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The Sustainability Imperative in Information Systems Research

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Abstract:

This paper reports on a panel discussion at the pre-ICIS 2015 Workshop on Green Information Systems on the current state and future perspectives of SIGGreen—the Association of Information Systems' special interest group on green information systems—and of green information systems (green IS) research in general. Over the past years, IS scholars have made important contributions advancing our knowledge about how information systems can contribute to solving problems associated with the degradation of the natural environment. However, it would appear that many view green IS as just another research topic in the IS field and not a very important one at that. This is questionable because sustainability is too important to be relegated as a footnote in the greater scheme of things. We suggest that the IS community should embrace sustainability as a core research imperative and integrate sustainability-related dimensions to research in theory and method, in rigor and relevance, and in the areas one chooses to research. We provide some actionable recommendations on how we as IS researchers and, indeed, how the IS field could help society and business interests make the transition to a sustainable world.

Keywords: Sustainability, Green Information Systems, Information Systems Research.

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1 The State of Affairs in Green IS Research

The natural environment is under imminent pressure of collapse. However, we can avoid this fate if we fundamentally change society's business-as-usual approach to economic growth, associated resource consumption, unbridled greenhouse gas emissions, and the generation of huge volumes of waste. If not, there is a very real danger that human existence itself is in jeopardy. Green IS—which, we argue, should now be a core subfield in the information systems (IS) field—focuses on understanding how we can use information systems to transform organizations and society into more sustainable entities (Watson, Boudreau, & Chen, 2010). Sustainability essentially refers to the “conservation, deployment, and reuse of resources in responsible ways” (Malhotra, Melville, & Watson, 2013, p. 1265).

Information systems can play a pivotal role in addressing environmental concerns because they enable one to implement more sustainable business and societal processes (Melville, 2010; Seidel, Recker, & vom Brocke, 2013; Watson et al., 2010; Watson, Boudreau, Chen, & Huber, 2008). Notably, information systems provide key affordances for practices such as sensemaking (Butler, 2011; Seidel et al., 2013), decision making (Butler, 2011), knowledge creation (Butler, 2011), belief formation (Melville, 2010), automation (Dao, Langella, & Carbo, 2011), and innovation (Melville, 2010), which are required to design and implement sustainable processes. As such, green IS showcases two important characteristics of the IS field: 1) IS is an applied field that seeks to improve practice, and (2) the relevance of IS research is largely determined by the problems it addresses and the knowledge it produces to address those problems.

SIGGreen—the Special Interest Group (SIG) on Green IS of the Association for Information Systems (AIS)—was founded in 2010 and had its inaugural meeting at the International Conference on Information Systems (ICIS) 2010 in St. Louis, Missouri, USA. Since then, SIGGreen has seen itself as a promoter of rigorous, practically relevant research that contributes to solving problems of environmental degradation and climate change. “The SIGGreen Statement on Environmental Change” (SIGGreen, 2012)—the SIG's central manifesto and message to the IS community—notes that¹ :

SIGGreen, the Special Interest Group on Green IS of the Association for Information Systems (AIS), accepts the scientific consensus that human activity bears significant responsibility for harmful and detrimental environmental change. The IS community should assume their share of this responsibility.

It also notes:

SIGGreen recognizes that the Information Systems discipline can have a central role in creating an ecologically sustainable society because of the field's five decades of experience in designing, building, deploying, evaluating, managing, and studying information systems to resolve complex problems.

Over the past several years, SIGGreen members have conducted workshops, run panels, organized conference tracks at major conferences (such as the International Conference on Information Systems, the European Conference on Information Systems, or the Americas Conference on Information Systems), and edited special issues in leading journals including *Management Information Systems Quarterly (MISQ)* and the *Journal of the Association of Information Systems (JAIS)*.

