

A Review of Electronic Government for Environmental Sustainability

Completed Research Paper

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Abstract

Environmental Sustainability is a global challenge. All governments are recommended to address this challenge by using digital technologies to provide e-government services and applications. In recent years, there has been a growing interest in e-government research in studying the issues of environmental sustainability. This paper provides a review of the literature that is available in the Digital Government Reference Library (DGRL) with an aim of synthesizing the knowledge and identifying the important areas for research. We assess the literature by adopting the E-government for Sustainable Development Research Assessment Framework (Estevez and Janowski 2013). The review shows that a few studies have been conducted for understanding e-government for environmental sustainability and little theoretical contribution was made. Drawing upon this assessment of the literature, we discuss several important research issues of exploring e-government services for environmental sustainability and the role of digital technologies in support of these services.

Keywords: E- government, Environmental Sustainability, Literature Review

Introduction

Environmental sustainability has become more and more crucial for sustainable development. Effective strategies and actions need to be taken by governments in addressing the issues related to it (Larsson and Grönlund 2014; Ostrom 2010). The United Nations (UN) 2030 agenda for Sustainable Development has defined 17 Sustainable Development Goals (SDGs) that are related to environmental sustainability ("Assembly and Goals" 2015). Governments have agreed upon achieving these goals, and they are responsible for taking actions for ensuring environmental sustainability with international collaborations.

However, the governments are much more vigilant than ever in achieving environmental sustainability (Brugmann 1996). Environmental Sustainability is considered the emerging dominant challenge at present and it is lead to massive environmental shifts such as global warming, rising sea levels, dramatically expanding droughts, ocean acidification, and loss of biodiversity (Gholami et al., 2016). In addition to improving the strategies and effectiveness of the governments (Lee 2017), all governments are recommended to address this challenge by using digital technologies to provide e-government services and applications. For examples, cloud computing, big data, artificial intelligence, and digital connectivity have generated the capability of developing more government-based services, such as engaging citizens in the processes of decision making and governance (Larsson and Grönlund 2014; He et al. 2017) and creating the opportunity to harness collective intelligence within the public sector, which could generate greater value from government initiatives (Harrison et al. 2012). Recently, more countries are engaging in developing smart cities and providing a number of smart environment related public services such as smart municipal solid waste management, smart grids and smart metering, smart buildings, efficient public lighting, public gardens and parks, smart traffic and bus services, and smart water management (distribution and sanitation) (Perez-Gonzalez and Daiz-Daiz 2015).

With the advancement of digital technologies, governments can align their strategies, policies, and priorities with technological innovations. Given the importance of providing e-government services for environmental sustainability and the potential significant role played by digital technologies in support of these services, this paper aims to synthesize the relevant knowledge from e-government research that, in our view, contributes to and deepens understanding of the research focus. Drawing upon the review and assessment of the literature, we discuss several important research issues pertaining to this focus.

The paper is organized as follows: the next section presents the basic concepts that are relevant to this review. The method section describes the methods used in the review. A detailed assessment of the literature is then provided. In the fourth section, the important research issues that emerge from the review are discussed. The final section provides a summary and presents the discussion of the findings.

Related concepts

Electronic Government

Electronic government (e-government) or Digital government is a multifaceted concept and it has been defined in different ways. The World Bank (World Bank, 2002, p.2) has defined E-government as “government-owned or operated systems of information and communications technologies (ICTs) that transform relations with citizens, the private sector and/or other government agencies so as to promote citizen empowerment, improve service delivery, strengthen accountability, increase transparency, or improve government efficiency”. The term ‘electronic governance’ is closely related to electronic government. Electronic governance covers a broader perspective and can be defined as the application of technology by governments to transform themselves, their interactions with customers and the relationships with citizens, businesses, other non-state actors and other arms of government, thereby creating an impact on the society (Estevez and Janowski 2013).

There are many advantages of developing and implementing e-government services. Major advantages can be listed as (1) more efficient government, (2) better services to citizens, and (3) improved democratic processes (Grönlund and Horan 2005).

Environmental Sustainability

Environmental Sustainability is defined as “stakeholder behavior impacting on the natural environment that meets the needs of the present without compromising the ability of future stakeholders to meet their own needs” (Elliot 2011, p.11). The World Commission on Environment and Development defined the term as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Sustainable Development IISD, 2018).

