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Digitalization as a tool for advancing sustainable development: Towards a Smart Green Planet

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Abstract

Access to a connected network of unexplored big data through digitalization could be profitable for both society and the terrain. In order to achieve an indifferent, ecologically sustainable, and healthy society, the development of smart systems linked to the internet of effects can produce special openings to strategically address issues related to the Sustainable Development Goals (SDGs). This standpoint outlines the possibilities that digitalization can offer for creating an unborn society that's sustainable." Digitalization to achieve sustainable development pretensions Steps towards a Smart Green Planet," concentrated on the part of digitalization, and the technologies associated with the Internet of effects (IoT) have been bandied for their implicit to break big challenges in the food- water- energy nexus, enable Industry4.0, ameliorate social good, and reduce the goods of climate change. Also emphasised on the connection between digitalization and sustainable development pretensions. The integration of smart technologies is seen as a game- changer that will ameliorate the three crucial factors of the food- water- energy nexus i) access to clean, safe drinking water;(ii) sustainable food product; and (iii) green energy generation and utilisation. Eventually, the perspective encompasses the advantages of digitization by offering a comprehensive vision of how it might help address the severe problems of dwindling global biodiversity and climate change.

Keywords: Digitalisation, Internet of Things (IoT), Food-Water-Energy Nexus, Sustainable Development,

INTRODUCTION

The UN Sustainable Development Goals (SDGs)

Since the United Nations Declaration on Sustainable Development was adopted by all 193 member states in 2015, sustainable development has gained significant attention in international public policy. It emphasises economic expansion, social inclusion, and environmental sustainability as the three main goals for human development. The world may accomplish "progress that fulfils the demands of the present without sacrificing the ability of the future generations to meet their own needs" by working together to achieve these goals. The idea was purposefully left open-ended in order to address a variety of issues, including the development of common business standards for the UN Global Compact and the World Business Council for Sustainable Development, as well as the planning of sustainable cities and livelihoods, sustainable agriculture, and smart health. The adoption of the Sustainable Development Goals (SDGs) in 2015 indicated that global leaders were committed to finding a more sustainable route to inclusive and equitable growth. The 17 SDGs, sometimes referred to as the 2030 Agenda, have 304 indicators and 169 objectives that address a variety of topics connected to development.

(https://www.un.org/sustainabledevelopment/)

These interconnected SDGs outline our civilization's critical demands in order to secure a sustainable and prosperous future. To fulfil the SDGs, innovative digital tool development that produces, uses, transmits, or sources electronic data for organisational activities can be leveraged. Digital sustainability could be used to characterise these tools that help achieve these particular goals. Smart technology is being used by Digital Sustainability to ensure sustainable economic growth while taking the SDGs into account and integrating them. Artificial intelligence and machine learning technologies, which have shown exponential development in their value and are expected to contribute about 14% to the world economy by 2030 **(George et al., 2020; Magistretti et al., 2019),**

The world is in a period of digitization during which the majority of our daily activities depend heavily on cutting-edge digital and computer technologies. In order to increase a system's productivity and efficiency, these modern technologies have applications in socioeconomic, environmental, sustainable, and climate research.

A new set of tools brought about by digitalization must be kept constant to ensure intelligent utilisation and their environmentally friendly nature. Sustainability and equal access are significantly impacted by the ability to use resources and services more efficiently **(Appio et al., 2021; Ardito et al., 2018)**, but there are a number of obstacles that must be overcome for these objectives to be successfully attained. Electronic device development and production consume up finite resources and create e-waste (unwanted electronic products that are no longer functional and are approaching or have reached the end of their "useful life"), which is barely recycled **(Ahirwar and Tripathi, 2021; Dhir et al., 2021).** There is an urgent need to take life-cycle into account and create e-waste recycling solutions. Another issue that could grow rather than shrink the gap between industrialised and emerging regions is the requirement for greater infrastructure. To meet the primary goal of eliminating inequality and poverty, infrastructure and equal internet access must be ensured, coinciding with the requirement to give final consumers digital education.

In this article, we examine how digitalization might help achieve SDGs in a variety of areas, including i) the food, water, and energy nexus, (ii) industry, (iii) citizen health and wellbeing, (iv) combating climate change, and (v) protecting biodiversity.

Each major issue is organised to address a broad question of how digitization might drive the shift toward a more sustainable and equitable society for each difficulty. We'll go into detail about the digitalization techniques used in particular contexts with the express purpose of advancing said sector and addressing said SDGs. Even so, it's necessary to draw attention to the close connections and correlations between the many fields, which make them difficult to distinguish. For instance, the wellbeing of residents of smart cities is directly impacted by the consequences of the food-water-energy nexus. Therefore, the benefits of industrial manufacturing, the importance for human health and wellbeing, and how digitalization supports the fundamental beliefs of our society are evaluated and addressed. The perspective concludes with a discussion of how digitization can help to preserve biodiversity and slow down climate change.

