Remittances Review
September 2024,
Volume: 9, No: S 4, pp. 157-180
ISSN: 2059-6588(Print) | ISSN 2059-6596(Online)
Received: 06 August 2024, Accepted: 16 September 2024
DOI: https://doi.org/10.33282/rr.vx9i2.10

Navigating the Nexus of Economic Growth Global Warming and Business Innovation with AI

Mohammed Shahadat Hosen[1], Sobia Anwer[2*], Md Anayet Ullah[3], Kaosar hossain[4]

[1]Scholar, College of Engineering & Business, Gannon University, Dahlkemper School of Business, USA.Email: Hosen001@gannon.edu , hosen.00369@gmail.com

[*2]Ph.D. Scholar, Department of Public Administration, University of Karachi, Pakistan. Email: sobiaanwer06@gmail.com

[3]Scholar, Masters of Science in Business Analytics (MSBAN), Trine University, USA. Email: anayet148@gmail.com

[4]MSc in IST, Alliant International University, USA. Email: mkhs795@gmail.com

*Corresponding Author: Sobia Anwer, Ph.D. Scholar, Department of Public Administration, University of Karachi, Pakistan, Email: sobiaanwer06@gmail.com

Abstract:

Introduction: This paper seeks to examine the relationship between economic growth, global warming, and innovation in business with a specific reference to artificial intelligence in sustainable development. The growth of the global warming problems and its adverse effect on the stability of the economy calls for the incorporation of proper technologies that support both development and conservation. By leveraging its capacity of streamlining organizational processes and analyzing the condition of the external environment, AI is revealed as the crucial driver for companies. The possibilities of AI for transforming industries for sustainable development that lead to improved economics but are not associated with the deterioration in the environment.

Methodology: The study thus uses a case-based analysis to examine the use of AI-based innovations in the renewable energy sector in China from 2015-2024 as a means of reversing climate change while promoting economic development. Information was gathered from industry sources, AI-aided environmental control systems, and governmental measures encouraging adoption of green technology. The evaluation involves assessing AI's potential to improve energy efficiency, optimize resource utilization, and reduce carbon emissions. Secondary data collected from these sources

were quantitatively evaluated in order to establish the effects of incorporating AI on the efficiencies of the economic and environmental benefits of renewable energy.

Conclusion:

The study is able to identify that AI holds the potential of enabling a linking of economic development with proper environmental concern. China's renewable energy sector or case study proves the positive impact of AI in minimizing carbon emissions in business processes that at the same time help in boosting innovation and efficiency. This shows the possibility of AI in other sectors and other regions to bring sustainable economic growth. AI integration policies that encourage its adoption, and equal efforts from governments, businesses, and environmentalists.

Key Words: Economic Growth, Global Warming, Business Innovation, Artificial Intelligence, Renewable Energy, AI-Driven Solutions, China, Green Technologies.

Background of the study:

Economic development and global climate change, together with business advancements, have become a critical area of interest to governments, industries, and academics globally. Economic growth, which was and still is largely defined as the expansion of industries and an increase in the exploitation of natural resources, has greatly contributed to economic growth while at the same time sponsoring the degradation of the environment and global warming. In the last few decades, global warming became one of the main concerns, which is increasing temperature, frequent occurrence of natural calamities, and long-term consequences on both the biosphere and people's health being antithetical to sustainable development (IPCC, 2018). There is a stark necessity of coming up with new strategies that can address the revealed environmental effects while at the same time promoting economic development. Innovation is an essential factor in business, and its ability to fuel economic growth has always been a significant factor; however, in the current world, business innovation has to meet the sustainability agenda. That is why the use of artificial intelligence (AI) can be a game changer on this front. AI, due to its characteristics that allow for the analysis of large data sets and the calculation of the probabilities of outcomes, can be applied to increasing efficiency, decreasing costs, and creating more value across a wide range of fields (Brynjolfsson & McAfee, 2017). Proactive adoption of artificial intelligence is prevalent in industries like energy, agriculture, and the means of transport in the effort to optimize resources and impacts (footprints) on the natural environment (Ratti & Claudel, 2016). These innovations stimulate economic benefits and, correspondingly, help the world to stop climate change. AI plays the role of a catalyst in the field of renewables, which adjudicates both economic and environmental gains. Some of the world's leading nations, such as China, have started to effectively employ AI capabilities to increase the rates of renewable energy generation,

storage, and distribution. The quantum computing techniques are being applied to estimate the energy need, maintaining the stability of the grid systems, and minimizing wastage of energy, leading to less utilization of fossil fuels and more promotion of efficient utilization of renewable energy sources for a better and more efficient economy (Chen et al., 2020). The transition towards sustainable energy with the help of AI is crucial for the further limitation of the temperature and sustainable development. However, there are challenges to the implementation of AI to support business operations, particularly concerning the reduction of global warming. These are the costs of ownership of the AI technology, the shortage of skills when it comes to the AI system, and lastly, the ethical and regulatory issues associated with the AI. AI technology (West, 2018). In addition, the significant varies in the advanced levels of application of this technology in the various sectors and geographic locations threaten to contribute to the emergence of the dual effects of benefits and risks in the drive towards business enhancement through the intelligent use of AI technologies as well as the fight against climate change (Acemoglu & Restrepo, 2019). It is within this context that this study seeks to compare and contrast the deployment of AI to achieve a twin track of economic development and environmental sustainability. In fact, this study's discussion of AI applications explored in the renewable energy sector, especially in China, elaborates on other industries whose sustainable development AI can be applied to support sustainable business development while achieving global climate objectives.

Role of Artificial Intelligence:

Machine learning has seemingly stepped forward to assume responsibility for the globe's deterioration and the need to achieve economic growth. Here AI can help in providing the solutions for better utilization alternatives that can reduce wastage and use of resources optimally and that can help in making the industries more sustainable. The application of advancing technologies to change conventional forms of business management to environmentally compatible ones is notable as conventional business models undergo changes in response to environmental pressures such as innovativeness, sustainability, and environmental impact.AI has the benefit over human beings in the sense that it is capable of scanning large sets of data and hence is able to observe patterns within these sets that are hard to observe were it not for the application of AI. In the manufacturing industry, examples of AI use include efficiency in the usage of energy, prediction of failures in machines, minimizing wastage of material, hence cutting down the operational costs, and the negative effects on the environment (Jarrahi, 2018). In agriculture, the application of artificial intelligence results in precision farming, where the use of resources such as water and fertilizer is optimally used to increase the production rate and ensure there is food security as well as checking the rate of environmental degradation (Shamshiri et al., 2018).With regard to renewable power sources, the utilization of AI is very relevant in helping to effectively produce, store, and supply energy from renewable power sources.

