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DIGITALISATION: A STEP TOWARDS SUSTAINABLE DEVELOPMENT

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Abstract:

The lines between the physical and digital world are increasingly blurred nowadays. Rapid digitalization is changing the natural environment. It is changing the way we observe, understand and interact with our ecosystem. It is also changing the actions we take on environmental issues. Computers, servers and other electronic devices require large amounts of natural resources. The energy to run them emits high amounts of CO2 and the low percentage of recycling are generating e-waste. Without denying the many benefits brought by these technologies, including for the environment, it is important for users, services providers and policy makers to understand what the impacts are and to learn how we can move greener digital technologies for sustainable development.

Key words: *Digitalisation, Sustainable Development*

Introduction:

Human society is becoming increasingly digital. This affects all sectors of economy and areas of life: via digital navigation devices, online shopping, information provision and communication to the increasingly automated control of industrial processes and the digitalisation of the energy system. Such a profound change not only changes our consumer behaviour, but also leads to increased resource consumption for the production, use and disposal of digital components and infrastructures.

In addition to the additional energy and resource requirements, digitalisation offers the opportunity to enable the necessary decarbonization to achieve the global climate goals. The questions to be addressed are what contribution digitalization can make to the desired transformation and how the sustainability of the use of digital technologies compares to alternatives. In this paper, possible environmental effects – both positive and negative – are presented as examples, which can arise depending on the application and the design of digitalisation measures.

Review of Literature:

- In the research article 'Digitalisation and environment: how does ICT affect enterprise environmental performance?' (2021) authors Huwei Wen & Chien Chiang Lee stated that

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industrial digitalisation improved enterprise environmental performance by introducing front-end cleaner production technologies, rather than by increasing pipe-end pollutant treatment facilities in China.

- Le Thanh Ha and Tran Thi Lan Huong in their research article 'Is digitalisation a driver to enhance environmental performance? An empirical investigation of European countries' (2022) demonstrated that the digital transformation process, especially digital skills, business digitisation, and digital public services, increased environmental performance. The investigation into the mechanism of the digitalisation-environment nexus provided empirical evidence of the influence of digital transformation on the environment and sustainability in the European Union.
- In research article 'Digitalisation and the Decoupling Debate: Can ICT Help to Reduce Environmental Impacts While the Economy Keeps Growing?' Tilman Santarius, Johanna Pohl and Steffen Lang (2020) concluded that a more active political and societal shaping of the process of digitalisation is needed to make ICT work for global environmental sustainability.
- The 27th edition of UNEP's Foresight Brief (November, 2021) explored the environmental impact of internet use and the increasing digitalisation of the economy. It outlined some of the mitigating factors that can be implemented to green our digital future.

Research Problem:

- Previous studies show that digitalisation may pose serious concern for environment. Yet it has not addressed adequately the significance of the greener digital technologies for a long-term sustainability.
- Hence it is a research gap in knowledge that there is a need to provide understanding to conscious and sensible use of digital devices and services.

Objectives:

- To identify the role of digitalisation in achieving sustainable development
- To recommend positive application of digitalisation for sustainability

Research Methodology:

The present study is based on secondary data. The data has been obtained from the related articles, research reports.

Significance of Sustainable development:

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. (Brundtland Report,1987). Environmentally sustainable economic growth refers to economic development that meets the needs of all without leaving future generations with fewer natural resources than those we enjoy today.

Relevance of Digitalisation:

The digital revolution is changing the way we work, live, and solve challenges. New technologies offer ground-breaking opportunities for environmental protection and climate action. For example, AI can strengthen climate predictions, enable smarter decision-making for decarbonising industries, and anticipate the effects of extreme weather. Digitalisation is an excellent lever to accelerate the transition towards a climate-neutral, circular and more resilient economy.

