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NUDGE ON SUSTAINABILITY: A BIBLIOMETRIC ANALYSIS

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ABSTRACT
The success rate of strategies for addressing sustainability issues is increasingly dependent on whether changes in public behavior can and will complement the practical solutions that are currently available. Nudge is a novel behavioral change intervention that is being widely used in the ongoing fight against sustainability issues such as energy conservation, sustainable water, food, and fashion consumption. This article explores the most prolific writers, institutions, and nations, in addition to the most cited papers and publications on Nudge and Sustainability, using the Scopus database. Bibliometric analysis is used to describe the bibliographic data, including the total number of publications and citations for 96 papers published between 2011 and 2022. In addition, the article creates a graphical representation of the bibliographic material by mapping journals, keywords, and institutions with bibliographic coupling and co-citation analysis using the VOS Viewer software. The results of the analysis show that studies about nudge and sustainability are currently more focused on the context of pro-environmental behavior which is mostly micro-behavior such as food consumption behavior. The findings are significant in terms of enriching the growing discourse of nudge in the context of sustainability, as well as providing policy recommendations for governments to better address the issues.

KEYWORDS:
Sustainability, nudge, pro-environmental behaviour, bibliometric analysis

INTRODUCTION

In the past decade, environmental issues have become steadily more concerning for the world's population. From extreme and erratic weather patterns, melting glacier ice that leads to climate change, air and water pollution that threatens human health, to deforestation and land degradation that have the potential to threaten safety and weaken the earth's ability to sustain humanity, there are a variety of environmental threats that have the potential to weaken the planet's ability to support human life (Global Environment Facility, 2002). Industrialization and urbanization are the main causes that most contribute to the occurrence of serious environmental degradation. Factories generate industrial waste which increases the discharge of untreated air and water pollutants as well as solid waste. Additionally, the

rising demand for energy and the number of automobiles have exacerbated the problem of air pollution. This kind of environmental pollution has caused serious physical, health and biological damage. Agricultural expansion, massive deforestation and construction of dams have increased land and water conflicts, leading to droughts and floods (Mori, 2013).

This worrying environmental issue has prompted intergovernmental countries affiliated in the United Nations to declare the Sustainable Development Goals (SDGs) on October 21, 2015 as a commitment to prioritize sustainability in every development effort until 2030. Since then, sustainability has become one of our goals. the most compelling ideals that every government in the world pursues to achieve. The "Brundtland Commission" defined sustainable development in its final report, Our Shared Future, as development that serves the demands of the present without compromising the ability of future generations to satisfy their own needs. Sustainability is a comprehensive strategy that examines ecological, social, and economic factors, realizing that all must be taken into account concurrently to achieve long-term success. (The Bruntdland Commission, 2013)

These environmental problems are causing thousands of companies to invest intensively in innovations in energy efficiency, renewable energy, resource productivity and pollution control. (Lubin & Esty, 2010). Not only from the private sector, the environmental crisis is also increasingly becoming a priority issue in the political and public sectors. Several policy instruments were then developed to address the issue of the environmental crisis, which is nothing but a sustainability issue.

The study of policy instruments in responding to sustainability issues has become the subject of study by scientists and the general public. The notions of sustainability and sustainable development have gained importance in scientific study on environmental concerns, policies related to environmental management, and industrial and agricultural output, among others (Ruggerio, 2021). It is very crucial to build systematic knowledge from research, policies and governance practices that have been carried out in overcoming problems of sustainability and environmental damage, because the building of knowledge can be a source of reference for formulating solutions to sustainability problems (Romero-lankao et al., 2022). The effectiveness of each research, policy instrument and practice carried out to solve environmental and sustainability crises may vary, therefore it is very important to know which practices are producing effective results in addressing sustainability issues.

Among all the policy instruments and practices that have been carried out to address sustainability issues, Nudge can be considered as a policy instrument that, if properly designed, can help ensure and increase the chances of success of environmental improvement efforts, and can even become a policy that replaces existing environmental policies. been done before but less effective (Elberg Nielsen et al., 2016). Nudge is a concept that developed in behavioral economics and behavioral science. Nudge is an intervention technique coined by Richard Thaler who later won him the Nobel Prize in Economics in 2017. Thaler and his co-author, Cass R. Sunstein explained that nudge is a behavior change technique that is carried out indirectly, not coercively, and seeks to maintain individual freedom of choice. to make their own decisions about their behavior

(Thaler & Sunstein, 2008). Behavior change strategies such as 'nudge' have become hugely popular with administrations (Baldwin, 2014) that (Ewert et al., 2021) mentioned that the behavioral study of public policy and administration can provide valuable insights into policy and social effects that transcend the individual level.

A study by Pelle G Hansen, then completes the definition by restating that nudge is an attempt to influence a person's decision making and behavior by exploiting cognitive biases that cause a person to make irrational decisions (Hansen, 2016). Nudges are usually done to modify non-deliberative aspects of a person's behavior and decision making (Lehner et al., 2016). Nudge is an effort to change individual behavior subtly by utilizing the use of graphic design, information presentation and interaction to direct people to make the desired decisions, without limiting the person's freedom of choice (Meske & Potthoff, 2017).

Nudge approach is a very promising behavior modification tool for many corporations and governments throughout the world since its implementation costs are lower than those of conventional intervention strategies, yet the outcomes are still effective and substantial. In addition, Nudge allows individuals whose behavior is about to alter to make their own decisions without compulsion, ensuring individual freedom of choice. In certain instances, Nudge is more effective than another more costly intervention approach (Lin et al., 2017). In addition, the nudge intervention technique is built with knowledge of human psychology, therefore it has the potential to provide more successful outcomes than other approaches to behavior modification that are not designed with psychological knowledge. Lastly, Nudge is frequently more effective than an approach in the form of rules, restrictions, prohibitions, or regulations; placing a high degree of restriction on a person's behavior can be counterproductive because more restrictions can signal that people cannot be trusted, causing them to feel resentful and decreasing their intrinsic motivation to perform the desired behavior (Behavioural Insights Team, 2015).

The implementation of nudges in several places has been shown to have a positive effect on increasing pro-environmental behavior as well as sustainability (Byerly et al., 2018). For example, applying nudges by modifying the form and context of how information is presented, people can be encouraged to change their diet and lifestyle to be healthier (Downs et al., 2009); (Vandenbroele et al., 2020), recycle and reduce waste production (Milford et al., 2015). In addition, applying nudges by utilizing the presentation of information about the behavior of social norms, people can be encouraged to bring up energy-saving behavior (Kroll, 2019). However, the potential of nudges as an alternative policy instrument to address environmental and sustainability crises has not been realized in many environmental-based policies and programs (Allcott & Rogers, 2014).

