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Review Article

Circular Economy 2.0: How Artificial Intelligence is Transforming Sustainability in Water Use

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ABSTRACT

The integration of new technologies in the circular economy can be a solution to maximize the efficiency of processes and improve the competitiveness of companies since the circular economy has also become a priority for the sustainable management the environment, in an effort to reduce waste production and promote sustainability. This article attempts, without any binding suggestion, solutions, or even fleeting recommendations, to connect these realities and reflections within the framework of the circular economy through artificial intelligence (hereinafter AI) and the new conception of care especially in water use. of the atmosphere in our common home, which is not only about to be realized, but to a large extent has already happened, making the oft-repeated phrase: "the future was yesterday" a reality. We simply intend to draw the reader's attention to how we can think about these new digital phenomena to take advantage of them in the circular economy that has become a priority for caring for the environment around the world, in an effort to reduce waste production and promote sustainability. New technologies offer a unique opportunity to integrate the circular economy into environmental sustainability planning and responsible ecology and, at the same time, improve the efficiency and effectiveness of recycling and reuse processes to change the way we produce and we consume.

Keywords: Artificial Intelligence; Digital technologies; Sustainability; Natural ecosystems; Renewable energy

INTRODUCTION

Environmental protection is one of the greatest challenges facing humanity today. Rapid population growth and industrialization have led to an increase in the production and consumption of goods and services, resulting in an increase in pollution, climate change and environmental degradation. The circular economy has been proposed as an innovative and sustainable approach to address these challenges as it seeks to reduce waste and resource consumption by designing products, services and systems that are sustainable and regenerative.

The standard that seeks to modify the way we produce and consume has become a key issue in environmental protection since it is based on three key principles: Regenerative design, cycle economy and preservation of natural resources. Regenerative design seeks to create products and systems that can be used in a sustainable and renewable way. Cycle economics seeks to keep resources in use for as long as possible, avoiding resource extraction and waste. The preservation of natural resources seeks to reduce resource extraction and preserve biodiversity and ecosystems.

The benefits of the circular economy are multiple. It can reduce pollution and greenhouse gas emissions by reducing the amount of materials that are extracted and converted into waste. In addition, it improves resource efficiency by reducing the need for raw materials and energy for production and can also create opportunities for new forms of business and employment in the sustainable resources sector.

The new generation that has grown up in an era of rapidly advanced and accessible digital technologies is a generation that has understood the importance of recycling, saving energy and caring for nature and with the union of both realities begins a new unprecedented era of human existence.

The circular economy is presented to them as an alternative to address the environmental and economic challenges facing the world today, since it is based on the reduction, reuse and recycling of materials, which allows a decrease in the generation of waste and the environmental impact. The implementation of this model can be an opportunity for sustainable development and care of the environment since it allows optimization of the use of resources,

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an improvement in the efficiency of processes and a reduction in costs.

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LITERATURE REVIEW

Circular economy

The economic model of "extract, produce and dispose" is reaching the limits of its physical capacity. The circular economy is an alternative that seeks to redefine growth, with emphasis on the benefits for the entire society in the protection of nature.

Driven by design and supported by the use of renewable energy and materials, something that, as we will see below, can support AI, the circular economy changes the way we design, produce and consume. The model is based on three principles and all of them protect the environment: Eliminate waste and pollution; keep products and materials in use, and regenerate natural systems.

Value creation opportunities within the framework of the circular economy are classified into technical and biological cycles of the economic system.

In the technical cycle, manufactured materials and products remain in use as long as possible. In this way, value is created through exchange, maintenance, reuse, remanufacturing and recycling. In the biological cycle, after having gone through multiple uses, the materials return safely to nature, thus returning nutrients to the earth and natural ecosystems [1].

Supported by a transition to alternative energy sources, the circular model creates economic, natural and social capital by eliminating waste and pollution by design, keeping products and materials in use and regenerating natural systems.

This implies dissociating economic activity from the consumption of finite resources and eliminating waste from the system, precisely from the design on which the circular economy places much emphasis.

Let's think, for example, about the following question: What would happen if you could reverse engineer everything? machine learning designers could create products, components and materials suitable for the circular economy. Using AI would realize better results faster due to the speed with which the computer algorithm can analyze large amounts of data and suggest initial designs or design adjustments. The developer can then view, adjust, and approve adjustments based on this data as AI gives designers greater insight into the most efficient designs to build and test, to optimize the design process.

