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Rethinking Sustainability: Questioning old perspectives and developing new ones

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Abstract

The concept of sustainability is still progressing, being complex and contested, and is therefore under continuous discussion and research. This special volume comprises 29 articles exploring recent developments of sustainability concepts, approaches, strategies, policies, and practices, as well as their roles and applicability in different geographic, socio-cultural and economic contexts. The majority of the articles were presented at the 22nd conference of the International Sustainable Development Research Society (ISDRS), held in Lisbon, Portugal, in July 2016. The articles address six overarching themes: i) global perspectives on sustainability challenges, policies and models; ii) the next frontiers of sustainability for corporations, iii) integration of non-traditional aspects and new forms of knowledge in sustainability research, iv) planning for sustainable development and sustainable cities, v) (higher) education for sustainable development and vi) human resources and sustainability. A summary of each article is given in this editorial, showing the diversity of themes, from theoretical and practical perspectives, and the broad range of different methods and research formats. The research presented in the articles was carried out in more than 17 countries on five continents. Notwithstanding the many efforts around rethinking sustainability research and practices, there are still many challenges to face and further opportunities for research on the topic.

Key-words: sustainable development, challenges, geographic-socio-cultural-economic contexts, new frontiers.

1. Introduction

Many definitions of the terms Sustainable Development (SD) and Sustainability have appeared over the past decades and these have been considered to be complex, controversial, open-ended and challenging, as they are open to different interpretations which are often mutually exclusive (Hussey et al., 2001; Baker, 2006; Lozano, 2008; Vogt and Weber, 2019). In this context, while on the one hand several sustainability discourses have arisen, reflecting the multi-dimensional character of the sustainability concept, which includes ecological, political, ethical, socio-economic, democratic, cultural and theological dimensions (Vogt and Weber, 2019), on the other hand the concept brings together discourses from different domains as illustrated by the broad view taken by the Sustainable Development Goals (United Nations General Assembly, 2015). Other trends have also been identified as well, whereby sustainability discourses have moved from an anthropocentric to a more eco-centric or holistic worldview (Baker, 2006; Imran 2014).

Major transformations are required to avoid crises and a possible future societal and environmental collapse (Hopwood et al., 2005; Lahsen 2016; IPCC 2018; IPBES 2019). Sustainability in practice requires changes in practices, mental models and behaviours (Lozano, 2015; Spangenberg and Lorek, 2019), from individuals, households, companies, public administration, academia and non-government organisations, as well as the strategic and policy levels of governments (Matos and Silvester, 2013). In this context, governments have committed to sustainability transitions (for example by adopting the 2030 Sustainable Development Agenda, United Nations General Assembly, 2015), while businesses and consumer-citizens have been engaged in initiatives and behaviours towards change, for example through Corporate Social Responsibility (CSR) and Corporate Sustainability (CS) schemes or by adopting alternative consumption patterns (Ivanova et al., 2016). Nevertheless, the scale, scope and urgency of the transitions required are considerable, while deliberately managing such processes is still a major challenge for all (Turnheima et al., 2015; Spangenberg, 2017). So far, the international SD research community has generated and accumulated knowledge from 'traditional' tested models and results from practical experiences in dealing with sustainability issues in different time and space contexts. Although much progress has been achieved, it has become necessary to start rethinking traditional modes of knowledge generation and its applicability (Hessels and van Lente, 2008; Miller and Wyborn, 2018), and to be ready to adapt the way of conceptualising and doing (Ramos, 2019). Scientists are challenged to apply more transformative research designs that would go beyond analytical observations and strive for stronger societal impacts (Schneidewind et al., 2016).

Within this line of thought, Ramos (2009, 2019) highlights that sustainability frontiers should also build upon non-traditional aspects of sustainability, such as goal and target uncertainties, new and old limits of socio-ecological systems, ethics, cultural dimensions, aesthetics and general non-material values (e.g. solidarity, compassion, mutual help). Hence, making it possible to include new emerging issues and to deal with aspects that have been overlooked in previous research.

This raises several questions, such as: How useful are the current sustainability initiatives for society and for effective stakeholder engagement? How should new tools and approaches to sustainability be tailored to produce effective impact on decision-making and policy processes? What are the strengths/benefits, drawbacks, opportunities and threats/barriers to change current sustainability research and policy paths? How resilient is the sustainability concept and what innovations can be expected in the future? In face of these open questions, this Special Volume (SV) aims to present recent developments on sustainability concepts, approaches, strategies, policies, and practices, as well as their roles and applicability in different geographic, socio-cultural and economic contexts. Considering the variety of existing sustainability discourses, the SV covers the following overarching themes:

A. Global perspectives on sustainability challenges, policies and models;
B. The next frontiers of sustainability for corporations;
C. Integrating non-traditional aspects and new forms of knowledge in sustainability research;

D. Planning for sustainable development and sustainable cities;
E. (Higher) Education for Sustainable Development;
F. Human resources and sustainability.