This study analyzes the development status and trends of research publications on nudges in the context of environment and sustainability using bibliometric methods. Despite the general relevance of nudge research, no previous research has been found that quantitatively analyzes the dynamics of nudge research in the context of sustainability. The purpose of this research can be explained through the following research questions: (1) What is the evolutionary history of nudge research publications in the context of sustainability issues? (2) Which journals, countries, institutions, authors, and articles are the

most influential in nudge research in the context of sustainability issues? (3) Which journals carry nudge research topics in the context of sustainability issues? (4) What are the core topics in the nudge topic in the context of sustainability issues? (5) Which topics and patterns stand out in the nudge research topics in the context of sustainability issues?

Starting from a description of the data sources and the methods used, this article examines the status and development of knowledge about nudges in the context of sustainability issues, maps the pattern of research trends and the latest publications of nudge research topics in the context of sustainability issues. In general, this research aims to summarize the main findings of nudge publications in the context of sustainability, including conclusions and directions for future development.

The findings of this study can have a significant influence on the advancement of discussion and debate about Nudge and sustainability issue, as well as provide a comprehensive bibliometric analysis in the field of nudge and sustainability. First, this study can give the research map and guideline on which topic needs more research and which topics are trending in the field of nudge and sustainability, so that nudge and sustainability researchers could have known which topics should be carried out next. Second, This research has the potential to yield insights that can lead to the development of a new and successful technique to supplement those that have been used previously to combat the global environmental challenges.

RESEARCH METHODS

The bibliometric analysis method is a method that is often used to present quantitative analysis and evaluate publication trends in a particular field of science or study topic. (Ellegaard & Wallin, 2015). Bibliometric analysis is a popular and rigorous method for exploring and analyzing large volumes of scientific data. This method enables researchers to unpack the evolutionary nuances of a specific field, while shedding light on the emerging areas in that field (Donthu et al., 2021). The method of bibliometric analysis mainly consists of a bibliographic overview of scientific publications which is usually selected from the most cited scientific publications. The overview generally includes a list of article authors, countries or topics that are trending in general. Often the focus of bibliographic analysis is oriented to patterns that emerge in the publication of certain research topics. including geographical and institutional aspects, indicators of research success, including the development of the topic from time to time, ranging from subject domains, disciplines, types of literature and authorship. The analysis covers various categories of research topics that range from journal articles, books, theses and patents to reports. In essence, bibliometric analysis can serve as a powerful tool for scientists to study a particular field of research by exposing the analysis to citations, geographic distributions, co-citations, and other categories as needed. (Zhuang et al., 2013).

To avoid the possibility of researcher bias, a keyword search of the literature was used to initiate this systematic review. The selected works comprise only scientific publications published in journals indexed in Scopus Core Collection. Not included are articles published in the form of papers, proceedings, book chapters, working papers, communications, or

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conferences. The keywords used are 'nudge AND sustainability', so the articles that appear are articles that contain these two keywords in 'title', 'abstract', and 'keywords'. The search was carried out on all articles published until March 19, 2022 (all years). The first search includes a total of 102 articles. To achieve objectivity, filtering is done twice. All articles obtained in this initial search were then re-examined to see the relevance of the articles to the research question and to eliminate the possibility of inconsistency and repetition. After the second screening was carried out, six articles were found that were completely irrelevant to the research question. The word nudge that appears in the abstracts of the six articles does contain the word nudge, but it does not function as a concept but only as a verb, so the six articles must be excluded.

The final sample consisted of 96 articles. Following selection, bibliometric analysis was carried out. First, we assessed the article distribution by country, institution, journal, and author. We analyzed the absolute and relative citation counts of the most referenced articles to estimate the impact and influence of various publications. Then, we constructed a bibliometric mapping of the topic using the VOS Viewer program, which allowed us to visualize the many links between research using co-citation and word analysis.

RESULTS AND DISCUSSION

Number of Publications

Based on the search, articles relating to Nudge and Sustainability were published for the first time in 2011. Every year from 2011-2022, it can be seen that there is a significant trend in the development of the publication of articles relating to Nudge and sustainability. Since the first article was published that discusses how changing the consumption behavior of employees in the world of work can have a significant positive impact on the formation of sustainable consumption patterns (Wilson et al., 2011), the number of articles linking nudge and sustainability published in the last eight years is relatively small. The average number of articles published in the last eight years is only 3-4 articles. In 2012, there were no published articles on nudges related to sustainability at all.

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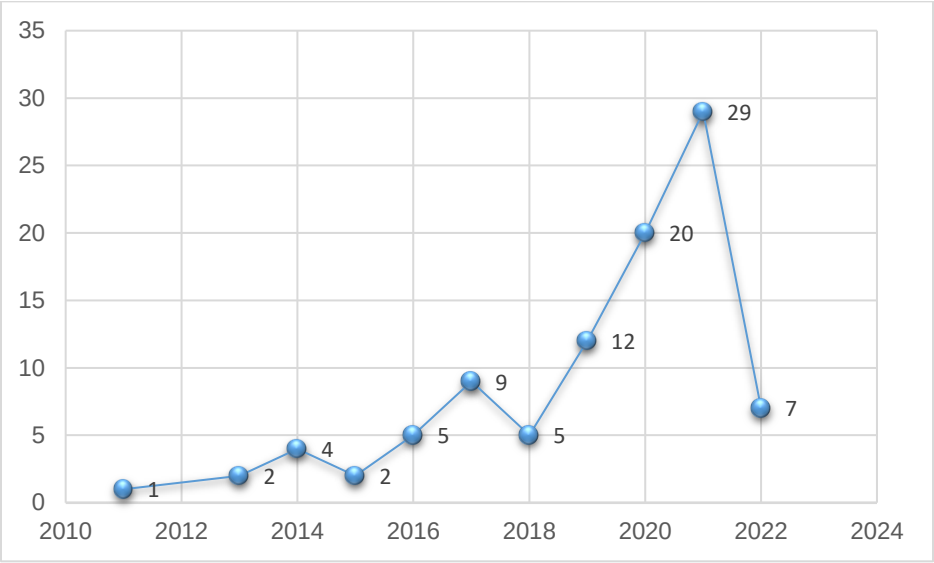

Figure 1. The Development of the Number of Nudge and Sustainability articles in Scopus Publications

As can be seen, a significant increase only occurred after 2018, where several important events related to the issue of the environmental crisis did occur, including the publication of an important study by the Intergovernmental Panel on Climate Change (IPCC) containing the latest warnings from scientists around the world. the world to be on guard from the problem of the climate crisis (Roberts et al., 2018). As well as several major climate disasters that occurred in several cities in the world such as forest fires that killed at least 85 people in California, United States, Typhoon Mangkhut which hit the Philippines and parts of mainland China, and water drought that occurred in Cape Town, South Africa. (Winston, 2018)**.** The number of publications of nudge articles related to sustainability will peak in 2021 (n = 29), although a surge in publications can also be anticipated in 2022, where in the first three months only 7 articles related to nudge and sustainability have been published.