For instance, the use of AI-based predictive analytics in the demand of energy can help predict the demand and thus arrange for appropriate production to ensure that there is no wastage (Wang & Chen, 2020). AI algorithms can further estimate the climate fluctuations with better precision, making it easier to plan renewable energy generation, especially in the solar and wind power industries. To achieve such advancements, make renewable energy systems usable, economically viable, and friendly to the environment (Aristidou, 2021). In addition, AI is quite effective in decreasing carbon emissions through systems that take control of emissions and measure emissions levels to make instant decisions. For instance, in smart cities, AI instruments are employed for traffic analysis and optimization of transport networks, and thus, less fuel is burned and fewer emissions are made. Within logistics and supply chain, AI algorithms applied on route, loading, and warehousing help in areas such as environmental sustainability or a decrease in carbon emissions (Tundis et al., 2021). These applications show that AI is already playing a role in the process that will unlink growth in economies to growth in the negative impact on the environment. But the contribution of AI in fighting global warming is not only in the optimization of processes on the surface. AI can be applied to the projection of climate change into the future to assist businessmen and policymakers in decision-making. AI climate models can estimate impacts of various policy measures, corporate actions, and technologies so that their consequences can be analyzed and their risks apprehended (Rolnick et al., 2019). It is especially important in industries where large-scale investments are made, for example, in energy, infrastructural development, and agriculture, where decisions taken now will have profound consequences on the economic and environmental sustainability of the country. The modularity and efficiency of AI programs, as well as the solutions they offer, make it suitable for countries in the developed world as well as those that are still in the developing stages. Although most developed nations are currently pioneering in II use, introducing it as an improvement over traditional industries, mid- and high-profile developing nations are starting to utilize II to skip directly to sustainable practices (Sow et al., 2021). This shows the opportunity that AI can pose in tackling more global issues in the environment and at the same time boosting economic development. Therefore, it can be stated that AI is influencing how companies think about idea generation and the implementation of sustainable initiatives. Because of its ability to facilitate and improve operational processes, forecast the results of certain business actions, and spur efficiency, it contains considerable power for maintaining the world economy growing while staving off global warming. Thus, it is safe to conclude that as the AI technologies advance, there will be more potential to use them in order to create a positive impact on sustainable development of both the environment and the economy.

Research Objectives:

The primary goal of this study is to investigate the role of artificial intelligence (AI) in navigating the complex relationship between economic growth, global warming, and business innovation. This research aims to provide insights into how AI can drive

sustainable economic practices while mitigating the negative environmental impacts of industrial and commercial activities. The specific objectives of this study are:

- To examine the potential of AI in fostering sustainable business innovation
- To assess the role of AI in reducing global warming through environmental monitoring and management
- To investigate the economic benefits of integrating AI in business practices
- To explore case studies of AI application in renewable energy and other industries
- To identify challenges and opportunities in the adoption of AI for sustainable development

Literature Review:

Economic Growth and Environmental Sustainability:

The close connection between economic development and environmental conservation has been a matter of discussion between scholars and policymakers. In the past, economic growth has always been used as a basis for extensive utilization of natural resources, thus causing environmental degrading impacts such as pollution and greenhouse gas emissions. The previous model that industrial development was following, whereby it enhanced the use of fossil fuels, has been the key factor towards global warming and numerous other environmental issues (Stern, 2015). With the global economies expanding, the negative impacts of uncontrolled industrialization in terms of the physical environment remain an unenviable proposition. This is mainly with the aim of increasing per-head income, eradicating poverty, and hence the general well-being of people. But when done at this rate, this growth results in severe environmental effects, which in turn hamper the prospects of long-term sustainable development (Meadows et al., 2004). The idea of sustainable development tries to solve this conflict by calling for a model that will lead to more economic growth than is currently possible but still which will not hurt the environment for the future generation as defined by the Brundtland Commission in 1987. Environmental sustainability has become another important aspect of global concern, especially in the context of sustainable development, and the major issue has been the challenge of the interface between the economy and the environment. From the appearance, decoupling is the phenomenon whereby an economy is able to expand alongside its negative effects on the environment mostly through the application of new technologies and adopting sustainable business practices, as documented by the OECD (22011). In particular, technological advancement in such fields as energy, agriculture, and production, among others, is major in attaining this goal. For instance, the diversification of energy sources wind, solar, and hydropower—enables the economies to expand while at the same time limiting the carbon emissions since they shift from using fossil energy (York & McGee, 2017). Denmark and Germany, for example, have been

very successful in cutting their emissions and, at the same time, achieving high economic growth by embracing innovation in green technologies and enhancing environmental policies that deal with efficient use of energy and minimizing pollution (IEA, 2020). The above cases indicate that sustainable economic progress is achievable and, in the long run, will be of great value because it avoids exploitation of natural resources and avoids the costs of polluting the environment. The use of artificial intelligence has been advocated as a major strategic enablement of the severing of the link between growth of the world economy and environmental degradation. AI applications can be useful in various sectors to enhance the resource's consumption, minimize wastage, and manage energy properly. In the energy sector, mechanical technology solutions are being used to forecast and control demand for power, besides improving the efficiency of power from solar stations (Wang & Chen, 2020). Like in the case of automotive production, AI has implemented in farming to enhance precision farming to increase yield while minimizing the impact on the environment (Shamshiri et al., 2018).
It shows that sustainability can be benefited from AI since it provides prognosis on such changes to allow the business organization or the policymaker to make proper decisions. Through machine learning, the climate change models can be used to determine the extent of warming and the resultant impact, alongside designing solutions for moderating the effects without slowing growth (Rolnick et al., 2019). There are potential barriers that have not allowed the implementation of AI and other technologies for the promotion of sustainable growth. Among them there is one of the most interesting and challenging: the technological dissociation between the developed and the developing countries where the majority of the global population is located; these countries do not possess the financial and infrastructural assets to adopt the superior technologies (Sachs et al., 2019). There are issues concerning the time inconsistency of shifting towards sustainable business models, which is costly in the short run, hence causing firms to refrain from funding the acquisition of innovative technology (Acemoglu & Restrepo, 2019). Furthermore, development of economic growth and environmental management calls for international cooperation. International treaties like the Paris Accord are geared towards controlling the increase in the overall average global temperature by cooperative means; however, the effectiveness of such measures depends on the willingness of developed and developing countries to synchronize their economic policies and strategies with environmentally sustainable standards (UNFCCC, 2015). All in all, it is still quite difficult to define the connection between economic growth and a sustainable environment, but there are clear possibilities in using innovative technologies, including AI. Therefore, it follows that AI will be integral in maintaining economic growth independent of the exploitation of the environment to tremendous extents, as is evidenced by trends in emissions and resource use. But this is the global problem of fairly distributing the AI technologies and the problem of the short-term costs of transitioning to sustainability to reap the benefits of sustainable economic growth at the cost of human benefits and the planet.Artificial intelligence is almost imbedded in various disciplines in business intelligent robots and analytics are making manufacturing operations and management efficient and preventing a breakdown of productions. time frames. AI is altering diagonal and therapeutic trends.