After more than five years of SIGGreen activities, we believe it is time to pause and take stock of what SIGGreen has accomplished, where we are as a research community, and what the next steps are going to be. Our activities as a research community (vom Brocke, Watson, Dwyer, Elliot, & Melville, 2012) and the increasing number of green IS publications (Esfahani, Rahman, & Zakaria, 2015) indicate the progress that the field has made. However, we argue that the IS field has not yet fully realized the importance of the topic and failed to fully embrace its role in understanding and promoting an information systems research agenda that can help solve problems of environmental degradation and climate change. It seems that green IS research is, by and large, considered yet another IS topic (Gholami, Watson, Hasan, Molla, & Bjørn-Anderson, 2016).

We addressed the issues underpinning the future of SIGGreen and green IS research in more general terms at our 2015 annual meeting—the SIGGreen pre-ICIS 2015 workshop held in Fort Worth, Texas, USA. Our workshop theme was titled “Exploring Greener Frontiers through IS”. We invited three panel

¹ Appendix A provides the complete statement.

speakers (the second, third, and fourth authors of this paper) to prepare statements on the future of SIGGreen. To provide some guidance, we gave the panelists two questions:

RQ1: How can SIGGreen promote the development of a cumulative body of green IS knowledge?

RQ2: How can SIGGreen effectively promote impactful IS research?

We also asked the panelists not to constrain themselves in preparing their statements. The first author moderated the discussion, and we asked those present at the workshop to comment on the panelists' positions and provide their input. We audio-taped the discussion, which provided the basis for compiling an initial version of this report. We then invited the panelists and various participants of the workshop to contribute to compiling this document, which reflects the spirit of SIGGreen as an open and inclusive community of IS academics. The result is this report, which presents a key recommendation that emerged from our discussion about how green IS research should be understood and valued in the information systems field.

We proceed as follows. In Section 2, we discuss our key recommendation. In Section 3, we present four avenues we think that the IS field should pursue in light of this recommendation. Finally, In Section 4, we conclude the paper and call on fellow academics to support us in what we believe is an important mission.

2 Green IS Research: The Sustainability Imperative

Green IS should not simply be promoted as another research area such as long-established topics such as "IT and organizations" or "IS development" (Sidorova, Evangelopoulos, Valacich, & Ramakrishnan, 2008). Doing so ignores the magnitude of the problem facing the world as we know and experience it (see Schramski, Gattie, & Brown, 2015); it would also fail to consider that all human activity—including that which makes use of information systems—is embedded in a single, bounded ecosystem that is threatened from within. It is clear that humans should have an interest in reducing the impact of their activity on the natural environment (Elliot, 2011) and, for instance, actively pursue the objectives of the 2030 agenda set out in the 2015 Paris Agreement of the United Nations Framework Convention on Climate Change (UNFCCC, 2015). Undervaluing the importance of sustainability as a core dimension in our research agenda might lead to a serious disconnect between salient technological, economic, ecological, and social factors and, thereby, alienate much of our research from the naturally given contingencies and limitations of a single, bounded ecosystem such as our planet. The IS field arose in response to the failure of computer-based systems based on purely technological business imperatives and narrow design considerations. The importance of considering social and political factors in IS research is now widely recognized in both research and practice. We now need to extend that consideration to include the environmental implications of *all* information systems.

The argument for treating social, technical, economic, and ecological dimensions holistically and in an integrative way is not new. Many businesses have adopted the triple-bottom-line principle (Elkington, 1997) and organizations have begun to produce "integrated reports" (as opposed to two distinct reports—a financial one and a sustainability one, which target different audiences). Integrated reporting requires organizations to present a more holistic picture of their past actions and strategic directions that leverage both sustainability and financial data on equal footing. Thus, integrated reports embody a multi-stakeholder perspective and offer a more complete picture of organizational risks. Case in point: SAP produced an integrated report in 2015 that combines financial, environmental, and social views and begins with the key statement: "We are all faced with global issues like population growth, climate change, social unrest, economic disparity. At the same time, we also see an accelerated movement to all things becoming digital, making it increasingly more complex to do business" (SAP, 2016).

