abstract:

The constantly growing production of synthetic materials and their presence in the environment gradually transform our Blue Planet into the Plastic One. Microplastics (MPs) enlarge significantly their surface during fragmentation processes. Undoubtedly, nanoplastics (NPs), emerging contaminants, and the Plastisphere, the total available surface of debris, are currently on the edge of science. Although a few research are dedicated to the analysis of MPs and NPs from the physical and chemical point of view, there is a lack of the correlation between the material characterization and the microbiological data. The ecological approach, covering the description of numerical antibiotic or metal resistance bacteria, dealing with toxicological issues or biodegradation, is of great importance. This paper creates the bridge between the material science approach and the eighth continent (as sometimes Plastisphere is called). It points out that the Plastisphere significance will grow within the coming years and it should not be regarded as one ecological niche, but a set of different ones. As the properties mainly depend on the surface morphology, its numerical characterization will be the base for the classification purposes to better describe and model this phenomenon. Apart from concerning the currently important issues of NPs and the Plastisphere, this paper presents the emerging area of research namely the numerical approach to their characterization. This proposal of an interdisciplinary approach to the classification of the Plastisphere's types might be interesting for the members of different scientific communities: nanotechnology, material science and engineering, chemistry, physics, ecology, microbiology, marine microplastics or picture analysis.

Citation:

Dabrowska, A. (2021). A roadmap for a Plastisphere. *Marine Pollution Bulletin*, 167, 112322. <https://doi.org/10.1016/j.marpolbul.2021.112322>

A novel photometric method for the determination of reflected solar irradiance in the built environment

Authors: Dariusz Heim¹, Dominika Knera¹

Affiliation: 1) Lodz University of Technology

Type of publication: Article peer review



Abstract:

The urban environment is characterised by diverse structures over an area consisting of buildings, greenery and various ground surfaces. The analysis and modelling of the reflected solar radiation distribution phenomenon in such surroundings are very complex. This paper presents a holistic approach to the analysis of reflected solar radiation in an urban environment. The main body of this work is the presentation and validation of a new method for determining solar irradiance reflected from the surrounding urban elements based on a high dynamic range imaging photometric technique and on-site luminous efficacy measurements. In the proposed method, the effect of the following parameters on the reflected solar irradiance is considered: the characteristics of the surrounding environment, the position of the sun, and the sky conditions. Reflected solar irradiance was determined on selected days throughout the year for two cases differing in urban environment characteristics. The evaluated reflected solar irradiance strongly depends on the surrounding environment, the season of the year, sky conditions and the position of the sun. These discrepancies indicate the complex characteristics of reflected solar irradiance. The proposed method has been validated by comparison of the obtained results with the measured value of solar irradiance incident on vertical surfaces. The convergence of the obtained results and the measurements was very high with a coefficient of determination of 0.95.

Citation:

Heim, D., & Knera, D. (2021). A novel photometric method for the determination of reflected solar irradiance in the built environment. *Renewable and Sustainable Energy Reviews*, 137, 110451. <https://doi.org/10.1016/j.rser.2020.110451>

Evaluation of the Consumer Perception of Sharing Economy: Cases of Latvia, Russia, Ukraine and Belarus

Authors: Tatjana Tambovceva¹, Jelena Titko², Anna Svirina², Dzintra Atstaja³, Maria Tereshina⁴

Affiliation: 1) Riga Technical University, 2) EKA University of Applied Sciences, 3) Riga Stradinš University, 4) Kuban State University

Type of publication: Article peer review



Abstract:

The overwhelming goal of large-scale cross-country research is to evaluate consumers' perception of a sharing economy. The research was limited by the number of respondents, as well as by the countries represented in the survey. Latvia, Russia, Ukraine, and Belarus were mostly represented, and only these responses (757) were analyzed. The study used multilevel modelling of sharing economy elements (dependent variable) in relation to personal characteristics (age, gender, income, industry) nested by the self-assessed level of eco-friendliness (a key predictor for the attitude towards sharing economy). Findings: The key personal characteristics, which influence a person's intention to be involved in the sharing economy practices, are level of income, education, and also self-perceived ecological friendliness. The sharing economy is not only a topic for investigation among academicians, but also an issue on the agenda of the European Commission, because it is considered as a driver for growth and job creation in the European Union. Despite an increasing interest and many studies, there is a limited number of studies focused on difference in perception of sharing economy depending on personal characteristics of respondents. This indicates the necessity of conducting such surveys, involving participants from different European countries. The given paper could be used as a methodological framework for other European researchers who are interested in the exploration of the topic regarding perception of the sharing economy.