For this SV, 29 articles from over 70 submissions were selected in total. The SV was associated to the 22nd conference of the International Sustainable Development Research Society (ISDRS), held in Lisbon, Portugal in July 13-15, 2016, and most authors in this SV participated in the conference. The articles address the overarching themes above from theoretical and practical perspectives, using a broad range of different qualitative and quantitative methods and research formats (e.g. case studies, literature review, and empirical experiments). The articles describe research carried out in more than 17 countries on five continents (Figure 1), with others being transnational, i.e. spanning Europe (Lazzarini et al., 2018; Moretto et al., 2018) or even the globe (Beumer et al., 2018; Goffi et al., 2018; Prieto-Sandoval et al., 2018; Miras-Rodrígues et al., 2018; Santos et al., 2019). This figure also shows the respective authors and the overarching theme into which the article falls into – see legend presented below the figure.

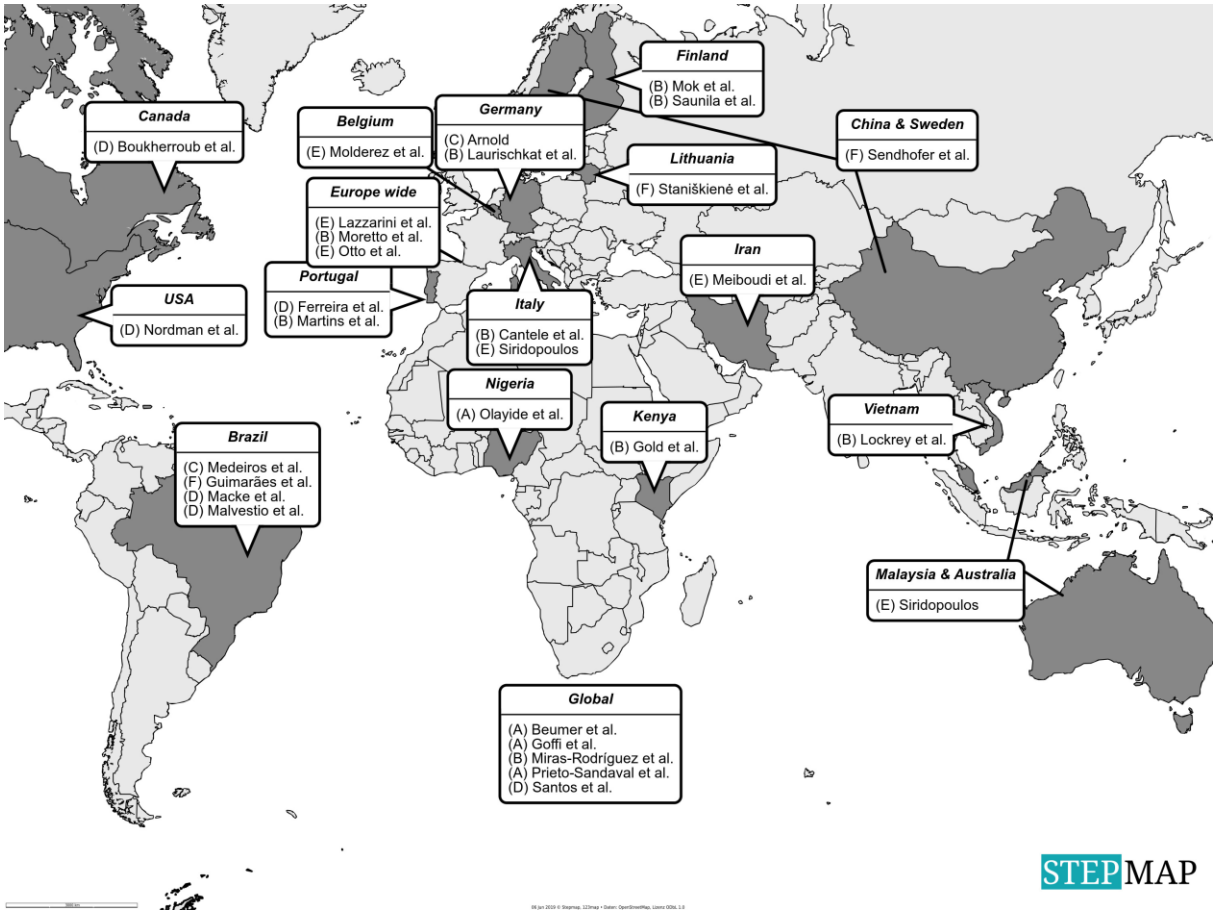

Figure 1. Overview of the countries where the research presented in this SV was carried out, with respective authors and overarching themes A to F.
*(Legend: **A** - Global perspectives on sustainability challenges, policies and models; **B** -The next frontiers of sustainability for corporations; **C** - Integrating non-traditional aspects and new forms of knowledge in sustainability research; **D** - Planning for sustainable development and sustainable cities, **E** - (Higher) Education for Sustainable Development; **F** - Human resources and sustainability)*