We argue that the IS academic community should follow this lead and embrace a more holistic view of business to reach an eventual symbiosis in which research informs practice and practice informs research. While the awareness of the potential of information systems to increase management's decision making capabilities and productivity is in our field's DNA, the potential of information systems to increase businesses' sustainability is not. As such, at core, we argue that:

For the IS field to operate in a socially responsible way and to meaningfully contribute to solving problems associated with the degradation of the natural environment, it should not treat green IS research as "yet another research area"; hence, IS research should and must embed sustainability as an integral element that spans areas of interest, theories, methods, levels of analysis, research outcomes, and stakeholders alike.

In adopting this position, we complement previous work that, for instance, has identified green IS directives for the IS field (Esfahani et al., 2015; vom Brocke et al., 2012); propose a green IS research agenda or important research questions (e.g., Dedrick, 2010; Esfahani et al., 2015; Melville, 2010; Seidel et al., 2013; Watson et al., 2010); call for impactful, solution-oriented IS research (e.g., Gholami et al., 2016; Malhotra et al., 2013); and argue that green IS research should focus on long-term perspective and reflexivity (El Idrissi & Corbett, 2016). Our argument has implications for IS scholars and their approach to the subjects of sustainability and green IS research, which we discuss in Section 3.

3 The Road Ahead: Implementing the Sustainability Imperative

Researchers have argued that, in order to meet its goals of societal relevance, green IS research must change the IS field's orientation from being inwardly focused to being more inclusive in its orientation, push research beyond developing theories and tackle global societal challenges, emphasize the social value of research contributions, reach out to non-IS scholars, and set examples for sustainable academic practices (vom Brocke, et al., 2012). We agree with this view. Some researchers have also reasoned that IS research should focus attention on impactful research that focuses on translating conceptualization and analysis into design and impact (Gholami et al., 2016; Malhotra et al., 2013). We also agree with these sentiments.

However, we suggest that it is necessary and timely for the IS field to take the next step: to understand that sustainability should be an imperative for our research agendas, funding schemes, and engagement with stakeholders. We must ask what we, as a community of scholars, can do to integrate green IS and, more broadly, sustainability dimensions into our research practice. We suggest four points of integration: 1) integration of sustainability into what we study in IS research, 2) integration with practitioners, 3) integration across fields, and 4) integration into our academic practices such as communication and traveling. We provide some actionable advice for each of these areas.

3.1 Integration of Green IS into the IS Research Agenda

It is self-evident that, given the circumstances we find ourselves in, IS academics—whatever their research focus, theory, or method—should acknowledge environmental and social aspects along with traditional economic imperatives such as efficiency and effectiveness. We suggest that one should consider sustainability as an important dimension to the core phenomena that IS scholars study, which holds whether the topic is information systems development; how individuals, groups, organizations, and markets interact with IT; or how IT impacts—and is impacted by—the context in which it is used (for an overview of traditional core IS research topics see, for instance, Benbasat & Zmud, 2003; Sidorova et al., 2008).

Following this line of thought, one must consider the impact of information systems on environmental sustainability alongside traditional measures of IS outcomes such as net benefits (DeLone & McLean, 2003) or performance impacts in terms of improved efficiency, effectiveness, or quality (Goodhue & Thompson, 1995). Following OECD recommendations, IS scholars need to consider the direct, indirect, and systemic effects of information systems on the natural environment. In addition, IS scholars should, as a matter of course, assess whether the IS phenomenon under study contributes to understanding environmental sustainability, how it can be achieved, and the role of information systems in doing so.

We argue that we need to move beyond the extant focus on exploitation and to focus attention also on exploration; that is, in identifying how novel and sustainable practices are afforded through existing and new information technologies and information systems and by interpreting them in light of sustainability-related social, business, and policy objectives. Current popular research themes such as the sharing economy, the Internet of things, big data, and social media are amenable to consideration with respect to the sustainability agenda given their potential for positive and negative impacts on the environment.

We further argue that we need to review our publication practices and make sure that they include ample provision for reviewing, accepting, and publishing green IS research. One might think of “green open spaces” in IS journals, which may involve special sets of review criteria to evaluate green IS papers and panels of expert reviewers to assess them. Some scholars have also argued that journal editors should make an ongoing commitment to promoting green IS scholarship by establishing sections of their journals dedicated to advances in this area (Watson et al., 2010). In order to advance this agenda, the IS Journal Marketplace (<http://journal-marketplace.org/call-for-papers-greenis/>), with the support of SIGGreen, has called for the submission of green IS papers to pre-evaluate and assess their contribution to the sustainability agenda and to ensure they align with the publication criteria of specific IS journals. We need more such initiatives if we are to make progress.

