Research Notes Letter

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Baltic University Programme

Research & Innovation for a sustainable Baltic Sea Region

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This issue of the Research Notes Letter contains 15 scientific abstracts on current research conducted at BUP participating universities. The Research Notes Letter aims to publish primarily multi- and interdisciplinary science related to sustainability and the Sustainable Development Goals indicated by the United Nations 2030 Agenda for Sustainable Development. All previous issues of the Research Notes Letter are available for download from the BUP website.

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The Research Notes Letter in short

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 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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Research Notes Letter archive

The 10 BUP themes

Content

Modelling the Future of the Baltic Energy Systems: A Green Scenario

Authors: Lubova Petrichenko[1], Roman Petrichenko[1], Antans Sauhats[1], Kārlis Baltputnis[1], Zane Broka[1]

Affiliation: 1) Riga Technical University

Type of publication: Article peer review

BUP theme: Energy Systems

Abstract:

The electricity sector in Europe and in the world is undergoing rapid and profound changes. There is a sharp increase in the capacity of renewable energy sources, coal and nuclear power plants are being closed and new technologies are being introduced. Especially rapid changes are taking place in the energy systems of the Baltic States. Under these conditions, there is an emerging need for new planning tools particularly for the analysis of the power system properties in a long-term perspective. The main contribution of this article lies in the formulation and solution of optimization problems that arise when planning the development of power systems in the Baltic States. To solve this problem, it is necessary to use models of various power plants and make a number of assumptions, the justification of which requires the following actions: to briefly review the current situation of the production and demand of energy in the Baltic power systems; to conduct an overview of the Baltic interconnections and their development; to make forecasts of energy prices, water inflow, energy production and demand; to set and solve the problems of optimization of power plant operation modes; to demonstrate the possibility and limitations of the developed tools on the basis of real-life and forecast data. In this paper, a case study is performed using the main components of the overall modelling framework being developed. It focuses on the Baltic power systems in 2050 under the conditions of significant expansion in the installed capacity of renewable energy sources (RESs) and diminished fossil fuel power plant activity. The resulting electricity generation mix and trade balance with neighbouring countries is assessed, showing that even with significant RES expansion, the Baltic countries remain net importers and because of the intermittency of RESs, there are hours within the year when the demand cannot be met.

Keywords: Modelling, power system planning, solar energy, the Baltic States, wind energy

Citation:

Petrichenko, L., Petrichenko, R., Sauhats, A., Baltputnis, K., & Broka, Z. (2021). Modelling the Future of the Baltic Energy Systems: A Green Scenario. *Latvian Journal of Physics and Technical Sciences, 58*(3), 47-65. https://doi.org/10.2478/lpts-2021-0016

Urban Green Infrastructure Inventory as a Key Prerequisite to Sustainable Cities in Ukraine under Extreme Heat Events

Authors: Oleksandra Khalaim[1], Olena Zabarna[2], Taras Kazantsev[3], Ihor Panas[1], Oleksandr Polishchuk[5]

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Type of publication: Article peer review

Abstract:

The frequency of extreme heat effects has recently increased in European cities due to climate change. The problem appears to be critical in urban areas where manmade structures significantly alter the temperature balance, thus highlighting the importance of sustainable management and proper inventory of urban green zones. Based on this, the paper provides a case study on using a combination of open-access and low-cost urban greenery inventory methods that could be used by municipal governments and private land managers to estimate the contribution of urban trees to the mitigation of urban heat impacts. The research focuses on the urban greenery inventory of courtyards in high-rise residential districts of the city of Kyiv (Ukraine), aiming to estimate the adapting potential of urban vegetation against heatwaves. Visual and thermal satellite images of Kyiv enabled us to estimate how the density of buildings and greenery is distributed and analyze the surface temperature in residential districts. A UAV thermal imaging survey was made in four selected locations with varying vegetation coverage, followed by leaf-based field instrumental analysis of photosynthetic activity in selected city tree species at hot temperatures. In addition, 16 portable temperature and humidity sensors were installed in shaded and sunlight-exposed areas of the locations in focus to assess the microclimate formation impact of trees in a high-rise residential courtyard. The Ukrainian legislation on the management of green spaces in cities was reviewed to find out whether it promotes the shaping of comfortable microclimates in residential districts; follow-up recommendations were made on how to improve the applicable provisions.