Citation:

Tambovceva, T., Titko, J., Svirina, A., Atstaja, D., & Tereshina, M. (2021). Evaluation of the Consumer Perception of Sharing Economy: Cases of Latvia, Russia, Ukraine and Belarus. *Sustainability*, 13(24), 13911. <https://doi.org/10.3390/su132413911>

Delineation of catchment area for the lake Kisezers for environmental sustainability

Authors: Janis Dumpis¹, Ainis Lagzdins¹, Ivo Sics²

Affiliation: 1) Latvia University of Life Sciences and Technologies, 2) Institute of Food Safety, Latvia

Type of publication: Article peer review



Abstract:

The study aims to develop a methodology for the delineation of a catchment area. The methodology includes the processing and analysis of LiDAR data, on-field height measurement data, bathymetric data, hydrological data. High definition catchment area maps are successfully constructed. Catchment area influencing factors such as water mass movement and changes in land use are determined. Lake Kisezers was selected as the study site because the location of the lake, the availability of data, the feasibility studies, the economic potential of the catchment area determine the topicality and significance of this study. The lake catchment area covers multiple rivers, urban and rural territories, forests, high and low terrains. In the catchment area of Lake Kisezers many hydrologic monitoring stations with continuous data are situated. In the research area, we can study how those factors interact with the possibility to perform a catchment area delineation. The final result of this study is the catchment area for Lake Kisezers. The research results are high-definition and can be used to understand locations of floodplains, territories with malfunctioning drainage systems. The repetition of this study requires extensive knowledge of cartography, experience in working with terrain and bathymetry data, wide range of GIS knowledge. The research was performed using computer software such as QGIS and GRASS GIS. The application of the methodology used in this study can serve as an example for delineation and analysis of a catchment area for other lakes and rivers. Overall, the study is a success.

Citation:

Dumpis, J., Lagzdins, A., & Sics, I. (2021). Delineation of catchment area for the lake Kisezers for environmental sustainability. *Agronomy Research* 19(4), 1718–1733.

<https://doi.org/10.15159/ar.21.137>

Re-meander, rewet, rewild! Overwhelming public support for restoration of small rivers in the three Baltic Sea basin countries

Authors: Sviataslau Valasiuk¹, Marek Giergiczny¹, Wiktor Kotowski¹, Halina Galera¹, Jette B. Jacobsen², Julian Sagebiel³, Wendelin Wichtmann⁴, Ewa Jabłońska¹

Affiliation: 1) University of Warsaw, 2) University of Copenhagen, 3) Swedish University of Agricultural Sciences, 4) University of Greifswald

Type of publication: Article peer review



Abstract:

Baltic Sea is one of the World's most oxygen-depleted seas, so the region requires urgent mitigation measures to significantly reduce nitrogen and phosphorus inputs from land through rivers, which cannot be achieved without large-scale restoration of wetland buffer zones. The manuscript summarizes the findings of the discrete choice experiment aimed at assessment of the preferences of Danish, German, and Polish citizens toward ecosystem services of lowland small rivers of the Baltic Sea basin. Our results suggest that respondents in all the studied countries are willing to pay substantial amounts to improve water quality in rivers and the Baltic Sea, as well as to restore naturally meandering rivers and natural riparian vegetation. Wild marshes and Wetland agriculture were equally valued as the most desirable options. Respondents systematically cared about the appearance of small rivers in their neighborhood. We conclude that re-meandering, rewetting of floodplains, and restoration of wild marshes (i.e. natural wetland vegetation) or development of wetland agriculture could gain a lot of public support in Europe.

