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HARNESSING AI FOR SUSTAINABLE ECONOMIC DEVELOPMENT

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ABSTRACT

This paper examines harnessing AI's role in advancing sustainability, arguing for "AI in the Sustainability Era" over "Sustainability in the AI Era." Through secondary data analysis, the study explores AI tools transforming both production and consumption. Challenges like high costs, privacy concerns, and digital literacy gaps hindering usage. The paper recommends affordable subscriptions and privacy-first design. AI must serve as a means to achieve ecological balance, inclusive growth and economic resilience.

Keywords: AI, sustainable economic development, tools, aspirational vision.

INTRODUCTION

“Sustainable Development”, “Green Growth”, and “Circular Economy” are not just trendy taglines but are crucial necessities in this contemporary era. The mantra of modern times should be **sustainable economic development**. Moreover the question of sustainability emerged only when resources started being over-exploited. **The motto had to be “AI in the Sustainability Era” rather than “Sustainability in the AI era”**. “Sustainability in the AI Era” makes AI the star and sustainability as just one of its applications, whereas “AI in the Sustainability Era” should have been the **responsible and strategic choice** because sustainability is the urgent global priority and the non-negotiable context in which all technologies, including AI must operate. But present times have shown a **misalignment**, where there is “Sustainability in the AI Era”, meaning we are at the edge of time focusing on sustainable economic growth after all depletion of resources! As we are currently living in the “AI Era”, it is important that our aspirational vision atleast now should be “AI in the



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Sustainability Era”. Therefore, harnessing AI tools for the sustainable growth of an economy is vital, because AI should be the means to an end and not the end itself!

Henceforth,

- **"Sustainability in the AI Era" is the Current motto; it is the urgent work on the ground.**
- **"AI in the Sustainability Era" is the Aspirational vision; it is the compass for the long journey.**

In 1987, the United Nations Brundtland Commission defined sustainability as “meeting the needs of the present without compromising the ability of future generations to meet their own needs.” AI is a field of computer science focused on creating smart machines that can perform tasks that typically require human intelligence, like learning, reasoning, and problem-solving (Google Cloud). By **integrating this Artificial Intelligence to Sustainability**, there are two major divisions:

- Green By AI :** Green by AI is the application side. This refers to using AI apps, websites and tools as eco-solutions. For example leveraging AI to reduce food waste among households.
- Green In AI :** Green in AI is the efficiency side. This approach aims to build, innovate and implement energy efficient systems within AI. For example designing models that need less processing power.

This study focuses on the practical manifestation of “AI in the Sustainability Era” by examining a range of accessible **AI tools designed to embed sustainability** directly into the core activities of production and consumption.

NEED FOR THE STUDY

IBM's State of Sustainability Readiness 2024 report stated that “while 90% of business leaders agree on AI positively impact sustainability, more than half have yet to implement it for sustainability initiatives.” This shows a major gap. Developing countries face climate vulnerabilities and resource constraints. This study is important to highlight that AI adoption is accelerating economic growth but without adequate sustainability assessment. **EY Future Consumer Index (FCI) 2024**, revealed that “62% of Indian consumers have made purchases influenced by AI recommendations” but 77% expressed data breach concerns. Future generation’s welfare depends on the present technological choices. This



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paper touches the area where AI is integrated for both production and consumption, identifies the challenges and recommends strategies for optimum utilisation of AI tools for sustainability.

STATEMENT OF THE PROBLEM

AI is rapidly altering how economies function from production systems to consumer behaviour. While it promised higher growth and efficiency, its long-term impact on sustainability has remained unclear. Many developing countries still lack clear policies and infrastructure to utilise AI responsibly. **The real problem is not the absence of technology but the absence of a balanced approach that connects AI with sustainable economic goals.** Therefore, it is vital to examine how AI must support growth without harming social equity and environmental sustainability.

REVIEW OF LITERATURE

1. **Thanyawatpornkul, R. (2024). Harnessing artificial intelligence for sustainable development in emerging markets: Exploring opportunities and challenges in Thailand. European Journal of Sustainable Development Research, 8(4), em0273.**

This study analysed how AI impacted sustainable development in emerging markets like Thailand. It revealed that AI adoption offered Thailand opportunities in environmental management, social services, and governance, but faced barriers including digital divides, ethical risks, regulatory gaps, and limited capacity.

2. **Sundaresan, P., & Choudhary, A. (2023). Harnessing Artificial Intelligence for Sustainable Development: Applications in the Pursuit of a Greener Future. Resilience, 360, 83.**

This study examined AI's dual role in sustainability. It optimized resources but also risked heavy energy consumption. It found that AI drives gains in energy, agriculture, and conservation, yet the benefits are not even, and its own ecological costs has posed a sustainability paradox.