Keywords: urban vegetation; urban green inventory; climate extremes; heatwaves; climate change; satellite mapping; heat tolerance; UAV thermal imaging; urban trees

Citation:

Khalaim, O., Zabarna, O., Kazantsev, T., Panas, I., & Polishchuk, O. (2021). Urban green infrastructure inventory as a key prerequisite to sustainable cities in Ukraine under extreme heat events. *Sustainability, 13*(5), 2470. https://doi.org/10.3390/su13052470

The food losses and food waste it's impact and initiatives on environmental management in the Slovak republic

Authors: Zuzana Kapsdorferová[1], Petronela Švikruhová[1], Mária Dobišová[1], Mária Medvedová[1]

Affiliation: 1) Slovak University of Agriculture in Nitra

Type of publication: Conference paper

Abstract:

Although there are no accurate data in the world on food losses and waste, according to the FAO, globally about one third of the food produced is lost or degraded as waste along the food chain, from production to consumption. The large scale of food losses and waste leads responsible politicians and strong economic players not to see this as a coincidence, but as an integral part of food systems. Successful reduction of food losses and food waste will save natural resources for future generations and has the potential to improve food security and nutrition by meeting the goals of the Agenda 2030 on Sustainable Development Goal n. 2: No hunger and Goal n. 12: Responsible consumption and production. We are witnessing a growing support for methods of sustainable agricultural production, which include e.g. also agroecology, sustainable intensification, climate-friendly agriculture, or smart technologies. Sustainability means the long-term ability of food systems to provide current food security so as not to threaten the environmental, economic and social ecosystems that generate food security and nutrition for present and future generations.

Keywords: food waste, food losses, sustainability, food systems, environmental management

Citation:

Kapsdorferová, Z., Švikruhová P., Dobišová, M. & Medvedová, M. (2021). The food losses and food waste it's impact and initiatives on environmental management in the Slovak republic. In *ICOM 2021 - Zero waste management and circular economy*. Mendel University Press, 198-209. http://dx.doi.org/10.11118/978-80-7509-820-7-0198

Digitalization in Just-In-Time Approach as a Sustainable Solution for Maritime Logistics in the Baltic Sea Region

Authors: Olena de Andres Gonzalez[1], Heikki Koivisto[1], Jari M. Mustonen[1], Minna M. Keinänen-Toivola[1]

Affiliation: 1) Satakunta University of Applied Sciences

Type of publication: Article peer review

Abstract:

This research provides an overview of the process and results of the development and implementation of the Port Activity Application. The aim of the application is to improve the coordination and information exchange mechanisms between the existing systems of ports and ships during piloting ordering process to ensure their effective interoperability, giving a better understanding of the impact of digitalization on the sustainability of seaports and maritime transport. To implement this concept, a system of step-by-step actions was developed, including determining the current situation, developing a business model and business logic for implementing an appropriate information and communication technology (ICT) solution, analysing the local government structure, analysing intermodal information exchange between stakeholders, developing and testing a new ICT tool. The ports of Rauma, Finland, and Gävle, Sweden, were used as pilot ports. As a result of the study, the main bottlenecks in the process of information exchange in ordering pilotage were identified. An improved business model and business logic, that allows the rational use of resources and reduces CO2 emission and the pressure on the environment, was developed. The testbed was conducted in an environment of real port operations. Currently, the open access source code is available for use for maritime cluster actors.