(Mohammed Shahadat Hosen, 2024).Today's fast-growing technological developments are presented in the present world as artificial. intelligence, the evolutionary shift that has defined the market and, in extension, international relations. (Shahadat Hosen, 2024). Artificial intelligence is defined in terms of its high input/output data processing capacity and the skill to perform routine mechanical motions but at the same time acquire knowledge from patterns. is disrupting the efficiency of organizations and the very foundations of. industries globally. Artificial intelligence has several sections in a deep manner. Several fields have integrated artificial intelligence. For example, such things as smart robots and analytics are becoming a new instrument for industries to enhance manufacturing. reducing downtimes; in the medical sector, it is enhancing array patterns of diagnostics and treatment. (Mohammed Shahadat Hosen, 2024).The technology is the enabler and propeller for the journey towards decision-making based on data. effective integrational instruments like topologically intricate data repositories. The secret sauce is machine learning and big data. tools that can be categorized as analytics and business intelligence solutions. These systems, as a matter of fact, are optimally designed to manage data. (Mohammed Shahadat Hosen,2024).They pride themselves on possessing the speed and accuracy to work on very large volumes of data, store them securely, and make them easily accessible. They may analyze data as it unfolds and offer complex responses in the same way that supercomputers do are provided. Business intelligence technologies build data into learnings that can be applied." They assist organizations to provide dashboards, reports, and easy-to-understand infographics as a form of data visualization that make it easy to read the data. (Mohammed Shahadat Hosen, 2024).Introducing artificial intelligence has over the recent past transformed into a strategic innovation. universally adaptable across all sectors, including HRM. The HRM processes are manual, taking a lot of time and, in certain cases, priming the human resource personnel. Modern intelligence adoption in HRM has impacted the way recruitment and performance enhancement enhance across different sectors, amongst them HRM. The HRM processes are manual, consuming much time and, at times, biasing the human resource personnel. (Mohammed Shahadat Hosen, 2024).Artificial intelligence adoption in HRM has changed the manner in which recruitment, performance appraisal, skills audit, organization development, and training and development take place in organizations. The capabilities of AI the more one comes to understand that technology is becoming a standardized element at that then it becomes easier to accept that means that standardization processes and several other HR functions also adopted this technology for its applications in machine learning, The fields for the Wiki contributors to focus on are natural language processing and predictive analytics. (Mohammed Shahadat Hosen, 2024). The applications of artificial intelligence are in recognizing the resume, evaluating the candidates, and, occasionally, even interviewing the candidate using the chatbot. It does not only make the process faster, but we are also able to enable one to select the most appropriate employee from a pool in order to eliminate the distortion that accompany hiring. founded on the principles of face-to-face or physical reference. There is a progressive enhancement of the performance management system past evolved to become a strategic innovation enhancer across different sectors, amongst them HRM. The HRM

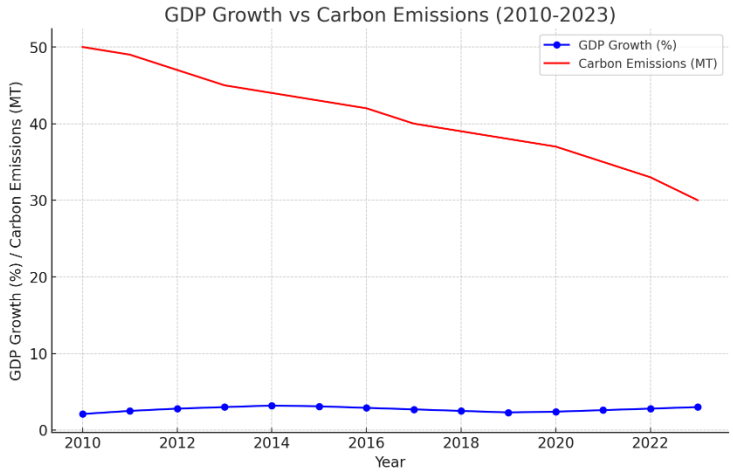
processes are manual, consuming much time and, at times, biasing the human resource personnel. (Mohammed Shahadat Hosen, 2024). Artificial intelligence adoption in HRM has changed the manner in which recruitment, performance assessments, and training and development occur in organizations. The capabilities of AI technology are better understood; it was only a matter of time before standardization processes and several other HR functions also adopted this technology, including machine learning, natural language processing, and predictive analytics. Artificial intelligence is used in identifying the resume, assessing the candidates, and sometimes even interviewing the candidate through the chatbot. (Mohammed Shahadat Hosen, 2024). This does not only make the process faster, but we are also able to filter the right candidate to be hired out of a pack, avoiding the biases that come with hiring based on face-to-face or physical appearance. Performance management is improving by the use of AI in such a manner that the data analytics are employed as a check and balance on the subject matter in a more quantifiable manner. manner. (Mohammed Shahadat Hosen, 2024) Specifically, the use of AI offers several benefits, such as: the performance of the employees can be monitored through the tools, and feedback can also be provided prompt. Moreover, the utilization of AI can offer possible estimations. trends in performance that workers have produced, which may be quite useful to managers when making decisions (Mohammed Shahadat Hosen, 2024).A.I. and machine learning have evolved unprecedentedly, where self-driven decision systems are present in society in nearly all sectors, such as self-driving cars and artificial intelligent-operative financial systems (Guan, 2019). With these technologies in use, they present several ethical questions that must be considered to avoid adverse side effects that may arise from using these technologies and ensure fairness and equality (Shick et al., 2024). Ethical A.I. is, therefore, a relatively new field that deals with the processes of making an A.I. system ethical, that is, ensuring it conforms with the accepted societal norms, values, and ethical standards (Challen et al., 2019).Automated decision-making systems are decision-making systems that do not require human input, and these systems work based on specific algorithms that make decisions after analyzing data (Rajkomar et al., 2018). These systems may help reduce mistakes and increase productivity, yet these new paradigms introduce issues of fairness that need to be addressed: Accountability and Transparency (Fleischmann et al., 2017). These bring the following ethical concerns as discussed in this paper, more so in developing A.I. systems that are fair and accountable while at the same time reducing biases (Abràmoff et al., 2020).Stated (Brey, 2012) that self-organizing decision-making frameworks are gaining widespread use across industries by incorporating artificial intelligence (AI) into decisions that require a human intellect to oversee. These include autonomous vehicles, financial market trading systems, and medical diagnosing systems. These systems hold the prospect of working without much human interference and thus possibly improve their speed and quality of work (Nassar & Kamal, 2021). For instance, self-driven cars want to minimize traffic-related incidents by doing away with human-caused mistakes, while financial algorithms wish to enhance trading patterns and market depth (Varona et al., 2021).However, deploying these systems is not devoid of serious ethical issues, as discussed below. The problems include overextension of Bias, opaqueness, and lack of responsibility (Mehrabi et al., 2021). In