Author's Country and Institution

Table 1. Distribution of articles by most influential countries, institutions, journals and research areas

Country			Institution			Journal			Research Area		
	N	%		N	%		N	%		N	%
United Kingdom	21	16.7%	Helsinki University	4	2.2%	Sustainability (Switzerland)	11	12.4%	Social Sciences	39	19.5%
United States	21	16.7%	University of Michigan, Ann Arbor	3	1.1%	Journal of Cleaner Production	4	4.5%	Environmental Science	34	17.0%

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Country			Institution			Journal			Research Area		
	N	%		N	%		N	%		N	%
Germany	12	9.5%	Pennsylvania State University	2	1.1%	Ceur Workshop Proceedings	2	2.2%	Business, Management and Accounting	22	11.0%
Australia	5	4.0%	National Technical University of Athens	2	1.1%	Cornell Hospitality Quarterly	2	2.2%	Energy	22	11.0%
Finland	4	3.2%	The Ohio State University	2	1.1%	Ecological Economics	2	2.2%	Economics, Econometrics and Finance	16	8.0%
Netherlands	4	3.2%	The University of Manchester	2	1.1%	Frontiers in Psychology	2	2.2%	Agricultural and Biological Sciences	12	6.0%
norway	4	3.2%	Arizona State University	2	1.1%	Journal of Environmental Psychology	2	2.2%	Computer Science	11	5.5%

If viewed by country, it can be seen in Table 1, the most productive countries in publishing articles related to nudges and sustainability are the United States and the United Kingdom with 16.7% each (n=21/96). Based on history, the two countries are indeed countries that are very influential in the development of nudge theory. The United States of America is the country where the term nudge was first popularized (Sugden, 2009)and the United Kingdom is the first country to establish a government institution that uses Nudge as the main basis for policy formulation known as the Behavioral Insights Team (Nudge Unit), thus finally enabling the nudge instrument. became famous and applied massively all over the world (Mukherjee, 2020). The following countries that are quite productive are Australia with 4% (n=5/96), followed by Finland, the Netherlands, and Norway each contributing 4 articles (3.2%). Based on these data, it is very clear that the publication of nudge and sustainability articles is still very concentrated in the United States and Europe. This of course opens a gap for researchers in Asia or Africa to fill.

If it is reviewed by the institution, it can be seen that there is no particular institution that dominates the publication of articles related to nudges and sustainability. Because on average each institution only publishes one to four articles. The institution with the most publications was Helsinki University with 2% of publications (n=4/96), followed by the University of Michigan Ann Arbor with 1.1% (n=3/96). And consecutively as many as 2 publications (1.1%) are Pennsylvania State University , National Technical University of Athens , The Ohio State University , The University of Manchester , Arizona State University . The remainder published only one article for each institution.

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The journal that produces the most publications related to nudges and sustainability is Sustainability (Switzerland) with a total of 12.4% publications (n=11/96). Followed by the Journal of Cleaner Productions with the number of publications 4.5% (n=4/96), and the rest publish an average of 2 to 1 article for each journal. The research area with the largest number of articles related to nudges and sustainability is Social Sciences with 19.5% (n=39/96), followed by Environmental Science with 17% (n=34/96), Business Management and Accounting with 11% (n=22/96), and Energy 11% (n=22/96). The rest with publications below 10% include Economics, Econometrics and Finance , Agricultural and Biological Sciences , and Computer Science. Based on these data, it can be concluded that currently, studies linking nudges and sustainability are mostly focused on social, environmental and business management science. Other potential areas such as governance and public policy are still waiting to be explored further.

All countries producing research on nudge and sustainability are designated as leading developed nations, as shown in Table 1. This indicates that research on nudge and sustainability is limited in underdeveloped nations. This underscores the significance and necessity of examining the application of nudges in tackling environmental issues in emerging nations.

Publications by Author

The 96 articles published in 2011 – 2022 were written by 159 different authors. Based on the results of the analysis it was found that the proportion of the number of articles published by each author was relatively even and no author stood out, where 98.1% (n=156/159) each author published one article, and the remaining 1.9% (n=3/159) published two articles each. The three authors are Kaaronen, Mont, and Moore each of whom publish different articles and have never co-authored an article.

Table 2. Most prolific authors in retirement and FL

No.	Name of Author	Country of Author	University/Institution	Number of Publications
1.	Kaaronen, RO	Netherlands	Universiteit van Amsterdam	2
2.	Mont, O.	Sweden	The International Institute for Industrial Environmental Economics	2
3.	Moore, P.	China	Lanzhou University	2

Most Cited Articles

Table 3. Most Cited Article

Rank	Title	Author	year	Journal	TC	C/Y

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1.	Behavioral factors affecting the adoption of sustainable farming practices: A policy-oriented review	Dessart FJ, Barreiro-Hurle J., Van Bavel R.	2019	European Review of Agricultural Economics	172	57.3
2.	Nudging – A promising tool for sustainable consumption behavior?	Lehner M., Mont O., Heiskanen E.	2016	Journal of Cleaner Production	158	26.3
3.	23 Ways to Nudge: A review of technology-mediated nudging in human-computer interaction	Caraban A., Karapanos E., Goncalves D., Campos P.	2019	Conference on Human Factors in Computing Systems - Proceedings	79	26.3
4.	Restaurant menu design and more responsible consumer food choice: An exploratory study of managerial perceptions	Filimonau V., Krivcova M.	2017	Journal of Cleaner Production	52	10.4
5.	Look at me Saving the Planet! The Imitation of Visible Green Behavior and its Impact on the Climate Value-Action Gap	Babutsidze Z., Chai A.	2018	Ecological Economics	40	10.0
6.	Affording sustainability: Adopting a theory of affordances as a guiding heuristic for environmental policy	Kaaronen RO	2017	Frontiers in Psychology	37	7.4
7.	All tools are informational now: How information and persuasion define the tools of government	John P.	2013	Policy and politics	34	3.8
8.	Food waste in the sharing economy	Richards TJ, Hamilton SF	2018	Food Policy	33	8.3
9.	Choice editing as a retailers' tool for sustainable consumption	Gunn M., Mont O.	2014	International Journal of Retail and Distribution Management	30	3.8
10.	Would an Energy Conservation Nudge in Hotels Encourage Hotel Guests to Conserve?	Cavagnaro E., Staffieri S.	2016	Cornell Hospitality Quarterly	25	3.6

Table 3 shows the articles with the highest number of citations in absolute terms (>100) sorted by citations per year (C/Y). The most cited article in absolute terms (172 citations) with a total of 57.3 citations per year was published by Dessart et al., (2021) . This article takes the context of sustainable agriculture into account by reviewing studies over the past 20 years examining what behavioral factors influence farmers' decisions to adopt sustainable agricultural practices. One of the findings proves that nudges with a social norm approach have a significant effect on sustainable agricultural practices.