Moldan et al. (2012) have proposed to understand environmental sustainability from different aspects. For example, (1) climate systems (covering climate and climate change, climate risk management, mitigation, and adaptation); (2) human settlements and habitats (covering cities, urbanization, and transport); and (3) energy systems (covering energy use, energy conservation, renewable energy, energy efficiency, and bio energy). These aspects directed us to find related literature of environmental sustainability in e-government research, such as e-government services for climate change (green and e-governance, green IT, pollution control); e-government services for human settlement (smart cities, smart traffic); and e-government services for energy savings (green energy, smart grids and smart metering, smart buildings, efficient public lighting).

Digital Technologies

Digital technologies can be used to automate and optimize governments’ operations and to provide greater e-services to the public. The technological development of big data, Internet of Things (IoT), wired and wireless networks, and sensor technologies allow the creation of active design tools that enable citizens to be involved in e-government services in addressing environmental sustainability (Hilty and Lohmann 2014). Many solutions are provided for our lives and for the betterment of society

through the Internet of Things (IoT) by integrating smart devices into our environment and by paving the way for innovative ICT applications used in smart cities, energy efficiency, and home automation (Frigerio et al. 2018) . Smart cities have become a widely discussed phenomenon with urban development and ICT technologies. The smart city concept could be applied as an effective and efficient solution in improving the quality of life of citizens in six domains: smart economy, smart people, smart governance, smart mobility, smart environment, and smart living. The concept can be further broadened and, within the smart environment, we could find sustainable resource management, environmental protection, pollution and attractiveness of environmental conditions (Marrone and Hammerle 2018).

Research method

In this paper, we conducted a literature review. A review has been defined as an objective, thorough summary and critical analysis of the relevant available research literature on the topic being studied (Cronin et al. 2008).The clear documentation of the process and the decisions made allow the review to be reproduced and updated.

Literature Search

The literature was retrieved from the most comprehensive e-government research database — Digital Government Reference Library (DGRL) Version 14.5, which was published December 15, 2018. The library contains 11,211 references of predominantly English language, peer-reviewed work in the study domains of digital government, digital governance, and digital democracy (“DGRL” 2018).

Searches were performed using the following keywords in the order of “Environmental Sustainability”, “Green” AND “E-governance”, "Pollution Control", "Green IT", "Green Energy", "Smart Traffic", "Smart" AND "E-governance" and "Smart City". The keywords were derived from the key focus areas discussed in understanding environmental sustainability (Moldan et al. 2012). As the keywords were searched within the DGRL, many of the studies are related to digital technologies. As inclusion criteria of the search, articles from all disciplines related to the research, with a primary focus on above key word categories, and studies published in English were considered. Papers were excluded if the articles’ information was not adequate to analyze all the required information in the study.

Selection of papers for the review

Table 1. The selected articles for the review

Keyword	No. of selected articles
Environmental Sustainability	11
Green AND E-governance	1
Pollution Control	2
Green IT	2
Green Energy	1
Smart Traffic	0
Smart AND E-governance	5
Smart City	37

As the first step, articles were filtered through the keywords. It resulted in 98 papers from all the keyword categories. It was noticed that there were 16 duplicates among same and different keyword categories. The filtered articles were re-examined using the abstracts of the articles, and 23 articles were excluded. Next, article abstracts were reviewed with the key research focus in mind. The

number of articles was further reduced to 59 after the search was refined with the inclusion and exclusion criteria (Table 1). The full text of the papers was carefully read to gain a comprehensive understanding of the research focus. The results were stored in a Microsoft Excel sheet for final analysis (some results can be found in Appendix A).

Research assessment framework

The articles were analyzed by adopting the research assessment framework proposed by E-government for Sustainability Development (EGOV4SD) (Estevez and Janowski 2013) (See Figure 1). The framework is based on six main constructs – problem, philosophy, method, data, process, and results. The *problem* construct explains the type of problem analyzed in the given research. It can comprise

perspectives such as government, technology, interactions, customers, and society. Regarding the *philosophy*, there are three commonly known philosophical paradigms, namely 'positivism', 'interpretive' and 'critical'. 'Positivism' is an approach to the study of society that relies specifically on scientific evidence, such as experiments and statistics, to reveal the true nature of how society operates. *Interpretivism* relies upon both the trained researcher and the human subject as the instruments to measure some phenomena and typically involves both observation and interviews. As explained in 'critical' philosophy, this philosophy challenges assumptions and suggests to introduce changes to the social world (Estevez and Janowski 2013). The *method* construct describes the types of research method applied and how it can be categorized as qualitative research method, quantitative research method, a combination of qualitative and quantitative research method or nor a clear research method (Estevez and Janowski 2013). The *data* construct describes the primary and secondary data collection methods such as questionnaires, interviews, document analysis, web content analysis, observation, literature reviews etc.(Estevez and Janowski 2013). The *Process* construct show how the research is grounded in theory, including — 1) theory-based research-using or testing an identified theory; 2) framework-based research - using a framework derived from theoretical work; 3) model-based research — applying

