Mapping evidence of individuals' sustainable consumption behaviour and energy or transport use in Africa: A scoping review

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ARTICLE INFO

Article history:

Received 29 August 2021

Received in rev. form 17 Sep. 2021

Accepted 20 Sep 2021

Keywords:

Consumer Behaviour, Sustainable Transport, Sustainable Energy Use, Africa

JEL Classification:

M31, P28

ABSTRACT

The study aims to systematically map and describe the evidence on individual's sustainable consumption behaviour and energy and transport use in Africa. The paper employed Arskey and O'Malley's framework of 2005 as a guide to conduct a scoping review. Using keywords separated by Boolean terms (AND/OR) with all limiters removed, relevant published studies in Science Direct, SCOPUS, and Google Scholar were searched. Full text screening guided by the inclusion criteria was independently conducted and data extraction was done using a piloted form to ensure accuracy and reliability of the data. The results revealed that out of 176 studies, six met this study's inclusion criteria and were included for data extraction. Among the six included studies, two were multi-country studies involving African countries, and a study each was conducted in Ghana, Mauritius, South Africa, and Egypt. Of the included studies, five were on sustainable energy consumption domain, one on energy use and recycling behaviour, and the factors influencing sustainable energy consumption; price, income, urbanization, intention, attitudes, subjective norms and personal values. However, we found no evidence on individual's sustainable consumption behaviour and transport use. Concluding, the results suggest that limited studies on sustainable consumption behaviour of energy and transport use are found in Africa. Therefore, further studies are needed to protect the gains made so far on environmental sustainability as well as to encourage and improve the individual's sustainable consumption practices.

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Introduction

Sustainable consumption (SC) behaviour is considered as one of the values of peoples' effort which offers significant knowledge for policy makers (Sharma and Jha, 2017). It is also believed to be influenced within political and societal context (Ritter et al., 2015; Terlau and Hirsch, 2015). Knowledge on global warming and its threats to the environment can sway consumers' behavioural intention and modify their desire towards sustainable consumption (Awuni and Du, 2016; Ansu-Mensah and Bein, 2019). Economically, transport promotes the growth and development of nations (Saidi et al., 2018). The aim of sustainable transport is to promote improved ways that will meet the needs of individuals and the public (Sagaris and Arora, 2016; Egset and Nordfjærn, 2019). Notwithstanding, urbanization and the massive use of transport as a result of good economic status of individuals contribute greatly to environmental degradation (Mohiuddin et al., 2018). This is one of the main reasons why goal 12 of the sustainable development goals (SDGs) aims to achieve a SC by the end of the year 2030 (Gaffney, 2014). A system of transport network; road network, railways, and air routes used connect countries and thereby attract investors which consequently promote international trading (Saidi et al., 2018).

Additionally, sustainable transportation necessitates the change in people's travel behaviors from the use of private cars to walking, bicycles and public transport (Geng et al., 2017). Similarly, transport involves energy use in its operation (Rodrigue et al., 2013).

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Through the use of various transport networks, the environment and natural resources are affected in different or similar ways despite the variation in energy use among countries (Kammen and Sunter, 2016). It is also reported that energy consumption has a strong relationship with economic growth. For instance, energy consumption can be influenced by economic growth and vice versa (Gelo, 2009). One of the sustainable consumption priority areas recognized under the 2003 Marrakech Process is energy. Energy plays a substantial role in every country's socioeconomic system. Energy sources include petroleum, natural gas, nuclear fuels and others. Some of which serve as energy for transport which could be reviewed with its usage for SC (Moser, 2015). Consequently, it is imperative for individuals to adopt cleaner energy sources and better means to meet their needs in respect of transport/energy use.