Keywords: maritime logistics; sea traffic management; shipping; sustainability; sustainable mobility; port digitalization; just-in-time approach; business model; environment; CO2 emission

Citation:

de Andres Gonzalez, O., Koivisto, H., Mustonen, J. M., & Keinänen-Toivola, M. M. (2021). Digitalization in just-in-time approach as a sustainable solution for maritime logistics in the baltic sea region. *Sustainability, 13*(3), 1173. https://doi.org/10.3390/su13031173

Integrating diverse model results into decision support for good environmental status and blue growth

Author: Laura Uusitalo[1], Thorsten Blenckner[2], Riikka Puntila-Dodd[1], Annaliina Skyttä[1], Susanna Jernberg[1], Rudi Voss[3,4], Bärbel Müller-Karulis[1], Maciej T. Tomczak[1], Christian Möllmann[5], Heikki Peltonen[1]

Affiliation: 1) Finnish Environment Institute, 2) Stockholm University, 3) Kiel University, 4) German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig, 5) Universität Hamburg

Type of publication: Article peer review

Abstract:

Sustainable environmental management needs to consider multiple ecological and societal objectives simultaneously while accounting for the many uncertainties arising from natural variability, insufficient knowledge about the system's behaviour leading to diverging model projections, and changing ecosystem. In this paper we demonstrate how a Bayesian network-based decision support model can be used to summarize a large body of research and model projections about potential management alternatives and climate scenarios for the Baltic Sea. We demonstrate how this type of a model can act as an emulator and ensemble, integrating disciplines such as climatology, biogeochemistry, marine and fisheries ecology as well as economics. Further, Bayesian network models include and present the uncertainty related to the predictions, allowing evaluation of the uncertainties, precautionary management, and the explicit consideration of acceptable risk levels. The Baltic Sea example also shows that the two biogeochemical models frequently used in future projections give considerably different predictions. Further, inclusion of parameter uncertainty of the food web model increased uncertainty in the outcomes and reduced the predicted manageability of the system. The model allows simultaneous evaluation of environmental and economic goals, while illustrating the uncertainty of predictions, providing a more holistic view of the management problem.

Keywords: Decision support system, Bayesian network, Environmental management, Ecosystem novelty, Model emulator, Socio-ecological system, Blue growth, MSFD, Good environmental status

Citation:

Uusitalo, L., Blenckner, T., Puntila-Dodd, R., Skyttä, A., Jernberg, S., Voss, R., ... & Peltonen, H. (2022). Integrating diverse model results into decision support for good environmental status and blue growth. *Science of the Total Environment, 806*, 150450. https://doi.org/10.1016/j.scitotenv.2021.150450

Carbon Ruins: Engaging with Post-Fossil Transitions through Participatory World-Building

Authors: Johannes Stripple[1], Alexandra Nikoleris[1], Roger Hildingsson[1]

Affiliation: 1) Lund University

Type of publication: Article peer review

Abstract:

While many pathways to post-fossil futures have been articulated, most fail to engage people in imagining themselves as being part of those futures and involved in the transition. Following recent calls for more immersive experiences, the 2019 initiative "Carbon Ruins—An Exhibition of the Fossil Era" (Carbon Ruins) is a performance set around a historical museum from the future, which uses recognisable, culturally powerful physical objects to bridge the gap between abstract scenarios and everyday experiences. Through its physical presence and extensive media coverage, Carbon Ruins struck a chord with scientists, activists, creative professionals, policy makers, civil society organisations, and the general public. Like other imaginary worlds, Carbon Ruins is not finished. It is an open-ended process of narrating, imagining, and representing (the transition to) a post-fossil future. In this article we reflect upon Carbon Ruins as a participatory form of world-building that allows for new ways of knowing, and new ways of being, in relation to post-fossil transitions. We discern three different kinds of authorship that were taken on by participants: as originators, dwellers, and explorers. While the originator makes the future world a recognisable place, the dweller can engage active hope in place of a passive sense of urgency, and the explorer can transform resignation into commitment, with a fresh determination to leave the fossil era behind. Situating Carbon Ruins within a critical political tradition, we find post-fossil world-building to be a form of critique that destabilises accustomed ways of thinking and opens up new fields of experience that allows things to be done differently.