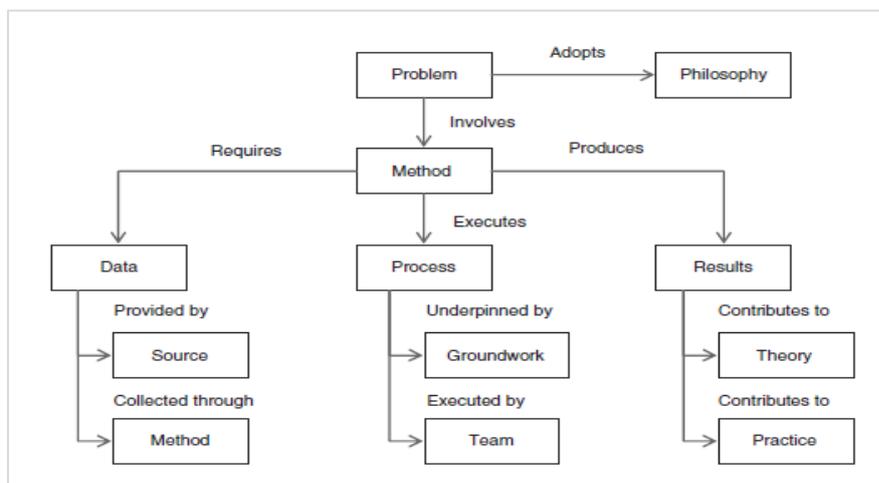


Figure 1. E-government for Sustainable Development research assessment framework (Estevez and Janowski 2013, p. 598)

research to theory and practice. It is possible to identify the theoretical contribution based on six groundwork categories from the process construct — theory-based, framework-based, model-based, schema-based, concept-based, and category-based and none if the research makes no contribution to theory. In addition to the theoretical contributions, the research practical contributions are assessed (Estevez and Janowski 2013).

Literature review results: E-government services for environmental sustainability

We assess the literature based upon the six main constructs of the E-government for Sustainable Development research assessment framework (Figure 1).

Problems that have been studied in the literature

Among the 59 analyzed articles, one paper may address more than one problem and a problem may be associated to several more problems related to environmental sustainability (See Figure 2). The review shows 53 (90%) papers based on digital technology related problems such as systems and services offered through ICT and internet (e.g.:Schulz and Newig 2015; Díaz-Díaz et al. 2017), e-governance process (e.g.:Tan and Eguavoen 2017;Coe et al. 2001; Lv et al. 2018), planning support systems (e.g. Choi and Lee 2016), smart technologies (e.g. Mechant et al. 2012), smart services (e.g. Perez-Gonzalez and Daiz-Daiz 2015), ICT innovations such as Internet of Things (IoT) and big data (e.g. Díaz-Díaz et al. 2017; Buck and While 2017) and renewable energy supply (Contaldi et al. 2007).

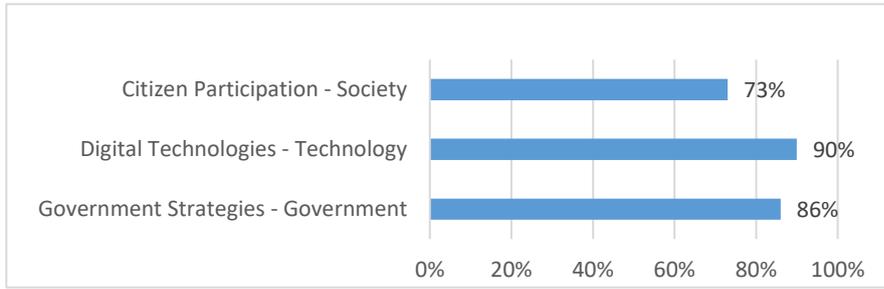


Figure 2. Distribution of the research problems among analyzed research papers

Another 51 (86%) papers refer to government strategies and practices. The government related problems can be listed as government strategies and development plans in environmental protection (e.g. Haigh and Griffiths 2008; Lee 2017), urban