Circular economy and environmental protection

The circular economy as a form of production and consumption that seeks to keep resources in use for as long as possible and reduce waste and emissions generated in production processes is important for environmental protection for several reasons:

Decrease in the extraction of natural resources: The circular economy seeks to keep resources in use for as long as possible and avoid their extraction. This reduces pressure on natural resources and helps preserve biodiversity and ecosystems.

Waste reduction: The circular economy seeks to reduce the amount of waste generated and promotes the reuse and recycling of materials. This helps reduce the amount of waste sent to landfills and reduces air, water and soil pollution.

Resource efficiency: The circular economy promotes resource efficiency by reducing the need for raw materials and energy for production. This helps reduce greenhouse gas emissions and air, water and soil pollution.

Innovation and new jobs: The circular economy promotes innovation and the creation of new jobs in the sustainable resources sector. This helps foster economic growth and sustainable development.

Cost savings: The circular economy can help companies reduce costs by reducing the need for raw materials and energy for production, as well as by reducing the amount of waste that is generated.

Improved brand image: Adopting circular economy practices can improve a company's brand image and reputation among consumers.

Broadly speaking, the circular economy can help reduce the extraction of natural resources, reduce waste, improve resource efficiency, foster innovation and job creation, reduce costs and improve brand image. These benefits are important for the protection of the environment and for sustainable development in general.

However, implementing a circular economy approach also presents challenges. The circular economy may require a significant reorganization of existing economic and production systems. Additionally, the circular economy may require significant investment in infrastructure and technology to support waste management and resource recovery.

Government policies and strategies can also play an important role in promoting the circular economy. Some government policies include fiscal and financial incentives for the implementation of circular economy practices, the regulation of waste management, and the promotion of innovation in sustainable resource technologies.

Artificial Intelligence (AI)

AI is a complex cybernetic system in which the so-called "black box" phenomenon occurs since the program algorithms are not predetermined, but are shaped by the control system itself, based on formalized descriptions of the objectives, in knowledge of possible actions and information about current changes in the external environment with the ability to perceive and analyze data, through self-learning [2].

Instead of automating manual tasks, AI performs large, frequent computerized tasks, and does so reliably and, in most cases, without interruption. Humans are still needed to configure the system and set the right goals as AI adds "intelligence" to existing products.

Many of the products we already use will be enhanced with AI capabilities, similar to how a voice assistant works. Siri has been added to a new generation of Apple products and has become an integral part of the company's brand.

Automation, conversational platforms, and bots can be combined with large amounts of data to improve many technologies. AI finds structures and patterns in data to learn new skills. In the same way that an algorithm can teach itself to play chess, it can teach itself what product to recommend alongside an internet user using the web, and the models adapt as new data is received.

Types of Artificial Intelligence (AI)

In the current state of the doctrine, three types of AI can be distinguished:

- Applied AI (IAA) is a set of computer programs that imitate with the greatest possible fidelity one or several human cognitive functions used in a specific activity without the participation of the human being to achieve determined objectives according to established criteria and parameters.
- General AI (GAI) is a set of computer programs that equivalently imitate-simulate a complex of human cognitive functions corresponding to the current state of science and technology, used in any type of activity without human participation to achieve established objectives according to certain criteria and parameters.
- Super AI (SIA) is a set of computer programs that simulate-model-the entire range of human cognitive functions, including consciousness, subjective experiences, feelings of dignity, respect, goodness, beauty, etc., surpassing with You grow human intelligence, which allows you to carry out any activity without human participation to achieve self-defined objectives according to your own autonomous criteria and parameters [2].

Regarding this work, since an advanced intelligence capable of self-perfection and with the full capacity to create AI has not yet been developed, we will focus on the first two. General AI is a purposeful system, as we saw, in any type of activity, that exhibits intelligent behavior comparable to the full range of human cognitive abilities. Applied AI, also called limited or specialized, qualitatively performs specific and well-defined tasks, generally associated with human cognitive abilities, such as image and speech recognition, trend prediction and pattern detection, but as we anticipate in an activity specific.

With the growing adoption of both AI technologies, both in the scientific community and society, there is concern about how this innovation will affect businesses, consumers and the economy on a larger scale.

The economically active population wants to know what AI means for their work and income, while businesses are also eager to find ways in which they can capitalize on the opportunities provided by this powerful process optimization tool. There is an opinion that AI technologies have the potential to revolutionize production and contribute to solving global problems associated with environmental protection, population explosion and stagnation of annual economic growth rates of GDP (Gross Domestic Product) of many countries [3].