Keywords: critical practice, experiential futures, imagination, post-fossil futures, world-building

Citation:

Stripple, J., Nikoleris, A., & Hildingsson, R. (2021). Carbon ruins: Engaging with post-fossil transitions through participatory world-building. *Politics and Governance, 9*(2), 87. https://doi.org/10.17645/pag.v9i2.3816

Fisheries management and tipping points: Seeking optimal management of Eastern Baltic cod under conditions of uncertainty about the future productivity regime

Authors: Rudi Voss[1,2], Martin Quaas[1,3]

Affiliation: 1) German Centre for Integrative Biodiversity Research(iDiv), 2) Kiel University, 3) Leipzig University

Type of publication: Article peer review

Abstract:

Historical patterns of the Eastern Baltic cod stock recruitment show a shift from a regime with high reproductive potential before the early 1980s to a regime with low reproductive potential since then. This shift can be attributed to increasingly unfavorable environmental conditions for cod reproduction at that time: critical salinity and oxygen levels, needed for successful egg and larval development, deteriorated. Yet, significant inflows of salt- and oxygen-rich water from the North Sea or improved eutrophication management might trigger a shift back to a more productive regime. Coupling a statistical recruitment model to a state-of-the-art, age-structured bio-economic model of the Eastern Baltic cod fishery, we study how optimal management depends on the uncertainty about the future productivity regime. We extend the predominantly theoretical literature on optimal management of a natural resource with a potential regime shift by analyzing an empirical model of age-structured population dynamics and by allowing for the possibility of a back-shift from a "bad" into a "good" regime. We find that with a higher probability of a shift back to the more productive regime the optimal management of the fishery becomes more conservative in the short run. We conclude that these benefits for the fishery warrant strong action reducing eutrophication to increase the probability of a regime shift back to high reproductive potential of the Eastern Baltic cod fishery.

Keywords: Baltic cod, bio-economic model, eutrophication, profits, regime shift, tipping point

Citation:

Voss, R., & Quaas, M. (2022). Fisheries management and tipping points: Seeking optimal management of Eastern Baltic cod under conditions of uncertainty about the future productivity regime. *Natural Resource Modeling, 35*(1), e12336. https://doi.org/10.1111/nrm.12336

EU Legislative Support in the Waste Sector

Authors: Eleonóra Marišová[1], Marina Valenciková[1]

Affiliation: 1) Slovak University of Agriculture in Nitra

Type of publication: Article peer review

Abstract:

In the waste sector, EU Member States implement EU legislation. They rely on EU Directives and their waste legislation and policies. During the evaluated period (2015 - 2021), the Slovak Republic amended the Waste Act 79/2015 Coll. and issued strategy papers following EU legislation. France adopted its National program for prevention of waste and Finland its National waste management plan. In our research, we use a method of comparison and analysis of selected legislative documents to examine the achievement of the Green Deal's objectives in the Slovak Republic and selected EU countries. We have shown the legislative process results through research, which indicate the achievement of set waste management goals. In our future research we will focus on building waste management infrastructure in the EU since it is necessary to apply the idea promoting the support of such waste treatment facilities that will be sustainable throughout their existence.

Citation:

Marišová, E., & Valenćiková, M. (2021). EU Legislative Support in the Waste Sector. *EU agrarian Law, 10*(2), 21-27. https://doi.org/10.2478/eual-2021-0009

Achievement of Sustainable Development Goals through the Implementation of Circular Economy and Developing Regional Cooperation

Authors: Natalija Cudecka-Purina[1], Dzintra Atstaja[1,2], Viktor Koval[3], Maris Purvinš[1], Pavlo Nesenenko[4], Oleksandr Tkach[3]

Affiliation: 1) BA School of Business and Finance, 2) Riga Stradinš University, 3) Institute of Market and Economic-Ecological Researches of the National Academy of Sciences of Ukraine, 4) Odesa National Economic University

Type of publication: Article peer review

Abstract:

Circular economy is a tool based on the inclusion of environmental, social, and governance performance (ESG) in decision-making to achieve sustainable development goals (SDG). In recent years, it has become clear that business-as-usual has nothing to do with sustainability, and alternative business models, primarily on technological grounds, must be implemented to mitigate the damage caused by significant and unpredictable effects of climate change. The current situation requires unprecedented and urgent changes to policies and business development models. The current research aimed to target on industrial symbiosis as one of the business models of the circular economy. It evaluated the benefits of symbiosis and the fostering of cooperation between industries and, consequently, has a major impact on resource efficiency ratios. The research is based on quantitative and qualitative research methods, including a literature review, assessment, and application of the triangulation method. As a result of this research, the authors realized a matrix for the development of regional or cross-country industrial symbiosis that can be used by policymakers to foster the development of symbiotic interconnections on a wide scale. The authors also recommend the development of the Baltic University Program (BUP) network center of excellence and methodological justification for industries to engage in industrial symbiosis (IS).