2. Navigating through the Special Volume – Overviews and Summaries

Figures 1 and 2 help the reader to navigate this SV. Figure 2 offers a quick overview of the six themes (A to F) and the respective subcategories that emerged for each theme during an iterative and reflective process of analysis. The overarching themes namely: *B. The next frontiers of sustainability for corporations* and *D. Planning for sustainable development and sustainable cities* are the ones covered by more articles. Figure 2 also aims to show the diversity of topics that can be found in each main theme. Furthermore, it demonstrates that none of the categories is exclusive: e.g. articles related to *Life Cycle Analysis (LCA)* or *Assessment* appear in more than one overarching theme and may invite the reader to explore eventually new contexts. *Corporate Social Responsibility (CSR) & Eco-innovation* is the dominant subcategory associated to five articles, followed by *Decision-making processes* with four articles – two articles in theme C and two in theme D.

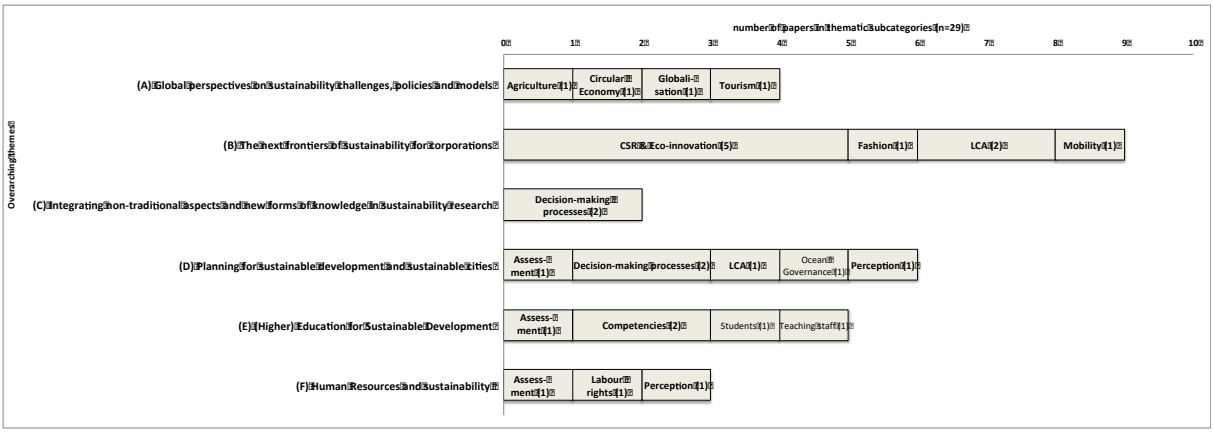

Figure 2 – Overview of the overarching themes A to F in this SV, with respective articles (n=29) and the associated thematic subcategories in alphabetical order
Note: CSR = Corporate Social Responsibility; LCA = Life Cycle Analysis

Next follows a brief summary of each article, organised by the overarching themes A to F and subsequently in alphabetical order. At the end of each summary, the subcategory to which the article was associated, is indicated in brackets.

A. Global perspectives on sustainability challenges, policies and models

This theme consists of four articles, each tackling different problems (agriculture, circular economy, globalisation, tourism, see Figure 2), but all touching a rather global perspective on the respective sustainability challenges:

Beumer et al. *(2018)* explored the sustainability of globalization by analysing its 'social robustness'. A content analysis based on the Cultural Theory typology was conducted on reports published by significant organizations in the field of global governance. Results demonstrated the overall dominance of the 'individualist' perspective across various organizations of global policy significance, delineating sustainable futures within three core themes of global governance: climate change, economy and health. This research contributes towards a more inclusive discussion on global issues that matter in the context of a sustainable future. According to the authors a more socially robust form of globalization is possible, but only if marginalized perspectives are included in the policy debates and thereby allowed to contribute to solving humanity's most pressing issues. [*globalisation*]

Goffi et al*. (2018)* assessed tour operators' sustainability orientation and engagement, determining whether variations among different tour operators exist. Based on a survey among tour operators

worldwide, the authors concluded that there is a relatively high sustainability orientation and engagement, and that the more sustainability-oriented the tour operators are, the more sustainability-engaged they are. In addition, results show that small-scale tour operators, specializing in nature and cultural tourism, and owning accommodation facilities are also highly engaged in sustainability. The authors highlighted that by introducing corporate sustainability strategies, tour operators can maintain their economic capital while preserving natural and social capital. [*tourism*]

