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# Ten Years of Sustainable Energy Planning and Management

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**ABSTRACT**

With this volume 40 the International Journal of Sustainable Energy Planning and Management can celebrate its 10 year anniversary. In this editorial we take a closer look at the journal's impact over its first 10 years of existence and highlight the articles that have made the largest impacts in the scientific community from a citation perspective. The topic of the journal – sustainable energy planning and management – has not decreased in importance over the first ten years of the journal's existence – and fortunately the results published in the journal has garnered interest and the impact of the journal has increased significantly. In terms of citations, the journal's 275 published articles, have received 1484 citations as per March 2024 and nine articles have 40 or more citations in Scopus. CiteScore ranks the journal in the top 10% out of 700+ journals within the topic of Geography, Planning and Development.

***Keywords***

Research review;
Smart energy systems;
District heating systems;
Sustainable energy planning

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## 1. Introduction

The opening section in the editorial of the first volume of the International Journal of Sustainable Energy Planning and Management read *"Energy security, fossil fuel depletion, socio-economic impacts and environmental pressures are all motivating factors that have brought energy policy, energy planning and energy management onto the public agenda over the last decades."*[1]. These issues are still prevalent one decade later with temperature records being frequently beaten, with the Russian attack on Ukraine bringing urgency to the phasing out of fossil imports to Europe from Russia and increasing fossil fuel prices from the same war. The International Journal of Sustainable Energy Planning and Management (IJSEPM) was formed, aimed at bringing together *"researchers working within energy systems analyses of local, regional and global levels, researchers working on feasibility studies and researchers working on public regulation to form an interdisciplinary platform for pertinent research on energy planning topics"* [1]. Today, a decade later, the journal remains committed to this goal. Moreover, the IJSEPM has evolved into a recognised forum for interdisciplinary research within sustainable energy planning, serving as a cornerstone for advancing the renewable energy transition agenda. With this 40$^{th}$ volume and 10-year anniversary edition, the IJSEPM has published 285 articles (275 up to and including Volume 39 plus 10 in Volume 40). Over time, the journal's CiteScore has evolved positively, as indicated in Figure 1.

Compared to other journals, the journal is in the 91$^{st}$ percentile within the category *Geography, Planning and Development*, 80$^{th}$ percentile within *Energy Engineering and Power Technology* and 70$^{th}$ percentile within *Renewable Energy, Sustainability and the Environment.*

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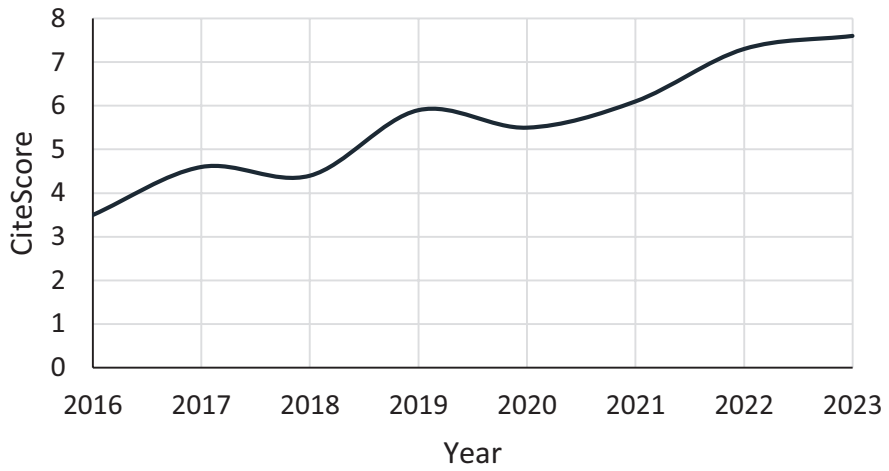


Figure 1: Scopus CiteScore for the International Journal of Sustainable Energy Planning and Management. Note that 2023 data is tentative. Retrieved March 8th 2024 from Scopus [2].

## 2. Research Impact

The highest cited article from the IJSEPM over its lifetime, both, in absolute terms and corrected for age by splitting citations over the number of years since publication is Henrik Lund and coauthors' article on smart energy systems and storage [3], with 308 citations (Scopus March 12th 2024). This paper stresses the different costs of storage in different parts of the energy system, and that by sector integration or smart energy system adaption, flexibility may be exploited outside the electricity system at a far lower cost than what is possible with a single-sector focus on electricity. The work builds on previous work by the authors on smart energy systems [4,5].