Keywords: circular economy, European green deal, industrial symbiosis, sustainability, transformation

Citation:

Cudečka-Puriņa, N., Atstāja, D., Koval, V., Purviņš, M., Nesenenko, P., & Tkach, O. (2022). Achievement of Sustainable Development Goals through the Implementation of Circular Economy and Developing Regional Cooperation. *Energies, 15*(11), 4072. https://doi.org/10.3390/en15114072

Stakeholders engagement for solving mobility problems in touristic remote areas from the Baltic Sea Region

Authors: Halina Kiryluk[1], Ewa Glińska[1], Urszula Ryciuk[1], Kati Vierikko[2], Ewa Rollnik-Sadowska[1]

Affiliation: 1) Bialystok University of Technology, 2) Finnish Environment Institute (SYKE)

Type of publication: Article peer review

Abstract:

Stakeholder participation is particularly important when dealing with mobility problems in touristic remote areas, in which there is a need to find sustainable solutions to increase transport accessibility. However, the literature lacks research linking the issues of establishing stakeholder groups with the most desirable level of involvement and methods ensuring involvement on the indicated level. The aim of the paper is to fill this gap on example of project dedicated to six Baltic Sea Regions. In the first stage key stakeholder groups were identified, then different methods and tools were proposed depending on levels of engagement of given group of stakeholders on solving the problems of local mobility. Two research methods were implemented–the case study and the content analysis of documents. The results of the research point to the existence of five key groups of stakeholders interested in solving transport problems of touristic remote areas: authorities, business and service operators, residents, visitors and others (like experts and NGOs). Among the five–authorities and business representatives–should be to a higher degree engaged. However, the main conclusion is that engagement local government units, when developing their own, long-term strategies for social participation, should adapt the selection of participation methods and techniques to a specific target group and the desired level of their involvement so as to include stakeholders in the co-decision processes as effectively as possible and achieve effective regional co-management.

Citation:

Kiryluk, H., Glińska, E., Ryciuk, U., Vierikko, K., & Rollnik-Sadowska, E. (2021). Stakeholders engagement for solving mobility problems in touristic remote areas from the Baltic Sea Region. *PloS one, 16*(6), e0253166. https://doi.org/10.1371/journal.pone.0253166

Managing a Circular Food System in Sustainable Urban Farming. Experimental Research at the Turku University Campus (Finland)

Authors: Leena Erälinna[1], Barbara Szymoniuk[2]

Affiliation: 1) University of Turku, 2) Lublin University of Technology

Type of publication: Article peer review

Abstract:

People around the world pay increasingly more attention to health, social, environmental, and ethical issues. As a consequence, they seek value in food that is fresh, less processed, and sustainably sourced. The article presents an experimental project supporting the implementation of a circular food system in the city of Turku, Finland. The outcome of the project is a globally replicable concept of managing a local circular food system in sustainable urban farming. The project had two objectives: (1) to reduce food waste in restaurants in the Turku University Campus; (2) to support local recycling of nutrients by composting food waste generated in the pilot restaurant and reuse the nutrients in the process of urban farming. The presented concept is based on the results of two experimental studies. It ties in with UN and EU sustainable development strategies and policies, e.g., Sustainable Development Goals (2, 11, and 12), the European Green Deal, the Farm to Fork Strategy, and the concepts of Circular Economy and Sustainable Cities.