To summarize, we suggest we need to take the following actions to better integrate green IS into the IS research agenda:

- Consider sustainability issues when studying the core IS phenomena.
- Consider the environmental impact of information systems in addition to traditional measures of IS effects and outcomes.
- Focus on how exploration of novel, sustainable practices are afforded by existing and new information technologies.
- Review publication and review practices in light of space and openness for dedicated green IS research.

3.2 Integration with Practitioners: Engagement with Industry Practitioners and Policy Makers

To achieve maximum value for society, we need to conduct green IS research that enhances theoretical understanding of IS-enabled sustainability and green IS research that focuses on sustainable design and impact to practice (Malhotra et al., 2013). Encouragingly, IS scholars have begun to translate explanatory and predictive theory into green IS design knowledge (e.g., Recker, 2016; Seidel, Chandra Kruse, Székely, Gau, & Stieger, forthcoming; Watts & Wyner, 2011). However, those steps are only first ones, and successful practice research requires deep engagement with industry practitioners and policy makers—“engaged scholarship” that employs new forms of knowledge generation aimed at providing both scientific and practical knowledge (Buhl, Müller, Fridgen, & Röglinger, 2012; Mathiassen & Nielsen, 2008; Van de Ven, 2007).

Business leaders are typically interested in green IS initiatives that can generate quick economic value and influence the bottom line. In fact, in many cases, environmental benefits are indirect outcomes of IS organizational initiatives to be more efficient or to reduce energy costs (as was the case for UPS’s telematics initiative—see Watson et al., 2010). Indeed, goals related to saving energy and reducing costs are often complementary. While it may be harder to convince decision makers to embark on green IS projects from which one expects long-term economic benefits, the potential gains might be even higher.

Engaging with policy makers and policy advisers—such as the International Renewable Energy Agency²—in order to change the institutional context might yield the largest benefit. Yet, we do not see any evidence that green IS research has impacted policy making. The key question is: how can we as IS academics actually participate, intervene, and talk about solutions? The European Union has an ambitious 20 percent climate and energy target for the year 2020, including a 20 percent cut in GHG emissions from 1990 levels, the generation of 20 percent of EU energy from renewables, and a 20 percent improvement in energy efficiency (European Commission, 2016). Certainly green IS has ample propositions to help policy makers achieve these targets. SIGGreen is dedicated to engaging with policy makers and “participat[ing] with other academic and practitioner associations in pursuing an environmentally responsible future” (SIGGreen, 2012). One area where sustainability issues impact directly on national and local policy makers is in national and local government. Research indicates that the public sector accounts for approximately 35 percent of GHG emissions; a typical local government in a medium-sized European municipality accounts for up to 38 percent of IT-related GHG emissions (Butler & Hackney, 2015). E-government is an area where studies on green IS for sustainability offer fertile opportunities to institute change and also influence policy makers through the policy grassroots and social movements.

To summarize, we suggest the following actions to better engage with industry practitioners and policy makers:

- Conduct green IS research that provides a theoretical understanding of IS-enabled sustainable business and social practices and that embeds sustainability into IS design and impact in practice.
- Convince IS decision makers that green IS can yield both short term and long-term economic benefits and that economic and ecological benefits are often complementary.
- Engage with policy makers and advisers and influence them at the grassroots level.