Citation:

Valasiuk, S., Giergiczny, M., Kotowski, W., Galera, H., Jacobsen, J. B., Sagebiel, J., Wichtmann, W., & Jabłońska, E. (2021). Re-meander, rewet, rewild! Overwhelming public support for restoration of small rivers in the three Baltic Sea basin countries. *Restoration Ecology*, e13575. <https://doi.org/10.1111/rec.13575>

Assessing the potential for sea-based macroalgae cultivation and its application for nutrient removal in the Baltic Sea

Authors: Jonne Kotta^{1,2}, Urmas Raudsepp², Robert Szava-Kovats¹, Robert Aps¹, Aurelija Armoskaite³, Ieva Barda³, Per Bergström⁴, Martyn Futter⁵, Fredrik Gröndahl⁶, Matthew Hargrave⁷, Magdalena Jakubowska⁸, Holger Jänes¹, Ants Kaasik¹, Patrik Kraufvelin^{5,12}, Nikolai Kovaltchouk¹, Peter Krost⁹, Tomasz Kulikowski⁸, Anneliis Kõivupuu¹, Ilmar Kotta¹, Liisi Lees¹, Sander Loite¹, Ilja Maljutenko², Göran Nylund⁴, Tiina Paalme¹, Henrik Pavia⁴, Ingrida Purina³, Moona Rahikainen¹⁰, Verena Sandow⁹, Wouter Visch¹¹, Baoru Yang¹⁰, Francisco R.Barboza¹

Affiliation: 1) University of Tartu, 2) Tallinn University of Technology, 3) Latvian Institute of Aquatic Ecology, 4) University of Gothenburg, 5) Swedish University of Agricultural Sciences, 6) Royal Institute of Technology, KTH, 7) University of Gothenburg, 8) National Marine Fisheries Research Institute, Poland, 9) Coastal Research and Management, Germany, 10) University of Turku, 11) University of Tasmania, 12) Åland University of Applied Sciences

Type of publication: Article peer review



Abstract:

Marine eutrophication is a pervasive and growing threat to global sustainability. Macroalgal cultivation is a promising circular economy solution to achieve nutrient reduction and food security. However, the location of production hotspots is not well known. In this paper the production potential of macroalgae of high commercial value was predicted across the Baltic Sea region. In addition, the nutrient limitation within and adjacent to macroalgal farms was investigated to suggest optimal site-specific configuration of farms. The production potential of *Saccharina latissima* was largely driven by salinity and the highest production yields are expected in the westernmost Baltic Sea areas where salinity is >23 . The direct and interactive effects of light availability, temperature, salinity and nutrient concentrations regulated the predicted changes in the production of *Ulva intestinalis* and *Fucus vesiculosus*. The western and southern Baltic Sea exhibited the highest farming potential for these species, with promising areas also in the eastern Baltic Sea. Macroalgal farming did not induce significant nutrient limitation. The expected spatial propagation of nutrient limitation caused by macroalgal farming was less than 100–250 m. Higher propagation distances were found in areas of low nutrient and low water exchange (e.g. offshore areas in the Baltic Proper) and smaller distances in areas of high nutrient and high water exchange

(e.g. western Baltic Sea and Gulf of Riga). The generated maps provide the most sought-after input to support blue growth initiatives that foster the sustainable development of macroalgal cultivation and reduction of in situ nutrient loads in the Baltic Sea.

Citation:

Kotta, J., Raudsepp, U., Szava-Kovats, R., Aps, R., Armoskaite, A., Barda, I., Bergström, P., Futter, M., Gröndahl, F., Hargrave, M., Jakubowska, M., Jänes, H., Kaasik, A., Kraufvelin, P., Kovaltchouk, N., Krost, P., Kulikowski, T., Kõivupuu, A., Kotta, I., ... & Barboza, F. R. (2022). Assessing the potential for sea-based macroalgae cultivation and its application for nutrient removal in the Baltic Sea. *Science of The Total Environment*, 156230.
<https://doi.org/10.1016/j.scitotenv.2022.156230>

Exploring the circularity potential regarding the multiple use of residual material