Olayide and Alabi *(2018)* explored the relationship between rainfall and food poverty through the assessment of vulnerability to climate change in an agricultural economy by geo-referencing and mapping rainfall variability and food poverty. Nigeria was used as the geographic area. Through a quantification of the scale and location of the area under food poverty and rainfall variability, scenarios were developed to provide alternative SD pathways of desirable outcomes. The findings provide a basis for policy formulation and implementation on inequity of food poverty and environmental sustainability. The authors concluded that there is need for agricultural transformation along vulnerability dimensions. [*agriculture*]

Prieto-Sandoval et al. *(2018)* propose a consensus view of the basic notions of the circular economy (CE) framework highlighting its relationship with eco-innovation. Based on a systematic literature review, four main outputs were drawn: a knowledge map of the CE, an analysis of the main notions of the concept, principles, and determinants of a circular economy. According to the authors the challenge is to know how the theoretical knowledge can be easily transmitted to practitioners and how the CE determinants can be supported through the micro, meso and macro levels. In addition, the question remains to see how the paradigm shift associated to CE can contribute to society's living in balance with nature. [*circular economy*]

B. The next frontiers of sustainability for corporations

This theme comprises nine articles and is thereby the largest theme in this special issue. The research was undertaken in Europe, Asia and Africa. While five articles can be labelled with *CSR & Eco-innovation* in their broadest sense, the remaining deal with very different subtopics such as *fashion*, *life cycle analysis (LCA)* and *mobility* (respectively), but all representing important sustainability challenges for corporations:

In their quantitative study consisting of a survey and structural equation modelling, ***Cantele and Zardini*** *(2018)* analysed responses from 348 Italian small-and medium enterprises (SMEs) with a focus on the relationship between corporate social performance and financial performance. Based on the circumstances that the majority of companies in Europe are SMEs and that their CSR practices differ from larger, multinational companies, with little empirical knowledge about the specificities of SMEs' sustainable management and the links to their financial stands, this study adds to the field by validating a new model on these links. Using inferential statistics, namely explorative factor analysis and several tests for correlations, as well as bootstrapping, the authors identified first and second level mediators with impacts for the companies' management: A strategic view on sustainability can bring several benefits to SMEs, such as improved competitiveness and performance, in particular social and economic components of sustainability. [*CSR & eco-innovation*]

Gold et al. *(2018)* take the reader to Kenya and present a longitudinal, data-rich case study about corporate community development in the semi-arid Kajiado County region, where the world's second largest soda ash manufacturer operates, the Tata Chemicals Magadi (TCM). The authors' research tackles the question of how corporate-initiated community involvement may lead to long-term community development. The majority of the population of that region, mainly Massai, live in great poverty and have traditionally depended on TCM for employment and other basic needs such as water. Starting with a comprehensive and critical literature review on CSR practices in developed and developing countries, they make then their pledge for a systems approach. The authors explain their

inductive and versatile qualitative research design, in which they used document archives analysis, interviews and focus groups with community members, as well as participant observation in corporate meetings, to develop a system dynamics model for the case study. As one of the main findings they underline the importance of the cultivation of the "we-feeling" and the experimentation with new forms of social responsibility. The article informs about the conditions to let a long-term community development project become successful. [*CSR & eco-innovation*]

Another systems approach, but in a very different context than the previous one of Gold et al. (2018), is used by ***Laurischkat and Jandt*** *(2018)* to explore sustainable mobility and energy solutions in Germany. With a focus on electric vehicles, photovoltaic systems and battery storages, the authors developed a new techno-economic model that helps to understand the synergies between these components and related costs, including options for parameter variations like customer needs or changing environmental factors into the simulation. Furthermore, they offer an approach to quantify the share of photovoltaic traction in the different scenarios. The model was validated in a German municipal utility and can inform future economically viable business models for sustainable technologies. [*mobility*]

Lockrey et al. *(2018)* address the poorly documented environmental performance of recycling construction and demolition waste in Vietnam. They do this by mapping the current recycling system and estimating recycling performance of concrete – a key component in construction and demolition waste in Vietnam. Their analysis is based on a life cycle assessment model supported by stakeholder interviews from six construction companies in Hanoi, involved in the life cycle of construction and demolition waste management. Their results indicate that potential net environmental benefits exist, but are dependent on a mechanised plant. Hence, their findings provide support to the benefits of technological advancements in concrete recycling in the construction and demolition waste sector. The authors recommend imposing clear and consistent construction and demolition waste classifications, establishing clear lines of responsibility, and coordinating activities amongst key stakeholders to promote the benefits of concrete recycling. [*LCA*]

