



# Research Notes Letter

*Research & Innovation for a sustainable  
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# Introduction

This issue of the Research Notes Letter **builds on published research articles submitted to us** by researchers at the BUP Participating Universities. Thank you for your cooperation and giving us the possibility to convey your research findings to a larger audience.

To have your publication presented both on the BUP web site and in a forthcoming issue of this newsletter please fill in the Research Notes Letter Form. Articles focusing on sustainable development in a wide sense or Education for Sustainable Development in the Baltic Sea Region are preferred.

On the BUP web site we have added some Researcher Presentations according to the BUP Themes. You will find all the presentations under the heading Researchers. There is room for many more, so take this opportunity to join the BUP researcher network by filling out the Researcher Presentation Form. A photo of yourself is required, preferably in the jpg-format.

Next issue of the Research Notes Letter will be published by the end of the year. Welcome with your contribution!

Dušan Bálint and Ulrika Klintberg  
Editors of this issue

# Content

Sustainable food packaging: materials and waste management solutions	
Visvaldas Varžinskas and Zita Markevičiūtė .....	4
‘Rapid Scenario Planning’ to Support a Regional Sustainability Transformation Vision: A Case Study from Blekinge, Sweden	
Giles Thomson, Henrik Ny, Varvara Nikulina, Sven Borén, James Ayers and Jayne Bryant .....	5
Sediment load variability in response to climate and land use changes in a Carpathian catchment (Raba River, Poland)	
Ewa Szalińska, Paulina Orlińska-Woźniak and Paweł Wilk.....	6
Analysis of Primary Energy Factors from Photovoltaic Systems for a Nearly Zero Energy Building (NZEB): A Case Study in Lithuania	
Rokas Tamašauskas, Jolanta Šadauskienė, Dorota Anna Krawczyk and Violeta Medelienė .....	7
The Changing Structure and Concentration of Agricultural Land Holdings in Estonia and Possible Threat for Rural Areas	
Evelin Jürgenson and Marii Rasva .....	8
Sustainable behaviour: evidence from Lithuania	
Ramunė Čiarnienė, Milita Vienažindienė and Rūta Adamonienė.....	9
Long-Term Consequences of Water Pumping on the Ecosystem Functioning of Lake Sekšu, Latvia	
Izabela Zawiska, Inta Dimante-Deimantovica, Tomi P. Luoto, Monika R zodkiewicz, Saija Saarni, Normunds Stivrins, Wojciech Tylmann, Anna Lanka, Martins Robeznieks and Tom Jilbert .....	10
Experiencing Nature: Physical Activity, Beauty and Tension in Tatra National Park—Analysis of TripAdvisor Reviews	
Agnieszka Niezgodna and Marek Nowacki .....	11
Of pipe dreams and fossil fools: Advancing Canadian fossil fuel hegemony through the Trans Mountain pipeline	
Naima Kraushaar-Friesen and Henner Busch .....	12
Urban Acupuncture in Historic Environment: Research of Analogues	
Aurelija Daugelaite and Indre Grazuleviciute-Vileniske .....	13
The Quality of Carrot after Field Biostimulant Application and after Storage	
Jarosław Pobereźny, Małgorzata Szczepanek, Elżbieta Wszelaczyńska and Piotr Prus .....	14
Sustainability Leadership in Higher Education Institutions: An Overview of Challenges	
Walter Leal Filho, João Henrique Paulino Pires Eustachio, Adriana Cristina Ferreira Caldana, Markus Will, Amanda Lange Salvia, Izabela S. Rampasso, Rosley Anholon, Johannes Platje and Marina Kovaleva.....	15
Education for Environmental Citizenship and Responsible Environmental Behaviour	
Goldman, D., Hansmann, R., Činčera, J., Radović, V., Telešienė, A., Balžekienė, A., and Vávra, J... 16	
To Lead Change - To Work and Study with Creativity and Structure - A Course Design for Deeper Learning Outcomes within a Course in Quality Technology	
Anette Oxenswärdh and Per-Arne Forsberg.....	17
Exploring Women’s Migration from Ukraine to Other Countries from the end of the 1980s to the 2020s	
Oksana Koshulko .....	18

Interdisciplinary foundation of formation of the spatial macroeconomics of Sustainable Development (SD)	
Lidiya Hryniv .....	19
Investigation of Cellulose-Based Aerogels for Oil Spill Removal	
Tatjana Paulauskiene, Jochen Uebe, Ali Ugurcan Karasu, Olga Anne .....	20
Development of Waste Collection Model Using Mobile Phone Data: A Case Study in Latvia	
Irina Arhipova, Gundars Berzins, Aldis Erglis and Evija Ansonsa.....	21
Energy-Transition Challenges in the Baltic Sea Region: An Overview of Socio-Political and Legal Gaps	
Farid Karimi and Michale Rodi.....	22
Coal mining waste in Poland in reference to circular economy principles	
Katarzyna Pactwa, Justyna Woźniak and Michał Dudek .....	23
Spatio-temporal variability and seasonal dynamics of snow cover regime in Estonia	
Birgit Viru and Jaak Jaagus.....	24