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The second most cited article, with 158 citations (26.3 citations per year), was written by Lehner et al., (2016) . The article offers an argument that nudges are the right instrument to address sustainability issues, especially in the context of consumption behavior. The other 3 articles that made it into the list of the 10 most cited articles also took the context of consumption behavior and food waste. The remaining 5 articles each take the context of human-computer interaction, greenhouse gas disaster mitigation, heuristics, government and energy.

In terms of citations, each of the aforementioned topics is quite prevalent. These subjects may have such a huge influence that study on those topics is urgently required, despite the fact that only a limited amount of research has been conducted thus far.

Thematic organization of the research field

As can be seen in Figure 2, the articles on Nudge and Sustainability came from three groups of publications. The first group, represented by the red group, collects publications in the social science area that focuses on sustainability. The journal with the most publications at 12.8% (n=11/96) in this cluster was Sustainability (Switzerland), followed by other journals such as Energy Policy. The main perspective of this research area relates to how Nudge is applied in policies related to development and sustainable energy.

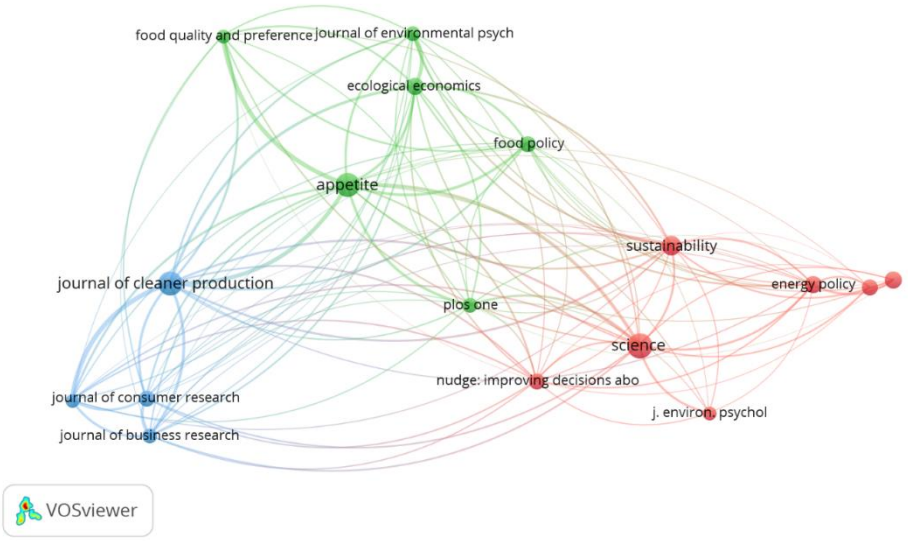

Figure 2. Co-citation network of jou rnals, prepared using VOSviewer software

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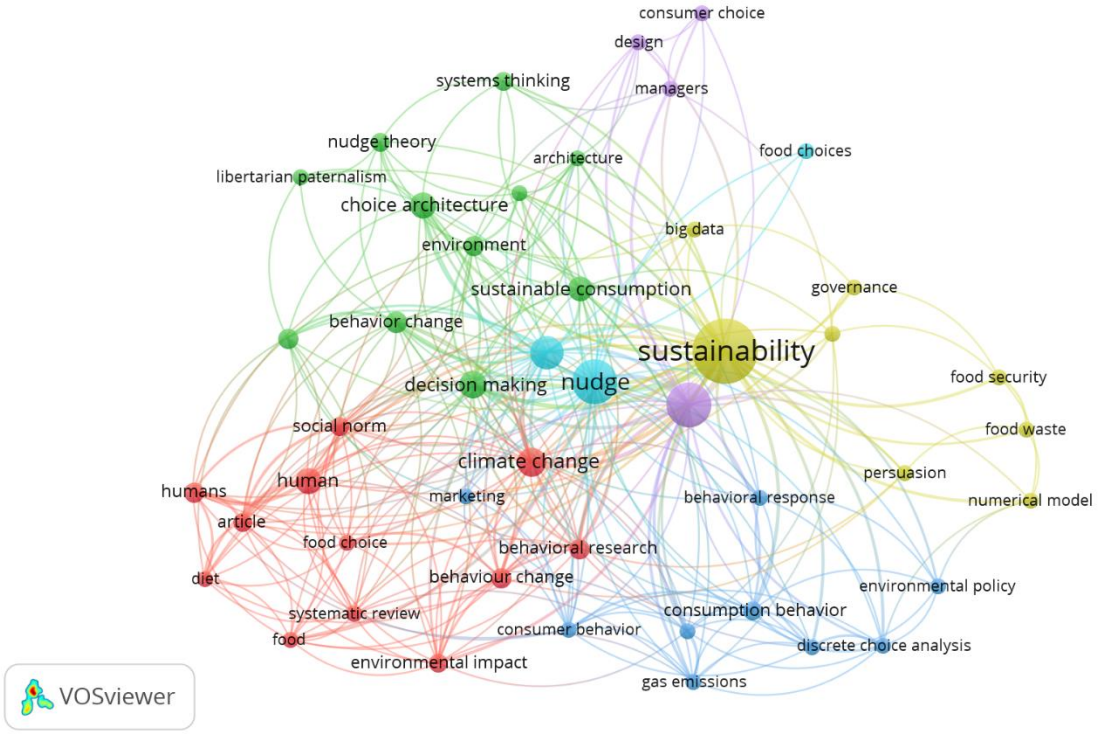

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Figure 3. Co-word analysis, prepared using VOSviewer software.

The group with the second largest population is represented by the blue cluster which mainly focuses on the business context and consumer research. The journal that produced the most publications in this cluster was the Journal of Cleaner Production with 4.7% (n=4/96) articles, followed by the Journal of Consumer Research and the Journal of Business Research. Next, the third most populous group, represented by the green cluster, is primarily concerned with the topic of Food Choice and Appetite, with journals such as Ecological Economics and the Journal of Environmental Psychology within it. This group is more likely to associate nudges with more minor pro-environmental behaviors, such as the behavior of consuming sustainable food and the behavior of managing food waste.

In 96 articles analyzed using Vosviewer, 47 keywords were obtained, of which 9 met the minimum threshold of 3 occurrences. The keywords "Sustainability" (49 occurrences and 122 total link strength), "Sustainable Development" (23 and 74), "Nudge" (24 and 61) and "Nudging" (13 and 45) were the keywords with the largest nodes. form the core.