Sustainable energy consumption is regarded as one of the consumption practices that decrease the ethical dangers linked to the overconsumption of fossil-fuel (Kasperbauer, 2017; Bauwens, & Eyre, 2017; Press and Arnould, 2009). In order to break even between sustainable energy consumption and sustainable development, strong governmental interventions are put in place by some countries (Wei and Hu, 2013). Notwithstanding, in the transport sector, few consumers mentioned environmental concerns during selection of transportation in Denmark. Nonetheless, in developing countries, sustainable energy sources are key elements that draw consumers to SC (Hassan et al., 2018). Hence, occupiers in the cities spend not less than 11% as part of their budget on transport (Lefèvre, 2009). Bosman and Slabbert (2016), stated that sustainable transport *"allows the basic access and development of needs of individuals, companies and society to be met safely and in a manner consistent with human and ecosystem health, and promotes equity within and between successive generations"* (Bosman and Slabbert, 2016).

Unlike Europe where domestic energy use is low (Frogart and Canzi (2004), residential energy use in China for heating and cooling could increase by 35% by the year 2030 (Zhang et al., 2016). Again, recent growth in transport sector in Europe as a result of private car use by individuals as means of transportation is likely to cause more accidents, congestion, pollution and degradation to the environment (Frogart and Canzi, 2004). Not different from Africa, transport and energy use could account for the depletion of the ozone layer (Li et al., 2019), unsustainable consumption patterns resulting in pollution, degradation of the environment globally (Zhang et al., 2019), rising greenhouse gas emissions, and various forms of environmental pollution which are likely to retard economic growth (Adom, 2019).

In consideration of the foregoing, and in order to reveal the gaps in literature as well as necessity for future research concerning sustainable consumption behaviour of transport and energy use, we systematically mapped literature and described the evidence to reveal the literature gaps and create awareness of the necessity for future research to fill the gaps identified. Consequently, the following is the study's research question: so far, what evidence exists on individual's sustainable consumption behaviour of energy and transport use in Africa? This paper contributes to the documentation of research gaps in the literature on sustainable consumption behaviors regarding energy use and transport use.

The remainder of this scoping review is structured to follow Arksey and O'Malley's framework of 2005 which starts with the methodology section and includes the following five steps: Identifying the research question, Identifying relevant studies, Study selection, Charting the data, and Collating, summarizing and recording the results (Arksey and O'Malley, 2005).

Methodology

Design of the Scoping Review

We explored sustainable consumption behaviour of transport and energy use using a scoping review methodology and presented evidence reported in Africa. Scoping review was more appropriate and helped with the documentation of research gaps. This study adopted the 2005 Arksey and O'Malley's framework as a guide (Arksey and O'Malley, 2005). We utilised the following steps: *identification of the research question; identification of relevant studies; study selection and eligibility; data charting; and collating, summarising and reporting of results* as stipulated by Arksey and O'Malley's in their framework (Arksey and O'Malley, 2005). We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) modified for Scoping Reviews checklist to guide the reporting of this study (Ansu-Mensah et al., 2019).

Identification of the research question

The research question for this study was: to date what evidence exists on individual's sustainable consumption behaviour of energy and transport use in Africa?

The Population, Content, and Context framework was used to determine the eligibility of this review question (*see Table 1*).

Table 1: The population, content, and context framework for defining the eligibility of the scoping review question

P: Population	Consumers/Individuals
C: Concept	Sustainable consumption behaviour: It refers to individuals' actions occurring at regular events when dealing with procedures in decision making and engagement of things concerning the environment (Dermody et al., 2015).
C: Context	Sustainable Transport: Sustainable transport is explained as any channel through which people access their needs consistently and in a safe manner with other correspondence and environment in a more beneficent way to both humans and the ecosystem. Sustainable transport modes include walking, bicycling, and the use of a public bus, rail, and ferry. Sustainable Energy Consumption: Sustainable energy consumption is perceived of as a consumption practice that decreases the ethical dangers linked to the overconsumption of fossil-fuel (Kasperbauer, 2017; Bauwens, & Eyre, 2017; Press and Arnould, 2009).