The role of digitalization in sustainability is addressed from various specific viewpoints connected to I the food-water-energy nexus, (ii) the economy and the welfare of citizens, and (iii) the climate change and biodiversity protection. It is also taken into account the comprehensive, long-lasting effects brought about by the linked advantages of all these measures.

Modern technology is reshaping agriculture and food production systems

Ultramodern technology is reshaping husbandry and food product systems. The agroecosystems are under further stress because to the continuously rising worldwide need for food, feed, fibre, and renewable energy. High and low heat stress, altered downfall patterns, raised carbon dioxide, adding frequency of extreme rainfall events including famines, cataracts, and volcanic disturbances, and increased saltness of soils are all pointers of changing climatic conditions. These consequences lead to an increase in product costs, pest infestations, and complaint outbreaks, all of which put strain on the world's agrarian land. The world needs to meet the nutritive requirements of 9.7 billion people by 2050, but it'll be a delicate task due to the increased food demand and stretched force networks. A hint of sanguinity is arising with the preface of digital technologies in husbandry. The sustainable operation of agrarian land and coffers is being gauged up by digital technology. Digital technologies support the selection of high yield- acquainted stylish practises, accurate resource inputs, lower product costs with better nutritive quality of agrarian yield, geo- tagging for precise vaticination, vigorous and elastic husbandry ways, crop data operation, post-harvest services, and agro-based diligence. Global husbandry earnings from digitalization in a variety of ways, including real- time monitoring, easy access to computers and smartphones, and consulting using satellite and rainfall data. Global husbandry earnings from digitalization in a variety of ways, including real- time monitoring, easy access to computers and smartphones, and consulting using satellite and rainfall data. By using rearmost digital tools, it's possible to increase Agri- products, resource conservation, above- ground biodiversity, gender equivalency, and planter commission chances. The Analytical Hierarchy Process is used to integrate RS- Civilians, fuzzy sense, and multicriteria evaluation to produce a superior database and a road chart for effective land- use patterns, crop variety, planning, monitoring, and decision- timber. These integration strategies give quick and effective access to a wealth of data, pressing connections, patterns, and practical trends for incorporating soil check data for bettered assessment of land-use felicity (Singha and Swain, 2016). Research has shown the advantages of using these styles as a long- term relief for largely productive and dependable agrarian systems. More agrarian systems to producing regions with advanced productivity are promised by smart integration of Civilians- grounded technologies.

Digitalization can help to accelerate plans to secure clean water for everybody

This composition also emphasized integration of water seeing to ensure water quality and cover public health. Water is one of the vital factors that will define the smart metropolises of the future. As metropolises invest in streamlining old- fashioned structure, it's the possibility to integrate internet- enabled tools and arising decentralized smart technologies. The use of the AI approach to optimize the design and control of water treatment systems and stressed the advantages of AI ways particularly the artificial neural networks (ANN) in water and wastewater factory modelling, expert rule birth, fault discovery and opinion, factory and instrument monitoring, dynamic soothsaying, and robust control. One of the foremost studies using the AI approach to design a water treatment system proposed two phases the analysis and conflation phases (Krovvidy etal., 1991). In the analysis phase, an inductive literacy algorithm and expert rules are arranged together to estimate the treatment effectiveness of several composites at different attention by an individual treatment process. In the conflation phase, the sequence of different treatment processes satisfying the treatment targets are attained using the knowledge rules generated from the analysis phase via the neural network system. This study provided the groundwork for the construction of the after-decision support system (DSS), which would be used to select, order, and build treatment plants for water. Artificial intelligence (AI) technologies have been decreasingly applied to restate the unresistant data into practicable knowledge to ameliorate the WTSs (Water Treatment Systems) operation and support decision-making.

Energy issues can be addressed through digitization

The energy sector faces a number of challenges, from well- known, long- standing problems, like prostrating obstacles to the grid integration of renewable energy coffers that are constantly changing, conforming the offer to the demand, or perfecting the effectiveness of the energy processes in the assiduity, to new, foreseeable problems, like dealing with rising energy demands performing from the global spread of digitalization and implicit security concerns. As with technology revolution, digitalization presents a wide range of fascinating possibilities but inescapably also raises a number of issues. Digitalization is anticipated to enhance our operation of electricity, circulate it to further remote locales, and make our energy systems more sustainable. We must be ready for any implicit new problems that digitalization may bring to our energy structure. By taking into account its part in the integration of renewable coffers, its clever operation of the complexity of our energy system mystifications, its use to optimise energy in the ever- inextinguishable artificial sector, and the

requirements for storehouse systems that its use brings, as an essential part to fulfil the former targets, digitalization has an impact on the sustainability of energy systems. consumers may profit from increased digitalization of energy systems, as, for case, the shift to smart digital measures can encourage them to avoid the use of electricity during peak times also, smart energy operation can be used for intermittent electricity generation and force in homes, for illustration, choosing when to toast hot water (i.e., which can be seen as a thermal battery) rather of exporting redundant electricity to the grid when it isn't needed. The generation and force of irregular electricity in homes can be managed intelligently. As opposed to dealing it to the electricity provider, this makes it possible for neighbours to change electricity with one another. This can be fulfilled in large apartment complexes or micro- grids by having a main metre and submeters for each consumer. The creation and perpetration of smart grids will determine how unborn electrical systems will be enforced. In the future, we'll be seeking for energy sources that are safe, reliable, and provident in addition to being environmentally friendly and clean.