Authors: Tetiana Shevchenko¹, Jakub Kronenberg², Yuriy Danko¹, Jana Chovancová³

Affiliation: 1) Sumy National Agrarian University, 2) University of Lodz, 3) University of Prešov

Type of publication: Article peer review



Abstract:

Building on recent insights in exploring material circularity, this study attempts to develop a methodological approach toward allocating an available circularity potential based on modeling the optimal chain of products in a manner that ensures utilizing the same material as many times as possible. The allocation of available circularity potential implies limitations on the use of specific primary materials for manufacturers of certain products by establishing access to the appropriate quality material used previously only for the modeled chain, thereby providing the greatest possible number of turns for a particular material in the economic system. This study adds to the current understanding of methods to maximize material looping in a circular economy by keeping the application range of specific materials as wide as possible, thereby preserving its long-term value. The findings contribute to the operationalization of a recycling strategy justified by its limitations on the use of primary materials for manufacturers of certain products to avoid wastage. Furthermore, the findings present a novel future research agenda for managing circularity potential with regard to continuous build-up and optimal allocation to save the value of material in the system as long as possible by increasing the number of its revolutions.

Citation:

Shevchenko, T., Kronenberg, J., Danko, Y., & Chovancová, J. (2021). Exploring the circularity potential regarding the multiple use of residual material. *Clean Technologies and Environmental Policy*, 23(7), 2025-2036. <https://doi.org/10.1007/s10098-021-02100-4>

Climate change in the Baltic Sea region: a summary

Authors: H. E. Markus Meier^{1,2}, Madline Kniebusch¹, Christian Dieterich², Matthias Gröger¹, Eduardo Zorita³, Ragnar Elmgren⁴, Kai Myrberg^{5,6}, Markus P. Ahola⁷, Alena Bartosova², Erik Bonsdorff⁸, Florian Börgel¹, Rene Capell², Ida Carlén⁹, Thomas Carlund¹⁰, Jacob Carstensen¹¹, Ole B. Christensen¹², Volker Dierschke¹³, Claudia Frauen^{1,14}, Morten Frederiksen¹¹, Elie Gaget^{15,16}, Anders Galatius¹¹, Jari J. Haapala¹⁷, Antti Halkka¹⁸, Gustaf Hugelius⁴, Birgit Hünicke³, Jaak Jaagus¹⁹, Mart Jüssi²⁰, Jukka Käyhkö¹⁵, Nina Kirchner⁴, Erik Kjellström², Karol Kulinski²¹, Andreas Lehmann²², Göran Lindström², Wilhelm May²³, Paul A. Miller²³, Volker Mohrholz¹, Bärbel Müller-Karulis⁴, Diego Pavón-Jordán²⁴, Markus Quante³, Marcus Reckermann³, Anna Rutgersson²⁵, Oleg P. Savchuk⁴, Martin Stendel¹², Laura Tuomi¹⁷, Markku Viitasalo⁵, Ralf Weisse³, Wenyan Zhang³

Affiliation: 1) Leibniz Institute for Baltic Sea Research Warnemünde, 2) Swedish Meteorological and Hydrological Institute, 3) Helmholtz-Zentrum Hereon, 4) Stockholm University, 5) Finnish Environment Institute, 6) University of Klaipėda, 7) Swedish Museum of Natural History, 8) Åbo Akademi University, 9) Coalition Clean Baltic, 10) Swedish Meteorological and Hydrological Institute, 11) Aarhus University, 12) Danish Meteorological Institute, 13) Gavia EcoResearch, 14) Deutsches Klimarechenzentrum, 15) University of Turku, 16) International Institute for Applied Systems Analysis (IIASA), 17) Finnish Meteorological Institute, 18) University of Helsinki, 19) University of Tartu, 20) Pro Mare, 21) Polish Academy of Sciences, 22) GEOMAR Helmholtz Centre for Ocean Research Kiel, 23) Lund University, 24) Norwegian Institute for Nature Research (NINA), 25) Uppsala University

Type of publication: Article peer review



Abstract:

Based on the Baltic Earth Assessment Reports of this thematic issue in Earth System Dynamics and recent peer-reviewed literature, current knowledge of the effects of global warming on past and future changes in climate of the Baltic Sea region is summarised and assessed. The study is an update of the Second Assessment of Climate Change (BACC II) published in 2015 and focuses on the atmosphere, land, cryosphere, ocean, sediments, and the terrestrial and marine biosphere. Based on the summaries of the recent knowledge gained in palaeo-, historical, and future regional climate research, we find that the main conclusions from earlier assessments still remain valid. However, new long-term, homogenous observational records, for example, for Scandinavian

glacier inventories, sea-level-driven saltwater inflows, so-called Major Baltic Inflows, and phytoplankton species distribution, and new scenario simulations with improved models, for example, for glaciers, lake ice, and marine food web, have become available. In many cases, uncertainties can now be better estimated than before because more models were included in the ensembles, especially for the Baltic Sea. With the help of coupled models, feedbacks between several components of the Earth system have been studied, and multiple driver studies were performed, e.g. projections of the food web that include fisheries, eutrophication, and climate change. New datasets and projections have led to a revised understanding of changes in some variables such as salinity. Furthermore, it has become evident that natural variability, in particular for the ocean on multidecadal timescales, is greater than previously estimated, challenging our ability to detect observed and projected changes in climate. In this context, the first palaeoclimate simulations regionalised for the Baltic Sea region are instructive. Hence, estimated uncertainties for the projections of many variables increased. In addition to the well-known influence of the North Atlantic Oscillation, it was found that also other low-frequency modes of internal variability, such as the Atlantic Multidecadal Variability, have profound effects on the climate of the Baltic Sea region. Challenges were also identified, such as the systematic discrepancy between future cloudiness trends in global and regional models and the difficulty of confidently attributing large observed changes in marine ecosystems to climate change. Finally, we compare our results with other coastal sea assessments, such as the North Sea Region Climate Change Assessment (NOSCCA), and find that the effects of climate change on the Baltic Sea differ from those on the North Sea, since Baltic Sea oceanography and ecosystems are very different from other coastal seas such as the North Sea. While the North Sea dynamics are dominated by tides, the Baltic Sea is characterised by brackish water, a perennial vertical stratification in the southern subbasins, and a seasonal sea ice cover in the northern subbasins.

Citation:

Meier, H. E. M., Kniebusch, M., Dieterich, C., Gröger, M., Zorita, E., Elmgren, R., Myrberg, K., Ahola, M. P., Bartosova, A., Bonsdorff, E., Börgel, F., Capell, R., Carlén, I., Carlund, T., Carstensen, J., Christensen, O. B., Dierschke, V., Frauen, C., Frederiksen, M., ... & Zhang, W. (2022). Climate change in the Baltic Sea region: a summary, *Earth System Dynamics*, 13, 457–593. <https://doi.org/10.5194/esd-13-457-2022>

Renewable energy sources in transnational cooperation in the Baltic Sea Region

Authors: Tomasz Studzieniecki¹, Tadeusz Palmowski²

Affiliation: 1) Gdynia Maritime University, 2) University of Gdansk

Type of publication: Article peer review



Abstract:

The implementation of the EU Strategy for the Baltic Sea Region has made the use of renewable energy sources a priority. The Region has always been economically and ecologically very diverse. The development of transnational cooperation became an opportunity to bridge the existing disparities and support renewable energy development. The aim of the article is to answer the question how the transnational cooperation implemented under the EU Cohesion Policy could contribute to BSR energy transition. The authors elaborated a research model, which presents a sequence of activities. The research used secondary sources, including KEEP data. EU. EUROSTAT, EUSBSR. The article examined the cooperation carried out within 41 projects financed under seven territorial cooperation programs in the BSR in the period 2000-2020. The research results are presented in terms of the subject, subject and space with the visualization made on the basis of NUTS 2 and NUTS 3 units.

Citation:

Studzieniecki, T., Palmowski, T. (2022). Renewable energy sources in transnational cooperation in the Baltic Sea Region. *Bulletin of Geography. Socio-economic Series*, 56(56): 7-21. <https://doi.org/10.12775/bgss-2022-0010>