Identification of relevant studies

We searched for relevant published studies in Science Direct, SCOPUS, and Google Scholar using keywords separated by Boolean terms (AND/OR). The databases search was conducted from 26th June, 2021 to 28th June 2021 using the following search strategy; “sustainable consumption” OR “green consumption” OR “consumption behaviour” OR “sustainable consumption behaviour” AND “transport use” OR “energy use” OR “energy conservation” OR “energy consumption” AND “people” OR “humans” OR “consumer” OR “individual”. Table 2 shows the full search strategy used for this study. All limiters (date, study design, and language) were removed during the databases search. Science direct, SCOPUS, and Google Scholar were used because they are the databases that are easily accessible and can be used to search for more published articles. We further searched the reference list of the included articles for relevant eligible studies. Assisted by Monica Ansu-Mensah (MAM), Peter Ansu-Mensah (PAM) conducted the database search guided by this study's eligibility criteria and imported all eligible titles to Mendeley Desktop library created for this study.

Table 2: The full search strategy used for this study

Date	Database	Keywords	Search results
26/06/2021	Science Direct	“sustainable consumption” OR “green consumption”	422,997
27/06/2021	Google Scholar	“transport use” OR “energy use” OR “energy conservation” OR “energy consumption” AND “Africa”	19,200
28/06/2021	SCOPUS	“Consumer” OR “individual” OR “humans” OR “people” AND “energy use” OR “transport use” AND “Africa”	59,990
28/06/2021	SCOPUS	“energy use” AND “Africa”	59,554
28/06/2021	SCOPUS	“transport use” AND “Africa”	59,575

Study selection and eligibility criteria

Study selection

Prior to abstract screening, duplicate titles were removed, and the cleaned library shared between the review team. PAM and MAM independently screened the abstract and full text articles. Discrepancies between PAM and MAM at the abstract and full text screening stages were discussed by the review team to reach consensus. We calculated the inter-rater agreement between the reviewers at the end of the full text screening stage. A kappa statistic 85% which was greater than 50% was interpreted as a high agreement observed between the reviewers (McHugh, 2012).

Eligibility criteria

Inclusion criteria

A study was included if it met the following inclusion criteria below:

- i. Studies presenting evidence in Africa,
- ii. Studies involving the human population,

- iii. Studies reporting findings on sustainable consumption behaviour,
- iv. Studies reporting findings on energy use,
- v. Studies reporting findings on transport use practices,
- vi. Studies reporting factors influencing sustainable consumption of energy and transport,
- vii. Peer reviewed primary studies (quantitative, qualitative, and mix-methods study designs),
- viii. Publications in English language

Exclusion criteria

- i. The exclusion criteria for this review were as follows:
- ii. Article conducted outside Africa
- iii. Studies involving firms
- iv. Studies reporting findings on waste minimization/reduction practices
- v. Publications in any other language apart from English language
- vi. Other types of reviews

Charting the data

Selected studies were comprehensively read for data extraction of the bibliographic details and relevant data such as author and date, study title, study aim, study setting, study design, domain of sustainable consumption, and study findings. Prior to the data extraction, the data extraction form was piloted by the two independent reviewers (PAM and MAM) using two included articles and the form amended based on the feedback received to ensure its trustworthiness. PAM extracted the data from the remaining four articles.

Collating, summarising, and reporting the results

Thematic analysis was used to analyse the data extracted from the included studies. The emerging themes from the findings were organised, manually coded, and structured around the following sub-themes briefly explained below.

Sustainable energy consumption – considered as a consumption practice that decreases the moral dangers usually linked to the overconsumption of fossil-fuel. It is also the efficient energy use which will ultimately produce low emissions and minimum pollution.

Energy use and recycling behaviour – these pro-environmental behaviours comprise various individual choices and actions whose outcome is the use of efficiency in energy consumption and lesser quantity of resources while at the same time reducing the adverse effects throughout the products or services life cycle. Recycling behaviour needs more time and a vigorous or determined attempt. For instance, consumers ought to organise, separate and sort waste for recycling. In short, waste should be thrown away at selected places and not to be dumped messily in the container.