AI can be an extremely powerful tool. Imagine if this were used to accelerate the transition to a circular economy and create new opportunities for large-scale positive change. Next, we will look at how integrating AI into our infrastructure can improve our ability to create new regenerative systems based on the principles of cyclicity.

Artificial Intelligence optimizing the use and management of the water sector

Artificial intelligence (AI) is making a strong impact in the water sector, offering innovative solutions to optimize its use and management in various areas, from smart agriculture to flood prevention.

Smart agriculture: AI algorithms analyze sensor data, satellite images and weather patterns to determine the exact need for irrigation at each time and area of the crop. This allows for more efficient use of water, avoiding waste and improving productivity, as we will illustrate in section XI with current models of this use.

In the field of urban irrigation, AI is applied in public parks and gardens to optimize irrigation based on climatic conditions, soil type and the specific needs of plants.

Leak detection: AI systems analyze large data sets of water consumption, pressure and acoustic sensors to identify leaks and breakdowns in distribution networks. This allows for quick repair and less water waste.

AI is also used to detect leaks and seepages in dams, reservoirs and large diameter pipelines, improving the safety and efficiency of these critical infrastructures.

Management of water quality and water resources: AI is used to analyze large volumes of sensor data in real time, allowing the identification of contaminants, pathogens and other substances that affect water quality.

AI systems optimize drinking water treatment processes, reducing energy and chemical consumption, and improving overall process efficiency.

Cognitive processing models predict the probability and severity of droughts, allowing for better planning and management of water resources, especially in arid or drought-prone areas.

AI is used to optimize watershed management, considering factors such as water demand, resource availability and environmental impacts.

Other applications with environmental impact: AI is used to predict and prevent floods by analyzing meteorological, hydrological and topographic data, allowing the implementation of early warning and evacuation measures.

Smart technology is also used to create educational tools and awareness campaigns on the responsible use of water, promoting the conservation and care of this vital resource, as we will expand on in the case of refugees and the cases of its application in section XI.

AI plays a critical role in combating water stress and water scarcity, which are intensifying due to climate change and population growth. Optimizing water use, leak detection and sustainable water resource management are aspects to ensure water availability for future generations.

Implementation examples

- The " Agrosmart " project uses AI to optimize irrigation on of hectares of crops in California, reducing water consumption by 20%.
- The company water aid uses AI to detect leaks in London's water distribution network, reducing water losses by 10%.
- The Australian government uses AI models to predict droughts more accurately, allowing for better water management planning.

AI is a powerful tool that has the potential to transform the way we manage and use water. Its application in various areas of the water sector allows us to move towards a more sustainable and efficient use of this vital resource, ensuring its availability for present and future generations.

How artificial intelligence can help the circular economy in protecting the environment

AI has the potential to favor the circular economy both for environmental protection and environmental conservation and for ecological preservation and sustainability through responsible ecology. Some of those ways are described below.

Transportation optimization: In transportation management, AI can be used to optimize traffic and reduce congestion in cities by avoiding combustion and thus environmental pollution. Intelligent algorithms intervene to identify traffic patterns and adjust traffic lights accordingly, reducing waiting times and improving efficiency in public transport.

Regarding public transportation, AI can help cities improve its efficiency and reduce traffic congestion by optimizing route and schedule planning. For example, machine learning algorithms are capable of helping public transportation systems adjust their frequency and route based on demand in real time.

To illustrate, public transportation systems can use AI to predict demand and adjust service frequencies accordingly. It is also possible to use machine learning algorithms to optimize transport routes and reduce travel time.

Energy efficiency: In energy management, AI can be used to help smart cities reduce energy consumption by monitoring consumption patterns and implementing energy-saving measures. For example, AI-based building control systems are capable of automatically adjusting temperature and lighting based on usage and the presence of people in the building, just as they already do with heating, ventilation and air conditioning. (HVAC) depending on the occupancy of the rooms and climatic conditions.

In addition, AI can be used to optimize the use of public lighting, adjusting the brightness and intensity of the lights depending on the time of day and the presence of people.

Waste management: AI can be a valuable tool to help promote the circular economy for sustainable environmental management used to optimize waste management, identifying the best way to recycle and reuse materials, reducing waste and emissions. It can be used to create innovative solutions such as developing new, more durable and easily recyclable materials or tracking and monitoring the supply chain, allowing companies to identify and correct problems more quickly and efficiently.