Keywords: sustainability, circular economy, sustainable cities, Farm to Fork, circular food system, urban farming, waste hierarchy, food waste, nutrients, food waste recycling, composting

Citation:

Erälinna, L., & Szymoniuk, B. (2021). Managing a Circular Food System in Sustainable Urban Farming. Experimental Research at the Turku University Campus (Finland). *Sustainability, 13*(11), 6231. https://doi.org/10.3390/su13116231

Human impacts and their interactions in the Baltic Sea region

Authors: Marcus Reckermann[1], Anders Omstedt[2], Tarmo Soomere[3,4], Juris Aigars[5], Naveed Akhtar[1], Magdalena Bełdowska[6], Jacek Bełdowski[7], Tom Cronin[8], Michał Czub[7], Margit Eero[8], Kari Petri Hyytiäinen[9], Jukka-Pekka Jalkanen[10], Anders Kiessling[11], Erik Kjellström[12], Karol Kuliński[7], Xiaoli Guo Larsén[8], Michelle McCrackin[13], H. E. Markus Meier[14,12], Sonja Oberbeckmann[14], Kevin Parnell[3], Cristian Pons-Seres de Brauwer[8], Anneli Poska[15,3], Jarkko Saarinen[16,17], Beata Szymczycha[7], Emma Undeman[13], Anders Wörman[18], Eduardo Zorita[1]

Affiliation: 1) Helmholtz-Zentrum Hereon, 2) University of Gothenburg, 3) Tallinn University of Technology, 4) Estonian Academy of Sciences, 5) Latvian Institute of Aquatic Ecology, 6) University of Gdansk, 7) Polish Academy of Sciences, 8) Technical University of Denmark, 9) University of Helsinki, 10) Finnish Meteorological Institute, 11) Swedish University of Agricultural Sciences, 12) Swedish Meteorological and Hydrological Institute, 13) Stockholm University, 14) Leibniz Institute for Baltic Sea Research

Type of publication: Article peer review

Abstract:

Coastal environments, in particular heavily populated semi-enclosed marginal seas and coasts like the Baltic Sea region, are strongly affected by human activities. A multitude of human impacts, including climate change, affect the different compartments of the environment, and these effects interact with each other. As part of the Baltic Earth Assessment Reports (BEAR), we present an inventory and discussion of different human-induced factors and processes affecting the environment of the Baltic Sea region, and their interrelations. Some are naturally occurring and modified by human activities (i.e. climate change, coastal processes, hypoxia, acidification, submarine groundwater discharges, marine ecosystems, non-indigenous species, land use and land cover), some are completely human-induced (i.e. agriculture, aquaculture, fisheries, river regulations, offshore wind farms, shipping, chemical contamination, dumped warfare agents, marine litter and microplastics, tourism, and coastal management), and they are all interrelated to different degrees. We present a general description and analysis of the state of knowledge on these interrelations. Our main insight is that climate change has an overarching, integrating impact on all of the other factors and can be interpreted as a background effect, which has different implications for the other factors. Impacts on the environment and the human sphere can be roughly allocated to anthropogenic drivers such as food production, energy production, transport,

industry and economy. The findings from this inventory of available information and analysis of the different factors and their interactions in the Baltic Sea region can largely be transferred to other comparable marginal and coastal seas in the world.

Citation:

Reckermann, M., Omstedt, A., Soomere, T., Aigars, J., Akhtar, N., Bełdowska, M., ... & Zorita, E. (2022). Human impacts and their interactions in the Baltic Sea region. *Earth System Dynamics, 13*(1), 1-80. https://doi.org/10.5194/esd-13-1-2022

How the loss of forest fauna undermines the achievement of the SDGs

Authors: Torsten Krause[1], Andrew Tilker[2]

Affiliation: 1) Lund University, 2) Leibniz Institute for Zoo and Wildlife Research

Type of publication: Article peer review

Abstract:

The human-driven loss of biodiversity has numerous ecological, social, and economic impacts at the local and global levels, threatening important ecological functions and jeopardizing human well-being. In this perspective, we present an overview of how tropical defaunation—defined as the disappearance of fauna as a result of anthropogenic drivers such as hunting and habitat alteration in tropical forest ecosystems—is interlinked with four selected Sustainable Development Goals (SDGs). We discuss tropical defaunation related to nutrition and zero hunger (SDG 2), good health and well-being (SDG 3), climate action (SDG 13), and life on land (SDG 15). We propose a range of options on how to study defaunation in future research and how to address the ongoing tropical defaunation crisis, including but not limited to recent insights from policy, conservation management, and development practice.