Martins et al. *(2018)* present a detailed sustainability assessment analysis of two Portuguese wines based on seven indicators, following a life cycle perspective for the winemaking and bottling steps. First, they contextualise the reader with the sustainable winegrowing concept started in the 1990's and underline the importance of life cycle thinking. Their comparative analysis illustrates the performance of a branded wine, with a low-market value, produced in large quantities and using diverse grapes, versus a high-market value "terroir" wine, produced in small quantities with grapes from only one vineyard. Using the common wine bottle of 0.75 litre as the functional unit, this study makes it easy to understand the differences and similarities of both wines. The largest difference can be observed in water consumption where the branded wine needs almost 5 litres of water for producing one bottle of wine, while the terroir wine needs only a little less than 1.6 litres. Other indicators show how the evaluation of each wine depends on respective life cycle stages or processes, showing e.g. details for carbon emissions in the winemaking and bottling steps, as well as energy consumption and packaging materials. In their conclusions, the authors point out a hotspot for future studies: as only in the case of the branded wine, Sulfur dioxide (SO_2) is added in the initial process to avoid fermentation, requiring a desulfitation process before bottling, water and energy consumption are consequently much higher and should be further investigated. [*LCA*]

Similar to Cantele and Zardini (2018), earlier in this SV, the research of ***Miras-Rodríguez et al.*** *(2018)* tackle the relationship between environmental practices and financial performance, but in their case with regard to manufacturing plants of large multi-national companies, having over 100 workers. The authors carried out a questionnaire survey targeting managers from 230 manufacturing plants (machinery, electronics and automotive components) in ten different countries, focusing in particular on questions related to the influence of the cultural environment as the potential main driver for sustainability practices. They classified the cultural environment according to the GLOBE Study on 62

societies (House et al., 2004) and to Hofstede (2000), namely rule-based vs. relationship-based, and found that the main drivers for environmental practices differ in each cultural context. In rule-based countries, cost savings are the main motivation, whereas in relationship-based countries the support of the top management is crucial for environmental practices. However, they could not find a significant relationship between environmental practices and financial performance. The authors conclude that their results might be useful for managers of such plants in order to develop appropriate strategies considering cultural differences. [*CSR & eco-innovation*]

Mok and Gaziulusoy *(2018)* developed a new theoretical framework to support strategic design interventions that aim to anticipate and address problems in systemic transitions by integrating two areas of knowledge: strategic design and transitions theories. They applied the theoretical framework to a case study of facilitating salmon trout aquaculture in Finland, where multiple conflicting values exist among key stakeholders. In that context they developed a local farmed fish certification called the Finnish Ekofish Certification, which is a strategic design intervention to improve transitions towards the Finnish aquaculture production target for 2020. Their study contributes to Finnish aquaculture's transition by offering a distinctive kind of measure through the application of strategic design. Moreover, by integrating design with pertinent knowledge, their research presents a specific new mode of strategic design for transitions that focuses on anticipating and mitigating foreseeable problems. [*CSR & eco-innovation*]

Moretto et al. *(2018)* present a sustainability roadmap they designed for fashion companies, from a supply chain perspective. The study was mainly motivated by the fact that many activities related to the production of fashion products are affected by critical environmental and social issues. In the case of the fashion industry, it is particularly relevant to assess sustainability from a supply chain perspective, since its business model has been predominantly built on the use of fragmented suppliers, often located in low labour cost countries that lack stringent environmental and social regulations, and on resource and pollution-intensive production processes. Despite that, the authors contend that roadmaps to guide companies in the introduction of sustainability principles from both operative and organisational viewpoints are lacking. Also, the literature that analyses the adoption of a comprehensive practice-oriented roadmap for achieving sustainability objectives over time, is limited. The article contributes to current knowledge about the motivations that drive companies and their supply chains to undertake new sustainable models in their business. At the same time, the proposed roadmap represents a tool for managers to guide their businesses toward sustainability. [*fashion*]

Saunila et al. *(2018)* analyse how companies value different dimensions of sustainability and how this relates to green innovation. Using survey data from a cross-section of companies in the horse industry in Finland, the study aimed to examine what drives green innovation investment and exploitation in terms of sustainability. By green innovation the authors mean innovation that aims to generate new ideas, goods, services, processes, or management systems that can be used to deal with environmental problems. Through their survey targeting company managers, the authors found that higher valuations of economic, institutional, and social sustainability was positively related with a willingness to invest in and exploit green innovation. In contrast, the valuation of environmental sustainability was not found to affect the willingness to invest in or exploit green innovation. The study provides a contribution from the horse industry context to the understanding of how green innovation is driven by sustainability. [C*SR & eco-innovation*]

C. Integrating non-traditional aspects and new forms of knowledge in sustainability research

As mentioned in Section 1, it has become necessary to rethink the approaches within sustainability research, calling for the integration of new and non-traditional forms of knowledge and new ways of doing research. The two articles in this theme respond to this call.