# Sustainable food packaging: materials and waste management solutions



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**Type of publication:** Article peer review

## Abstract

Current food packaging model in most cases is “linear material flow model” and is far from sustainable alternative – “circular economy” – approach where materials are recycled and recovered at the end of each service life. High concern is rising on packaging waste and especially plastic packaging and negative environmental impact. A number of factors including policy and legislative changes, rising concerns on food and packaging waste, environmental contamination, world demand for food and energy resources, undoubtedly makes an impact on development of biodegradable and compostable packaging made from renewable environment friendly resources and sustainable waste management opportunity at the end of product life.

The aim of this article is to review food packaging waste situation in European Union (EU) and available on a market sustainable food packaging solutions and materials they are made from, paying special attention to plastics and bioplastics products. Differences between “biodegradability” and “compostability” will also be indicated as well as clear distinctions between terms of “biobased”, “biodegradable” and “compostable” will be highlighted.

## Citation

Varžinskas, V., & Markevičiūtė, Z. (2020). Sustainable Food Packaging: Materials and Waste Management Solutions. *Environmental Research, Engineering and Management*, 76(3), 154-164. DOI: [10.5755/j01.ere.m.76.3.27511](https://doi.org/10.5755/j01.ere.m.76.3.27511)

# 'Rapid Scenario Planning' to Support a Regional Sustainability Transformation Vision: A Case Study from Blekinge, Sweden

**Authors:** Giles Thomson<sup>1</sup>, Henrik Ny<sup>1</sup>, Varvara Nikulina<sup>1</sup>, Sven Borén<sup>1</sup>, James Ayers<sup>1</sup> and Jayne Bryant<sup>1</sup>

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**Type of publication:** Peer review article



## Abstract

This paper presents a case study of a transdisciplinary scenario planning workshop that was designed to link global challenges to local governance. The workshop was held to improve stakeholder integration and explore scenarios for a regional planning project (to 2050) in Blekinge, Sweden. Scenario planning and transdisciplinary practices are often disregarded by practitioners due to the perception of onerous resource requirements, however, this paper describes a 'rapid scenario planning' process that was designed to be agile and time-efficient, requiring the 43 participants from 13 stakeholder organizations to gather only for one day. The process was designed to create an environment whereby stakeholders could learn from, and with, each other and use their expert knowledge to inform the scenario process. The Framework for Strategic Sustainable Development (FSSD) was used to structure and focus the scenario planning exercise and its subsequent recommendations. The process was evaluated through a workshop participant survey and post-workshop evaluative interview with the regional government project manager to indicate the effectiveness of the approach. The paper closes with a summary of findings which will support those wishing to conduct similar rapid scenario planning exercises to inform policy planning for complex systems.

## Citation

Thomson, G.; Ny, H.; Nikulina, V.; Borén, S.; Ayers, J.; Bryant, J. 'Rapid Scenario Planning' to Support a Regional Sustainability Transformation Vision: A Case Study from Blekinge, Sweden. *Sustainability* 2020, *12*, 6928.

DOI: [10.3390/su12176928](https://doi.org/10.3390/su12176928)

# Sediment load variability in response to climate and land use changes in a Carpathian catchment (Raba River, Poland)



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**Type of publication:** Article peer review

## Abstract

**Purpose:** This study analyzes the variability of sediment loads under variant climate change and land use scenarios in a Carpathian catchment with a dam reservoir. The areas with the highest share of sediment loads are tracked to establish possible indications for future catchment management plans. **Materials and methods** Analyses were performed for the Raba River catchment (Poland, Carpathian Mountains) with use of the Macromodel DNS/SWAT. The RCP 4.5 climate forecast predictions (2021–2050 and 2071–2100), downscaled for the area of Poland, and land use predictions from the DYNAClue model for the Carpathian area, were taken into consideration. A total of seven scenarios were created, accounting for precipitation (P1 and P2), temperature (T1 and T2), land use (LU) changes, and combined effects (COMB1 and COMB2).

**Results and discussion:** The average load delivered to the dam reservoir was estimated as 2.43 Gg y<sup>-1</sup>, and its seasonal/yearly variability was followed by local meteorological phenomena. Among the tested factors, precipitation change, in terms of total amount and intensity, exerted the most impact on sediment loads causing their increase. Temperature and land use changes resulted in a slight decrease. Combined scenarios implied that changes of the catchment area use, such as increase of forest cover, can noticeably reduce sediment loads delivered into a dam reservoir.

**Conclusions:** The performed simulations revealed the importance of incorporating variant scenarios for catchment management plans, development of land use mitigation measures (erosion), and operational procedures for the dam reservoir. Particular attention should be paid to warmer winters with heavy rainfalls and temperatures above zero, which together with a lack of plant vegetation result in elevated annual sediment loads reaching the dam reservoir. Further changes must be mitigated by anti-erosion investments.