In Figure 3 it can be seen that in the yellow cluster, "sustainability" has a thicker line with "nudge", "sustainable development", "behavior change" and "food security". The keyword “sustainable development” is also a bridge that connects “sustainability” in the yellow cluster with key words in the red cluster related to “climate change”, “behavioral research”, food

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choice" and "environmental impact". The keywords "nudge" and "nudging" became the keywords that connected "sustainability" in the yellow cluster to the keywords in the green cluster related to "environment", "choice architecture", "systems thinking" and "behavior change". Looking at the distribution of these keywords, it can be concluded that nudge publications related to sustainability study more about changes in individual behavior that are oriented towards pro-environmental behavior or sustainable behavior such as the behavior of consuming pro-environmental foods.

Table. 4 Most Frequent Keywords

No.	Keywords	Frequent
1.	Sustainability	49
2.	Nudge	24
3.	Sustainable development	23
4.	Nudging	13
5.	Climate Change	10
6.	Decision Making	9
7.	Choice architecture	8
8.	Human	8
9.	Sustainable consumption	7
10.	Behavior change	6

Recent Research Trends

In order to find out the latest research trends and hottest topics, the contents of the articles published in the last two years (during 2021 and 2022 from January to March) were analyzed in depth for extraction. The summary of the extraction can be seen in Table 5.

Table 5. Research Trends in 2021 & 2022

No.	Name and Year	Objective
1.	De Bauw et. al. (2022)	This article analyzes the possibility of numerous digital functions to encourage customers to choose healthier and more environmentally friendly food choices (De Bauw et al., 2022).
2.	Parkin & Attwood (2022)	This study presents two online randomized controlled trials to test the efficacy of two menu design strategies to nudge participants' meal selections away from meat and toward vegetarian foods (Parkin & Attwood, 2022).
3.	Lenton et. al. (2022)	This study identifies the essential individuals and acts that might enable and precipitate positive tipping moments toward global sustainability (Lenton et al., 2022).
4.	Manners et. al. (2022)	Dietary data were collected at a high frequency using a data collecting method piloted in Rwanda that was powered by citizen science concepts. Long-term monitoring of food quality measurements might assist in identifying groups and regions with a high likelihood of nutrition insecurity, hence leading efforts to alleviate the related health and social concerns (Manners et al., 2022).
5.	McCarty and Faber (2022)	This paper provides a methodology for assessing the variations in emissions, land usage, and water consumption caused by the deployment of a plant-based nudging technique at a typical conference (McCarty & Faber, 2022).
6.	Souza-Neto et. al. (2022)	This article organizes the research on nudge interventions in tourism and sustainability studies (Souza-Neto et al., 2022).

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No.	Name and Year	Objective
7.	Bhasin & Kumar (2022)	This study's objective is to build a conceptual framework of the impacts of competitive and collaborative strategy components on customer behavior (Bhasin & Kumar, 2022).
8.	Nkrumah (2021)	Utilizing desktop research, this analysis of South Africa's energy policy papers pertinent to sustainability was undertaken. The study employs (inter)national tools and jurisprudence to comprehend how a state institution, such as the court, may persuade the executive branch to limit growing greenhouse gas emissions (Nkrumah, 2021).
9.	Glasgow et. al. (2021)	The Nudge pragmatic clinical study aims to improve medication adherence and patient outcomes in three integrated healthcare delivery systems by using population-level pharmacy data to give nudges via mobile phone text messaging and an artificially intelligent interactive chat bot (Glasgow et al., 2021).
10.	Gupta et. al. (2021)	This research seeks to examine the challenges people encounter in utilizing sustainable ways of daily transportation (Gupta et al., 2021).
11.	Soliev et. al. (2021)	This research examines the disparities within the group and focuses on ways to influence individuals who currently support measures to reduce climate change (Soliev et al., 2021).
12.	Brand & Augustin (2021)	This study is required to establish a connection between sustainable design and pertinent human behavior (e.g., in corporate offices and educational settings) in order to assure its permanent legacy (Brand & Augustin, 2021).
13.	Kaaronen & Rietveld (2021)	This study presents 10 practical principles for building strategic design interventions for affordance-based behavior modification in urban contexts (Kaaronen & Rietveld, 2021).
14.	Dhanorkar & Siemsen (2021)	This study demonstrates how nudges in the form of reminders may serve as a simple yet effective management lever to raise the chance that such activities will be performed by focusing attention on them (Dhanorkar & Siemsen, 2021).
15.	Trewern et. al. (2021)	This study analyzes retailer perspectives of sustainable diets and their tactics and difficulties to supply and promote 'less and better' meat and dairy purchases (Trewern et al., 2021).
16.	Cozzio, Tokarchuk & Maurer (2021)	This study's objective is to research how hotel customers might be persuaded to participate more actively in hospitality plate waste avoidance and moderation at buffets by devising persuasive interventions (Cozzio et al., 2021).
17.	Hankammer, Kleer & Piller (2021)	This study illuminated the untapped potential of consumer co-design in a mass customization (MC) context to promote sustainable consumption. We theorize and experimentally explore a number of potentials for firms to enhance sustainable consumption and production in collaboration with customers (Hankammer et al., 2021).
18.	Fyhri, Karlsen & Sundfør (2021)	This study employed a multi-method approach to investigate the behavior and experiences of cyclists before and after bike lanes were dyed red with asphalt (Fyhri et al., 2021).
19.	Caspersen & Navrud (2021)	This study examines whether consumers' environmental attitudes and behavior are reflected in their stated preferences for last mile delivery options for clothing rentals, and whether preferences vary across groups of respondents based on socioeconomic characteristics, income, and environmental attitudes (Caspersen & Navrud, 2021).
20.	Morren et. al. (2021)	This study used a mixed-methods design to construct four information nudges and evaluate their influence on food decisions (Morren et al., 2021).
21.	Lynch, Andersson & Johansen (2021)	This article discusses how the integration of systems thinking and entrepreneurship might be utilized to encourage students toward sustainability (Lynch et al., 2021).
22.	Sun, JJ et. al. (2021)	This study provides marketers with concrete tactics to assist customers overcome product durability neglect and encourage them to spend more on fewer high-end, durable items (Sun et al., 2021).