In a still rather unconventional manner, ***Arnold*** *(2018)* demonstrates how systemic constellations were used to access intuitive and unconscious knowledge in decision-making processes for human-machine interfaces. The author followed an exploratory case study design to generate new hypotheses about how to improve modelling and IT-based decision-making processes in digitised production environments. Data was collected via two systemic structural constellations (video-recorded and transcribed), observation, testing and heuristics. Since sustainability science is still rather built on conscious information and analytical tools, and also social research methods rely on only 2% of conscious thinking and expressions, the author demonstrates that systemic constellations can constitute an innovative research instrument to include hidden knowledge. Being part of field and action research, systemic constellations differ from other qualitative methods as they work with representative perception, emerging from spatial arrangements of persons or symbols. The research generated several new hypotheses and biases, e.g. "what should be remembered" and "not enough meaning" and how this hidden knowledge can be used to enhance sustainability in the given context. [*decision-making processes*]

In a complex procedure, ***Medeiros et al.*** *(2018)* analysed six different frameworks for behaviour change strategies in order to help designers in particular in their decision-making processes when developing new products. They elaborated a specific decision support diagram for this purpose. With the objective to unify vocabulary and methods in the existing frameworks, they followed a four steps qualitative approach using 12 experts to discuss in-depth the selected frameworks from the literature and their newly elaborated diagram, integrating the experts' adjustments. According to the proposed diagram, the authors suggest four phases to induce sustainable behaviour and to take into account culture, age groups in form of generation types, user and products' control, generic and detailed strategies to be incorporated into new products. [*decision-making processes*]

D. Planning for sustainable development and sustainable cities

The six articles in this theme deal with all forms of planning activities from different perspectives and in diverse contexts. While the first two articles take the reader out of the city, with works on forest management and ocean governance, respectively, the remaining tackle sustainability challenges for cities.

The article by ***Boukherroub et al.*** *(2018)* puts forward a generic framework for designing decision theatres to support forest participatory planning. Decision theatres allow combining visualisation and decision modelling capabilities together with human capacity of insight and interaction. The authors argue that decision theatres can therefore address the challenges associated with involving stakeholders in the decision-making process, namely that it can be very complex and time consuming. They demonstrate the use of a decision theatre through the conceptual design of a decision-support system in the province of Quebec, Canada, where they mapped the planning process and identified the decision theatre components required to support it. They discuss how their approach can contribute to engage stakeholders in the decision-making process by increasing participation frequency, collecting more inputs from stakeholders, supporting the development and evaluation of alternative options and the selection of preferred alternatives. [*decision-making processes*]

Ferreira et al. *(2018)* developed a framework to evaluate the performance of marine spatial planning (MSP), using the Portuguese maritime area as a case study. A step-by-step participatory approach was designed to develop a set of fifteen indicators (of inputs, process, outputs, outcomes) that could constitute the core of an evaluation mechanism of the performance of the Portuguese MSP system. The indicators allow an assessment of the economic, social, and environmental effects of MSP, including some integrative high-level indicators such as well-being. This framework materialised a shift from the current practice of top-down, unilateral, definition of evaluation mechanisms (including indicators) in MSP, towards a new participatory approach to the monitoring and evaluation stages of

the MSP cycle. The authors stressed that this research may constitute a useful tool in the emerging field of MSP evaluation in Europe and beyond, in articulation with the 2030 Agenda for Sustainable Development of the United Nations (UN) (particularly Goal 14, for the Ocean). [*ocean governance*]

Macke et al. *(2018)* look into the topic of the smart city concept, more specifically the perceptions surrounding it. As they point out, academics and urban planners tend to perceive the smart city concept as favouring technological products and solutions over end users and their quality of life. Against that background, their study addresses the need for an integrated analysis approach that considers the smart city as an organic whole, which encompasses objective and subjective quality of life domains. They did this by evaluating the perceptions of 400 residents in a smart city – Curitiba, Brazil – in terms of quality of life, and analysing the main elements of citizens' satisfaction with their home city. Their results revealed a general low satisfaction with the main elements that characterize Curitiba as a smart city, providing support for their initial argument that an integrated analysis is needed. They could identify four main quality of life domains: socio-structural relationships, environmental well-being, material well-being and community integration. The authors conclude that these domains can be regarded as success factors for smart cities, as meeting them would improve citizen's quality of life. In that way, this study contributes to better understanding the interconnected facets of quality of life domains in the smart cities context. [*perception*]

Malvestio et al. *(2018)* explore the consideration of environmental and social issues in transport policy, plan and programme (PPP) making in Brazil. Their research is motivated by the fact that in many developing and emerging economies, a perceived urgency to promote economic growth frequently means that environmental and social costs of development are overlooked. In order to determine the extent to which environmental and social issues are considered, as well as identify the barriers for better practice, the authors investigated the legal and institutional frameworks for transport PPP making, the substantive focus of PPPs as well as perceptions of actors involved in their preparation. Their findings showed that whilst the need to respect environmental and social issues is recognized in sectoral guidelines and underlying values, in practice they are poorly considered. The lack of instruments for a systematic consideration of issues, the nature of existing PPP making processes, and the dominance of political and economic interests are among the main constraints to a better consideration of SD in transport PPP making. In face of their findings, Malvestio et al. (2018), recommend that Strategic Environmental Assessment (SEA) be introduced as an instrument for a more rigorous and clearly prescribed consideration of environmental and social issues. [*assessment*]