development planning (e.g. Sharma and Singh 2016), smart city implementation (e.g. Chatfield and Reddick 2016; Perez-Gonzalez and Daiz-Daiz 2015; Anthopoulos et al. 2018; Buck and While 2017; de Wijs et al. 2016), environmental pollution reduction and environmental quality (e.g. Zhang et al. 2016), governments’ prioritization of environmental matters (e.g. Gil-Egui et al. 2011), governance processes (e.g. Scholl and AlAwadhi 2016; Lv et al. 2018), collaborative governance (e.g. Pereira et al. 2017), policy issues (e.g. Choi and Lee 2016). The other 43 (73%) papers refers to citizen participation/collaboration related problems which can be elaborated as citizen participation (e.g. He et al. 2017; Schulz and Newig 2015), citizen perspectives and use of applications and offered services (e.g. Chatfield and Reddick 2016) and collaborative approaches in achieving environmental sustainability (e.g. Termeer and Bruinsma 2016 ; Pereira et al. 2017).

Philosophy

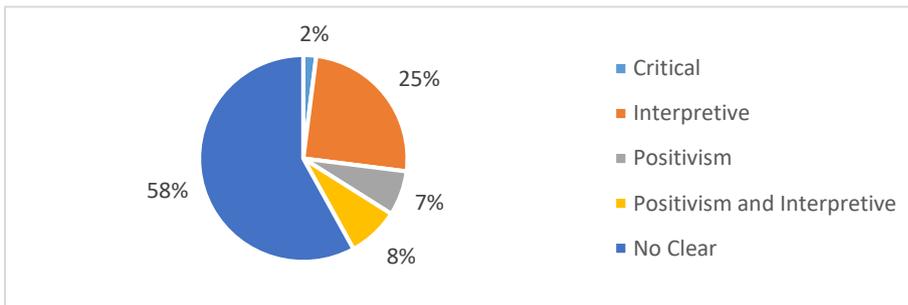


Figure 3. Philosophical approaches adopted by the analyzed papers

During the study of analyzing the papers in terms of philosophy adopted by the papers, it is noted that among the 59 papers analyzed, 34 (58%) did not follow any clear research approach (e.g. Mechant et al. 2012; Coe et al. 2001; van et

al. 2016), 15(25%) adopted an ‘interpretive’ approach (e.g. Sharma & Singh 2016; Chatfield & Reddick 2016), 4(7%) adopted ‘positivism’ (e.g. Yeh 2017; Lee 2017; Pereira et al. 2017; Contaldi et al. 2007), 5(8%) adopted both ‘positivism’ and ‘interpretive’ (e.g. He et al. 2017; Choi and Lee 2016; Gil-Egui et al. 2011) and 1 (2%) adopted a ‘critical’ approach (Shelton 2015).

Method

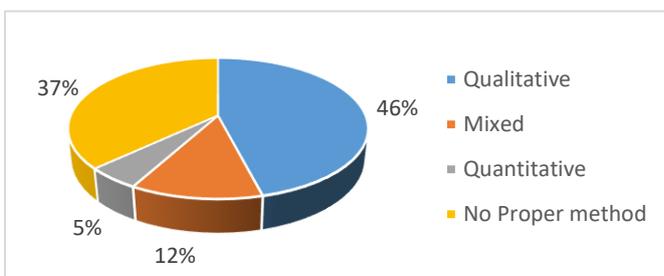


Figure 4. Research Methods adopted by the analyzed papers

Among the 59 analyzed papers, 27 (46%) applied qualitative research methods – case study, observation, document review, web content analysis etc (e.g. Haigh and Griffiths 2008; Sharma and Singh 2016; Scholl and AlAwadhi 2016), 3 (5%) applied quantitative research methods (Lee 2017; Yeh 2017; Contaldi et al. 2007), 7 (12%) adopted both qualitative and quantitative (e.g. Mechant et al. 2012 ; He et al. 2017;

Tan and Eguavoen 2017) and 22 (37%) did not apply a proper research method (e.g. Waart et al. 2016; Buck and While 2017; Lee J. and Lee 2014).