IoT sensors can also be used to monitor waste levels in containers and optimize collection based on their capacity.

Transportation: Intelligent algorithms can be used to analyze transportation data, such as details of public transportation systems and data from bike-sharing systems, to identify patterns and trends that can be useful in preventing environmentally polluting combustion.

It can also help predict maintenance problems in mobile transportation equipment, avoiding failures and reducing the need to replace them or circulate with defects, increasing the polluting effect.

Other complementary benefits

Design: It is worth giving a model for optimizing processes in production. End-of-life products are not as homogeneous as they originally were, making them more difficult to automatically disassemble, sort, and separate. The potential value that neural network-based technology can derive from using waste in a closed economy for food production will be up to US$127 billion per year by 2030 [4].

In this regard, specific applications of AI include:

- Use image recognition to determine when fruit is ready to be harvested.
- More efficient matching of food supply and demand; and increase the value of food by-products.

The equivalent opportunity for AI to accelerate the transition to a circular economy for consumer electronics is up to $90 billion per year by 2030.

AI applications in this case include:

- Selection and design of special materials; extend the useful life of electronics through predictive maintenance.
- Automation and improvement of e-waste processing infrastructure through a combination of image recognition and robotics.

Creating greater awareness and understanding how AI can be used to support the circular economy will be essential to foster applications that span and go beyond the areas of circular design, circular business model operation and green infrastructure optimization.

Ultimately, AI can be applied to the complex task of redesigning entire networks and systems, such as reshaping supply chains and optimizing global logistics infrastructure, in any sector. Supporting these systemic applications of this neurotechnology will require both collaboration between relevant stakeholders and a degree of oversight to ensure that data can be exchanged openly and securely,

and that AI is developed and deployed in an inclusive and fair manner.

Biometric nanotechnology

There are many opportunities for AI to help optimize the infrastructure needed to circulate materials in an economy, many of them focused on the ability of AI algorithms to recognize and identify objects using cameras and other sensors.

While this nanotechnology has great potential to become mainstream for positive change, it also raises questions about creating fairness, interpretability, privacy, and security in these systems, which are currently the focus of research and development [2].

AI applications require systems designed according to best practices (best practice) along with considerations unique to machine learning. With the potential to be fairer and more inclusive than decision-making processes based on ad hoc rules or human judgment, there is a risk that any unfairness in such AI systems could have far-reaching consequences.

Since 1950s, AI's ability to help solve problems has grown significantly, due in part to massive increases in computing power and data availability. Its applications and capabilities have evolved and are now seen as a promising technology for many sectors and businesses.

It is estimated that in 2020, AI attracted $39 to $54 billion in global corporate investments, and it is estimated that global spending on AI in 2022 has already reached $432 billion, representing a growth of 19.6% compared to 2021, which contributed to the promotion and dissemination of this technology; and it is planned to expand the investment package to 13 trillion US dollars for global economic activity by 2030.

The role in the transition

The implementation of AI in the circular economy can represent important benefits for sustainable development, such as reducing environmental impact, optimizing resources and improving the efficiency of production processes. However, its implementation can also present challenges, such as the economic cost and the need for a significant initial investment.

To understand the role that AI can play in the transition to a circular economy for environmental protection, it is necessary to understand the current capabilities and future potential of machine learning, and how it can be used to help design, operate and optimize circular society.

AI is an umbrella term for a collection of technologies associated with models and systems that perform human-like cognitive functions. AI helps solve problems with pattern recognition, prediction, optimization, and recommendations based on data from videos, images, audio, numbers, text, and more.

Developing an AI algorithm generally follows the process of collecting data, analyzing the data, designing the algorithm, and refining it to obtain a result that can solve a particular problem. First, the necessary data is collected by capturing images and other metadata. The data is then sequentially labeled and constructed into a machine-readable format and an algorithm is developed. Depending on the use case, different types of algorithms can be used.

The algorithm is then refined in an interactive process (working in parallel with the continuous analysis of the obtained results and adjusting subsequent work steps), during which it is trained on the training data sets until it can take its training to new and unknown data so that it can be used in real applications, such as visual identification of a specific object. Creating and implementing specialized AI to care for the environment is not easy and requires a set of basic elements that must be in place.

Computer experts are needed to design algorithms, prepare training data, and transform the results of the algorithms into results that make sense to humans. Another requirement is to have enough high-quality data to train the algorithm. Garbage in, garbage out means that poorly designed data leads to poor quality results.