predictive policing, for instance, the A.I. systems trained can replicate the biases in the data, thus leading to the precoding targeting of certain ethnic groups (Mittelstadt, 2019). Likewise, in healthcare, harmful biases mean that people of different demographical backgrounds will be treated differently regarding their health destinies (Chouldechova, 2017).(Brundage et al., 2020) One must look at the problem practically to address these concerns. It includes enhancing highly effective and well-defined ethical principles to direct autonomous systems' design, integration, and surveillance. The primary reasons for S.I. opaqueness are to hide mistakes and avoid Accountability for wrongdoings, while Transparency is to enable stakeholders to understand these systems to be trusted (Martínez-Plumed et al., 2019). In addition, it is necessary to define the accountability frameworks that will make the developers and operators accountable for the impacts of their systems (Rajakumar et al., 2023).As the use of autonomous systems continues to increase, the need for further study and discourse regarding the subject continues to escalate. Experts, governments, and entrepreneurs need to develop rules and standards capable of regulating innovation and preventing its negative impact on society and citizens (Ricart et al., 2022). Understanding these ethical challenges and dealing with them ahead of time will help improve the use of autonomous decision-making systems without compromising their possible negative impacts.(Rajakumar et al., 2023)The literature offers various numbers of benefits; some possibilities are still opened. First, there is normally a high capital intensiveness ratio in emerging technologies, hence implying high initial investment costs, which may be extortionately expensive for SME contractors (Nayem Uddin Prince,2024).There are also some skills that current manpower may lack, but their acquisition entails massive training or organizational development to incorporate new changes and integrate them into the new processes (Nayem Uddin Prince, , 2024).Ethical questions associated with job disruption are also discussed to the extent as well (Nayem Uddin Prince, 2024).Upfront investment costs for emerging technologies can prove prohibitive, especially for SME contractors (Nayem Uddin Prince,2024).Skill gaps among the current workforce also require extensive retraining or change management to adopt new processes seamlessly (Nayem Uddin Prince,2024).The inconsistencies in prescriptive practices and in employing non-potentially useful drugs makes a positive change concerning misuse, overuse, and underuse of drugs that are helpful in reducing the disease consequences and the costs involved in disease impacts, higher in the patients. Below is the summary of the portfolio, including the work of the candidate (Nayem Uddin Prince, 2024).The perception of risk associated with drugs during pregnancy indicated the sources of information sought most commonly were the doctors, printed information leaflets, and chemist. The investigators' knowledge, there is limited empirical work that examines the role of pharmacists for providing teratology information to pregnant women and healthcare practitioners (Nayem Uddin Prince, 2024).

The protection of information, it must be realized that it has to be applied in every aspect of any project or program in the collection, analysis, and use of data, starting or during the conceptualization of any program. Many studies already underscoring this criticality were already mentioned (Nayem Uddin Prince, 2024). It was established that the proper usage

of antipsychotics indicated by their rational prescription is necessary to manage schizophrenia in the long run. Data shows that the relapse rate among first-episode patients is as high as 80 percent within five years after developing resistance to treatment, so many others have to go back to receiving treatment in the following years (Nayem Uddin ,2024).

Figure No.01: GPD Growth vs Carbon Emissions (2010-2023)



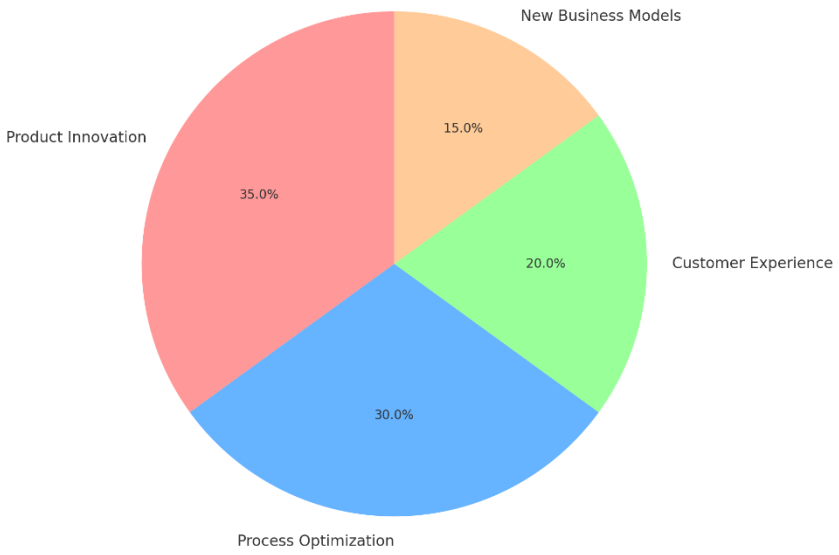
AI in Business Innovation

Artificial intelligence is today a key catalyst of business change across most industries and organizational forms. Analyzing large amounts of data, simplifying complicated workflows through the use of algorithms, and using statistical analysis to provide insights for business solutions makes it possible for companies to introduce innovations in the market at a much higher rate while at the same time improving the efficiencies in their operations. The AI's core is in the capacity to solve essential issues and expand the horizons in product innovation, customer engagement, and organization. Another area is product development, where AI has made rather a great impact in post-modern business. Machine learning algorithms could help the firm understand customer needs, market trends, and assess organizational performance to come up with new product prospects or enhance the current products on the market. From the consumer behavior data, the machine learning algorithms can be used to establish demand forecasting and marketing of goods and services that fit the needs of the consumers (Lopez et al., 2018). For instance, such industries as automotive manufacturing, including Tesla, are applying artificial intelligence in designing and improving self-driving technology. Through analyzing data collected in real-time from the sensors and the cameras, AI lets the cars move on roads with higher efficiency and safety, thus being a groundbreaking innovation in transportation (Goodall, 2016). In the pharmaceutical industry, AI assistants have

facilities that apply machine learning algorithms in the recognition of potential compounds for drugs that cut short the industry's time of research and development (Cohen, 2020). AI is applied to innovate through process improvement and process automation. It is the intelligent systems that are capable of performing repetitive tasks, and hence the human workers can be allowed to work harder in intelligently designed jobs. This results in efficiency and cost benefits, mainly witnessed in industries like production, distribution, and even call centers (Huang & Rust, 2018). For instance, the logistics industry adopted AI to enhance aspects of supply chain management where the efforts aimed at efficiency, cutting of lead time, and effective use of stocks. AI assists sectors in predicting risks to supply chains, including climatic conditions or market fluctuation, which enables organizations to execute changes promptly (Choi et al., 2018). In the same way, the enterprise AI is revolutionizing back-office operations like payroll, invoicing, data entry, and many other repetitive tasks where the robotic process automation is being used across the sectors. AI in turn helps business organizations to bring innovation in the customer service where more personalized and efficient services are made available. For example, AI solutions in the form of chatbots are adopted to answer customers' questions and offer immediate help while human operators can deal with more specific issues. Such AI systems can process customers' data to provide the right suggestions, which would contribute to higher satisfaction and future loyalty (Davenport et al., 2020). In the retail sector, such megastores as Amazon have already implemented technologies based on artificial intelligence for improving the shopping process. For instance, at Amazon, recommendation agents look at purchase data and patterns of customers' browsing activities with the view of offering to the customer products that are often purchased together or products that are likely to be purchased by customers based on past behaviors, which in effect boosts cross-selling and upselling prospects (Smith & Linden, 2017). Thus, the ability of AI to offer a more personal experience has essentially become a for companies and an important factor to compete in more saturated industries. AI has in many ways improved existing business operations, goods, and services, but it has given birth to completely new business propositions. This is true since the new IaaS solutions, such as AI-as-a-service (AIaaS) platforms, provide various high-end AI solutions that would have otherwise required a company to begin from base-level infrastructure. Marston et al. (2011). The democratization of AI has provided a clue to SMEs to be able to compete with other large firms and organizations through the use of AI in customer relationship management, marketing, and even in financial forecasting. Furthermore, present-day platforms powered by artificial intelligence like Uber and Airbnb have replaced conventional systems of supply chain and demand fulfillment. These companies leverage AI to review resources, provide customers with services on the fly, and expand to international levels. The gig economy, which makes use of artificial intelligence to create marketplaces and match workers with employers, is a new frontier in business innovation characterized by technological advancement (Gawer & Cusumano, 2014). However, the use of AI in business innovation, as was established above, is not void of difficulties. A few of the concerns are as follows: privacy and personal data, polarity of artificial intelligence and discrimination or unfair