Data Collection

Among the 59 papers analyzed, 28(47%) relied on secondary data, 18(35%) relied on primary data and 11(18%) relied on both primary and secondary data. As data collection methods, different methods such as case study, document review, interview, literature review, web site analysis and observation have been adopted. While 34 (58%) of the papers applied a single data collection method, 25 (42%) other papers applied more than one data collection method. 16 (27%) papers relied on literature reviews(e.g. Lee and Lee 2014;Wu et. al 2018;Yeh et al. 2016), 15 (25%) papers on case studies (e.g. Sharma and Singh 2016; Choi and Lee 2016;Termeer and Bruinsma 2016), 13 (22%) on interviews (e.g. Scholl et al. 2016; Pereira et al. 2017; Scholl and Al Awadhi 2016) and document analysis , 5 (8%) on web content analysis (e.g. Gil-Egui et al. 2011; He et al. 2017; Tan and Eguavoen 2017) and observation(e.g. Waart et al. 2016; van et al. 2016; Chatfield and Reddick 2016) and 2 (3%) papers on questionnaire (He et al. 2017; Yeh 2017) as data collection method.

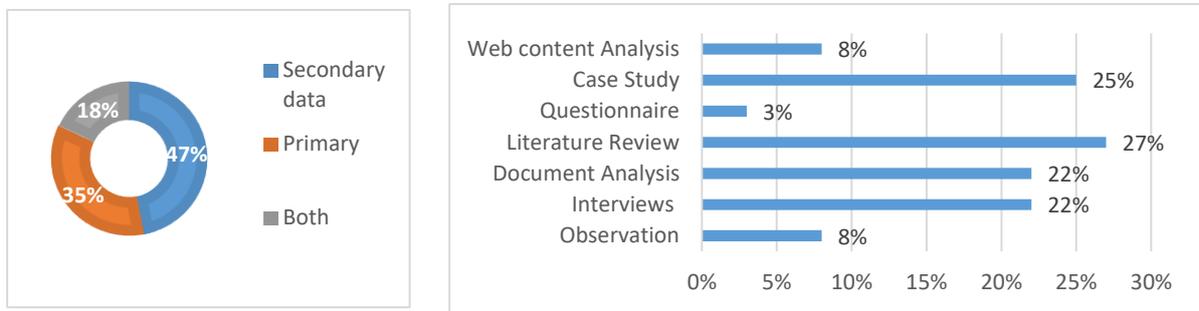


Figure 5. Data Collection methods applied in the analyzed papers

Process

In the research assessment framework, the process construct highlights theoretical underpinnings of the papers. It is noted that more than half of the research carried out does not use any special theoretical foundations. It means as far as theoretical foundations are concerned, 34 (58%) out of the 59 papers that were analyzed were not based on any theoretical foundations. Another 10 (17%) papers were based on models (e.g. Unified Smart City Conceptual

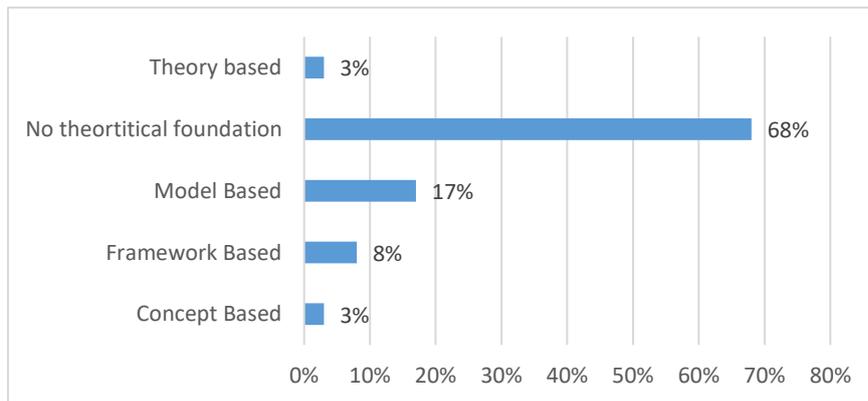


Figure 6. Theoretical foundations of the analyzed papers

model (Anthopoulos et al. 2018), Analytical model (Lee 2017), Osterwalder’s Business Model Canvas (Díaz-Díaz et al. 2017), 3D City model (Khan et al. 2017), Open Innovation model (Scuotto et al. 2016), Model of collaborative governance (Bartenberger and Grubmüller 2014)). 5 (8%) papers were framework based (e.g. : Government strategy framework (Haigh and Griffiths 2008), Framework analysis of air quality (Marek et al. 2017), Analytical framework of participation (Schulz and Newig 2015), 2 (3%) each on concept and theory based research process (Resource dependence, social embeddedness, and citizen-centric e-governance theories (Chatfield and Reddick 2016) and Framing theory (Gil-Egui et al. 2011).