3. **Van Wynsberghe, A. Sustainable AI: AI for sustainability and the sustainability of AI. AI Ethics 1, 213–218 (2021).**

This paper emphasised that Sustainable AI should not only focus on using AI for environmentally and socially beneficial goals (AI for sustainability) but also



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prioritize designing AI itself environmentally sustainable (sustainability of AI). It argued that current efforts mainly concentrated on the former, neglecting the environmental impacts of AI training and development processes. The author also proposed a comprehensive view where the entire AI lifecycle—design, training, tuning, deployment, and governance—must be environmentally responsible.

RESEARCH GAP

While existing literature extensively debates the theoretical implications and challenges of AI for sustainability, there is a lack of consolidated, exploratory research that identifies, and evaluates the specific, existing AI tools available for both producers and consumers to implement sustainable practices immediately. This study is structured around sustainability as a **two-sided coin** – it requires systemic change in how we produce and how we consume.

OBJECTIVES OF THE STUDY

1. To analyse AI's potential in sustainable economic development
2. To explore AI's role in production and consumption
3. To identify the challenges hindering the usage of AI tools
4. To recommend optimum utilisation of AI for sustainable economic development

RESEARCH METHODOLOGY

This study is descriptive and exploratory in nature. The study is based on secondary data such as journals, articles, websites, online portals, media platforms and previous literature to fulfill the research's primary objectives.

DISCUSSION AND RESULTS

Building upon the need for “AI in the Sustainability Era” established in the introduction, this section explores specific AI tools that are currently enabling sustainable economic development through their impact on production and consumption activities in line with the objectives.

I. AI TOOLS FOR PRODUCTION

1. Google Cloud: This is a platform that enhances business growth with smarter utilisation of AI imbuing sustainability strategy. From the industrial networks with Watershed and Palo Alto Networks and other partners, Google Cloud aims to achieve NetZero commitments and helps business organizations to transform to sustainable businesses in



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supply chain, energy, transportation, financial services and ESG reporting. For example: If we hosts applications on Google Cloud, our carbon footprint is reduced by their efficiency and clean energy purchases. Simultaneously, Google Cloud provides the visibility (Carbon Footprint reports) and control (choosing low-CO2 regions) to minimize it further. Google Cloud claims that 96% companies have atleast one sustainability programs.

2. Net0: This embeds AI for sustainable management of business. It provides strategies to reduce emissions, energy, waste, water etc modified and adjusted in real time, making Net0 adaptive. “Net0’s AI transforms sustainability data into action.” It completely transforms business objectives and makes them focus on sustainability led profit enterprise. By incorporating certain real-time sensor readings, updated emissions factors, and the latest regulatory changes, Net0 enables enterprises to adjust sustainability strategies dynamically rather than waiting for outdated historical reports.

3. Amazinum: This is a platform (Ukraine-based) that offers hundreds of AI and ML services for species identification, biodiversity monitoring, ecosystem health monitoring, air and water quality monitoring etc. It enhances business efficiency and boosts revenue. Amazinum is not just a merely a tool but a tech enabler for sustainability, supporting other businesses become more eco-friendly through data.

4. Kisan e-Mitra: This is an AI-powered, multilingual, voice-based chatbot launched by the Indian government to provide 24/7 assistance for the PM-KISAN scheme. It helps the farmers check application status, installment details, and beneficiary information in 11 regional languages. The tool aims to provide an instant, personalized support to more than 92 lakh farmers, reducing the need for manual inquiries.

5. Persefoni: This is a leading AI-powered SaaS platform for carbon accounting and sustainability management. It acts as an ERP for climate data and allows companies and financial institutions to measure, analyze, and report their greenhouse gas emissions. The platform provides tools for Scope 1, 2, and 3 emissions, regulatory compliance (CSRD, SEC, etc.), and AI-driven insights via PersefoniAI.

II. AI TOOLS FOR CONSUMPTION

1. Ecosia: A search engine app as well as browsing tool that uses its profits to plant trees and support broader climate action. It was founded by Christian Kröll in 2009 in Berlin, Germany. Use it like a regular search engine — search the web from the app. Ecosia directs



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100 % of profits (from ads) into environmental work, especially reforestation, thus helping absorb CO₂ and protect biodiversity. The app also allows to track our impact profile showing approximate trees planted and climate contribution. It is Privacy-focused with no selling of user data. As of 12th Feb 2026, around 24,72,88,178 trees have been planted and Euros 99,310,408 (Rs. 10,67,07,04,718.78) is dedicated to climate action.

2. Good On You: An ethical fashion and beauty rating app that lets one check how sustainable and socially responsible brands are before we buy. It was founded in Australia (Sydney) by Sandra Capponi and Gordon Renouf; launched in 2015. Good On You helps shoppers support brands that do better for people, the planet, and animals, shifting demand toward more responsible business practices. This contributes to better production and consumption patterns globally. In 2023, over 4 million people used Good On You for making sustainable choices.