Factors influencing sustainable consumption – these are the determinants that impact sustainable consumption. Sustainable consumption herein refers to the reduction in consumption, consuming in a different manner, the choices, use and disposal of goods, services, and in what way this can be altered to bring benefits both socially and environmentally.

Sustainable transport use – described as whichever channel that individuals/consumers, businesses, and societies constantly get their needs in a harmless way which is beneficial to the environment and future generations. In brief, it is the use of less diesel/petrol-powered transport.

Results

Of the 176 potentially eligible articles obtained from the database search, 22 duplicates were removed. Afterward, 113 and 35 articles were excluded from the abstract and full article screening stages respectively (*see Figure 1*).

There was a substantial level of agreement between the reviewer's responses at full article screening stage (Kappa statistic = 0.85, $p < 0.01$; (McHugh, 2012). The reasons for exclusions following the full article screening were: four (4) studies were review papers (Couth and Trois, 2010, 2012; Mandelli et al., 2014; Mokua, 2000); inability to access the full text of four (4) studies (Elum and Momodu, 2017; Kazungu, 2010; Mudau, 2015; Vanderschuren et al., 2010), two (2) were published without methods (Godard, 2013; Kane, 2010). Fourteen (14) did not present on any of this study's outcomes (Aboginije et al., 2020; Chingono and Mbohwa, 2016; Gumbi, 2015; Hurth, 2005; Jonsson, 2011; Karani and Jewasikiewitz, 2007; Khonje, 2018; Kitila and Woldemikael, 2019; Larney and Aardt, 2010; Madigele et al., 2017; Mudzengerere and Chigwenya, 2012; Muzenda, 2014; Uchegbu and Ubani, 2009; Vossberg et al., 2014), and eleven (11) did not report on any of the domains in sustainable consumption (Adeoye and Spataru, 2018; Ateba and Jurgens Prinsloo, 2019; Fakoya and Nakeng, 2019; Inglesi-Lotz and Pouris, 2012; Okukpon, 2015; Onu and Mbohwa, 2019; Ouedraogo, 2017; Ozonoh et al., 2018; Raman and Tewari, 2011; Saidi et al., 2018; Winkler, 2007).

Figure 1: PRISMA flow diagram showing screening results

Characteristics of the included studies

Of the six included studies, two were multi-country studies (Adom, 2019; Masoso and Grobler, 2010). The first multi-country study involved 22 countries (Cameroon, Ethiopia, Ghana, Kenya, Mozambique, South Africa, Sudan, Zambia, Zimbabwe, Algeria, Benin, Botswana, Democratic Republic of the Congo, Congo Republic, Egypt, Mauritius, Morocco, Nigeria, Senegal, Tanzania, Togo, and Tunisia) (Adom, 2019), and the second involved two countries (Botswana and South Africa) (Masoso and Grobler, 2010). Also, one study each presented evidence from Ghana (Präger et al., 2019), Mauritius (Bekaroo et al, 2018), South Africa (Mtutu and Thondhlana, 2016), and Egypt (Marzouk and Mahrous, 2020). Five studies were on sustainable energy consumption domain (Adom, 2019; Bekaroo et al., 2018; Marzouk and Mahrous, 2020; Masoso and Grobler, 2010; Präger et al., 2019), while one was on energy use and recycling behaviour (Mtutu and Thondhlana, 2016). Two of the included studies were descriptive quantitative design and quantitative survey studies (Adom, 2019; Mtutu and Thondhlana, 2016), another two were experimental studies (Bekaroo et al., 2018; Masoso & Grobler, 2010), one was a cross-sectional survey (Präger et al., 2019), and one was a mixed-methods study (Marzouk and Mahrous, 2020), (see Tables 3 and 4).