Results/contributions

In terms of contribution to theory, 42 (71%) out of the 59 analyzed papers made no such contributions. In papers with theoretical contributions, 10 (17%) papers are framework-based (e.g.: Estevez and Janowski 2013; Schulz and Newig, 2015; Damurski 2018) and 7 (12%) are on models (Anthopoulos et al. 2018; Scholl & Al Awadhi 2016; Pereira, Macadar et al. 2017). All other contributions are based on practice. Out of those 42 papers 16 (29%) papers focus on analysis (e.g.: Soma et al. 2016; Mechant et al. 2012; Hollands 2015), 5 (8%) papers are based on analysis & assessment (e.g.: He et al. 2017; Lee 2017; Choi and Lee 2016), 9 (15%) on improving local governance (e.g.: Sharma and Singh 2016; Zhang et al. 2016; Termeer and Bruinsma 2016), 4 (7%) on policy recommendation (Pollio 2016; Shelton et al. 2015; Contaldi et al. 2007; Baek and Park 2015), 1 (2%) on prototype (Buck and While 2017) and 7 (12%) on artifact (e.g.: Sideridis et al. 2017; Waart et al. 2016; Khan et al. 2017).

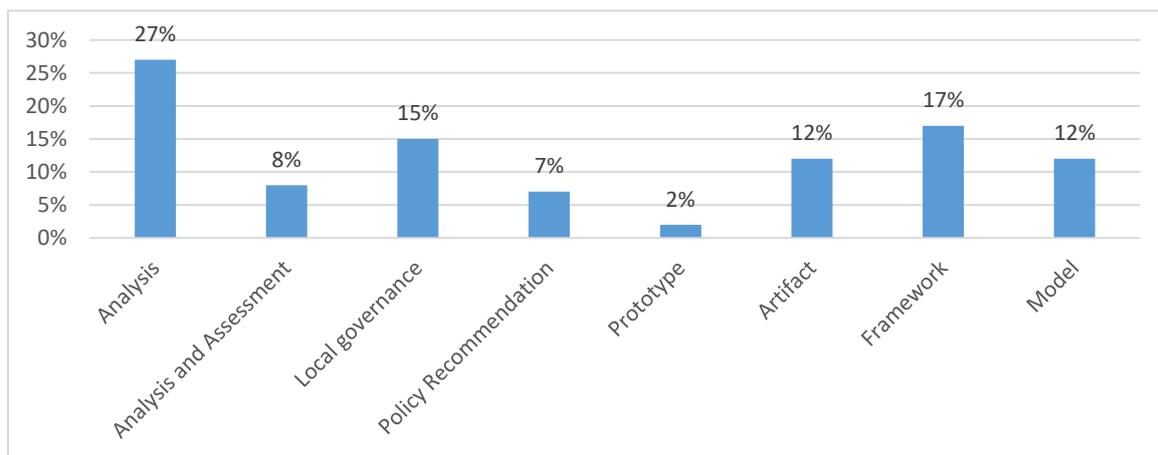


Figure 7. Results derived from the analyzed papers

Summary

We found only 59 papers from over 11,000 articles in the DGRL (version 14.5) which have studied the related problems of e-government for environmental sustainability. This clearly suggests that very little research has been conducted on this research focus (See Appendix A).

The review results show that various types of problems have been studied, especially in the areas of digital technologies, government strategies, and practices, and citizen participation/collaboration. The most studied research problem areas are (1) the application of digital technologies in solving environmental issues; (2) the role of ICT in empowering and engaging citizens in seeking solutions to environmental problems; (3) smart city development through innovations, user-centered smart city applications and services, developing technology infrastructure, and platforms such as new government affairs service platform; and (4) use of technology advances such as geographical information system (GIS), cloud computing, Internet of Things (IoT), big data, and other innovations for e-government services development. Surprisingly, most of the research did not follow any clear research philosophies, and the research methods were mostly qualitative, having case study, literature review, document analysis, and interviews. The research inquiry processes were not theoretically grounded. The research contributions were practice analysis and solution-based artifacts; the theoretical contribution is rare.

Research issues in e-government for environmental sustainability

The review of the literature on e-government for environmental sustainability reveals several research issues. While some empirical work has been undertaken to address the situation, country or context depended upon environmental sustainability problems, little contribution is made to e-government research. Hence, there are research gaps in the body of knowledge in this area. In this section, we will briefly discuss the research issues that may bridge the gaps.