² www.irena.org

3.3 Integration across Fields and Cultures: Interdisciplinary and Intercultural Green IS Research

Green IS research must be inter- and transdisciplinary (Elliot, 2011). We need to not only communicate our research outside the IS academic community (vom Brocke et al., 2012) but also actively engage with scholars and practitioners from other fields, such as management, computer science, engineering, environmental science, environmental psychology, or architecture. Computer scientists have studied energy efficiency (Barroso & Hölzle, 2007), and they might profit from our field's expertise in management and organization. Operations research scholars develop optimization models to minimize fuel consumption and CO₂ emissions in logistics and supply chains, but those models become practical with the support of decision support systems (Mansouri, Lee, & Aluko, 2015). Economists study market mechanisms in energy markets and talk about smart grids and, thus, need to know the contingencies of the underlying sensor networks and information flows. Researchers in these other fields habitually neglect to consider the potential of information systems to address environmental issues; they also are unaware of the IS field's significant contribution in this regard. Management journals and specific sustainability journals underrepresent the role of green IS. This missed opportunity decreases our odds of getting grants from funding organizations (such as the National Science Foundation in the United States), which typically value cross-disciplinary research.

The underrepresentation of green IS coupled with the strong focus on sustainability in other fields creates opportunities for green IS researchers to engage with other fields through conferences, journal outlets, and professional meetings. For instance, an additional membership in professional organizations for management, operations, or computing allows green IS researchers to present relevant research and encourage the inclusion of sustainability concerns to colleagues in other fields in their native context. Such interactions build on the IS tradition of including scholars from diverse reference fields (Hirschheim & Klein, 2012), while allowing the profession to expand its influence. Due to its inherently inter- and transdisciplinary nature, the IS field could serve as a boundary spanner and enable a steady information flow between all fields concerned with sustainability.

Previous research has explored the negative influence of business school theory (Adler, 2002), particularly economic theory, on management decision making in organizations (Ghoshal, 2005) and the behavior of academics (Ferraro, Pfeffer, & Sutton, 2005). Management gurus reportedly argue, for example, that executives who are concerned about the environment should be “fired...and fast” (Bakan, 2005). Just as corporate social irresponsibility and selfishness led to the financial crisis in 2008—with the finger of blame pointed by many at the graduates of business schools and MBA programs—so too it led to neglecting sustainability across the business world despite the gains made in recent years. Green IS could, therefore, exert an influence in changing the ethos of business schools through its impact on management, finance, and economics colleagues.

Moreover, because environmental sustainability is not considered with the same sense of urgency across national and cultural boundaries, we argue that it is important to support collaborations involving stakeholders (researchers and research participants) from different countries. Europeans' environmental consciousness, for example, might be greater than that of, for example, the United States, China, India, and European citizens, organizations, and laws typically have a greater concern for environmental issues than others. Leveraging these differences could create opportunities for cross-cultural influences.

As such, SIGGreen focuses on “participat[ing] with other academic and practitioner associations in pursuing an environmentally responsible future” (SIGGreen, 2012).

To summarize, we suggest the following steps to better integrate green IS research with other fields:

- Actively engage with scholars and practitioners from other fields.
- Capitalize on opportunities of IS as a boundary-spanning field.
- Collaborate with stakeholders from different countries.
- Influence a change in business school curricula.

3.4 Integration into our Academic Practices: Walking the Talk

As a community, we should set an example by integrating sustainability into our research conduct and day-to-day activities (vom Brocke et al., 2012). In this line of thinking, the SIGGreen Statement on Environmental Change (SIGGreen, 2012) states: “Members of the IS community should assume their

share of the responsibility to reduce wherever possible, the environmental impact of activities in which they participate.”.

There are many activities that we could perform as an academic community to “walk the talk”; for instance, with regard to our conference and workshop practices. IS scholars could offset carbon emissions when booking our conference travel; choose vegetarian food as default; and obtain support from the AIS Council to promote and institute such practices. SIGGreen has conducted several successful virtual sessions as part of their annual workshops, and we intend to intensify these activities.

At an individual level, IS scholars can integrate green IS practices in their day-to-day lives. They might use IS devices (e.g., a smart plug and an associated app) in the home to learn about home energy usage patterns. Information systems can provide advice on making green decisions, such as selecting sustainable products for the home³, and can promote green practices at academic and research institutions. There are simple changes that can be implemented immediately, such as using power management features, switching off systems when not in use, or reducing the amount of printouts and going electronic. At the organizational level, for instance, we can encourage the greening of data centers through server virtualization, energy conversation, and eco-friendly design (Murugesan, 2008) or promote the development of green IS strategies (Unhelkar, 2012).