Table 3: Characteristics of the included studies

Author & Date	Study title	Geographical location	Study design	Population	Sample size
(Bekaroo et al., 2018)	Enhancing awareness on green consumption of electronic devices: The application of Augmented Reality	Mauritius	Experimental study	University Students	40
(Adom, 2019)	An evaluation of energy efficiency performances in Africa under hetero-geneous technologies	Cameroon, Ethiopia, Ghana, Kenya, Mozambique, South Africa, Sudan, Zambia, Zimbabwe, Algeria, Benin, Botswana, Congo DR, Congo Rep., Egypt, Mauritius, Morocco, Nigeria, Senegal, Tanzania, Togo and Tunisia	Descriptive quantitative study	22 African countries	594
(Präger et al., 2019)	Biomass sources for a sustainable energy supply in Ghana – A case study for Sunyani	Ghana	Cross-sectional survey	Inhabitants of Sunyani	250,000
(Mtutu & Thondhlana, 2016)	Encouraging pro-environmental behaviour: energy use and recycling in Rhode University in South Africa	South Africa	Quantitative survey study	Staff and students	70
(Masoso & Grobler, 2010)	The dark side of occupants' behaviour on building energy use	Botswana and South Africa	Experimental study	Occupants	6 commercial buildings
(Marzouk & Mahrous, 2020)	Sustainable consumption behavior of energy and water-efficient products in a resource-constrained environment	Egypt	Mixed methods	Consumers	519

Table 4: Study findings

Author & Date	Domain of SC	Factors influencing SC	Study findings
(Bekaroo et al., 2018)	Sustainable energy consumption	Intention, perceived usefulness and perceived enjoyment	Positive correlation between AR and learning enhancement on green consumption of electronic devices.
(Adom, 2019)	Sustainable energy consumption	Price, income, and urbanization	Improving upon the technical processes of the production of energy services promotes SC. Again, high income increases energy consumption
(Präger et al., 2019)	Sustainable energy consumption	Utilization of biomass	Utilizing biomass in Ghana in a modern and efficient way will solve energy problems, affect local markets positively and support the implementation of renewable energies
(Mtutu & Thondhlana, 2016)	Energy use and Recycling behaviour	Personal values as barriers to pro-environmental behaviour	The study called for the assumptions underlying intervention strategies aimed at promoting pro-environmental behaviour and to get rid of barriers to enable pro-environmental actions.
(Masoso & Grobler, 2010)	Sustainable energy consumption	Energy savings during occupied hours and Energy savings during non-occupied hours	Air conditioning systems and other equipment that are left on unnecessarily at the end of day
Marzouk & Mahrous, 2020	Sustainable energy consumption	Attitudes toward conservation, subjective norms, perceived moral obligation	Insightful implications for practitioners and public policymakers are developed.

Sustainable Energy Use

Sustainable energy consumption

Of the six included studies, five reported evidence of sustainable energy consumption. In Mauritius, Bekaroo et al. adopted the 'augmented reality' (AR) technology on green consumption of electronic devices such as television sets and computers (Bekaroo et al., 2018). Their study discovered that the use of these electronic devices among households and businesses has been beneficial as well as destructive to humankind (Bekaroo et al., 2018). Their study also revealed a positive relationship between AR and learning improvement on green usage of electronic devices (Bekaroo et al., 2018). Adom in 2018 conducted "an evaluation of energy efficiency performances in 22 Africa countries under the heterogeneous technologies" and found that enhancing the technical processes of energy services production indeed promoted sustainable consumption (Adom, 2019). Adom's study also espoused that factors such as price, income and urbanization perform substantial roles in energy consumption (Adom, 2019). In Ghana, Präger et al. studied the utilisation of biomass sources for sustainable energy and concluded that biomass sources could be utilised to resolve problems of energy in Ghana (Präger et al., 2019). Präger et al.'s study findings also showed that biomass can support the adoption of renewable energies (Präger et al., 2019). In "the dark side of occupants' behaviour on building energy use," Masoso and Grobler in 2010 analyzed the poor energy use by occupants in commercial buildings in Botswana and South Africa (Masoso & Grobler, 2010). The study revealed that equipment and appliances were left on without use after office hours (Masoso & Grobler, 2010). In Egypt, Marzouk and Mahrous study on conservation behaviour of Egyptian consumers reported that public media influence, self-preference, and perceived moral obligation had significant effect on conservation behaviours of energy and water (Marzouk and Mahrous, 2020).