Although 2.5 quintillion bytes of data are created every day (for comparison, this number is equivalent to a quarter of all insects alive at any given time), most of this data does not have the capacity to be used for AI due to insufficient labeling.

Additionally, data privacy and security may limit use and access.

This points to another building block: AI infrastructure. For example, to obtain value from it, organizations need to create digital processes, an open culture around a certain AI and, at a technical level, the appropriate processing power to process all the input data.

To achieve an effective transition towards a circular economy based on AI for the protection of nature and environmental responsibility, it is important that appropriate policies and strategies are implemented, which encourage innovation and technological development in this area. The participation of all the actors involved in the process is also important, including companies, governments and civil society of all the cities involved.

Intensive energy use

AI requires that so-called Information and Communication Technologies (ICT) teams be programmed and trained at the stage of their productive use. The operation of digital ICT infrastructures and end devices are a major contributor to total electricity consumption. Therefore, the figures usually disseminated provide an overview of the total estimated energy consumption of the ICT infrastructure.

Much of today's digital data processing takes place in large data centers and digital networks, rather than on end-user devices. It can be assumed that large data centers will also become the epicenter of AI application. This is regardless of the fact that AI functions can also be implemented on user end devices at a micro level, such as self-learning thermometers.

Digital infrastructures, such as data networks and data centers, are constantly growing in size and capacity. A comprehensive assessment of the energy consumption and resource consumption of the global digital infrastructure has not yet been carried out, as there is currently no technology capable of doing so.

The International Energy Agency (IEA) estimates that global Internet traffic, one of the measurable indicators of digitalization, has grown 12 times since 2010, or about 30% per year.

Looking ahead, global Internet traffic is expected to double to 4.2 trillion gigabytes by 2022. Data centers, digital networks and other ICT consume around 7% of the world's electricity today (It is estimated between 5% and 9%) and this proportion is expected

to increase to 13% by 2030 for IEA, and even grow up to 20% according to different sources [5].

DISCUSSION

Some practical models of its implementation

Both governments and large and small companies have already developed Roadmaps of sustainable processes for countries and cities in the business environment for the sustainable management of the environment. Let us next consider the global practice of introducing AI into the circular economy for environmental protection, using the following examples:

In technology

Countries such as Denmark, Finland, Norway and Sweden have seen in recent years an unusual explosion of foreign companies, mainly americans, seeking to migrate or open new data centers. The reasons are many, and among them we can highlight low temperatures, cheap energy and a stable and growing economy.

Investments in the data center market within the Nordic countries have exceeded $3 billion in the last 18 months following the COVID-19 pandemic, and this figure is expected to continue increasing. Furthermore, today they already host the infrastructure of 49% of foreign technology companies, something that no other region in the world has.

The combined power available for these facilities is already close to 800 MW for the region, and it is estimated that more than 5,500 MW of renewable energy will be available in the next two years, which will make the price even lower and even more attractive for companies.

Another important factor is low temperatures, which makes it even cheaper to set up a data center, since cooling becomes very affordable and easy to install. For example, few social media data centers Lulea, Sweden, has an average annual temperature below 2 degrees Celsius [6]. Denmark intends to take the lead in using AI to support the transition to green technologies [7].

Apple has been one of the last to join the Nordic data center trend. In 2015, construction began on a 166,000-square-meter facility in Viborg, Denmark, which operates solely on wind power from an offshore farm and hydroelectric power imported from Norway. In addition, the excess heat generated by the servers is used for a heating system connected to a city in the area, thus heating several houses during the day and night.

The first stage of this center came into operation at the end of 2017, while its full operation is scheduled to be ready in 2025.

In line with these investments, the Nordic country has developed the following priority areas, which include:

- The Danish government has identified five public sector data sets that can be made available to businesses, researchers and the public. The data sets will not contain personal data, but rather environmental and climate data.
- Through its membership in the ESA (European Space Agency), Denmark is also helping to collect and process large amounts of meteorological, environmental and climate data. Much of this data is freely available to citizens, companies, governments and researchers.

Additionally, the following priority areas have been identified:

Energy and public services: use of AI to develop new products, services and business models. These products can help other businesses, as well as consumers, optimize their energy consumption and therefore reduce their costs and carbon footprint.

Agriculture: AI to support the development of precision agriculture in order to continue sustainable agriculture in Denmark.