## Citation

Szalińska, E., Orlińska-Woźniak, P., & Wilk, P. (2020). Sediment load variability in response to climate and land use changes in a Carpathian catchment (Raba River, Poland). *Journal of Soils and Sediments*, 1-12.

DOI: [10.1007/s11368-020-02600-8](https://doi.org/10.1007/s11368-020-02600-8)

# Analysis of Primary Energy Factors from Photovoltaic Systems for a Nearly Zero Energy Building (NZEB): A Case Study in Lithuania



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**Type of publication:** Article peer review

## Abstract

Following a new climate and energy plan, the European Union (EU) gives big attention to energy savings. The overall assessment of energy saving measures is very important. Thus, it is crucial to estimate in a proper way the primary energy factor, which is used in calculations of primary energy consumption from renewable energy (RE) sources in a Nearly Zero Energy Building (NZEB). The conducted studies of the literature and national regulations showed that different methods to determine energy from photovoltaic (PV) systems are used. The aim of this paper is to evaluate the primary energy factors of energy from photovoltaics and determine the average value. To achieve this aim, the data of 30 photovoltaic systems from Lithuania were analyzed. The results show a 35% diversification in the values of non-renewable primary energy factor, depending on the PV systems' capacities, with the average on a level of 1.038.

## Citation

Tamašauskas, R., Šadauskienė, J., Krawczyk, D. A., & Medelienė, V. (2020). Analysis of primary energy factors from photovoltaic systems for a nearly Zero Energy Building (NZEB): A case study in Lithuania. *Energies*, 13(16), 4099.

DOI: [10.3390/en13164099](https://doi.org/10.3390/en13164099)



# The Changing Structure and Concentration of Agricultural Land Holdings in Estonia and Possible Threat for Rural Areas



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**Type of publication:** Article peer review

## Abstract

In most European countries, there has been a decrease in the number of farms, while the area of agricultural land has remained almost the same. This ongoing process of land concentration can affect Europe's small farms and rural areas. The EU has acknowledged that the problem is serious and that, to solve it, it must be studied more closely. Accordingly, the aim of this study is to discuss changes in the agricultural sector from the aspect of land use, with emphasis on land concentration in Estonia, further scientific discussion about the effects of changes in land use on rural areas is encouraged. The study is carried out using two kinds of data sources: (1) statistical data from Eurostat, FAOSTAT and Statistics Estonia, (2) data from the Estonian Agricultural Registers and Information Board. The conclusion of the paper is that while the number of farms is going down, the average area of agricultural land use per farm is on the rise in Estonia. Agricultural land has been increasingly concentrated into the hands of corporate bodies. This study shows that there is a status of land concentration in Estonia that needs ongoing studies and a proper policy should be established to mitigate the impact of land concentration.

## Citation

Jürgenson, E., & Rasva, M. (2020). The changing structure and concentration of agricultural land holdings in Estonia and possible threat for rural areas. *Land*, 9(2), 41.

DOI: [10.3390/land9020041](https://doi.org/10.3390/land9020041)

# Sustainable behaviour: evidence from Lithuania



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**Type of publication:** Article peer review

## Abstract

There is an increasing focus on bridging human behaviour and attitudes towards sustainability. This article focuses on the factors that influence sustainable behaviour of working people. Based on a systematic and comparative analysis of scientific literature, the authors of the paper present the theoretical conceptual model, which illustrates sustainable behaviour. The aim of the empirical research is to examine how employees relate to sustainable behaviour across generations, genders and different modes of education through economic, environmental and social domains. A quantitative method in the form of a survey was selected to capture individual employee attitudes and actions regarding sustainable behaviour. A total of 412 complete responses from Lithuanian employees were used for data analysis. The results of empirical research revealed a significant relationship between gender, generation and education, and sustainable employee behaviour.

## Citation

Engineering Management in Production and Services, Volume 12, Issue 1, Pages 80–92, eISSN 2543-912X.

DOI: [10.2478/emj-2020-0007](https://doi.org/10.2478/emj-2020-0007)

# Long-Term Consequences of Water Pumping on the Ecosystem Functioning of Lake Sekšu, Latvia



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**Type of publication:** Article peer review

## Abstract

Cultural eutrophication, the process by which pollution due to human activity speeds up natural eutrophication, is a widespread and consequential issue. Here, we present the 85-year history of a small, initially *Lobelia–Isoëtes* dominated lake. The lake's ecological deterioration was intensified by water pumping station activities when it received replenishment water for more than 10 years from a eutrophic lake through a pipe. In this study, we performed a paleolimnological assessment to determine how the lake's ecosystem functioning changed over time. A multi-proxy (pollen, Cladocera, diatoms, and Chironomidae) approach was applied alongside a quantitative reconstruction of total phosphorus using diatom and hypolimnetic dissolved oxygen with chironomid-based transfer functions. The results of the biotic proxy were supplemented with a geochemical analysis. The results demonstrated significant changes in the lake community's structure, its sediment composition, and its redox conditions due to increased eutrophication, water level fluctuations, and erosion. The additional nutrient load, particularly phosphorus, increased the abundance of planktonic eutrophic–hypereutrophic diatoms, the lake water's transparency decreased, and hypolimnetic anoxia occurred. Cladocera, Chironomidae, and diatoms species indicated a community shift towards eutrophy, while the low trophy species were suppressed or disappeared.