3. NoWaste: This is a pantry/food inventory management app that helps users track what food they have at home — in the fridge, freezer, and pantry — to reduce food waste and save money. It is developed by KH Creations ApS, based in Denmark. Take a photo of your receipt and NoWaste AI instantly recognizes all items, quantities, and prices. No manual entry needed. It has Barcode scanning to quickly add groceries to your inventory also sort items by category, expiry etc. By helping you avoid buying duplicate items and using food before it goes bad, NoWaste supports less waste, lower grocery bills, and smaller carbon footprint from wasted food. NoWaste app is used by individuals across 181 countries.

4. Ecolink – AI Product Scanner: Ecolink, introduced by Ecosapiens foundation, is an AI-powered shopping assistant app that uses advanced artificial intelligence, image recognition, and barcode scanning to instantly analyze product health, sustainability, and ethical ratings. It reveals hidden ingredients, carbon footprints, and toxins in groceries, cosmetics, and clothing to help users make smarter, eco-conscious buying decisions. As of July 2024, the app is being used for sustainability purposes by over 1,50,000 platform users, and has planted over 2,40,000 trees.

5. JouleBug: This is a free gaming app that is easy and fun to build sustainable habits. Playing eco-friendly tasks will give points and this can be shared on social media platforms to showcase sustainability commitment. The completed actions are stored on profile, that



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provides insights on the amount of water we have preserved through collective actions and how much CO₂ emissions we have reduced. The platform has over 1 lakh users, catering to individuals, corporations, and universities. The app saw over 11,000 new users in 2023 and saved 27.8 million liters of water and 144.6 million kilograms of CO₂.

FINDINGS

- Tools like Google Cloud, Net0, and Persefoni allow businesses to monitor carbon emissions, optimize supply chains, and adapt strategies dynamically using live data, proving AI's potential for sustainable production.
- AI supports sector-specific sustainability also through biodiversity monitoring (Amazium) and farmer assistance (Kisan e-Mitra)
- Consumer-focused apps like Ecosia, Good On You, NoWaste, Ecolink and JouleBug empower individuals to make eco-conscious choices.
- High implementation costs, privacy concerns, digital literacy gaps, poor infrastructure hinder the usage of AI tools.
- Strategic investments in training, affordable subscriptions and privacy first designs can help optimize AI's role in sustainable development.

CHALLENGES

1. AI tools are heavily dependent on data. If the databases are poorly maintained, or it is old historical data, this leads to failed real-time sensor readings and henceforth sustainability might partially be achieved.
2. Implementing these sophisticated AI tools becomes expensive for both producers as well as consumers. It requires significant financial investment, subscription to premium softwares and also to provide training. This may be prohibitive for small businesses.
3. For a business to use these AI tools, they must integrate them into their existing legacy systems. This integration process can be complex, time-consuming, and prone to technical failures, hindering adoption.
4. There is a significant barrier in digital literacy. First of all, Digital reach in rural regions is limited, moreover lack of awareness, knowledge to use such AI tools became a major hindrance.



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5. Scaling these tools to reach the entire target audience is a major hurdle. Ensuring that tools like Ecolink and NoWaste become mainstream enough to actually shift consumption patterns requires massive marketing and user adoption campaigns.
6. Users maybe hesitant to use AI apps fearing the use of personal data being sold or misused.

RECOMMENDATIONS

- AI organisations can invest in Real-Time monitoring systems to ensure accurate carbon reporting and sustainability management.
- Providing special season discounts, or low rate subscriptions will help Small Scale industries to integrate AI tools into their business operations
- There should be massive, on-ground training programs to provide awareness of apps and then educate farmers and rural populations on how to use voice-based AI and chatbots.
- To ensure AI tools achieve critical mass, developers must partner with community organizations, social-media influencers.
- AI tools must adopt a "privacy-first" design, clearly disclosing how user data is used. Independent audits and certifications for apps would reassure users that their consumption habits are secure.

CONCLUSION

The present research paper touches upon the urgent need for sustainability. This era is the AI Era, where every field, every action, every nook and corner is AI with all its pros and cons. The paper's aim was to enlighten on how one could visualize and implement sustainability utilising AI in every field, every action, every nook and corner. **This study was done particularly to provide awareness regarding the sustainable AI tools that could be utilised for both production as well as consumption.** The study highlighted how AI can drive responsible producer and consumer behaviour. But Challenges such as high implementation costs, data privacy concerns, digital literacy gaps, must be addressed strategically. By investing in real-time infrastructure, and ensuring inclusive access through training and discounts, stakeholders can harness AI not as an end in itself, but as a powerful means to achieve long-term ecological balance, inclusive growth and economic resilience.



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