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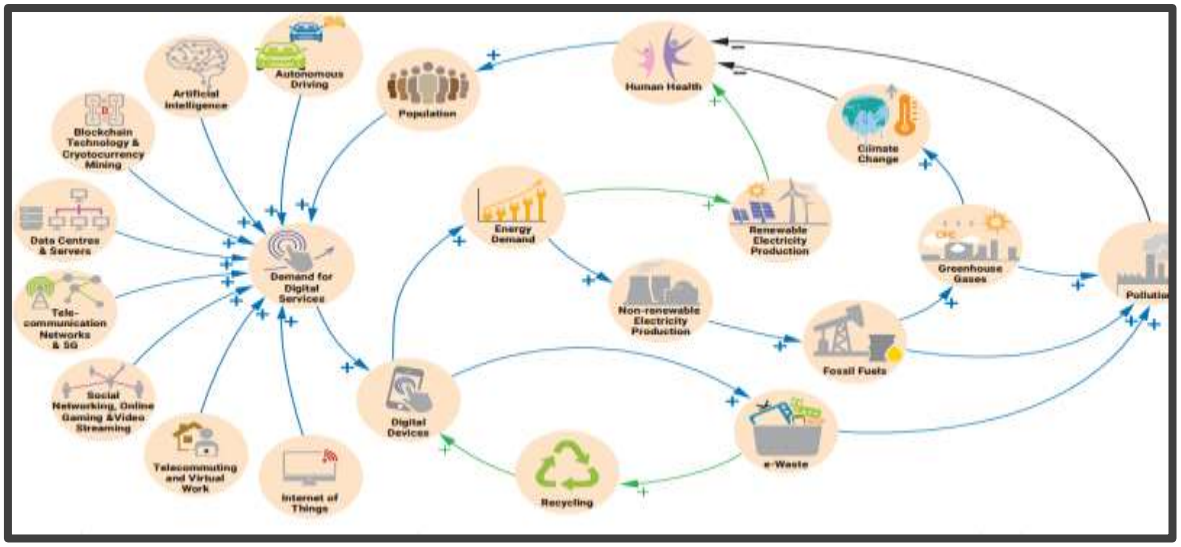
Environmental effects of digitalisation – positive or negative?



Source: A Systems Thinking Perspectives (UNEP, Foresight brief, November 2021)

- Above diagram shows that demand for digital services drives production and supply of digital devices causing an increase in energy demands. Electricity supply through fossil fuels that are polluting and increase greenhouse gases will worsen climate change and in turn adversely impacts human health. Digital devices, if built and operated using renewable energy resources and with recyclable components such as batteries, will help improve human health through reducing pollution and climate change.
- This approach in turn leads to a more sustainable reinforcement of demand for digital services. (+) Influence is in the same direction, (-) influence is in the opposite direction (UNEP, Foresight brief, November 2021)

Effects of digitalisation:

- **Increase in Energy Demand** – Internet usage consumed up to 7% of the global electricity consumption (Andrae 2020; eon 2021) and was responsible for up to 3.8% of global greenhouse gas (GHG) emissions (Bordage 2019)
- **Impacts from mineral and metal supply chains needed for digital products and energy technologies** - Bits and bytes are invisible to our eyes, but the engines that run this hidden network are built from materials extracted from the earth. This extraction process, as well as the production process to turn the minerals into cell phones, computers and servers, comes with its own environmental footprint across the lifecycle. Similarly, the increasingly level of green energy technologies that power digital technologies also have supply chains based on extensive use of metals and rare earth minerals. (International Institute for Sustainable Development [IISD] 2018)
- **Increase of e-waste** - The lifetime of digital hardware is relatively short. E-waste that is disposed in landfills, contaminates soil and groundwater, putting food supply systems and water sources at risk (United Nations 2017;

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UNEP 2019b; Forti et al. 2020). These hazardous substances are threatening human health through direct contact as well as contamination of soils and water. This is affecting mostly the poorest population in the least developed countries and therefore has significant societal and environmental impacts.

Main Finding:

As digitisation and utilization of digital services increases in the future, it is important to consider the impact that this has on the environment. The total energy consumption and the related CO2 and GHG emissions of ICT are on a steady rise.

Efforts towards sustainable digitalization:

There has been growing attention of digital footprint, and interest is growing in finding environmentally sustainable solutions towards global digitalisation.