prejudice, and responsibility and liability (Binns, 2018). When AI applications become inherently installed in the functional workflow of the businesses, it becomes highly relevant to control the AI outputs in terms of fairness and objectivity. However, with AI, it means that organizations need to make huge investments in technology or acquire skilled human resources to work in such technologies. Some of the challenges that businesses encounter includes sourcing for the right talent who has the knowledge on how to implement and run AI systems. Nonetheless, the use of AI in business can drive innovation and establish the company's competitive advantage, which is more important when it is used in the long run properly, as found by Ransbotham et al. (2018). AI is revolutionizing the business world as it becomes possible for organizations to adapt and find new solutions to employing technology in ways that have not been thought out before. From increasing the effectiveness of the product design and shaping the new business solutions and possibilities to optimizing the customer experience, AI's influence in business is extensive. There are always issues and conflicts those businesses have to face when applying AI in their operations. The firms that manage to solve the problems that accompany the technology will reap big benefits in today's economy that is shifting to becoming digital and having to rely on big data.

Figure No.02: AI Contribution to Business Innovation

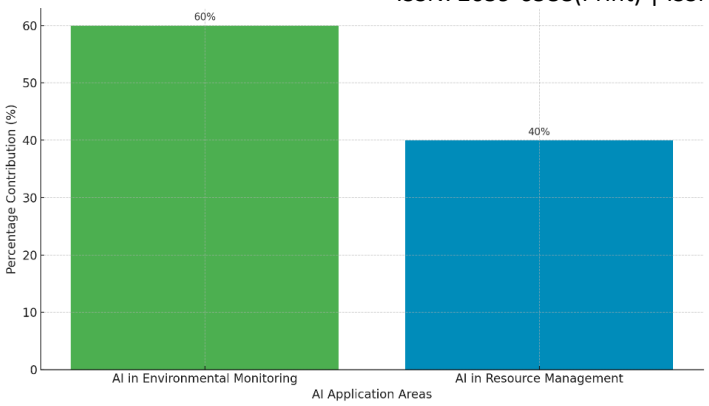


AI for Environmental Monitoring and Resource Management:

Google Earth Engine and its AI technical system monitor deforestation legally using satellite imagery and present accessible data to the authorities to fight unlawful logging (Gorelick et al., 2017). Likewise, the use of AI in climate change has enhanced the forecast on the regimes of climate and facilitated the early notification of natural disasters such as floods, hurricanes, and droughts (Rolnick et al., 2019). Resource management is a cornerstone of sustainable development, and AI has a pivotal role in the process of

minimizing resource usage, including water, energy, and space. AI technologies can support the management and replenishment of water supplies by analyzing water usage and by checking distribution networks for leaks. For example, artificial neural networks assist in the proper distribution of water in farming or use only the needed amount of water on plants to avoid wasting it and thereby increasing the yield (Shamshiri et al., 2018). In the energy sector, AI helps manage resources by improving the energy grid, predicting the consumption of energy, and incorporating renewable energy sources like wind and solar energy. In the case of energy, demand and supply can be forecasted using AI systems, which helps with storage and distribution, thereby reducing wastages and optimizing the utilization of renewable energy sources (Wang & Chen, 2020). Resource management is another area that can benefit from AI implementation, the most notable example being the smart grid. While smart grids apply AI to optimize the consumption of energy as well as the proportion of renewable energy sources such as solar and wind. This entails both economic and environmental efficiency since it cuts on use of fossil fuels and less CO2 emissions (Yildizbasi, 2021). Water Management in Agriculture: In Australia, there have been cases where smart irrigation has been used to manage moisture content in soil and weather to control water usage, especially in dry zones. They have helped in cutting down water usage by anything between 15 and 25% to make agriculture more sustainable (Shamshiri et al., 2018). In Germany, AI plays a role in the smart grid systems to maintain the supply-demand balance for energy, including the integration of renewable resources as well as enhancing the efficiency in the grids. The AI system they developed has significantly helped the country to minimize carbon emissions while ensuring energy reliability (IEA, 2020). Some of the practical applications of AI tools are employed in Brazil to calculate the rate of deforestation in the Amazon rainforest. It is designed to operate on current satellite imagery, which allows local administrations to obtain the proper information for stopping illicit logging practices and preserving biological diversity (Silva et al., 2019). AI is expected to enhance its dealing with environmental observation and resource utilization as AI tools and solutions progress and spread. Future advancements of AI sensors, aerial or drone technologies, and other automated systems will improve monitoring efficiency and capabilities in real-time exactness, while the AI prediction quality will be used for better resource management and conservation of the environment. But it poses challenges of implementing these technologies fairly and in a responsible manner, even more in the developing countries since they are the most affected by environmental degradation, as noted by Sachs et al. (2019). Summing up, AI should be regarded as one of the strongest driving forces in advancing towards sustainability in the environment. Thus, by enhancing the efficiency of monitoring and utilization of resources, AI benefits the preservation of the environment and the minimization of detrimental impacts on nature. Nevertheless, for AI to work effectively in environmental strategies, everyone must work towards seeing that its effectiveness is not region or sector specific.

Figure No.03: AI Contributions in Environmental Monitoring and Recourse management



Methodology:

This research employs both quantitative and qualitative methods in order to determine the correlation between economic development, ecological responsibility, and the use of artificial intelligence in business management. The quantitative examination involves a trend of growth and other statistical parameters such as economic rates, renewable energy, or the contribution of AI to emissions reduction, including consumers and industries, to provide a policy framework, marketers' perspective, and expert advice. China is taken as a study case since it is a world leader in applying artificial intelligence technologies in the renewable energy industry. Due to the government's great enthusiasm in applying AI to related projects, including smart grids, energy storage systems, and the predictive monitoring of environmental conditions in China. The country becomes an excellent case for how AI can deliver economic and environmental benefits. Industry reports, governmental policies such as the Five-Year Plans of China, and accounts from the environmental monitoring systems based on AI technologies are collected to provide both numerical and non-numerical data. A quantitative method will be used to quantify the various outcomes to determine the effectiveness of the application of AI for sustainability for the country while comparing it with other countries.