Energy use and recycling behaviour

One out of the six included studies presented evidence on energy and recycling behaviour. In South Africa, Mtutu and Thondhlana in 2016 conducted a study involving university students and faculty staff to examine the association between the participants' energy consumption and recycling behaviour (Mtutu and Thondhlana, 2016). Their study results showed that demographics (age, staff and students), and personal values (social relations, aesthetic beauty and diversity, varied life, and freedom) mediated pro-environmental behaviour (Mtutu and Thondhlana, 2016). Again, their findings indicated that students were less worried about the environment, whereas faculty members were more motivated towards pro-environmental behaviors (Mtutu and Thondhlana, 2016). In addition, Mtutu and Thondhlana reported that although personal values shape individuals' attitudes towards the environment, they do not continually convert into pro-environmental behaviour (Mtutu and Thondhlana, 2016). Hence, Mtutu and Thondhlana suggested that pro-environmental behaviors such as energy conservation and sustainable recycling should be promoted (Mtutu and Thondhlana, 2016).

Factors influencing sustainable consumption

Of the six included studies, four additionally reported evidence on factors that influence sustainable consumption. Bekaroo et al. study revealed that intention to use, perceived usefulness and perceived enjoyment are the factors influencing sustainable energy consumption (Bekaroo et al., 2018). However, a study on the use of varied energy efficiency technologies in Africa reported that price, income, and urbanization are the factors that influence sustainable consumption (Adom, 2019). Conversely, Mtutu and Thondhlana's study revealed personal values as barriers to pro-environmental behaviour (Mtutu and Thondhlana, 2016). Whilst personal values shaped participants' attitudes toward the environment (Mtutu and Thondhlana, 2016), consumers' attitudes toward conservation formed the basis of energy conservation behaviours (Marzouk and Mahrous, 2020).

Sustainable transport use

This scoping review found no study reporting findings on sustainable transport use based on the inclusion criteria. This suggests a major knowledge gap which needs to be filled as regards quantitative research.

Discussion

We conducted a scoping review aimed to map available evidence on the individuals' sustainable consumption behaviour of energy and transport use in Africa. The results showed fewer six (6) studies were conducted in this field based on this study's eligibility criteria. Five (5) studies reported evidence on sustainable energy consumption whereas, one (1) study reported on energy use and recycling behaviour.

This study's findings revealed that high income increases energy consumption (Adom, 2019), and the use of electronic devices by individuals is beneficial as well as destructive to humankind, whereas there is a positive relationship between augmented reality and learning enhancement on green consumption of electronic devices (Bekaroo et al., 2018). These findings are in agreement with many other studies that have established that high income of individuals increases their energy consumption in emerging countries (Rafindadi et al., 2019; M. Zhang & Bai, 2018). Similarly, the result on electronic devices is supported by Shittu (Shittu, 2020) and

Arain et al. (Arain et al., 2020), who found that electronics are important to households in that they help save energy whilst it is also an emergent sustainability problem culminating in increases in energy demand due to rising household appliances.

It was also revealed that improving the technical processes of the production of energy services indeed promoted sustainable consumption (Adom, 2019). This finding is consistent with the results in Shittu (Shittu, 2020) that the use of technology improves household sustainable energy consumption.

This study further found that utilising biomass sources in a modern and efficient way is applicable to resolve energy problems and support the adoption of renewable energies (Präger et al., 2019). Conversely, this finding is in sharp contrast with scholars (Shittu, 2020) and (Al-marri et al, 2018) previous studies that biomass use is harmful to public health and therefore an unsustainable source of energy.

This study additionally found that air condition systems and other appliances are not switched off after office hours and this indicates poor energy use by occupants in commercial buildings (Masoso and Grobler, 2010). However, the study of (Al-marri et al., 2018) found that energy-saving programmes can be used with appliances (eg. air conditioners, TVs, or computers) which can go off automatically if not being used.