## Citation

Zawiska, I.; Dimante-Deimantovica, I.; Luoto, T.P.; Rzodkiewicz, M.; Saarni, S.; Stivrins, N.; Tylmann, W.; Lanka, A.; Robeznieks, M.; Jilbert, T. Long-Term Consequences of Water Pumping on the Ecosystem Functioning of Lake Sekšu, Latvia. *Water* 2020, *12*, 1459.

DOI: [10.3390/w12051459](https://doi.org/10.3390/w12051459)

# Experiencing Nature: Physical Activity, Beauty and Tension in Tatra National Park—Analysis of TripAdvisor Reviews



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**Type of publication:** Article peer review

## Abstract

The aim of this article is to analyse the experiences gained by tourists visiting one of the most visited protected areas in Poland—the Tatra National Park (TNP). The authors focused on the following question: does the natural heritage of the national park affect visitors' unique experiences or is environmentally valuable area not important for their experiences? This article uses mixed quantitative (Text Mining, co-occurrence network analysis) and qualitative (narratives research) methods. Data for analysis—reviews posted by users between April 2011 and September 2019—were downloaded from TripAdvisor.co.uk. Reviews on TripAdvisor indicate that the most important for visiting tourists were the experiences of physical activity. This confirms the trend of maintaining health and the desire to regenerate physical strength. The group of reviews related to connection to nature experiences is extremely small, which indicates that tourists probably did not come to TNP as a result of a preference for experiences related to ecological awareness. Some tourists felt tension, which indicates that the carrying capacity was exceeded. There is a doubt as to whether tourists who want to engage in physical activity must necessarily visit the area with the highest degree of nature protection.

## Citation

Niezgoda, A., & Nowacki, M. (2020). Experiencing Nature: Physical Activity, Beauty and Tension in Tatra National Park—Analysis of TripAdvisor Reviews. *Sustainability*, 12(2), 601.  
DOI: [10.3390/su12020601](https://doi.org/10.3390/su12020601)

# Of pipe dreams and fossil fools: Advancing Canadian fossil fuel hegemony through the Trans Mountain pipeline



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**Type of publication:** Article peer review

## Abstract

This article uses the Trans Mountain pipeline expansion project as a Canadian case study to critically examine and showcase one instance of the hegemony of fossil fuels in the era of global heating. The present Canadian federal government, under the leadership of Liberal Prime Minister Justin Trudeau, is seeking to simultaneously position itself as a global climate leader while supporting the exploitation of Canada's extensive bitumen oil reserves. We apply a critical discourse analysis to seven speeches given between 2016 and 2019 by two members of the Canadian federal government on the Trans Mountain pipeline expansion project to interrogate how the government discursively reconciles these two contradicting stances. Our analysis yields three main results: 1) the government naturalizes bitumen as a substance, culturally and politically hindering the capacity for Canada to move beyond it, 2) the extraction of bitumen is portrayed as an imperative, implicating the overall economic and social health of Canada and justifying the government's use of coercion and 3) appeals to climate change and action are paradoxically subsumed into the argument for bitumen extraction. Overall, we argue, this discourse depoliticizes the social and environmental struggles surrounding bitumen extraction. It functions to maintain the hegemony of fossil fuels in the era of global heating, thus foreclosing on possibilities of leaving the fuels in the ground while reinforcing Canadian bitumen's multi-dimensional carbon lock-in.

## Citation

Kraushaar-Friesen, N., & Busch, H. (2020). Of pipe dreams and fossil fools: Advancing Canadian fossil fuel hegemony through the Trans Mountain pipeline. *Energy Research & Social Science*, 69, 101695. DOI: [10.1016/j.erss.2020.101695](https://doi.org/10.1016/j.erss.2020.101695)

# Urban Acupuncture in Historic Environment: Research of Analogues



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**Type of publication:** Article peer review

## Abstract

Today's cities face a variety of development, rehabilitation and preservation challenges. Historical built environment deserves particular attention in this regard. Urban regeneration projects are particularly complex here because of the dense urban fabric and the risk of damage to the heritage values. In order to understand how to overcome these challenges, we explore the concept of urban acupuncture in this research. The urban acupuncture focuses on small, precisely targeted, rapid and usually low-cost changes that positively affect social, ecological, and even economical and physical dimensions of the surrounding environment. The aim of this research was to identify the recent interventions in historic urban environment of Kaunas city (Lithuania) that can be seen as the analogues of urban acupuncture and to evaluate them using the designed set of criteria integrating the characteristics of urban acupuncture, the patterns of socially and ecologically responsible biophilic design and the requirements for preservation and development of historic built environment.