- **Net Zero Commitments**: Major cloud and data centre operators, including Amazon, Google and Microsoft have adopted climate neutral goals by 2030 (Stramski, 2020). Many companies are off-setting their CO2 -emissions by, for example, investing in CO2 or Methane-reducing technologies or in regenerative agriculture and reforestation projects (Apple 2020; Regen Network 2021).
- **Relocation of large server farms**: Some companies have moved their server farms entirely into areas rich in renewable energy, such as Norway.
- **Reuse of heat**: Some data centres have started projects aimed at reusing the heat produced in the cooling process for heating nearby buildings (Börje 2019)
- **Gain in energy efficiency**: Energy efficiency has greatly improved with introduction of Hyperscalers which are computing networks for achieving massive scaling in the area of cloud computing and big data.
- **International initiatives**: **EU Green Digital Declaration** - 26 CEOs of companies have signed a Declaration to support the Green and Digital Transformation of the EU. **"Digitalistion for Sustainability – Science in Dialogue" (D4S):** It is a new European research group that is dedicated to developing a progressive vision for a digitalization that fosters environmental and social sustainability. The project aims at enhancing the science-policy discourse by delivering a comprehensive analysis of opportunities, risks and governance options regarding digitalisation and sustainability.

Recommendations:

In order to avoid digitalisation becoming an environmental problem itself, different measures and incentives can be adopted by policy makers, companies, service providers and users.

- **Electricity production**: Accelerate the adoption of renewable energy for ICT industries, including manufacturer and server farms. This should include the procurement of Renewable Energy Certificates.
- **Greening ICT supply chain:** Improve the governance of the ICT sector supply chain, especially with regard to the extraction of rare minerals and metals, the recycling of e-waste and the safe disposal of toxic materials.
- **Lifespan:** Extend the life span of servers and other devices using evolutive design and circular economy models to enable the upgrading and replaceability of key components.

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Cooling: Reduce the air-conditioning needed for server farms and re-use the heat generated for other purposes.

- **Digital debris:** Encourage users and institutions to delete cloud content that is no longer used or to archive information to external drives that are switched off when in long term storage.
- **5G**: Consider the installation of one single network of antennas, which can be shared by the various operators to reduce the number of antennas, thus reducing the amount of hardware needed, as well as the radiation exposure.
- **Online behaviours**: Large-scale adoption of environmentally responsible online behaviour by many individuals is vital for combating climate change and promoting sustainability. Small actions such as turning off video during a virtual meeting, reducing the quality of streaming services, decreasing gaming time, limiting time on social media, sending fewer e-mails (and without unnecessary copying) deleting e-mails and non-essential content on cloud-based storage services or unsubscribing from email lists can significantly reduce the environmental footprint of Internet use.
- **Cryptocurrencies:** The framework for the technologies of cryptocurrencies should be assessed. Regulations and policies are needed to guide the type of technologies used and the associated energy requirements.
- **Digital product passports**: The concept of a digital 'product passport' is currently being developed in the EU. It will provide digital information on a product's origin, durability, composition, environmental and carbon footprint, reuse, repair and dismantling possibilities, and end-of-life handling. Different aspects of the product passport would be available to businesses, governments and consumers.
- **Public procurement of Green ICT**: As governments and international organizations procure ICT infrastructure to upgrade their services or to close the digital divide, they should follow best practice in terms of Green ICT.

Scope and Limitation of study:

Due to time and word limit for the study, a detailed study was not possible. This is likely to play a role in under-reporting the effects of digitalisation. There is a further scope to study measures for eco-friendly digital devices and services.

Conclusions:

The growing potential of the Internet and digital tools comes with both benefits and challenges.

- Demand for digital services drives production and supply of digital devices are causing an increase in energy demands. Electricity supply through fossil fuels that are polluting and increase greenhouse gases will worsen climate change and in turn adversely affects health of environment. On the negative side, the environmental footprint of the digital infrastructure poses serious threats to our planet and future generations.
- Digital devices, if built and operated using renewable energy resources and with recyclable components such will help improve environmental conditions through reducing pollution and climate change. This approach in turn leads to a more sustainable reinforcement of demand for digital services.
- If we consider digitalisation to reduce climate

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change and environmental footprint on our planet, there are many opportunities to invest in greening the enterprises by using 100% renewable energy, optimized cooling systems of the data centres and the reuse of used materials and produced heat.

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