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No.	Name and Year	Objective
23.	Acheampong, RA et. Al. (2021)	This study investigates how autonomous cars may influence travel behavior through mode selection and the resulting sustainability consequences (Acheampong et al., 2021).
24.	Vucetich, J.A. et. al. (2021)	This study examines the issues of combining conservation ethics and psychology realms of expertise in an effort to solve conservation concerns (Vucetich et al., 2021).
25.	Trujillo, CA et. al. (2021)	This study compares the effectiveness of personal and societal norms in creating pro-environmental preferences, as well as the capacity of controlled choice contexts to modulate the link between declared preferences and evoked emotions that may activate feedback learning systems (Trujillo et al., 2021).
26.	Vandenboele, J. et. al. (2021)	This study examines if modifying the option architecture of a big retail shop boosts nonusers' purchases of meat alternatives (Vandenbroele et al., 2021).
27.	Goncalves, D. et. al. (2021)	This study aims to determine how a social norm nudge, a strategically placed message transmitting fruit and vegetable purchase norms, might influence dietary choices (Gonçalves et al., 2021).
28.	Uehara, Takuro and Ryo Sakurai (2021)	This study's objective was to determine if SDGs, as a phrase or logo, served as a nudge or choice architecture prior to and during the Covid-19 crisis (Uehara & Sakurai, 2021).
29.	Chambers, T. et. al. (2021)	This study investigates the efficacy and health equity implications of treatments that use behavioral insights to enhance the dietary outcomes of children (Chambers et al., 2021).
30.	Yang, X. et. al. (2021)	This study investigates how mental simulation might enhance customers' product evaluations and intentions to purchase recycled food (Yang et al., 2021).
31.	Werkmeister, C. et. al. (2021)	This study (1) determined a list of eight prerequisites for selecting environmentally-friendly transportation alternatives and (2) built a mobile application (app) that encourages carpooling via digital nudges (Werkmeister et al., 2021).
32.	Ohtake F. (2021)	This study studies nudges that encourage evacuation during heavy precipitation, prophylactic Covid-19 infection behaviors, and Covid-19 immunization (Ohtake, 2021).
33 .	Fernandes, Nascimento, Belchior GPN (2021)	To identify, on the basis of Behavioral Economic Theory, the probable nudges chosen by the State in order to partially guarantee the right to an ecologically balanced environment, as stipulated by the 1988 Federal Constitution (Fernandes et al., 2021).
34.	Schulz, Bitsch, and Hanf (2021)	This paper covers the marketing idea of nudge (Schulz et al., 2021).
35 .	Chen and Geng (2021)	This article explains the conditions under which the MOOC provider has a financial incentive to nudge the learners, the optimal price of the verified track, and the optimal effect of the nudge efforts, as well as the sensitivity of the optimal strategy to market parameters such as the quality of the verified track, the learners' marginal gain from peers, the unit cost of the nudge efforts, and the expected value of the prospective cost of the audit track (Chen & Geng, 2021).
36 .	Prusaczyk, Earle, and Hodson (2021)	This article examined the efficacy of a brief nudge or education intervention meant to decrease the likelihood of ordering an all-beef burger in favor of a beef-mushroom burger (Prusaczyk et al., 2021).

Paying attention to the data above, it is found that most research talks about healthy food/ diet choice (7 researches), sustainable tourism/ travel (5 researches), consumer behavior (7 articles), sustainable design/ architecture (4 articles), and marketing (2 articles).

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CONCLUSION

The results of the analysis show that so far, the topic of nudge and sustainability is a topic that has not been explored by many researchers with the number of publications only ranging from 96 publications, a number that is quite small for the time span of all time. However, this fact can be seen as an opportunity to fill the scientific gap on this topic. Although the first publications linking nudges and sustainability only appeared in 2011, the evolution of the number of publications related to this topic has shown a very significant increase. The results of the analysis also show that studies linking nudges and sustainability are currently more focused on the context of pro-microenvironment behavior change such as food consumption behavior. These results indicate that there are still many gaps that can be filled for subsequent studies, especially in the context of macro behaviors such as industry or government behavior. The implication of this study is that more study about the applicability of Nudge in the policy of Sustainability are still required. Some themes/ topics that can be explored deeper are climate change, conservation effort, ecological balanced environment, and actions of global sustainability.

Perhaps, the most significant drawback of this work is the choice of required papers for analysis. This article solely examines SCOPUS-indexed publications, therefore relevant studies that are not indexed by SCOPUS but are still relevant may be removed. Infrequently, some of the articles evaluated may not include keywords, which might somewhat alter the findings of a coworker's analysis.

REFERENCES

Acheampong, R. A., Cugurullo, F., Gueriau, M., & Dusparic, I. (2021). Can autonomous vehicles enable sustainable mobility in future cities? Insights and policy challenges from user preferences over different urban transport options. *Cities*, *112*. https://doi.org/10.1016/j.cities.2021.103134

Allcott, B. H., & Rogers, T. (2014). *The Short-Run and Long-Run Effects of Behavioral Interventions : Experimental Evidence from Energy Conservation †*. *104*(10), 3003–3037.

Baldwin, R. (2014). From Regulation to Behaviour Change: Giving Nudge the Third Degree. *The Modern Law Review*, *77*(6), 831–857. https://doi.org/10.1111/1468-2230.12094

Behavioural Insights Team. (2015). *Applying behavioural insights to reduce fraud , error and debt*. http://38r8om2xjhhl25mw24492dir.wpengine.netdna-cdn.com/wp-content/uploads/2015/07/BIT_FraudErrorDebt_accessible.pdf

Bhasin, S., & Kumar, B. (2022). Using Mathematical Framework to Nudge the Customers. In *Studies on Entrepreneurship, Structural Change and Industrial Dynamics* (pp. 63–70). Springer Nature. https://doi.org/10.1007/978-981-16-4795-6_6

Brand, J. L., & Augustin, S. (2021). Can we sustain sustainability? A critical synthesis of pertinent literature. *Sustainability (Switzerland)*, *13*(22). https://doi.org/10.3390/su132212753

Byerly, H., Balmford, A., Ferraro, P. J., Hammond Wagner, C., Palchak, E., Polasky, S., Ricketts, T. H., Schwartz, A. J., & Fisher, B. (2018). Nudging pro-environmental behavior: evidence and opportunities. *Frontiers in Ecology and the Environment*, *16*(3),