1. The findings show that more than half of the research does not adopt a clear research philosophy. Interpretive philosophy the most common applied, while positivism and critical philosophies are rarely applied in research. Considering the research methodology, most of the research does not use a proper research method while the remainder is mostly qualitative in nature. More rigorous studies using proper research methodologies are required in research design and research conduct.
2. The review results provide meaningful analyses, recommendations, models, and frameworks for e-government services for environmental sustainability. Many of the solutions are narrowed down to context, situation, and country, and therefore, more empirical, and strong theoretical studies are required to produce more knowledge and theories that can be generalized and utilized in different research contexts.
3. Many of the papers discuss about general environmental sustainability and in very few papers “real or specific” environmental sustainability issues are studied. Among the 59 papers analyzed: climate resilience (Sharma and Singh 2016), environmental pollution reduction (Zhang et al. 2016), industrial pollution (Tan and Eguavoen 2017), and pollution due to vehicle traffic /transportation (Lv et al. 2018) are the only “real” environmental issues addressed.
4. In the review, 53 papers discuss the use of digital technologies in achieving environmental sustainability. Most of the papers discuss smart city services as a general solution but are of limited use in coping with specific environmental issues.

Conclusion

In this paper, we have presented state-of-the-art knowledge on e-government for environmental sustainability, based on the review, assessment, and synthesis of the relevant literature from e-government research. Some general conclusions can be drawn from this paper.

1. The theoretical understanding of issues regarding e-government for environmental sustainability is limited. The body of knowledge in this research focus lacks a contribution to theory development for addressing environmental issues through e-government research.
2. Most of the studies focus on governmental strategies and policy-making instead of investigating the “real” environmental sustainability issues. More e-government research is needed to address the various environmental problems that are critical for sustainable development.
3. The literature review indicated most of the research focuses on smart city-related services for environmental sustainability. More studies should be related to other environmental sustainability problems. It is necessary to find e-government solutions for specific environmental issues such as climate systems, urbanization, energy systems, natural and ecosystems, carbon and nitrogen systems, and aquatic systems, for example.
4. Digital technologies are effective solutions for e-government services for mitigating environmental problems. Through digital technologies, governments can plan for a comprehensive digital transformation of environmental concerns of the different stakeholders, either organizations or citizens. These interactions will enable the improvement of productivity, collaboration, scale, process efficiency, and innovation.

Environmental sustainability is a global challenge. All governments are recommended to address this challenge by using digital technologies to provide e-government services and applications. In recent years, there has been a growing interest in e-government research in studying the issues of environmental sustainability. It is thus important that we can understand and build upon the body of knowledge pertaining to this research focus. However, more diversified perspectives, philosophies, and theories should be adopted in exploring this complex phenomenon. Furthermore, we believe that the role of digital technologies plays in providing e-government services for handling this complex phenomenon should receive considerable attention and become a focal point of inquiry.

Appendix A: Summary of selected articles findings

Authors	Research Problem	Results and research contributions
Environmental sustainability		
Haigh and Griffiths 2008	E-government strategy in environmental protection	Analysis: E-government priorities should enhance
Estevez and Janowski 2013	Intersection of e-governance for Environmental Sustainability	Proposes a Conceptual framework
He et al. 2017	Public participation in environmental sustainability issues	Analysis: ICT will empower citizens
Lee 2017	Estimate the effects of e-government development on environmental sustainability	Analysis: Government strategies and effectiveness contributes in achieving Environmental Sustainability goals
Sharma and Singh 2016	Climate resilience in urban development planning	Study existing governance policies and urban development plans
Schulz and Newig 2015	Public participation in environmental sustainability issues	Analytical framework for involving public
Chatfield and Reddick 2016	Smart city implementation for an Environmental Sustainability	Citizen-centric social governance framework
Zhang et al. 2015	Environmental pollution reduction and environmental quality	Review China's informational governance on the environment
Choi and Lee 2016	Spatial planning	Develop a standardized Planning Support System
Termeer and Bruinsma 2016	General sustainability issues vs. Collaboration	Collaborative forms of governance in solving sustainability problems
Soma et al. 2016	Information age impacts on sustainability	Core informational governance trends in dealing with sustainability in the Information age
Green AND E-governance		
Gil-Egui et al. 2011	Governments' prioritization of environmental matters within their e-government websites	Analysis of framing of environmental concerns
Pollution Control		
Perez-Gonzalez and Daiz-Daiz 2015	Effectiveness of the Smart City	Analysis: Good governance practices
Tan and Eguavoen 2017	Industrial pollution	Communication interface for a state and society relation
Smart AND E-governance		
Mechant et al. 2012	Smart City development through innovation.	Recommendations Idea Generation for innovations
Coe et al. 2009	E-governance processes	Analysis: Identify how the new governance structures should work
Damurski 2018	Challenges for e-planning	Conceptual Framework for e-planning
Pereira et al. 2018	Citizen engagement in e-governance	Framework for building new, smart governance models
Sideridis et al. 2017	Human settlements	E-Government (ReMoGo) System
Green IT		
Baek and Park 2015	Policy issues needed for the sustainable development.	Direction for a government
Contaldi et al. 2007	Renewable Energy Supply	Policy recommendations