Moreover, the findings indicated that students are less worried about the environment, whereas faculty members are more motivated towards pro-environmental behaviours, such as, energy consumption and recycling behaviour, while demographics (age, students and staff) mediated pro-environmental behaviour (Mtutu and Thondhlana, 2016). On the contrary, it is inadequate to conclude that in a university, faculty and staff are persuaded to engage in recycling behaviours (Arain et al., 2020).

This study found factors influencing sustainable consumption of energy in Africa. We found that intention to use, perceived usefulness and perceived enjoyment ensured sustainable energy usage (Bekaroo et al., 2018). However, factors such as price, income, urbanization (Adom, 2019), personal values (Mtutu and Thondhlana, 2016), and attitudes and subjective norms (Marzouk and Mahrous, 2020) were revealed to be some of the factors influencing sustainable energy use in Africa. Similar to our study finding, some studies conducted by (Brounen et al., 2012; Zhang and Bai, 2018; Rafindadi and Mika'Ilu, 2019; Wang et al. 2020 George-ufot et al. 2017) confirmed that, price, income, urbanization, and attitudes influence sustainable energy consumption. Contrariwise, (Salim and Shafiei, 2014) have concluded that urbanization has no apparent effect on energy consumption.

We found no study focusing on sustainable transport use based on this study's eligibility criteria. Hence, the results suggest a dearth of knowledge on sustainable transport use in Africa. Though, our study revealed a major gap in the domain of sustainable transport in Africa, yet it is noteworthy that, there is a vast knowledge of extant literature on sustainable transport in other regions of the world (eg. Europe) (Nedeliaková and Renata, 2019). Sustainable transport enhances quality of life in urban centres, enables citizens to perform roles linked to trade, and helps develop urban centres (Nedeliaková and Renata, 2019). Besides, authors (Nedeliaková & Renata, 2019; Stephenson et al., 2017), see transport as a concern so, they are calling for policies, technologies and behaviours which could reduce negative environmental effects whereas augmenting economic outcomes. Thus, the transport sector is an essential area of sustainable development.

Implications

It is notable that all the included studies in this scoping review were conducted in urban settings. In these locations, there is a very high rise in energy consumption among individuals, communities, and companies and this indiscriminate energy use has calamitous consequences, while, there is also a substantial impact of transportation on individuals and the ecosystem in such places (Adom, 2019; Ansu-Mensah & Bein, 2019; Bekaroo et al., 2018; Marzouk and Mahrous, 2020; Masoso and Grobler, 2010; Mtutu and Thondhlana, 2016; Präger et al., 2019). In view of the greater upsurge in the consumption of energy and the adverse effect of transportation in such urban settings, it is, therefore, imperative that sustainable energy consumption is introduced. Besides, sustainable transport modes, such as walking, bicycling, use of public bus, rail and ferry systems should be adopted (Kane, 2010). Indeed, the above recommendations will not only save individuals, and communities money, energy, improved health, and enhanced standard of living, but will also protect the environment, the ecosystems and posterity by helping them to acquire their basic needs (Ansu-Mensah and Bein, 2019). Furthermore, unsustainable energy use will negate the achievement of the SDG 7 (7.1 and 7.3) targets of ensuring sustainable and modern energy for all by 2030. Individuals should therefore become energy efficient through the judicious use of energy such as; turning off unused appliances, using energy-efficient bulbs and appliances. It is also important for African countries to invest in solar and wind energy sources. Similarly, governments should invest in public transportation and make accessible and safer bicycle and pedestrian walking paths. What's more, there is the need to make available reliable energy for health facilities and for access to clean water. In so doing, energy needs will be met and the environment will be protected. The SDG 11, targets 11.2 and 11.3 indicate that sustainable transport systems for all, enhancing sustainable urbanisation, and reducing municipal waste management by 2030 could only become a reality if people have access to public transport, proper urban planning and management, and regular collection of urban waste. In this manner, a promising future where there will be access to energy services and sustainable transport systems lie in wait for individuals and posterity.