## Citation

Daugėlaitė, A. and Gražulevičiūtė - Vileniške, I. 2018. Urban Acupuncture in Historic Environment: Research of Analogues. *Journal of Sustainable Architecture and Civil Engineering*, 23(2): 5-15. DOI: [10.5755/j01.sace.23.2.21434](https://doi.org/10.5755/j01.sace.23.2.21434)

# The Quality of Carrot after Field Biostimulant Application and after Storage



**Authors:** Jarosław Pobereźny<sup>1</sup>, Małgorzata Szczepanek<sup>1</sup>, Elżbieta Wszelaczyńska<sup>1</sup> and Piotr Prus<sup>1</sup>

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**Type of publication:** Article peer review

## Abstract

The carrot (*Daucus carota* L.) is a staple vegetable in human nutrition in Europe. In recent years, the use of biostimulants in vegetable crops has become a way to affect the quantity and quality of yields. The aim of this study was to assess the effect of the type and methods of biostimulant (natural seaweed extract Kelpak and synthetic Asahi) application on the nitrates and nitrites content in carrot roots after harvest and storage. The study was based on a strict field experiment with carrot cv. 'Karotan', conducted in Poland (53°13'N; 17°51'E) in three successive growing seasons and after six months of storage (RH 95%, and air temperature +1 °C). The biostimulants were applied during the growing season in a foliar form. The content of NO<sub>3</sub><sup>-</sup> and NO<sub>2</sub><sup>-</sup> in carrot after harvest depended on the dose and the date of biostimulant application. The single application of biostimulant Kelpak as well as two times of Asahi had no effect on the nitrate and nitrite content, while the application of Kelpak in a total dose of 6 or 7 dm<sup>3</sup> ha<sup>-1</sup> increased them. The maximum intake of nitrates and nitrites following the harvest and storage was, respectively, 7.1, 2.3% and 6.7, 2.1% of the ADI.

## Citation

Pobereźny J., Szczepanek M., Wszelaczyńska E., Prus, P. 2020. The Quality of Carrot after Field Biostimulant Application and after Storage. *Sustainability* 2020, 12(4), 1386.

DOI: [10.3390/su12041386](https://doi.org/10.3390/su12041386)

# Sustainability Leadership in Higher Education Institutions: An Overview of Challenges

**Authors:** Walter Leal Filho<sup>1</sup>, João Henrique Paulino Pires Eustachio<sup>2</sup>, Adriana Cristina Ferreira Caldana<sup>2</sup>, Markus Will<sup>3</sup>, Amanda Lange Salvia<sup>1</sup>, Izabela S. Rampasso<sup>4</sup>, Rosley Anholon<sup>4</sup>, Johannes Platje<sup>5</sup> and Marina Kovaleva<sup>1</sup>

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**Type of publication:** Article peer review



## Abstract

Sustainability leadership entails the processes, which leaders, policymakers, and academics undertake in order to implement sustainable development policies and other initiatives within their organizations. It encompasses approaches, methods, and systemic solutions to solve problems and drive institutional policy towards a more sustainable organization. Higher Education Institutions (HEI) play a particularly important role, especially with regard to their institutional leadership role in promoting sustainable development. There is a paucity of research focusing on sustainability leadership in universities. In order to address this gap, this paper discussed the concept of sustainability leadership based on literature and empirical insights. The study aimed to understand the main characteristics of sustainability leaders at HEI and the main challenges they are confronted with. Secondary research questions involved gender issues and positive outcomes of sustainability leadership. The empirical component of the study consisted of an online-questionnaire survey performed among leaders (n = 50) from a set of universities in 29 countries. The sampling scheme was purposive, based on the membership in the Inter-University Sustainable Development Research Program (IUSDRP). The study was explorative in nature, and the descriptive statistics were used for the analysis. Due to the purposive sampling, the participants from top management positions could be considered as experienced, and their views were assumed to be information-rich. With a self-evaluation, the respondents described their leadership style and their usual traits, with inclusive style and systemic thinking being predominant in the sample. Regarding the skills, the respondents selected the ability to innovate, to think long-term, and to manage complexity from a pre-defined set of options. Connectedness with interdisciplinarity and knowledge about organizational settings, as well as global challenges and dilemmas, were stated as important issues related to the knowledge required for being a leader. Regarding requirements for a change towards more sustainable universities' curriculum adaptation, investments in education for sustainable development (ESD), sustainable procurement, and reporting were mentioned. The study also revealed that gender issues were taken seriously among the sampled institutions, which is an encouraging trend. Challenges seen in implementing sustainability leadership are, for instance, a lack of interest by the university administration and among some members of the academic community, as well as lack of expertise and materials or resources. Based on the empirical insights, a set of measures were listed and which may be adopted in the future, so as to allow leaders of Higher Education Institutions to enhance their sustainability performance.

