

# Artificial Intelligence Applied to Sustainable Development in Digital History

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## Abstract

*Future historians will remember 2020 as a watershed year when a pandemic brought unprecedented societal changes. The pandemic also brought to the forefront the increasing prominence of technology in solving various societal problems. It has heightened our awareness of the importance of information, social technologies, and IT infrastructure in our personal and professional lives. The combination of the sustainability imperative and digital imperative has opened up new opportunities for information systems (IS) research to examine how it can help humanity to achieve these goals. In particular, digital and IS technology has a role to play in the monitoring of potential solutions, but also an integral element of climate change solutions. Increasingly, researchers and historians are referencing the importance of responsible digitalization to eliminate significant levels of e-waste. The reality is that technology is an integral component of the global efforts to get to net zero. However, its adoption requires pragmatic tradeoffs as we transition from current behaviours to a more climate-friendly society. The aim of this paper is to highlight how, thanks to a literature search of an interdisciplinary nature, historians can stress the significant role that digital technology can play in improving resilience to global warming-related natural hazards, reducing emissions and enhancing the ability of humans to take the necessary steps to realize net zero.*

**Keywords:** sustainability, digital world, digital history, climate change, information technology, sustainable development goals

Future historians will remember 2020 as a watershed year when a pandemic brought unprecedented societal changes. The pandemic also brought to the forefront the increasing prominence of technology in solving various societal problems. It has heightened our awareness of the importance of information, social technologies, and IT infrastructure in our personal and professional lives. The combination of the sustainability imperative and digital imperative has opened up new opportunities for information systems (IS) research to examine how it can help humanity to achieve these goals. In particular, digital and IS technology has a role to play in the monitoring of potential solutions, but also an integral element of climate change solutions. Increasingly, researchers and historians are referencing the importance of

responsible digitalization to eliminate significant levels of e-waste. The reality is that technology is an integral component of the global efforts to get to net zero. However, its adoption requires pragmatic tradeoffs as we transition from current behaviours to a more climate-friendly society. The aim of this paper is to highlight how, thanks to a literature search of interdisciplinary nature, historians can stress the significant role that digital technology can play in improving resilience to global warming-related, natural hazards, reducing emissions and enhancing the ability of humans to take the necessary steps to realize net zero.

Despite the significant loss of human lives and livelihoods, the COVID-19 pandemic has provided an excellent opportunity for humanity to act in solidarity and use this crisis as a catalyst for achieving the United Nations (UN) Sustainable Development Goals (SDG). Future historians will remember 2020 as a watershed year when a pandemic brought unprecedented societal changes (Dwivedi et al., 2022). Lockdown, contact tracing, online classes, online health consultation, and work-from-home became part of our everyday lexicon, and some of these terms, such as online classes and health consultation, are now indispensable components of our transformed world. The pandemic also brought to the forefront the increasing prominence of technology in solving various societal problems. It has heightened our awareness of the importance of information, social technologies, and IT infrastructure in our personal and professional lives.

The combination of the sustainability imperative (focusing beyond profit to include people and the planet) and digital imperative (digital substitutions for the physical and the emergence of new emerging technologies), henceforth termed digital sustainability (George et al., 2020a, Pan et al., 2022), has opened up new opportunities for information systems (IS) research to examine how it can help humanity achieve these SDGs (Qureshi et al., 2021; Pan and Zhang, 2020). The emphasis on the creative deployment of technologies through organizational activities to advance SDGs is a distinguishing feature of digital sustainability. Another noteworthy characteristic of digital sustainability is its incorporation of socioecological value into economic propositions, in contrast to the common discourse on sustainability that typically entails deliberations on the trade-offs between environmental, social, and economic dimensions from diverse perspectives (George et al., 2020a).

Notably, emerging technologies are getting more attention. Artificial intelligence (AI), blockchain, quantum computing, and the metaverse are a few examples of emerging technologies. The characteristics and goals of these technologies vary. Blockchain, for instance, is essentially a distributed ledger that can be used to encourage transparency in organizations. Artificial intelligence, or AI, on the other hand, is essentially a digital technology that aims to imitate human intelligence (artificial general intelligence, or AGI), though it can currently only perform relatively more straightforward tasks (artificial narrow intelligence, or ANI). However, a particular subset of AI known as machine learning (ML), a data-intensive approach where machines learn from data, is increasingly used for prediction. Specific ML techniques, like deep learning, are employed for tasks like language translation. Large language models (LLMs) are currently hailed as advancements in AI because they can read, summarize, translate, and communicate in natural languages (Van Noorden, 2022). Conversational agents based on LLMs, such as ChatGPT and Bard, that belong to the class of AI known as generative AI (AI that can generate content) are the most discussed AI in 2023, and their potential to replace or collaborate with human employees is increasingly debated.