This study suggested limited published research on sustainable consumption behaviour of energy in Africa. It also suggested a dearth of published literature on sustainable transport use in Africa. This study's finding about the latter is particularly worrying considering

that previous studies have shown the need for sustainable transport policies in Africa (for instance, in South Africa) (Godard, 2013; Kane, 2010; Vanderschuren et al., 2010). Considering the rising urbanisation as well as increasing population in Africa, this study evidence the need for scholars to embark on the trajectory of doing more research on sustainable consumption behaviour regarding energy and transport usage. This will be essential to facilitate the attainment of SDG goal 12 which stipulates responsible consumption patterns by 2030. It is important to stimulate public venture in public transportation and “*make bicycle paths and walking safer and accessible*” as Africa progresses towards sustainable transportation targets. In efforts towards achieving SDG 11 by 2030, there is the need to invest in sustainable public transport, sustainable energy use, and engage more people in sustainable urban planning decisions in Africa. Countries can help by making available affordable and easily accessible sustainable public transportation systems. Also, car sharing can be introduced in order to reduce emissions. Additionally, attitudinal change is needed, so, when awareness is heightened, behaviours of consumers and societal members would change and energy/transport sustainability will be promoted.

Conclusion

This scoping review paper attempts to map evidence and summarize the characteristics of sustainable behaviors as regards energy and transport of Africans from existing literatures. In so doing identifying voids or gaps in existing research. The study used Arskey and O'Malley's framework of 2005 as a guide. The study's findings indeed suggest that there is a literature gap and for that matter, limited studies are found in Africa on sustainable consumption behaviour of energy and transport use. For that reason, further studies are needed to help promote, encourage, and improve sustainable consumption practices thereby, achieving goal 12 of the SDGs proposed for 2030. Given that energy and transportation demand is likely to increase along with population growth and/or higher levels of affluence, this is decidedly something to keep an eye on, including for the purposes of meeting the SDGs.

It is worth mentioning that there was an extensive search for relevant studies on sustainable consumer behaviour and energy/transport use in Africa. This study included Boolean operators as part of the search strategy to optimize the search. This study, to the best of our knowledge, is the first scoping review in this field of research. This study has also helped to identify the evidence existing and the gaps in the literature on individual's sustainable consumption behaviour and energy/transport use in Africa. On the other hand, this review also has several limitations. Only peer-review publications emanating from primary studies were searched for. The included studies were also sourced from only four evidence sources. This possibly resulted in the exclusion of potentially relevant grey literature and other published studies that may have existed in other evidence sources not captured by this study. This scoping review was also limited to African countries; hence, it cannot be generalized. Limiting the scope of the search from the year 2009 to 2020 meant that all potentially relevant studies that were done before 2009 were also excluded. This study was further limited to individuals' sustainable consumption practices. The inclusion of firms and communities would have broadened the perspectives, but due to lack of external funding, we could not include all these aspects. Nonetheless, we recommend future review studies to focus on firms and community's sustainable consumption practice or behaviour with regards to energy and transport use. Moreover, meta-analysis using quantitative was not conducted due to the explorative nature of scoping reviews. Primary study should be conducted in sustainable transport use in Africa, while motivating recycling behaviour change in individuals. We also recommend a full systematic review and meta-analysis to assess the impact of individual's sustainable consumption practice and energy use in future to help inform policy decisions. Despite all these limitations, this study provides useful evidence to help guide future research. It also adds to the body of knowledge in this field of research.

Acknowledgement

Author's contributions

Peter Ansu-Mensah (PAM) conceptualized and designed the study. PAM and Monica Ansu-Mensah (MAM) contributed in the abstract and full article screening. PAM contributed to the quality assessment of the included studies. PAM and MAM contributed to the design and data extraction process as well as synthesis of data. PAM wrote the manuscript and both MAM and PAM critically reviewed it. All authors approved the final draft manuscript.

Abbreviations

Augmented Reality (AR); Millennium Development Goal (MDG); Sustainable Development Goals(SDGs); Sustainable Consumption (SC)

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