## Citation

Leal Filho, W. Pires Eustachio, J.H.P., Ferreira Caldana, A.C. et al. 2020. Sustainability Leadership in Higher Education Institutions: An Overview of Challenges. *Sustainability* 2020, 12, 3761.

DOI: [10.3390/su12093761](https://doi.org/10.3390/su12093761)



# Education for Environmental Citizenship and Responsible Environmental Behaviour

**Authors:** Goldman, D.<sup>1</sup>, Hansmann, R.<sup>2</sup>, Činčera, J.<sup>3</sup>, Radović, V.<sup>4</sup>, Telešienė, A.<sup>5</sup>, Balžekienė, A.<sup>5</sup>, and Vávra, J.<sup>6</sup>

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**Type of publication:** Book chapter



## Abstract

The notion of Environmental Citizenship embodies behaviour – an actively involved citizen who exercises his/her environmental rights and obligations in the private and public spheres. Education for Environmental Citizenship implies behavioural change; its goal is to facilitate an individual's intellectual growth (cognitive domain) and emotional capacity (affective domain) that may lead to a critical and actively engaged individual. Human behaviour is overwhelmingly sophisticated, and what shapes pro-environmental behaviour is complex and context specific. Furthermore, empirical research indicates a discrepancy between possessing environmental knowledge and environmentally supportive attitudes and behaving pro-environmentally. The point of departure of this chapter is that the social and psychological study of behaviour has much to inform the study of environmental behaviour and, deriving from this, to inform regarding the type of education towards behaviour/action in the goal of sustainable socioecological transformation. The chapter focuses on internal (psychosocial) factors. It presents selected models regarding factors influencing behavioural decisions that are acknowledged as influential theoretical frameworks for investigating pro-environmental behaviour, as well as various theories that inform these models. These are categorised into knowledge-based models; attitude-, value- and norm-oriented models; skills, self-efficacy and situational factors; and new approaches to environmental behaviour models. The chapter concludes with suggestions for Education for Environmental Citizenship deriving from the various models.

## Citation

Goldman D. et al. (2020) Education for Environmental Citizenship and Responsible Environmental Behaviour. In: Hadjichambis A. et al. (eds) Conceptualizing Environmental Citizenship for 21st Century Education (pp. 115-137). Environmental Discourses in Science Education, vol 4. Springer, Cham.

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# To Lead Change - To Work and Study with Creativity and Structure - A Course Design for Deeper Learning Outcomes within a Course in Quality Technology



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**Type of publication:** Article peer review

## Abstract

**Purpose:** In this paper a new course design as a case study is presented. The course was given at bachelor level at Uppsala university, campus Gotland, within the division of quality technology. The purpose of the case is to give students an opportunity to practice acquired theoretical knowledge by offering them the opportunity to create an organization of their dreams, working in small groups.

**Methodology/Approach:** This paper builds upon a case study approach, combining a literature review, document studies over the performed course and evaluations over the course.

**Findings:** The case study shows that course design can be an important inspiration and a bridge between theory and practice for the students. Course design seems to support students' learning processes according to evaluations of the course. Course design offers benefits of the collective learning, especially for distance students. It increases independence, understanding of one's mission and accountability for it. Students are given the opportunity to practice the theoretical knowledge in their education in a creative and inspiring way. Still, there are further demands and challenges left of improvement in the course design.

**Research Limitation/implication:** The research limitation is that this study consists of only one course in Quality Technology.

**Originality/Value of paper:** This study contributes to the discussion about learning at university level through a case study. Category: Case study

## Citation

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# Exploring Women's Migration from Ukraine to Other Countries from the end of the 1980s to the 2020s



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**Type of publication:** Article peer review

## Abstract

The paper presents the results of research concerning women's migration from Ukraine from the end of the 1980s to the 2020s. The paper considers two types of female migration, based on different motives, reasons, outcomes, and means to achieve the realization of their migration plans. The methodology of the paper consists of primary and secondary sources of information. The two types of female migration explored are those taking place in the 1980s and those in the 2020s. The first wave of female migration from Ukraine, from the end of the 1980s to 2000, has been called 'women attempting to migrate through despair' and the second wave, from 2000 to 2020, has been called 'attempts by women to migrate due to need and danger'.

## Citation

Koshulko, O. 2020. Exploring Women's Migration from Ukraine to Other Countries from the end of the 1980s to the 2020s. *Randwick International of Social Science (RISS) Journal Vol. 1 (1): 127-132*. DOI: [10.47175/rissj.v1i1.16](https://doi.org/10.47175/rissj.v1i1.16)

# Interdisciplinary foundation of formation of the spatial macroeconomics of Sustainable Development (SD)



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**Type of publication:** Article

## Abstract

This article proposes a concept of the formation (establishment) of spatial macroeconomics of sustainable development that expands the system of coordinates in the research in economic science as it takes into account physical parameters of biosphere terrestrial space in economic development.

