

Artificial intelligence in shaping the future of sustainable development

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Abstract

The paper presents the concept of sustainable development presenting the challenges and future potential of artificial intelligence, from risks to productivity boosts. Sustainable development seeks to meet human needs and depends on communities committed to creating prosperous, environmentally friendly, and sustainable practices. Nowadays, artificial intelligence is an important part of the modern world and society, transforming industries, innovation and offering solutions to complex problems, yet there is much uncertainty about its future. The emerging relationship between sustainability and artificial intelligence presents substantial potential for solving global issues, even as it confronts the considerable environmental consequences associated with the technology.

Keywords: development, sustainability, goals, artificial intelligences.

1. Introduction

The concept of sustainable development has been defined over the decades in various international scientific debates and has taken on precise political implications in the context of globalization.

In recent history, the first signal that the economic and social developments of the world's countries and of humanity can no longer be separated from the consequences of human activity on the natural environment was given in the 1972 Club of Rome report entitled *The Limits to Growth* (Meadows Report). It summarized data on the evolution of five parameters: population growth, the impact of industrialization, the effects of pollution, food production and trends in the depletion of natural resources.

As part of this process of shaping sustainability, a number of international conventions have been adopted which establish precise obligations on the part of states and strict deadlines for implementation on climate change, biodiversity conservation, protection of forests and wetlands, limiting the use of certain chemicals, access to information on the state of the environment and others, which outline an international legal space for the practical application of the precepts of sustainable development.

2. Results and discussions

Climate change is of interest to all [1]. It affects almost every socio-economic sector, from agriculture to tourism, from infrastructure to health. It impacts on strategic resources such as water, food and energy. They slow down and even threaten sustainable development, and certainly not only in developing countries. The cost of inaction is high and will become even higher if we do not act immediately and decisively.

To ensure the sustainable development, it is necessary to focus on a limited number of core priorities relating to knowledge transfer and innovation, forestry and rural areas, to farm viability, to the competitiveness and promoting innovative technologies and the sustainable management, to the organization of the food chain, including the processing and marketing, to risk management, restoring, preserving and enhancing, to the promotion of resource efficiency and the shift towards a low carbon economy, and to promoting social inclusion, poverty reduction.

Sustainable development aims to meet the needs of people and relies on communities that are rethinking on developing wealthy, green and sustainable activities [2].

The 2030 Agenda for Sustainable Development, adopted by the United Nations in 2015, provides a global blueprint for achieving peace, prosperity and environmental sustainability through 17 interlinked Sustainable Development Goals (SDGs). To achieve these goals its needed integrated, cooperative strategies to address challenges like poverty reduction, ecosystem conservation, peace-building, and inclusive economic development.

The 2030 Agenda for Sustainable Development has set 17 goals (SDGs - Sustainable Development Goals).

The 17 Sustainable Development Goals (SDGs) of the 2030 Agenda have been accepted by all countries present at the UN. These objectives are related to [3]:

- No Poverty - Eradicate poverty in all its forms and in all contexts;
- Zero Hunger - Eradicate hunger, ensure food security, improve nutrition and promote sustainable agriculture.
- Health and well-being - Ensuring healthy lives and promoting well-being for all at all ages.
- Quality education - Ensuring quality education and promoting lifelong learning opportunities for all.
- Gender Equality - Achieving gender equality and empowering all women everywhere;
- Clean water and sanitation- Ensure availability and sustainable management of water and sanitation for all;
- Affordable and clean energy - Ensuring access to affordable energy for all in a secure, sustainable and modern way;
- Decent work and growth - Promoting sustained, inclusive and sustainable economic growth;
- Industry, innovation and infrastructure - Building resilient infrastructure, promoting sustainable industrialization and encouraging innovation;
- Reduced inequalities - Reducing inequalities within and between countries;
- Sustainable cities and communities - Develop cities and human settlements to be inclusive, safe, resilient and sustainable.
- Responsible consumption and production - Ensuring sustainable consumption and production patterns;
- Climate action - Take urgent action to combat climate change and its impacts;

- Aquatic life - Conservation and sustainable use of oceans, seas and marine resources for sustainable development;
- Terrestrial life - Protecting, restoring and promoting the sustainable use of terrestrial ecosystems, managing forests sustainably, combating desertification, halting and repairing land degradation and halting biodiversity loss;
- Peace, justice and effective institutions - Promote peaceful and inclusive societies for sustainable development, access to justice for all and effective, accountable and inclusive institutions at all levels;
- Partnerships to achieve the goals - Strengthening the means of implementation and revitalizing the global partnership for sustainable development.