This is followed by an article by Connolly and Mathiesen [6] regarding transition to 100% renewable energy systems with 161 citations in Scopus (Scopus March 12th 2024). In this article, the authors develop an approach for modelling and designing 100% renewable energy systems, with a focus on seven stages. The seven stages suggested in the paper are: *"1) reference, 2) introduction of district heating, 3) installation of small and large-scale heat pumps, 4) reducing grid regulation requirements, 5) adding flexible electricity demands and electric vehicles, 6) producing synthetic methanol/DME for transport, and finally 7) using synthetic gas to replace the remaining fossil fuels."*

Third in terms of Scopus citations with 108 citations (Scopus March 12th 2024) is Rasmus Lund and coauthors' work on low-temperature district heating in an energy systems perspective [7]. The authors investigate the energy system impacts of district heating at three different temperature levels, using the widely applied EnergyPLAN energy systems model (see [8,9]). Their results indicate that the lowest temperature set (forward 55°C – return 25°C) is the most attractive from an economic perspective – despite the need for decentralised boosting using heat pumps.

In [10], Henrik Lund and coauthors investigate the role of heat savings in renewable energy-based smart energy systems, finding an optimal heat savings level for new buildings as well as buildings under deep renovation of around 50%. For buildings that are not under renovation, savings *"hardly pays"*, a conclusion also supported in a study by Meyer and coauthors [11].

Aravena and coauthors [12] (fifth place by citations – fourth by annual citations) use the LUT Energy System Transition (see [13,14]) to model a transition for Chile, finding not only a renewable energy-based pathway, but also one with a lower levelised cost of energy and an energy system relying exclusively on domestic energy resources.

In [15], Prina and his team from EURAC research investigate smart energy system pathways for the municipality of Bressanone-Brixen in Italy using EnergyPLAN in combination with PV-STOth and in [16] Tronchin and coauthors investigate cost optimal levels of energy efficiency improvements – also in an Italian case study.

At a tied eight place, Østergaard and Coauthors [17] and Best and coauthors [18] review scientific literature on smart energy systems and fourth generation district heating and compare low-temperature and ultra-low-temperature district heating respectively. Lastly, in a tenth

place, Østergaard and coauthors investigated desalination in Jordan [19] with a focus on efficiency gains from energy system integration, basing their work on EnergyPLAN simulations.

In addition to the top ten in terms of total citations, five additional articles stand out as being among the top ten in terms of citations per year; this list thus makes accommodation for newer articles. Prina and coauthors' [20] work on the ePLANOpt model has attracted attention, and is also a model that has been used more and more in the scientific literature. Akinwale and Adepoju [21] looked into the willingness to adapt renewable energy technologies, and is thus a high ranking article of the journal outside the general energy planning field of scenario and transition modelling. Østergaard, Johannsen and Duic [22] reviewed energy systems' research, and Karipoğlu, Genç and Koca [23] address wind power siting from a multi-criteria perspective. Lastly and newest on the list, Röder and coauthors [24] investigated the layout of district heating networks.

In general, observing the research output of the journal is also a testament to the increasing complexity of the energy planning field. While there have traditionally been many electricity and heating sector integration studies in this journal, the agenda has shifted to not only smart energy systems, integrating also transport and industry, but also systems including other aspects including energy-water nexus, and systems with negative emissions. At the same time, addressing the economic and organisational aspects of the planning of the energy transition is also essential for the appropriate planning of an energy transition.

## 3. This issue

In this issue, Agu and coauthors [25] address the socio-economics of transitioning islands, addressing eight islands. A methodology using the Keynesian Income Multiplier (KIM) and Analytical Hierarchy Process (AHP) is applied, informed by interviews with local experts. Positive impacts on male employment across sectors exceed energy costs. Female employment, especially in tourism, also benefits. Community ownership and local training are essential for maximizing benefits. Islands has been a recurring theme in the journal with previous work presented by Marczinkowski on including local conditions in energy islands planning [26], Del-Busto on participation [27], Meschede on the importance of weather data on the simulation of Gomora [28], and Ferreira developing renewable energy scenarios for the island of Santiago in Cape Verde [29].