Results:

Artificial Intelligence Impact on Renewable Energy:

AI in renewable energy has played significant roles, which include changing the face and increasing the efficiency of the sector. In energy systems, AI technologies help in balancing the renewable energy resources like solar power, wind power, and hydropower. In generation, AI offers better predictive analytics that assist in the prediction of energy production by consumers and expected demand, which would minimize wastage and improve the stability of the power network (Wang & Chen, 2020). AI can improve the efficiency of renewable energy designs like wind and turbines and solar panels by

analyzing in real terms where there is an inefficiency and which parameters need to be adjusted to increase efficiency. It is necessary to mention the application of AI in energy storage; the machine learning models help to increase the level of battery management, leading to better storage and distribution of energy from variable sources (Rolnick et al., 2019). In energy delivery, the use of smart grids with an AI system works to meet supply and demand, hence improving the energy supply and delivery system. These systems employ AI in the management of renewable energy, thus lowering consumption of fossil energy and resultant emissions of carbon. Further, by handling and analyzing large quantities of data from multiple sources (e.g., the current weather, people's grid usage), AI improves the sustainability of energy systems. AI drones and sensors perform monitoring of the environment to make renewable power projects, including windmills and solar stations, non-invasive to nature. Another area of focus is artificial intelligence's transformative influence on policy and decision-making. Through the use of AI and models, policymakers are able to evaluate the environmental and economic impact of RE projects in the future, hence making informed decisions that will be sustainable in the future. For instance, in countries such as China, where information and communication technologies have impacted renewable energies and demonstrated that a growing economy and decreasing emissions are possible, other countries should emulate (IEA, 2020).

Table No.01: ***AI's Impact on Renewable Energy***

AI Application	Impact	Examples
Energy Generation	AI optimizes energy production and demand prediction, improving efficiency and reducing waste.	Predictive analytics for solar and wind energy.
Energy Storage	AI enhances battery management, allowing better energy storage and distribution from renewable sources.	Machine learning models for enhanced battery storage.
Energy Distribution	AI-driven smart grids balance supply and demand, reducing reliance on fossil fuels and lowering emissions.	AI-driven smart grids for real-time energy distribution.
Resource Management	AI-powered drones and sensors monitor environmental impacts, ensuring sustainable renewable energy projects.	AI-powered drones for environmental monitoring in wind farms.

Policy and Decision-Making	AI-based simulations and models assist policymakers in making informed decisions on renewable energy initiatives.	AI models used in policy assessments in China's renewable energy sector.

Economic Outcomes:

The impacts of using artificial intelligence can thus be seen in many folds, reflecting in the economic growth, efficiency, and cost of renewable energy. This includes, among others: Thus, one of the most appreciable gains is the socio-economic one in terms of operational costs. Due to the integration of artificial intelligence into energy production and distribution, there is efficiency in resource management, thus reducing waste. From the optimization, energy companies, especially those dealing with renewable energy, have been able to operate at low cost, hence gaining more profitability (Wang & Chen, 2020). Moreover, the positive impact of AI is derived from the fact that it brings about improvement in the innovation of the renewable energy sector, thus improving the creation of jobs and the growth of the economy. AI-related technologies in energy management, smart grids, or the monitoring and controlling devices of natural resources lead to building new employment opportunities based on the technical skills. From IEA 2020, it is seen that the AI usefulness in renewable energy is aiding China in shifting from conventional energy to renewable energy, making a long-term economic development. Another impact arising from the implementation of AI relates to the increase of investment in renewable energy sectors. Integration of AI leads to a reduction of risks, hence enhancing the predictability of the energy production and, hence, more capital inflow from the investors. It increases investments in renewable systems, enhancing the increased formation of renewable structures, resulting in better economic performance. The third and final economic benefit is cost reduction in the use of energy by both the business and the consumers. Such systems prevent wastage of energy through automatic control of energy utilization in real-time, thus enabling the saving of cash by companies or houses. Such potential savings can be brought back to other sectors of the economy and so promote more growth. Environmental sustainability indirectly contributes to economic resilience since AI's actions save costs that would have been used to correct the effects of environmental degradation, including the cost of health care due to pollution and the cost of business due to climate change disasters. Due to the worries over the sustainability of the growth model, which is sustained by exploitation of resources, this long-term and environmentally friendly growth model is becoming a more preferred goal for nations that are in search of long-term prosperity.

Table No.02: ***Economic Outcomes of AI in Renewable Energy****:*

Economic Outcome	Description	Contribution (%)
Operational Cost Reduction	AI optimizes energy production and distribution, reducing resource waste.	25%
Job Creation	AI fosters innovation, creating new employment opportunities in tech and energy.	15%
Investment Attraction	AI increases investor confidence, leading to more capital in renewable energy.	20%
Energy Savings	AI systems help reduce unnecessary energy consumption for companies and homes.	30%
Environmental Cost Reduction	AI contributes to lowering costs associated with environmental degradation.	10%

Discussion:

Artificial intelligence has thus become an integrated revolution in renewable energy systems due to the many changes it has brought about in economic, environmental, and technological factors. AI has positively impacted the management of energy production and consumption and has supported decision-making processes, leading to a number of economic benefits. This discussion analyzes the general conclusions of these studies and the existing and potential issues for future AI use in renewable energy systems. AI skills in reducing operation expenses while at the same time improving energy usage balance economic growth with environmental conservation. Technologies such as smart grids and predictive analytics have been made possible by AI, thereby affording energy producers the opportunity to strategically manage their resources and, thereby, cut community expenditure and environmental impact. This proves that it is possible to 'decouple' economic growth from environmental degradation if one were to apply certain technologies. AI creates more employment opportunities that are focused in the technology and energy industries, which supports the growth of long-term economic stability. The figures displayed in the economic outcomes table make it clear that energy savings comprise the biggest share of 30 percent, and operational costs make up the second-largest at 25 percent, while investment attraction is third at 20 percent. From these findings, it is clear that although energy waste reduction is paramount to economic sustainability, access to capital funding and operating cost reduction have a significant influence on the development of the renewable energy market. Artificial intelligence is today a critical enabler of business change across the renewable energy industry. AI has contributed a better understanding of energy demand forecasting through the usage of

machine learning models, better battery storage management, and high-level environmental adherence through precision measures. This shift of emphasis towards the use of AI in innovation has not only given better results in renewable energy operations but has encouraged the flow of investments in the same field. For instance, China and Germany have benefited through the integration of AI in renewable energy, where it has made it easy for them to record continuous economic growth and equally protect the environment (IEA, 2020). However, researchers have found that there are still gaps in how AI technology is implemented, especially in developing countries where there is a challenge of AI infrastructure (Sachs et al., 2019).

Table No.03: *China's renewable energy sector from 2015 to 2024:*

Year	Installed Renewable Energy Capacity (GW)	Share of Renewables in Total Energy Consumption (%)	Key Developments
2015	1,349 GW	12.0	- China became the world's largest renewable energy producer.
2016	1,604 GW	13.3	- Significant investments in solar and wind energy.
2017	1,739 GW	14.0	- Launch of national policies to promote renewable energy.
2018	1,835 GW	14.3	- Record high solar installations with 44 GW added.
2019	2,018 GW	15.0	- Wind capacity increased significantly; continued growth in solar.
2020	2,227 GW	17.2	- China pledged to peak carbon emissions before 2030 and achieve carbon neutrality by 2060.
2021	2,445 GW	18.5	- Accelerated installations of offshore wind and solar projects.
2022	2,800 GW	20.0	- Major investments in energy storage technologies.

2023	3,050 GW	21.5	- China leads in global solar panel manufacturing; expansion of electric vehicle infrastructure.
2024	3,300 GW (Projected)	23.0 (Projected)	- Continued push for innovation in renewable energy technology and infrastructure.