Citation:

Krause, T., & Tilker, A. (2022). How the loss of forest fauna undermines the achievement of the SDGs. *Ambio, 51*(1), 103-113. https://doi.org/10.1007/s13280-021-01547-5

Global Learning for Sustainable Development: A Historical Review

Authors: Birgitta Nordén[1], Helen Avery[2,3]

Affiliation: 1) Malmö University, 2) Lund University, 3) Linnaeus University

Type of publication: Article peer review

Abstract:

Despite continued efforts by educators, UN declarations and numerous international agreements, progress is still limited in handling major global challenges such as ecosystem collapse, accelerating climate change, poverty, and inequity. The capacity to collaborate globally on addressing these issues remains weak. This historical review of research on global learning for sustainable development (GLSD) aims to clarify the diverse directions that research on GLSD has taken, to present the historical development of the research area, and highlight emerging research issues. The review summarizes key findings of 53 peer-reviewed publications, published in English in the period 1994–2020 identified with the search terms "global learning" and "sustainable development", sustainability or GLSD, respectively. The review documented a gradually growing knowledge base, mostly authored by scholars located in the global North. Conclusions point to what we might achieve if we could learn from one another in new ways, moving beyond Northern-centric paradigms. It is also time to re-evaluate core assumptions that underlie education for sustainable development more generally, such as a narrow focus on formal learning institutions. The review provides a benchmark for future reviews of research on GLSD, reveals the emerging transformative structure of this transdisciplinary field, and offers reference points for further research.

Citation:

Nordén, B., & Avery, H. (2021). Global learning for sustainable development: A historical review. *Sustainability, 13*(6), 3451. https://doi.org/10.3390/su13063451

Consumer attitudes and concerns with bioplastics use: An international study

Authors: Walter Leal Filho[1], Jelena Barbir[1], Ismaila Rimi Abubakar[2], Arminda Paço[3], Zaneta Stasiskiene[4], Marie Hornbogen[1], Maren Theresa Christin Fendt[1], Viktoria Voronova, Marija Klõurbanga[5]

Affiliation: 1) Hamburg University of Applied Sciences, 2) Imam Abdulrahman Bin Faisal University, 3) University of Beira Interior, 4) Kaunas University of Technology, 5) Tallinn University of Technology

Type of publication: Article peer review

Abstract:

The world production of plastic exceeded 360 million tonnes in 2020 alone, a considerable amount of which is not properly disposed of. The significant pressures and damages posed by conventional plastic to human and environmental health suggest that alternatives are urgently needed. One of them is "bioplastic", which is defined as bio-based plastic that is (or not) biodegradable. This paper reports on a study on the perceptions of bioplastics among consumers in 42 countries to identify their levels of information and concerns. The results suggest that most respondents have positive expectations regarding the future of bioplastics to replace conventional plastics fully or partially, especially for food containers, kitchenware, and boxes and bags for packaging. They also reported that the low costs and increased availability of bioplastic products on the market are likely to be the main drivers for their wide-scale adoption. However, many participants are unsure whether they would buy bio-based and biodegradable products if they are expensive. Overall, whereas a rather positive attitude to bioplastics has been identified, greater efforts are needed to address the many information needs of consumers towards upscaling the adoption of bioplastics. Relevant policies are therefore needed to encourage investments in the large-scale manufacture and market uptake of bioplastics. The paper reports on an initial study of consumer behavior, in a sample of countries spread across all geographical regions.

Citation:

Filho, W. L., Barbir, J., Abubakar, I. R., Paço, A., Stasiskiene, Z., Hornbogen, M., ... & Klõga, M. (2022). Consumer attitudes and concerns with bioplastics use: An international study. *Plos one, 17*(4), e0266918. https://doi.org/10.1371/journal.pone.0266918