The object of this research in spatial macroeconomics are the complex ecosocioeconomic systems (ESES) in whose core lie the terrestrial ecological systems characterized by a certain volume of the Earth's ecosystem supply.

Spatial macroeconomics studies the models of commensurability of biophysical and value estimates on the way to the formation of sustainable economy development of ESES. This article proposes also a physical and economic paradigm of the formation of economy of sustainable development that unlike the existing paradigms takes into account natural sources of primary cycle of wealth accumulation in the economy. This gives grounds for the methodological changes in the theory of value and for the construction of a qualitatively new model of monetary economy for resolving the problems of sustainability.

The latest physical economics is an integral (synthesizing) science that applies transdisciplinary approaches to the study of the cause-and-effect linkage in complex stationary ecosocioeconomic systems of different hierarchy levels. New heuristic models therein are based on the synthesis of the laws of physics, biology, geobotany, geochemistry, landscape science, biophysics and economics.

## Citation

Hryniv, L. 2018. Interdisciplinary foundation of formation of the spatial macroeconomics of Sustainable Development (SD). *Visnyk of the Lviv University, Economy Series, Issue 55: 3-12*. Lviv, Ukraine. ISSN 2078-6115.

DOI: [interdisciplinary-principles-of-formation-of-the-spatial-macroeconomics-of-sd/](https://doi.org/10.23930/2078-6115/1801003)

# Investigation of Cellulose-Based Aerogels for Oil Spill Removal

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**Type of publication:** Article peer review

## Abstract

Oil pollution caused by heavy shipping traffic in the Baltic Sea could be removed by the help of highly porous aerogels made from the waste. These could be produced from environmentally friendly cellulose, e.g. from paper waste, but would have to be hydrophobized for oil sorption. Such a cellulose aerogel was investigated in this research work. Six types of aerogel with 0.5, 1.0, 1.5, 2.0, 2.5 and 3.0 wt-% cellulose with porosities in the range of 96–98% stabilised by unsaturated polyester as cross-linker have been produced. Aerogel's sorption capacity as well as its regeneration for sorption of crude oil, marine diesel oil and biodiesel sorption from water surface and mechanical strength have been estimated. It was found out that crude oil sorption capacity reach  $29.67 \pm 0.39$  g g<sup>-1</sup>, biodiesel –  $29.07 \pm 0.26$  g g<sup>-1</sup>, while marine diesel oil –  $26.26 \pm 0.39$  g g<sup>-1</sup>. The aerogel with 0.5 wt-% cellulose shows the best sorption properties after 10 cycles of the sorption.

## Citation

Paulauskiene, T., Uebe, J., Karasu, A.U. *et al.* Investigation of Cellulose-Based Aerogels for Oil Spill Removal. *Water Air Soil Pollut* **231**, 424 (2020).

DOI: [10.1007/s11270-020-04799-1](https://doi.org/10.1007/s11270-020-04799-1)

# Development of Waste Collection Model Using Mobile Phone Data: A Case Study in Latvia

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**Type of publication:** Conference paper

## Abstract

In organizing household waste management and controlling waste collection and disposal, it is necessary to minimise risks to the environment and human health and, where possible, ensure that waste is recycled and returned to the economic cycle. Different models are being applied to increase waste collection management efficiency, but in recent years, the mobile phone data is widely used to solve various application problems. The research objective is to develop a waste collection model, which responds to the population's current demands and allows planning waste container loading, based on mobile phone data statistics. The developed approach, techniques and data model can be used for waste container analysis and optimisation of their placement near small commercial structures, information kiosks, residential areas and other places attracting larger amounts of people. The developed relational data model includes information about mobile phone base stations, waste container data, calendar table and geographic location table. Further steps include data processing and data modelling in order to generate a data model for visual and quantitative analysis. The methods and data analysis techniques used in this research could be used to build a commercial product for mobile data operators allowing predicting the most appropriate placement of waste containers in any territory where mobile base station data is available. The choice of any of the proposed strategies allows achieving both direct benefits, like increasing the collected amount of recyclable glass, and indirect benefits – an increase in the amount of glass collected in the remaining containers.

## Citation

Arhipova I., Berzins G., Erglis A., Ansonska E. (2020) Development of Waste Collection Model Using Mobile Phone Data: A Case Study in Latvia. In: Arai K., Kapoor S., Bhatia R. (eds) *Advances in Information and Communication*. FICC 2020. *Advances in Intelligent Systems and Computing*, vol 1130. Springer, Cham.