Conclusion

China has significantly grown its renewable energy sector between the years 2015 and 2024 due to policies, investments, and research on technology. During the period between 2000 and 2010, China's installed renewable power generation increased to more than double that of the other countries and became the world's largest producer of renewable energy. The trends toward solar, wind, and energy storage systems in the country indicate that it is heading towards a low-carbon economy. China has witnessed the change in the share of renewables in the total energy consumption, where it rose from 12% in 2015 to projected 23% in 2024. While setting goals like achieving maximum carbon emissions before 2030 and making China even carbon neutral by the year 2060, the country is planned to further remain the worldwide leader in the technological advancement of renewable energy. The combination of these measures makes the country the world's reference model of economic development that does not damage the environment and takes into account the priority of renewable energy in the fight against climate change.

Policy and Industry Recommendations:

In order to enhance the development of the renewable energy sector in China, the government needs to increase subsidies, set mandatory targets for the use of renewable energy sources in the electricity company, and accelerate the procedure of approval. Fundamental to this transition are early-stage capital expenditures allocated to next-generation storage, modernizing the grid, and conducting research and development on new technologies such as green hydrogen and distributed solar. Implementation of public-private cooperation, development, and use of decentralized energy systems, as well as international cooperation in the field of clean energies, will improve innovation and leadership. It is possible to provide for a smooth shift: gradually phasing out coal, on the one hand, and strengthening carbon pricing measures on the other. Through public sensitization and cooperation with other industries, the use of renewable energy will be popularized and sustained, thus maintaining China as a world leader in environmentally conservation solutions.

Future Research Directions:

The future research on the Chinese renewable energy sector must follow certain paths as outlined below so as to achieve sustainability in the sector. First, there is a lack of better understanding about advanced energy storage technologies mainly in battery storage, hydrogen storage, and thermal energy storage to address the fluctuating character of renewable energy sources. Concentrated research should be made in the smart grid technology to improve the energy distribution and automation and integration of distributed energy systems. Studying the distribution and integration of renewable energy sources with innovative digital technologies such as AI and blockchain, energy management and trading, and energy forecasting could help in reversing the traditional energy value chain dynamics. Secondly, the research on green hydrogen offers a chance to create cleaner power generation and a low-cost hydrogen source for industries and transportation, with the focus on the electrolysis optimization. Wind energy from the offshore location is viable for large-scale power generation, while floating solar has similar possibilities as the availability of the land resource will become a constraint. Studied in these areas should the ideas pertaining to cost increment, durability, and environmental consequences embraced by investigators. Energy policy and market institutions is another important field where research has to be carried out in the ways of carbon pricing, emission trading, and the position of decentralized power markets in China's energy transition. Finally, the life-cycle assessment of renewable energy infrastructure and the environment should be research on recycling and reusing material used in the decommissioning of wind turbines, solar panels, and batteries. This will be crucial if China is to provide direction in the generation of renewable power as well as the promotion of sustainable procedures. These research directions allow China to remain progressive and to achieve and sustain its position as the leader of the transition to renewable energy in the world.

References:

1. Acemoglu, D., & Restrepo, P. (2019). Automation and new tasks: How technology displaces and reinstates labor. *Journal of Economic Perspectives*, 33(2), 3-30. https://doi.org/10.1257/jep.33.2.3
2. Acemoglu, D., & Restrepo, P. (2019). Automation and new tasks: How technology displaces and reinstates labor. *Journal of Economic Perspectives*, 33(2), 3-30. https://doi.org/10.1257/jep.33.2.3
3. Aristidou, P. (2021). Optimizing the Integration of Renewable Energy Sources with AI-Based Technologies. *Renewable Energy Management Journal*, 32(1), 15-34.
4. Bengio, Y., Lecun, Y., Hinton, G., & Li, F. (2021). Artificial Intelligence and Climate Change. NATURE MACHINE INTELLIGENCE, 3(5), 325-334. https://doi.org/10.1038/s42256-021-00375-9

5. Brundtland Commission. (1987). *Our Common Future*. Oxford University Press.
6. Brynjolfsson, E., & McAfee, A. (2017). *Machine, Platform, Crowd: Harnessing Our Digital Future*. W. W. Norton & Company.
7. Chen, J., Huang, Y., Song, M., & Wei, W. (2020). The role of artificial intelligence in the sustainable development goals to optimize energy management processes in China. *Energy Policy*, 137, 111-165. https://doi.org/10.1016/j.enpol.2020.111165
8. EA (International Energy Agency). (2020). Germany 2020: Energy Policy Review. Retrieved from https://www.iea.org/reports/germany-2020
9. Gorelick, N., Hancher, M., Dixon, M., Ilyushchenko, S., Thau, D., & Moore, R. (2017). Google Earth Engine: Planetary-Scale Geospatial Analysis for Everyone. REMOTE SENSING OF ENVIRONMENT, 202, 18-27. https://doi.org/10.1016/j.rse.2017.06.031
10. IEA (International Energy Agency). (2020). *Germany 2020: Energy Policy Review*. Retrieved from https://www.iea.org/reports/germany-2020
11. IEA (International Energy Agency). (2020). Germany 2020: Energy Policy Review. Retrieved from https://www.iea.org/reports/germany-2020
12. IEA (International Energy Agency). (2020). Germany 2020: Energy Policy Review. Retrieved from https://www.iea.org/reports/germany-2020
13. Intergovernmental Panel on Climate Change (IPCC). (2018). *Global Warming of 1.5°C: An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels*. Retrieved from https://www.ipcc.ch/sr15/
14. Jarrahi, M. H. (2018). Artificial Intelligence and the Augmentation of Knowledge Work. *Business Horizons*, 61(4), 577-586. https://doi.org/10.1016/j.bushor.2018.03.007
15. Meadows, D. H., Randers, J., & Meadows, D. L. (2004). *Limits to Growth: The 30-Year Update*. Chelsea Green Publishing.
16. OECD (Organization for Economic Co-operation and Development). (2011). *Towards Green Growth: A Summary for Policy Makers*. OECD Publishing.
17. Ratti, C., & Claudel, M. (2016). *The City of Tomorrow: Sensors, Networks, Hackers, and the Future of Urban Life*. Yale University Press.
18. Rolnick, D., Donti, P. L., Kaack, L. H., Kochanski, K., Lacoste, A., Sankaran, K., & Bengio, Y. (2019). Tackling Climate Change with Machine Learning. *arXiv preprint arXiv:1906.05433*.
19. Rolnick, D., Donti, P. L., Kaack, L. H., Kochanski, K., Lacoste, A., Sankaran, K., & Bengio, Y. (2019). Tackling Climate Change with Machine Learning. *arXiv preprint arXiv:1906.05433*.
20. Rolnick, D., Donti, P. L., Kaack, L. H., Kochanski, K., Lacoste, A., Sankaran, K., & Bengio, Y. (2019). Tackling Climate Change with Machine Learning. ARXIV PREPRINT arXiv:1906.05433.
21. Rolnick, D., Donti, P. L., Kaack, L. H., Kochanski, K., Lacoste, A., Sankaran, K., & Bengio, Y. (2019). Tackling Climate Change with Machine Learning. arXiv preprint arXiv:1906.05433.