The study by ***Nordman et al.*** *(2018)* tackles the often expensive problem of stormwater management, through a case study in Grand Rapids, a medium-sized city in Michigan, United States of America. Within the general framework of integrated watershed management, Nordman and colleagues estimated the economic benefits and costs of various green infrastructure practices that mimic natural hydrology to reduce stormwater quantity while improving its quality. They used a benefit transfer approach to estimate the net present value of capital, operations, and maintenance costs, as well as the direct and indirect benefits. The suite of benefits varied for each green infrastructure practice and included flood risk reduction; reductions in stormwater volume, total phosphorus, total suspended solids, and air pollution; scenic amenity value; and CO_2 storage. The study has found that conserved natural areas had the largest net present value per cubic meter of water quality volume reduced, followed by street trees, rain gardens, and porous asphalt. On the other hand, infiltrating bioretention basins and green roofs had negative net present values. However, if a green roof is used to attain certification such as Leadership in Energy and Environmental Design (LEED), then the net benefits turn positive. This study provides insights that can support the implementation of cost-effective stormwater management practices. [*decision-making processes*]

Santos et al. *(2019)* developed a conceptual model for the management of illegal dumping degraded areas by municipal services, based on the United Nations Environment Programme and the Society of Environmental Toxicology and Chemistry (UNEP/SETAC) guidelines, that use a social life cycle assessment approach. The Construction and Demolition Wastes (CDW) in municipalities were used as a case study for the model implementation. The framework intends to promote the improvement of social conditions and the socio-economic performance of a product throughout its life cycle for all the stakeholders involved. The authors highlighted that the developed approach allows the creation of value along the product chain, defining action priorities to improve environmental, social and economic impacts at the local level. The specificity of each community defines how the future is faced and how it contributes to the effective improvement of life quality, turning problems into opportunities. [*LCA*]

E. (Higher) Education for Sustainable Development

Five articles are included in this theme, with very diverse topics and contexts. These are: (i) green schools in Iran (Meiboudi et al., 2018), (ii) using art in the classroom (Molderez and Ceulemans, 2018), (iii) experiences from a Massive Open Online Course (MOOC) on climate change and its effect on critical thinking (Otto et al., 2019), (iv) an article focusing on teaching staff (Lazzarini et al., 2018) and (v) an article focusing on students (Sidiropoulos, 2018). The following paragraphs provide further details.

Lazzarini et al. *(2018)* analysed characteristics of engineering faculty staff engaged in training activities for SD, using the results of a semi-structured survey responded by 18 academics. Their analysis includes teaching and research activities, the integration of the SDGs into the respondents' teaching, the societal outreach and their perception of recognition/evaluation. Furthermore, the authors offer a bibliometric analysis of the respondents' scientific production represented in maps of science. They conclude that academics engaged in SD are promoters of principles and values related to SD and that they often connect different groups within and outside the university, reaching towards the wider society. These academics often enact the role as agents of change but are not recognised as such. The authors provide several recommendations for educational leaders in engineering faculties. [*teaching staff*]

Meiboudi et al. *(2018)* first analyse several existing rating systems for green schools around the globe and explain how the current green schools in Iran, certified under the eco-schools program, fail the consideration of socioeconomic and cultural conditions and impede advancing the schools' further commitment to sustainable performance. They then adopted a five-step research methods design to develop a new rating system for green schools in Iran, including a modified Delphi approach with questionnaires and focus groups, as well as Thurstone case V and a conjoint analysis. Their sample focused on all principles of green schools in Iran, 56 in total, having received data from 42 schools. The new rating system proposes four classes of green schools and was tested in one pilot case study. [*assessment*]

Molderez and Ceulemans *(2018)* inspire with their exploratory study to use arts as an unconventional way to teach diverse concepts related to sustainability, such as system, boundaries, uncertainty, among others, and to foster systems thinking. The authors explain in particular the selection of two paintings, one from Magritte and the other from Escher, and how these were incorporated into a CSR course. They used a survey with closed and open-ended questions to inquire about students' experience with using art in their study programmes and their perceptions of the links between CSR and systems thinking. The survey was responded by 122 business students of three different master programmes and revealed that the paintings were perceived as helpful to understand complex

sustainability concepts, especially systems thinking. Furthermore, this alternative learning method revealed to be useful for thinking critically and visual literacy. [*competencies*]

Otto et al. *(2019)* explored the impact of MOOCs on learning in the context of a wider audience about climate change. The findings were based on a self-assessment questionnaires of participants from two climate change MOOCs provided by two-distance learning universities in Germany and Portugal, respectively. The results indicated that the participants' gained competencies to critically engage in the climate change debate. The authors concluded that MOOCs are able to convey certain learning outcomes to the students and thus can contribute to climate change literacy. Options for potential improvement are to think of better ways of how to integrate MOOCs into climate change education or to consider possibilities to increase the attractiveness of MOOCs by using innovative formats to overcome the barriers between formal and informal learning. [*competencies*]