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# Energy-Transition Challenges in the Baltic Sea Region: An Overview of Socio-Political and Legal Gaps

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**Type of publication:** Book chapter in *From Economic to Energy Transition. Energy, Climate and the Environment*

## Abstract

In order to meet the climate targets established by the European Union and the Paris Agreement, it is essential to reduce carbon dioxide emissions in the Baltic Sea Region while securing the energy supply. In addition, for various political and security reasons, there is a preference for minimising reliance on Russian energy sources, particularly in the BSR countries that are part of Central and Eastern Europe. A timely clean energy transition is therefore crucial, not only to meet established targets but also to address these concerns. Far from resolving these issues, the controversial Nord Stream 2 gas pipeline project has only added to the complexity of the energy transition in the Baltic Sea Region. Crucial macro-level socio-political and legal challenges must be addressed in order to expedite an energy transition in the region. This chapter is an endeavour to identify these challenges and their root causes.

## Citation

Karimi F., Rodi M. (2021) Energy-Transition Challenges in the Baltic Sea Region: An Overview of Socio-Political and Legal Gaps. In: Mišík M., Oravcová V. (eds) *From Economic to Energy Transition. Energy, Climate and the Environment*. Palgrave Macmillan, Cham.

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# Coal mining waste in Poland in reference to circular economy principles

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**Type of publication:** Article peer review

## Abstract

The article deals with the problem of mining waste, which is the largest group of waste balance in Poland. Based on research, the current state of waste management in Polish coal mining has been identified. This is a challenge that is facing not only the domestic mining industry, but also international mining. As demonstrated using the example of international solutions, the essence of waste classification is gaining practical significance. A dynamically developing, more flexible and advanced technology enables the 3R principle (Reduction, Reuse, and Recycle) of Circular Economy theory to be applied in practice to the mining industry. Coal mining waste generated due to the absence of selective mining methods and coal beneficiation can be reused in co-firing processes for energy production after being treated. Further reuse of coal mining waste also has a positive effect on land reclamation and restoration, which in turn will minimize the size of mining dumps. Non-energy uses of coal may be found in the chemical industry, but some production methods may raise additional questions regarding excessive CO<sub>2</sub> emissions. In a circular economy, it is important to identify all possible ways to reuse resources. As part of the research, the current state of coal mining waste was examined. Based on the described solutions for the use of mining waste, a sustainable, socio-environmental CE strategy for this group in the selected area of waste has been proposed together with the highest and best use analysis for dumps in complex legal, economic and technical conditions.

## Citation

Pactwa, K., Woźniak, J., & Dudek, M. (2020). Coal mining waste in Poland in reference to circular economy principles. *Fuel*, 270, 117493.

DOI: [10.1016/j.fuel.2020.117493](https://doi.org/10.1016/j.fuel.2020.117493)



# Spatio-temporal variability and seasonal dynamics of snow cover regime in Estonia

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**Type of publication:** Article peer review

## Abstract

Climate warming influences highly on snow cover regime in the midlatitudes. Snow cover conditions, in turn, affect human activity very much. The aim of this study was (a) to analyse spatial and temporal variability of snow cover duration, (b) to analyse spatial and temporal variability of the start and end dates of the period with the permanent snow cover, (c) to describe spatial, temporal and seasonal variability of median and maximum snow depth in Estonia and (d) to determine the presence of long-term changes and trends in these parameters during the period 1950/51–2015/16. Time series of daily snow depth at 22 stations for that period were processed in order to obtain reliable estimates of changes in the snow regime. Snow cover data are non-normally distributed, therefore, median and quartile range were used to describe the mean state and variability of snow cover. Only those dates were included into the analysis when snow cover was observed at least on 50% of days in the time series. Trend analysis was made using the Mann-Kendall test and trend values were found using the Theil-Sen's method. A large spatio-temporal variability of snow cover duration was found. The median number of days with snow cover at the 22 stations was 112, varying between 61 and 130 days. In the coastal regions of Estonia and especially on the western coast of Saaremaa Island snow cover duration has been much lower than in the continental part. The longest snow cover period is observed on uplands in south-eastern and north-eastern Estonia. It was found that, in the average, the period with the permanent snow cover in the continental Estonia begins on 19 December and ends on 18 March. There was a negative trend in snow cover duration due to the earlier snow melting in spring at the majority of stations. The end date of the permanent snow cover has shifted earlier by 10–30 days in 66 years and its duration has decreased accordingly. The maximum snow depth has been recorded on uplands of south-eastern Estonia with the median value 38 cm. There was a decreasing multiannual trend in snow depth from January to the end of March. Changes in snow depth were largest in the end of February and in March when the trend was statistically significant. In the average, snow depth has decreased by 0.5–1.5 cm per decade, i.e. by 2–9 cm throughout the whole study period.

## Citation

Viru, B., & Jaagus, J. (2020). Spatio-temporal variability and seasonal dynamics of snow cover regime in Estonia. *Theoretical and Applied Climatology*, 139(1-2), 759-771.

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