Sabidussi and Wasser [30] present a paper which tackles assessing Energy Transition Readiness in businesses, using organizational learning theory and a new taxonomy of readiness indicators. It aids targeted interventions and benchmarking, broadening strategic management discourse. The present article overarches several studies from the journal detailing more specific areas of the energy transition, where there is a notably a series of techno-economic studies, but also studies more relating to the planning and implementation of the energy transition. This incudes, e.g., Selvakkumaran and Ahlgren's work on local transition processes [31], Krog and coauthors' work on consumer involvement in district heating [32], Lybæk and Kjær's work on the role of municipalities in the transition, and Del-Busto on participation in island transition [27].

Kurbatova et al. [33] discuss Ukraine's grid reliability challenges with high renewable electricity penetration and post-war energy transition policies. Despite promoting renewables, grid integration faced critical issues due to flexibility and storage shortcomings. In addition to this, the Russian invasion halted necessary policy reforms. Previous work on Ukraine published in this journal includes Kurbatova's work on biogas from cooperatives [34] and landfill gas [35].

Tóth et al. [36] also take a starting point in the Russian war on Ukraine, investigating the household energy consumption in Hungary. In Hungary, weather conditions are also more important for the demand than in the European Union in general. Previous studies on Hungary include Csontos and coauthor's work on rural district heating [37], Csedő on innovation networks with a focus on power to gas [38] and Szép's article on links between utility costs and energy demand [39].

In [40], Sathyan and coauthors examine hurdles hindering electric vehicle adoption, such as battery limitations, charging infrastructure, and sustainability concerns using India as a case study. It highlights research community efforts to address these challenges, classifying them as technical, economic, and sustainable. This journal has published a series of studies on electric vehicles, though typically from a more techno-economic perspective [41–43] or from an energy system perspective [44], thus the present article compliments the existing body well. In addition, the journal has a long track-record on studies on India. Malik and coauthors on hybrid systems in India [45], Paliwal on isolated systems [46], Kumar

on residential PV systems [47] and Narula on energy security [48].

Hansen and Skov [49] examine e-fuel projects in Denmark via interviews with project personnel, experts, and authorities. SWOT and factor evaluations identify internal and external implementation factors. The authors find that stakeholder collaboration is vital, mitigating regulatory and market challenges, and that widespread interest and engagement signal positive prospects. This is the first paper in the journal dedicated to power-to-x, though previous studies have included the technology in wider system perspectives, e.g., Mezzera and coauthors on waste heat from power-to-x [50].

## 4. Smart Energy Systems conference (SES 2023)

The volume also includes two articles from the Smart Energy Systems Conferences, Copenhagen 2023.

In the first, Petersen and coauthors [51] assess integrating wind farms and hydrogen production on the Faroe Islands to increase energy independence. Different scenarios are made and analysed using EnergyPLAN, and results show technical prospects but also that support mechanisms are required for economic feasibility. The present article is the first on the Faroe Islands and on offshore energy hubs in this journal. Previous offshore studies have addressed location [52], support mechanisms [53], grid investments [54] and a more general study on the development of marine energy projects [55].

Secondly, Manz et al. [56] address district heating, outlining that energy system models often overlook distribution grid costs, which ultimately affects the assessments of district heating's importance. In their paper, they assess the prospects of district heating in Germany finding potential markets shares of 17-52% by 2050. This journal has published several studies on district heating in Germany, including Röder on network design [24], Trabert on run-of-river hydropower-based district heating [57,58], Best on temperature levels [18] and Kersten and coauthors on methodologies on district heating planning [59].

## 5. SDEWES 2023

Finally, this issue includes one article from the Sustainable Development of Water, Energy and Environmental Systems (SDEWES) conference in 2023. In this paper, Chlela and Selosse [60] focus on an area of growing concern – water usage in the energy transition. Water is not only required for cooling processes, but also in gasification, carbon capture or emission control systems in addition to demands and restriction set forward by the use of hydroelectricity. Previous water-energy nexus articles in this journal have addressed, e.g., desalination [61,62]. Melo and coauthors [63] looked at the nexus for hydropower in Brazil, and similarly Almulla addressed the nexus with a focus on international sharing of hydropower resources [64].

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