Via an extensive online survey with a two stage pre-post run, ***Sidiropoulos*** *(2018)* obtained over 1200 responses from university students in Australia, Italy and Malaysia, that allowed her to investigate how sustainability education influenced the students' worldviews, attitudes and behaviour towards sustainability along their studies, assessing also demographic, academic and situational factors. Data was collected between 2013-2015 from nine different universities, and students were assigned either into the "intervention group" or "control group", depending whether the students' courses included at least 10 per cent about sustainability concepts or not at all. The author performed quantitative data analyses, using several tests of inferential and descriptive statistics as well as longitudinal and cross-sectional analyses between pre- and post-data samples. The complex results offer diverse important aspects for reconsidering current approaches in ESD. Even though exposure to sustainability issues may have resulted in more connectedness to nature or higher awareness for interlinkages of human actions and consequences for the environment, only incremental improvements and pro-sustainability values were achieved, but not a transformation. The author alerts that "integrating ESD in an ad-hoc and largely voluntary manner has produced weak results" and calls for interweaving sustainability in each study programme in order to create "transition pathways towards transformational change." [*students*]

F. Human Resources and Sustainability

This last overarching theme composed of three articles that deal with questions related to human resources and sustainability from different angles, namely the perception of workers and employees regarding health and other social sustainability issues, (Guimarães et al., 2018, and Staniškienė and Stankevičiūtė, 2018), and questions related to labour rights (Sendhofer and Lernborg, 2018):

By means of a survey questionnaire, ***Guimarães et al.*** *(2018)* assess the perceptions of workers in a cement plant in Brazil, regarding sustainability and health issues related to the practice of co-processing (where alternative, rather than conventional, fuels and raw materials are introduced into a standard cement production process). These include pollution, conditions and safety of work, the environment, individual and collective health, employment opportunities, capacity building and training offered by the company, co-processing of waste, public transparency, and active participation of the population in decision-making. They found positive opinions towards most issues, except for the ones related to the local population's knowledge about the practice of co-processing and to the population's participation in the decision-making processes, which were both viewed negatively. This suggests that efforts are needed, so that populations living near the cement plant can have access to information on the environment and on activities that pose risks, as well as the opportunity to participate in decision-making. Their article also highlights that education and training programs for staff, together with a supportive work environment, is important to gain expertise and know-how needed for integrated pollution prevention and control in cement companies. [*perception*]

Sendhofer and Lornberg *(2018)* studied the question how knowledge on labour rights is communicated to workers in the digital era. They explored via a qualitative in-depth case study the potentials of an app to train workers in the fashion industry about their labour rights. The data includes interviews with managers and workers from two different Chinese suppliers, observations on site about working conditions, as well as documentation and continuous dialogues with the Swedish company that had developed the app. Their findings consist of several advantages using the app for training purposes, e.g. ad-hoc measurability of training sessions and participatory training methods. The authors discuss critically their findings and raise important questions regarding digitalisation, in particular about learning and knowledge acquisition. [*labour rights*]

Following a mixed-methods research design, ***Staniškienė and Stankevičiūtė*** *(2018)* present a case study of a Lithuanian company, committed to CSR, in which they investigated social sustainability dimensions from the employees' perspective. As according to their literature review, the employees' perspective is missing in current social sustainability measurement frameworks, they conducted ten interviews with management staff and collected 120 responses to a representative survey among the employees, in order to propose a more complete framework. Based on the analysis of their qualitative and quantitative data, they identify six dimensions, in which health and safety constitute the most important aspects of social sustainability. The authors tested their framework in the company and conclude that social sustainability measurements require a balance between quantitative and qualitative methods in order to be comprehensive. [*assessment*]

3. Conclusions

This special issue demonstrates the lively debate and the broad spectrum of rethinking of sustainability approaches in very diverse contexts of life and advances the necessary debates about the most pressing challenges of the current time. Researchers in this area are still facing several challenging issues and open questions, such as 'What are the transition pathways towards transformational change?', 'What are the innovating approaches to foster systems thinking and sustainability literacy?', 'By anticipating and mitigating foreseeable problems can we avoid unsustainable actions?', 'What is the contribution of circular economy to society's living in balance with nature?', 'How can planning best contribute to a sustainable development and sustainable cities?', 'What are the next necessary steps to transform the human system in order to prepare the younger generations for the sustainability challenges ahead?', 'How to foster capacity building, resilience and sustainability competencies not only in institutions but in society in general?'. While such questions are here with us to stay and will require further debate, this SV takes stock of the current state of the debate and thus offers a platform from which further research can be conceptualised.

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