159–168. https://doi.org/10.1002/fee.1777
Caspersen, E., & Navrud, S. (2021). The sharing economy and consumer preferences for environmentally sustainable last mile deliveries. *Transportation Research Part D: Transport and Environment*, *95*. https://doi.org/10.1016/j.trd.2021.102863
Chambers, T., Segal, A., & Sassi, F. (2021). Interventions using behavioural insights to influence children's diet-related outcomes: A systematic review. *Obesity Reviews*, *22*(2). https://doi.org/10.1111/obr.13152
Chen, X., & Geng, W. (2021). Enroll now, pay later: optimal pricing and nudge efforts for massive-online-open-courses providers. *Electronic Markets*. https://doi.org/10.1007/s12525-021-00470-7
Cozzio, C., Tokarchuk, O., & Maurer, O. (2021). Minimising plate waste at hotel breakfast buffets: an experimental approach through persuasive messages. *British Food Journal*, *123*(9), 3208–3227. https://doi.org/10.1108/BFJ-02-2021-0114
De Bauw, M., De La Revilla, L. S., Poppe, V., Matthys, C., & Vranken, L. (2022). Digital nudges to stimulate healthy and pro-environmental food choices in E-groceries. *Appetite*, *172*. https://doi.org/10.1016/j.appet.2022.105971
Dessart, F. J., Barreiro-Hurlé, J., & Van Bavel, R. (2021). Behavioural factors affecting the adoption of sustainable farming practices: a policy-oriented review. *European Review of Agricultural Economics*, *46*(3), 417–471. https://doi.org/10.1093/ERAE/JBZ019
Dhanorkar, S., & Siemsen, E. (2021). How Nudges Lead to Improved Energy Efficiency in Manufacturing: Evidence from Archival Data and a Field Study. *Production and Operations Management*, *30*(10), 3735–3757. https://doi.org/10.1111/poms.13479
Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, *133*, 285–296. https://doi.org/10.1016/J.JBUSRES.2021.04.070
Downs, J. S., Loewenstein, G., & Wisdom, J. (2009). Strategies for promoting healthier food choices. *American Economic Review*, *99*(2), 159–164. https://doi.org/10.1257/aer.99.2.159
Elberg Nielsen, A. S., Sand, H., Sørensen, P., Knutsson, M., Martinsson, P., Persson, E., & Wollbrant, C. (2016). *Nudging and Pro-environmental Behaviour*.
Ellegaard, O., & Wallin, J. A. (2015). The bibliometric analysis of scholarly production : How great is the impact ? *Scientometrics*. https://doi.org/10.1007/s11192-015-1645-z
Ewert, B., Loer, K., & Thomann, E. (2021). Beyond nudge: advancing the state-of-the-art of behavioural public policy and administration. *Policy & Politics*, *49*(1), 3–23. https://doi.org/10.1332/030557320X15987279194319
Fernandes, A. D., Nascimento, L. Q., & Belchior, G. P. N. (2021). Green nudges: Green incentives conferred by the state as a means of inducing sustainable behaviors . *Revista Juridica*, *1*(63), 490–516. https://doi.org/10.21902/revistajur.2316-753X.v1i63.5256
Fyhri, A., Karlsen, K., & Sundfør, H. B. (2021). Paint It Red - A Multimethod Study of the Nudging Effect of Coloured Cycle Lanes. *Frontiers in Psychology*, *12*. https://doi.org/10.3389/fpsyg.2021.662679
Glasgow, R. E., Knoepke, C. E., Magid, D., Grunwald, G. K., Glorioso, T. J., Waughtal, J., Marrs, J. C., Bull, S., & Ho, P. M. (2021). The NUDGE trial pragmatic trial to enhance cardiovascular medication adherence: study protocol for a randomized controlled trial.

Trials, *22*(1). https://doi.org/10.1186/s13063-021-05453-9

Global Environment Facility. (2002). *The challenge of sustainability: an action agenda for the global environment*.

Gonçalves, D., Coelho, P., Martinez, L. F., & Monteiro, P. (2021). Nudging consumers toward healthier food choices: A field study on the effect of social norms. *Sustainability (Switzerland)*, *13*(4), 1–14. https://doi.org/10.3390/su13041660

Gupta, T., Kar, N., Mishra, W., & Loudon, G. (2021). Persuasive Design for Sustainable Mobility. *Proceedings of the 12th India Conference on Human-Computer Interactiion*, 123–127. https://doi.org/10.1145/3506469.3506490

Hankammer, S., Kleer, R., & Piller, F. T. (2021). Sustainability nudges in the context of customer co-design for consumer electronics. *Journal of Business Economics*, *91*(6), 897–933. https://doi.org/10.1007/s11573-020-01020-x

Hansen, P. G. (2016). The definition of nudge and libertarian paternalism: Does the hand fit the glove? *European Journal of Risk Regulation*, *7*(1), 155–174. https://doi.org/10.1017/S1867299X00005468

Kaaronen, R. O., & Rietveld, E. (2021). Practical lessons for creating affordance-based interventions for sustainable behavior change. *One Earth*, *4*(10), 1412–1424. https://doi.org/10.1016/j.oneear.2021.09.013

Kroll, T. (2019). *NUDGING PEOPLE TO SAVE ENERGY IN SMART HOMES WITH SOCIAL NORMS AND SELF-COMMITMENT*. 0–10.

Lehner, M., Mont, O., & Heiskanen, E. (2016). Nudging – A promising tool for sustainable consumption behaviour? *Journal of Cleaner Production*, *134*, 166–177. https://doi.org/10.1016/J.JCLEPRO.2015.11.086

Lenton, T. M., Benson, S., Smith, T., Ewer, T., Lanel, V., Petykowski, E., Powell, T. W. R., Abrams, J. F., Blomsma, F., & Sharpe, S. (2022). Operationalising positive tipping points towards global sustainability. *Global Sustainability*, *5*. https://doi.org/10.1017/sus.2021.30

Lin, Y., Osman, M., & Ashcroft, R. (2017). Nudge: Concept, Effectiveness, and Ethics. *Basic and Applied Social Psychology*, *39*(6), 293–306. https://doi.org/10.1080/01973533.2017.1356304

Lubin, D. A., & Esty, D. C. (2010). The sustainability imperative. *Harvard Business Review*, *88*(5). https://doi.org/10.1201/9780429490361-22

Lynch, M., Andersson, G., & Johansen, F. R. (2021). Merging systems thinking with entrepreneurship: Shifting students' mindsets towards crafting a more sustainable future. *Sustainability (Switzerland)*, *13*(9). https://doi.org/10.3390/su13094946

Manners, R., Adewopo, J., Niyibituronsa, M., Remans, R., Ghosh, A., Schut, M., Egoeh, S. G., Kilwenge, R., & Fraenzel, A. (2022). Leveraging Digital Tools and Crowdsourcing Approaches to Generate High-Frequency Data for Diet Quality Monitoring at Population Scale in Rwanda. *Frontiers in Sustainable Food Systems*, *5*. https://doi.org/10.3389/fsufs.2021.804821

McCarty, T., & Faber, G. (2022). Estimating the environmental benefits of plant-based nudging. *International Journal of Environmental Studies*. https://doi.org/10.1080/00207233.2022.2042970

Meske, C., & Potthoff, T. (2017). Association for Information Systems AIS Electronic Library (AISeL) THE DINU-MODEL – A PROCESS MODEL FOR THE DESIGN OF NUDGES

THE DINU-MODEL – A PROCESS MODEL FOR THE DESIGN OF NUDGES. *Ecis*, *2017*, 2587–2597. http://aisel.aisnet.org/ecis2017_rip%0Ahttp://aisel.aisnet.org/ecis2017_rip/11

Milford, A. B., Øvrum, A., & Helgesen, H. (2015). Nudges to increase recycling and reduce waste. *NILF Discussion Papers*, *101*, 1–27.