How IM/IT/IS can be utilized to improve situation regarding climate change. Recent reports have highlighted that IT/IS can lead to a more efficient and sustainable energy consumption using smart grids,

smart housing and smart logistics. Statistics suggest a possible fifteen per cent reduction in the emission of greenhouse gases- close to the annual emissions of China.

There are many initiatives to reduce energy consumption and carbon emissions. Japan's \$32 million Green IT Project promotes highly energy-efficient ICTs in three areas. It aims to reduce the energy consumption of network components and data centres by more than 30%. And Japan is experimenting with organic light-emitting diodes to cut the power consumption of displays by 50%.

Technology can also offer cost-effective market-driven solutions using sensors, software and networks. Technologies can also help monitor and evaluate climatic conditions and change and may help mitigate natural disasters. We also need to have supported policies and regulations for green energy. Supporting the demand for green technologies is only one step. Certain pacts undertaken by regulatory bodies, such as the European Commission and the United Nations, also pave the way to regularize sustainable technology development.

We have to ensure that new technology development is cognisant of impending climate changes. One of the ways to enable technology development that conforms to environmental and sustainability goals is for governments to penalize technology developers who fail to adhere to global warming constraints. Leaders in the IT sector need to ensure that new technology developments and innovations are guided by the Sustainable Development Goals (SDGs) prescribed by the UN. Further, government and regulatory authorities may promote climate-friendly IT innovations by prescribing the necessary guidelines and incentives for better e-waste management and lower energy demands.

Climate-change mitigating technology is a wide research area where researchers are attempting to gain more insights into the technology portfolio which can be utilized to mitigate the climate changes such as carbon emission, energy consumption and e-waste.

- Reuse/ recycle and sustainable manufacturing
- Closed supply chain and e-waste removal
- Reducing waste and efficient consumption using technology
- Monitoring of natural disasters using technology.
- Zero power ICT solutions
- e-waste management
- Circular economy
- Green IT
- Energy Management for data centres and telecommunication networks
- Leveraging data science and Artificial Intelligence for predicting climatic changes and natural disasters

Information Technology and the Internet of Things (IoT) are vital in confronting climate change problems and help in managing the threats posed by climate change. IT and IoT are part of the solution as their applications are being used to cut greenhouse gas emissions and they help countries manage climate change. IT and IoT are needed for the precipitous transfer of information concerning the risks of climate change. In this context, a few questions which need deeper research include - How can information needed for decision-making be collected and disseminated in an efficient manner which can help to advance the integration of climate risks into plans and policies, which can be useful for those who need it most? How can a low-cost IoT infrastructure be created in the urban and rural areas of

developing countries which can enable authentic and speedy dissemination of real time data related to greenhouse gas emissions? How can IT and IoT be used to enable countries to adapt to climate change?

Education is vital in enabling people to understand the impact of climate change on life on this planet. Educating and creating awareness can help to change the attitude and behaviour of people. Education alone can help in ensuring that people start adopting a sustainable lifestyle and also develop skills that can help in managing climate change. Education can not only inspire people to change their attitudes and behaviour but also helps them to make informed decisions which can have an impact on climate change. A deep-seated shift in pedagogy is needed for IT and IoT to enhance teaching and learning for sustainability. Teaching about climate change requires an interdisciplinary and cross-disciplinary approach to synthesize diverse ideas. The information about climate change and its impact must be introduced within the school curriculum. IT must be used to create interactive activities on climate change which can help students to understand and learn in a better fashion. Projects related to sustainable development and climate change must be introduced at the high school level. IT tools which can help measure carbon emissions must be taught along with practical application of the same. Teaching and learning, which has hands-on experiences with technology, must be emphasized. At the undergraduate and graduate levels, educating and giving opportunities to students to work on environmentally sustainable projects to attain sustainability objectives using IT and IoT technologies can immensely help in bringing out-of-the-box solutions to climate change problems.

The interplay of sustainability in technology and by technology must therefore be addressed by all stakeholders in industry and academia. One solution to achieving this interplay is to utilize the capabilities of information management (IM) and the related field of information systems (IS), which are reliant on the acquisition of information, the custodianship and distribution of that information to those who need it, and its ultimate disposal through archiving or deletion thereof. However, valuable information can only be provided to users if access to data is available.

The use of technology and IS is an integral component of many of the proposed mitigation measures as governments and societies around the world take the necessary steps to transition to net zero. Governments have a critical role in combating global warming from the legislative and policy perspective, but to ensure the targets set for 2050 have a realistic chance of being achieved, we need change at a societal level. The IS and technology industry has a critical role to play in the monitoring of progress toward net zero, but also a pivotal role in the development of innovative solutions to better manage emissions and offer people alternatives to current carbon based practices.