Digitalization is the key to accelerating advances in business and social welfare

As digital technologies advance, there are enormous changes occurring in industrial production of goods and services. The term "Industry 4.0" was coined to define the fourth industrial revolution as being driven by digitization rather than just automation. Modular manufacturing will take place in factories made out of "smart" things in the future. There is a push in technology that will permit more automation and mechanisation at the same time.

e-Health technology used to advance health and quality of life

The term "e-health" is used by the World Health Organization to refer to all the various elements of the internet of health things (IoHT) that are developing medical technology in the modern day. In order to support and advance long-distance clinical health care, patient and professional health-related education, public health, and healthcare administration, there is a growing field of medicine called telemedicine (use of electronic information and telecommunication technologies).

Digital tools are essential for fostering wellbeing and raising quality of life because they make it easier to obtain healthcare. One of the SDGs that is gaining momentum globally is wellbeing. People can use computers and mobile phone apps to interact in a variety of ways (phone call, video conference, email, app). Telemedicine can shorten hospital stays and decrease the frequency of admissions. It has been shown that preventive actions can postpone mortality. All of these factors reduce the use of medical resources, have a good effect on the healthcare system, and quicken the pace of medical attention.

Global Biodiversity Assessment: Digitalization

The technique of gathering and making historical and current biodiversity data available in digital form has become more widespread. To establish and evaluate a biological baseline for assessing the effects of climate change, land use, invasive species, and land cover on biodiversity worldwide, digitalization of collection-based research is helpful.

In order to evaluate biodiversity, it is important to investigate the long-term effects of climatic and anthropogenic influences on the environment. Field samples of environmental change and pollution are collected using traditional data collection methods, but they are now supplemented by the use of Internet of Things (IoT) technology. The ability to mine such a massive volume of data for usable information to construct environmental management policies has been made possible by big data analysis and cloud computing.

Utilizing mobile application software offers exceptional chances for independence and interaction with agricultural stakeholders. Applications also promote farming communities as crucial components of precise and sustainable agriculture while guaranteeing financial rewards (reduced poverty).

The current use of Internet of Things technology has significantly enhanced data collection techniques and quick big data analysis, which is favourable for the deployment of solutions and effective monitoring. Studying the long-term effects of climatic and human-caused factors on the environment and biodiversity is clearly necessary. In this race against time to halt climate change, digitization is a game-changing instrument for scientists. Climate change is threatening the increasing agricultural output, food security, and livelihood of millions of people worldwide. Agriculture significantly contributes to the emissions of greenhouse gases (GHGs) and global warming **(Gebresamuel et al., 2021)**. Climate-smart agriculture (CSA) techniques based on digital technologies that incorporate the advantages of sustainable production, climate resilience, and lower GHG emissions seem to be very promising and provide a viable solution to current issues **(Abegunde et al., 2020).**

Six significant transformations are anticipated to be required to achieve the aims of the Sustainable Development Goals by 2030, and it is anticipated that digitalization will have profound implications on economies and communities. A

decarbonized energy system, better human capital, ethical consumption and production, wholesome, inexpensive food and clean water, sustainable cities and communities, and digital government are all desirable goals.

Conclusion

The path to a smart, green planet is defined by digitalization, which offers solutions and promotes sustainable growth. IoT, big data management, and artificial intelligence integration have already shown a wide range of advantages. In the years to come, digitalisation will tremendously benefit sustainable development. Internet of Things as a vital instrument for planetary health and sustainable food production. Water treatment and energy generation can be optimised through artificial intelligence. Smart technologies can promote wellbeing and offer equitable access to services. The use of digital technology can direct efforts to combat climate change and preserve biodiversity. Particular consideration should be given to the effects of unequal data access, which can lead to digital poverty and, as a result, widen rather than narrow the gap in inequality. Strongly networked systems that use the cloud should have their cybersecurity strengthened. India, a signatory to the Sustainable Development Goals (SDGs) Declaration, has taken the initiative to launch the Digital India programme, with an emphasis on delivering digital infrastructure as a fundamental service, digital services on demand, and digital empowerment to all residents. Information and communication technologies for development (ICT4D) are being used by all Digital India initiatives to deliver citizen-, business-, and government-focused services through mission-mode projects. ICT4D utilises mobile, social media, cloud computing, and data analytics. However, the advantages of incorporating big data into daily life can enhance the quality of life and significantly help humanity in addressing the sustainability concerns to ensure the resilience of people, biodiversity, and the environment.

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