A few years ago, the AIS Council adopted the vision of an ICT-enabled bright society as an AIS grand vision project. An AIS taskforce was created and a collaboration with the International Telecommunication Union (ITU) established to support research addressing cybercrime, a pressing issue that organizations all over the world face. Similarly, we argue that our IS research leadership should take a stance towards addressing climate change and environmental degradation, and should partner with international organizations in conducting IS research that addresses these global challenges. As a research community, we cannot be a bystander to the current worldwide environmental threat and need a grand vision and a project that fosters solutions towards achieving it.

To summarize, we suggest the following actions to better integrate green practices into our research conduct:

- Reduce the impact of conference travel through offsetting carbon emissions or using tools for virtual collaboration.
- Incorporate green IS practices in our day-to-day activities.
- Develop a grand vision project and build partnerships with international organizations.

4 Conclusion

Green IS research is an area of endeavor in the IS field that is concerned with a problem of global concern. The IS field has not yet fully realized the magnitude of the problem nor embraced sustainability as an integral part of its research agenda. Business has in many ways led research thus far. Thus, we believe that it is time for our research community to close the gap and not only follow the lead of business but also forge ahead to guide the way. Sustainability should be a core imperative in IS research. We should, therefore, integrate sustainability into our research agendas, funding schemes, stakeholder engagements, and curricula. Time is not on our side. Climate change and environmental degradation are occurring before our eyes, yet the pace of our response is paradoxically glacial.

³ For example, see http://www.ecobuildingpulse.com/products/nine-green-product-databases-make-selecting-sustainable-materials-easy_s

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Appendix

The SIGGreen Statement on Environmental Change

SIGGreen, the Special Interest Group on Green IS of the Association for Information Systems (AIS) accepts the scientific consensus that human activity bears significant responsibility for detrimental environmental change. Members of the IS community should assume their share of the responsibility to reduce wherever possible, the environmental impact of activities in which they participate. It is incumbent upon them, as IS professionals, to apply their knowledge and expertise towards global sustainable development.

SIGGREEN recognizes that sustainable development:

- Is a complex challenge requiring a holistic and multidisciplinary systems approach for its resolution;
- Has social and economic origins and consequences that must be considered in an integrated, systematic, and scientific manner;

SIGGREEN recognizes that the Information Systems discipline can have a central role in creating an ecologically sustainable society because of the field's five decades of experience in designing, building, deploying, evaluating, managing, and studying information systems to resolve complex problems.

SIGGREEN understands that:

- Information improves humans' ability to make decisions related to environmental change;
- Information systems are essential to enabling the large scale cooperative action that is necessary to address challenges related to environmental change;
- Information systems provide critical mechanisms to support a sustainable society.

SIGGREEN will:

- Maintain a role for IS in mitigating, reversing and adapting to environmental change;
- Facilitate encourage and disseminate innovative, research that contributes to resolving environmental change problems;
- Provide leadership in championing and implementing less environmentally damaging practices for its academic endeavors;
- Participate with other academic and practitioner associations in pursuing an environmentally responsible future.

Members of SIGGREEN are encouraged to take the following actions:

- Develop appropriate curricula, programs and content to provide IS students with the skills and knowledge to contribute to resolving environmental change problems;
- Undertake appropriate solution-oriented research into environmental change issues of mitigation, reversal, and adaptation;
- Apply their skills and knowledge to help organizations address environmental change problems.

About SIGGreen: siggreen.wikispaces.com

SIGGreen is a group of Information Systems researchers dedicated to finding socio-technical solutions in support of environmental responsibility and sustainable development.

Chair:	Deputy Chair/Chair Elect:	Past Chair:
Dr. Cathy Dwyer, Pace University, NY	Dr. Chadi Aoun, University of Technology, Sydney	Dr. Helen Hasan University of Wollongong

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Figure A1. SIGGreen Statement on Environmental Change (SIGGreen, 2012)

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