The 17 goals are commitments and actions to eradicate poverty, fight inequality and injustice and protect the planet by 2030.

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The rapid adoption of digital technologies in public service delivery and governance has transformed the way governments operate, interact with citizens, and deliver public services. However, the emergence of new technologies such as artificial intelligence has paved the road to a new era [4].

Nowadays, artificial intelligence is an important part of the modern world and society, transforming industries, innovation and offering solutions to complex problems, yet there is much uncertainty about its future. Although artificial intelligence has a major influence on our activities, becoming present in many areas, we cannot exclude the human factor. Artificial intelligence is a powerful tool for accelerating sustainable development, offering innovative solutions for the environmental, social, and economic pillars of the UN Sustainable Development Goals (SDGs).

The progress assessment carried out in 2024 reveals that the world is severely off track to realize the 2030 Agenda. Of the 169 targets, 135 can be assessed using available global trend data from the 2015 baseline to the most recent year, along with custodian agency analyses; 34 targets lack sufficient trend data or additional analysis. SDG progress is affected by ongoing challenges in the availability and timeliness of data to monitor all 17 Goals [5].

As the urgency of sustainable development intensifies, artificial intelligence stands out not only as a technological breakthrough but also as a powerful tool to accelerate progress across all 17 Sustainable Development Goals (SDGs).

In terms of climate action, artificial intelligence can help forecasting, support early warning systems and optimize renewable energy implementation. Using advanced algorithms and satellite imagery, artificial intelligence can forecast natural disasters, observe biodiversity decline, and track climate impacts in real time at a global scale. With this real-time insight, countries can step in sooner and prevent greater damage.

When talking about peace and justice, artificial intelligence can be used to build a reliable governance, support access to justice, ensure transparency and detect fraud.

Artificial intelligence can be used to optimize and improve water usage and treatments and can help creating new jobs. Artificial intelligence powered systems can optimize resource consumption and can help reducing pollution. Although there is tremendous potential for artificial intelligence, it is not without risks.

Artificial intelligence facilitates the development of a circular economy by optimizing recycling operations, reducing waste generation, and fostering the reuse of resources.

In view of a greener and circular economy, the general trend in European Union is to improve and enhance all activities related to waste management, starting with the quantities of waste generated and ending with the disposal of the waste.

However, the use of artificial intelligence includes high energy consumption and potential social inequalities, requiring careful governance and ethical oversight.

At its core, sustainability means meeting the needs of the present without compromising the needs of future generations. Using artificial intelligence one can process vast amounts of data and identify patterns that can lead to higher efficiency, reducing waste and easier decision making. Identifying specific aspect can be a step in effective results while mitigating potential challenges.

3. Conclusions

While artificial intelligence can drive progress, it also brings serious challenges, especially when used in the absence of clear ethical guidelines.

History shows that when people join forces and combine their creativity, it can overcome many challenges.

Unfortunately, the 2025 progress assessment revealed that the world remains far off track from achieving the 2030 Agenda [6]. The next five years will determine whether the world meets the ambition of the 2030 Agenda — or leaves millions behind to face a future defined by poverty, inequality, and climate catastrophe.

As two of the most influential forces of the modern age, sustainability and artificial intelligence are reshaping the future of business, policy, and society.

Businesses and governments need to implement artificial intelligence governance frameworks built on transparency, accountability, and human-centered design. With the right approach, artificial intelligence can significantly accelerate the progress towards an inclusive and sustainable world. The real challenge is not simply what artificial intelligence is capable of, but how we, as a global community, choose to direct and use it.

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The study is a sum of information collected in the many years of activity, in the events organized and events attended.

Working in the field of education, teaching environmental protection and management, mitigating for a sustainable development and fighting for against climate change I could observe the impact that technology has in many domains and hoe we can use artificial intelligence to shape up the future of our world.

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