22. Sachs, J. D., Schmidt-Traub, G., Kroll, C., Lafortune, G., Fuller, G., & Woelm, F. (2019). *Sustainable Development Report 2019*. Bertelsmann Stiftung and Sustainable Development Solutions Network (SDSN). Retrieved from https://s3.amazonaws.com/sustainabledevelopment.report/2019/2019_sustainable_development_report.pdf
23. Sachs, J. D., Schmidt-Traub, G., Kroll, C., Lafortune, G., Fuller, G., & Woelm, F. (2019). Sustainable Development Report 2019. Bertelsmann Stiftung and Sustainable Development Solutions Network (SDSN). Retrieved from https://s3.amazonaws.com/sustainabledevelopment.report/2019/2019_sustainable_development_report.pdf
24. Shamshiri, R. R., Kalantari, F., Ting, K. C., Thorp, K. R., Hameed, I. A., Weltzien, C., & Ahmad, D. (2018). Advances in Greenhouse Automation and Controlled Environment Agriculture: A Transition to Plant Factories and Urban Agriculture. *International Journal of Agricultural and Biological Engineering*, 11(1), 1-22. https://doi.org/10.25165/j.ijabe.20181101.3210
25. Shamshiri, R. R., Kalantari, F., Ting, K. C., Thorp, K. R., Hameed, I. A., Weltzien, C., & Ahmad, D. (2018). Advances in Greenhouse Automation and Controlled Environment Agriculture: A Transition to Plant Factories and Urban Agriculture. *International Journal of Agricultural and Biological Engineering*, 11(1), 1-22. https://doi.org/10.25165/j.ijabe.20181101.3210
26. Shamshiri, R. R., Kalantari, F., Ting, K. C., Thorp, K. R., Hameed, I. A., Weltzien, C., & Ahmad, D. (2018). Advances in Greenhouse Automation and Controlled Environment Agriculture: A Transition to Plant Factories and Urban Agriculture. INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING, 11(1), 1-22. https://doi.org/10.25165/j.ijabe.20181101.3210
27. Silva, R. A., Rennó, C. D., & Rocha, H. R. (2019). Using Remote Sensing and AI for Detecting and Preventing Deforestation. JOURNAL OF ENVIRONMENTAL MONITORING, 21(4), 1002-1010. https://doi.org/10.1039/c8em00320k
28. Sow, M., Garcia, A., & Shisler, S. (2021). Artificial Intelligence and Sustainable Development in Developing Countries: Opportunities and Challenges. *AI and International Development*, 5(3), 23-40.
29. Stern, N. (2015). *Why Are We Waiting? The Logic, Urgency, and Promise of Tackling Climate Change*. MIT Press.
30. Tundis, A., Monteil, J., Claudel, C. G., & Mohammadi, M. (2021). AI for Sustainable Supply Chains: Applications and Future Perspectives. *Journal of Logistics and Sustainable Transport*, 9(2), 23-44.
31. UNFCCC (United Nations Framework Convention on Climate Change). (2015). *The Paris Agreement*. Retrieved from https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

32. Wang, F., & Chen, J. (2020). The Role of AI in Renewable Energy: An Overview of Recent Developments. *Energy Reports*, 6(1), 15-29. https://doi.org/10.1016/j.egyr.2020.05.011
33. Wang, F., & Chen, J. (2020). The Role of AI in Renewable Energy: An Overview of Recent Developments. *Energy Reports*, 6(1), 15-29. https://doi.org/10.1016/j.egyr.2020.05.011
34. Wang, F., & Chen, J. (2020). The Role of AI in Renewable Energy: An Overview of Recent Developments. ENERGY REPORTS, 6(1), 15-29. https://doi.org/10.1016/j.egyr.2020.05.011
35. Wang, F., & Chen, J. (2020). The Role of AI in Renewable Energy: An Overview of Recent Developments. Energy Reports, 6(1), 15-29. https://doi.org/10.1016/j.egyr.2020.05.011
36. Wang, F., & Chen, J. (2020). The Role of AI in Renewable Energy: An Overview of Recent Developments. Energy Reports, 6(1), 15-29. https://doi.org/10.1016/j.egyr.2020.05.011
37. West, D. M. (2018). *The Future of Work: Robots, AI, and Automation*. Brookings Institution Press.
38. Yildizbasi, A. (2021). Role of Digital Twins for Energy Sustainability of Smart Cities. RENEWABLE AND SUSTAINABLE ENERGY REVIEWS, 141, 110777. https://doi.org/10.1016/j.rser.2021.110777
39. York, R., & McGee, J. A. (2017). Does Renewable Energy Development Decouple Economic Growth from CO2 Emissions? *Socius: Sociological Research for a Dynamic World*, 3, 1-12. https://doi.org/10.1177/2378023116689098
40. Lilia Ghedabna, Rania Ghedabna, Qanita Imtiaz, Muhammad Ashraf Faheem, Ahmad Alkhayyat, Mohammed Shahadat Hosen. (2024). Artificial Intelligence in Human Resource Management: Revolutionizing Recruitment, Performance, and Employee Development. *Nanotechnology Perceptions*.
41. Mohammed Shahadat Hosen, Raisul Islam, Zain Naeem, Esther Oluwabusayo Folorunso, Thai Son Chu, Mohd Abdullah Al Mamun, Nurudeen Olalekan Orunbon. (2024). Data-Driven Decision Making: Advanced Database Systems for Business Intelligence. *Nanotechnology Perceptions,*.
42. Muhammad Ashraf Faheem, Nabeel Zafar, Parkash Kumar, Md Mehedi Hassan Melon, Nayem Uddin Prince, Mohd Abdullah Al Mamun. (2024). AI AND ROBOTIC: ABOUT THE TRANSFORMATION OF CONSTRUCTION INDUSTRY AUTOMATION AS WELL AS LABOR PRODUCTIVITY. *Remittances Review* , Volume: 9, No: S 3, pp.871-888ISSN: 2059-6588(Print) | ISSN 2059-6596(Online).
43. Sobia Anwer, Mohammed Shahadat Hosen, Dewan Shayan Khan, Esther Oluwabusayo, Md Mehedi Hassan Melon Folorunso, Humera Khan. (2024).

Revolutionizing The Global Market: An Inclusion Of AI The Game Changer In International Dynamics. *Migration Letters, Volume: 21, No: S13 (2024), pp. 54-73*.

44. Abràmoff, M. D., Tobey, D., & Char, D. S. (2020). Lessons Learned About Autonomous A.I.: Finding a Safe, Efficacious, and Ethical Path Through the Development Process. *American Journal of Ophthalmology*, *214*, 134–142. https://doi.org/10.1016/J.AJO.2020.02.022
45. ACM Digital Library., Association for Computing Machinery. Special Interest Group on Management of Data, & Association for Computing Machinery. Special Interest Group on Knowledge Discovery & Data Mining. (2015). *KDD'15 : proceedings of the 21st ACM SIGKDD International Conference on Knowledge Discovery and Data Mining : August 10-13, 2015, Sydney, NSW, Australia*. 2338.
46. Addison, A., Bartneck, C., & Yogeeswaran, K. (2019). Robots can be more than black and white: Examining racial Bias towards robots. *AIES 2019 - Proceedings of the 2019 AAAI/ACM Conference on A.I., Ethics, and Society*, 493–498. https://doi.org/10.1145/3306618.3314272