Mori, A. (2013). *Environmental governance for sustainable development : East Asian perspectives*. 384.

Morren, M., Mol, J. M., Blasch, J. E., & Malek, Ž. (2021). Changing diets - Testing the impact of knowledge and information nudges on sustainable dietary choices. *Journal of Environmental Psychology*, *75*. https://doi.org/10.1016/j.jenvp.2021.101610

Mukherjee, I. (2020). *Behavioural Insights Teams (BITs) and Policy Change : An Exploration of Impact , Location , and Temporality of Policy Advice*. https://doi.org/10.1177/0095399720918315

Nkrumah, B. (2021). Courting emissions: climate adjudication and South Africa's youth. *Energy, Sustainability and Society*, *11*(1). https://doi.org/10.1186/s13705-021-00320-6

Ohtake, F. (2021). Can nudges save lives? *Japanese Economic Review*. https://doi.org/10.1007/s42973-021-00095-7

Parkin, B. L., & Attwood, S. (2022). Menu design approaches to promote sustainable vegetarian food choices when dining out. *Journal of Environmental Psychology*, *79*. https://doi.org/10.1016/j.jenvp.2021.101721

Prusaczyk, E., Earle, M., & Hodson, G. (2021). A brief nudge or education intervention delivered online can increase willingness to order a beef-mushroom burger. *Food Quality and Preference*, *87*. https://doi.org/10.1016/j.foodqual.2020.104045

Roberts, D., Pidcock, R., Chen, Y., Connors, S., & Tignor, M. (2018). *Science Editor*. https://www.ipcc.ch/sr15/download/#full

Romero-lankao, P., Frantzeskaki, N., & Griffith, C. (2022). *Chapter 13 : Sustainability Transformation Emerging from Better Governance*. 263–280.

Ruggerio, C. A. (2021). Sustainability and sustainable development: A review of principles and definitions. *Science of The Total Environment*, *786*, 147481. https://doi.org/10.1016/J.SCITOTENV.2021.147481

Schulz, F., Bitsch, L., & Hanf, J. (2021). Old wine in new skins – nudging in the wine industry . *Mitteilungen Klosterneuburg*, *71*(2), 187–195.

Soliev, I., Janssen, M. A., Theesfeld, I., Pritchard, C., Pirscher, F., & Lee, A. (2021). Channeling environmentalism into climate policy: An experimental study of Fridays for future participants from Germany. *Environmental Research Letters*, *16*(11). https://doi.org/10.1088/1748-9326/ac30f7

Souza-Neto, V., Marques, O., Mayer, V. F., & Lohmann, G. (2022). Lowering the harm of tourist activities: a systematic literature review on nudges. *Journal of Sustainable Tourism*. https://doi.org/10.1080/09669582.2022.2036170

Sugden, R. (2009). On Nudging: A Review of Nudge: Improving Decisions About Health, Wealth and Happiness by Richard H. Thaler and Cass R. Sunstein. *Http://Dx.Doi.Org/10.1080/13571510903227064*, *16*(3), 365–373. https://doi.org/10.1080/13571510903227064

Sun, J. J., Bellezza, S., & Paharia, N. (2021). Buy Less, Buy Luxury: Understanding and Overcoming Product Durability Neglect for Sustainable Consumption. *Journal of*

Marketing, *85*(3), 28–43. https://doi.org/10.1177/0022242921993172
Thaler, R., & Sunstein, C. (2008). *Nudge*. Yale University Press.
The Bruntdland Commission. (2013). *What is sustainability ?*
Trewern, J., Chenoweth, J., Christie, I., Keller, E., & Halevy, S. (2021). Are UK retailers well placed to deliver 'less and better' meat and dairy to consumers? *Sustainable Production and Consumption*, *28*, 154–163. https://doi.org/10.1016/j.spc.2021.03.037
Trujillo, C. A., Estrada-Mejia, C., & Rosa, J. A. (2021). Norm-focused nudges influence proenvironmental choices and moderate post-choice emotional responses. *PLoS ONE*, *16*(3 March). https://doi.org/10.1371/journal.pone.0247519
Uehara, T., & Sakurai, R. (2021). Have sustainable development goal depictions functioned as a nudge for the younger generation before and during the covid-19 outbreak? *Sustainability (Switzerland)*, *13*(4), 1–18. https://doi.org/10.3390/su13041672
Vandenbroele, J., Slabbinck, H., Van Kerckhove, A., & Vermeir, I. (2021). Mock meat in the butchery: Nudging consumers toward meat substitutes. *Organizational Behavior and Human Decision Processes*, *163*, 105–116. https://doi.org/10.1016/j.obhdp.2019.09.004
Vandenbroele, J., Vermeir, I., Geuens, M., Slabbinck, H., & Van Kerckhove, A. (2020). Nudging to get our food choices on a sustainable track. *Proceedings of the Nutrition Society*, *79*(1), 133–146. https://doi.org/10.1017/S0029665119000971
Vucetich, J. A., Macdonald, E. A., Burnham, D., Bruskotter, J. T., Johnson, D. D. P., & Macdonald, D. W. (2021). Finding purpose in the conservation of biodiversity by the commingling of science and ethics. *Animals*, *11*(3), 1–22. https://doi.org/10.3390/ani11030837
Werkmeister, C., Schoormann, T., & Knackstedt, R. (2021). Promoting Carpooling Through Nudges: The Case of the University Hildesheim. In A. F., S. R., & S. S. (Eds.), *Innovation Through Information Systems* (Vol. 2, pp. 656–672). Springer Science and Business Media Deutschland GmbH. https://doi.org/10.1007/978-3-030-86797-3_43
Wilson, M. L., Foster, D., Lawson, S., & Eddison, S. (2011). Nudging people at work and other third-party locations. *2nd International Workshop on Persuasion, Influence, Nudge and Coercion Through Mobile Devices 2011*, *722*, 47–50.
Winston, A. (2018). *The Story of Sustainability in 2018: "We Have About 12 Years Left."* https://hbr.org/2018/12/the-story-of-sustainability-in-2018-we-have-about-12-years-left
Yang, X., Huang, Y., Cai, X., Song, Y., Jiang, H., Chen, Q., & Chen, Q. (2021). Using imagination to overcome fear: How mental simulation nudges consumers' purchase intentions for upcycled food. *Sustainability (Switzerland)*, *13*(3), 1–21. https://doi.org/10.3390/su13031130
Zhuang, Y., Liu, X., & Nguyen, T. (2013). *Global remote sensing research trends during 1991–2010: a bibliometric analysis*. 203–219. https://doi.org/10.1007/s11192-012-0918-z