Green Energy		
Gil-Castineira et al. 2011	Platform for test functionalities of Smart City	Test smart-city applications and services.
Smart City		
van Waart et al. 2016	Smart City implementation	Participatory prototyping approach
Anthopoulos and Janssen 2016	Smart City implementation	Unified smart city conceptual model (USCM) for benchmarks Smart Cities
Díaz-Díaz et al. 2017	Business model in Smart city	Real-life smart city ecosystem
Buck and While 2017	Urban technological innovation	Technology infrastructure to enable the integration
Scholl and AlAwadhi 2016	Government ICT initiatives	New governance structure for a City
Chiodi 2016	Finding solutions for Urban safety	E-participation in urban planning
Hollands 2015	Smart City implementation	Participation-based and citizen run interventions into the smart city
Pereira et al. 2017	Interactions with stakeholders	Conceptual model to analyze the smart city initiative
Lee and Lee 2014	Smart city services	New typological framework for classifying smart city services
Khan et al. 2017	Citizen participation in urban decision making	Participatory planning tools
Meijer and Bolivar 2016	Smart city governance	Recommendations for research into smart city governance
Lv et al. 2017	Governmental services	A new government affairs service platform
de Wijs et al. 2016	Gaps between Smart City concept theory and Practice in the real world	Analysis of current implementation of the smart city concept
Pereira et al. 2017	Collaborative governance	ICT to enable collaborative governance
Scuotto et al. 2016	Development of urban areas and effected firms' innovativeness	Open Innovation approach to smart cities
Gascó-Hernández 2018	Challenges faced by a city	A city model co-conceptualized and co-implemented with ordinary citizens and other stakeholders
Walravens 2015	Mobile services provided in Smart Cities	Theoretical framework for the analysis of business models
Marek et al. 2017	Exploring a smart city approach in post-earthquake	Recommendations for citizen-led initiatives
Meijer et al. 2016	Smart city implementation	Recommendation for Smart city implementation
Basiri et al. 2017	Urban management issues and urban planning	Theoretical background on Smart city and Urbanization - Urban Planning
Scholl and AlAwadhi 2016	Smart-city collaboration	Model Based eCityGov Alliance
Anthopoulos 2017	Smart City (Theory vs. Practice)	Analysis of Smart city implementation
Pollio 2016	Smart city implementation	Analysis of smart cities for the age of austerity
Shelton et al. 2015	Urban governance and planning	Grounding of analysis in the existing cities

Yeh 2017	ICT-based Smart city services	Factors influence on usage of Smart city services
Bartenberger and Grubmüller 2014	Participative and collaborative forms of governance	Framework of collaborative governance
Kourtit et al. 2017	Effective use of ICT in Smart City	Lessons for city management
Calzada 2017	Urban governments	Identify an implicit smart city-regional governance strategy
Rossi 2016	Mobilization of Smart city	Smart city strategies
Frecè and Selzam 2017	Security of data	Data management of a smart city
Khan et al. 2017	Security and privacy concerns	'Smart Secure Service Provisioning' (SSServProv) Framework
Van et al. 2016	Smart city implementation	Analysis of smart city concept
Anthopoulos and Fitsilis 2013	Evolution of Smart city	Study of Smart cities
Gil-Garcia et al. 2015	Smart city governance	Conceptualization of smart city
Wu et al. 2018	Urban problems: environmental pollution, resources shortage, and traffic jam	Development framework.
Wiig 2018	Security of an Area	Surveillance network
Yeh et al. 2016	Vehicle parking	Parking management system

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