Transportation: In the field of transportation, AI can be used to provide better and more timely public transportation. Furthermore, new solutions can be developed to optimize traffic management for the benefit of public and private transport users.

In Denmark, a series of specific projects related to the topic of machine learning and neural networks have been created. Danish funding for an AI strategy with 24 initiatives has been set at €9.2 million for the period 2019-2027.

In agriculture

Hungary has also committed in its national AI strategy to developing it to be high-tech and environmentally friendly. Hungary is the only state that has quantitative environmental targets in its AI strategy. By using data-driven systems, ammonia emissions from agriculture should be reduced by 32% by 2030. By 2030, 70% of renewable energy production planning should be smart.

Hungary's AI strategy includes transformation programs covering several areas:

- Climate change-driven agriculture- AI will help to reduce the adverse effects of climate change on agriculture.
- Development and application of AI-based optimization solutions in the field of agricultural and livestock production, the introduction of AI-supported forecasting methods to improve the quality of water, soil and air to optimize management efficiency.
- Establish an agricultural data collection system, including environmental data, to improve the efficiency of government operations and develop new services for farmers; Introduction of smart grid technologies to help create more accurate production schedules for climate-dependent grid and renewable energy operation.

Water in refugee camps

Artificial intelligence is emerging as a hopeful tool to address challenges related to water access in refugee camps, where safe drinking water and adequate sanitation are often a critical issue. Let's look at some examples of how AI is being applied in this field:

Water purification: Water filtration systems are being developed that use AI to optimize the purification process, adapting to the quality of raw water and using the minimum necessary amount of chemicals. AI is also used to design portable desalination systems that run on solar or renewable energy, allowing access to drinking water in areas with a shortage of freshwater.

Monitoring and management of water resources: Smart sensor networks are implemented to monitor the quality and quantity of water in real time, allowing more efficient management of the water resources available in the camps. AI algorithms can predict future water demand based on factors such as the number of refugees, weather conditions and usage patterns, allowing for better water planning and distribution.

Awareness and education: AI is used to create personalized communication tools that educate refugees about the importance of hygiene, responsible use of water and prevention of water-related diseases. Interactive chatbots are also developed that answer frequently asked questions about water, hygiene and health, providing accessible and timely information to refugees.

However, the implementation of AI solutions in refugee camps may be limited by a lack of access to technology, infrastructure and internet connectivity. It is necessary to train camp staff and refugees themselves in the use and maintenance of AI technologies, ensuring adequate technical support. Equally is involving refugees in the process of designing and implementing AI solutions, ensuring that they respond to their specific needs and consider their cultural perspectives.

AI has great potential to improve access to safe drinking water and adequate sanitation in refugee camps, contributing to the health, well-being and dignity of people displaced by conflict or persecution. However, it is important to address challenges related to accessibility, training and inclusion to ensure that these solutions are effective, sustainable and adapted to the specific needs of each context.

Examples of implementation in three refugee camps:

- **Mbera, Mauritania:** The UN is using an AI-powered water purification system to provide safe drinking water to thousands of refugees in this camp.
- **Zaatari, Jordan:** UNHCR is implementing an AI-based water resources monitoring program to optimize water management in this camp, one of the largest in the world.
- **Dadaab, Kenya:** Interactive AI-powered chatbots are being used to educate refugees about hygiene and prevention of water-related illnesses in this camp.

The safe water optimization tool

For years, SWOT (Strengths, Weaknesses, Opportunities, and Threats) has been facilitating the management of this resource in refugee camps so that water is a source of life and not of diseases in these critical environments. In addition to the circular economy of the use of drinking water, it is one of the first operational deployments of artificial intelligence applied to humanitarian aid.

Building on work begun in South Sudan, the SWOT v2 research team studied distribution and household chlorination levels in refugee camps around the world, using this data they were able to model post-chlorine decomposition. distribution and generate evidence-based, site- specific water chlorination targets.

They put these modeling tools in the cloud to create the prototype and conducted a test study in a large refugee camp in Bangladesh that doubled the proportion of households with clean water and features an upgrade that will dramatically increase quality and safety of the water.

CONCLUSION

The circular economy and AI can be an opportunity for the conservation and protection of the environment and the solution to the environmental and economic challenges facing the world today. The integration of new technologies promoting the circular economy can maximize the efficiency of processes, improve the competitiveness of companies and reduce the waste of resources for sustainable management of the environment. However, to achieve an effective transition, it is necessary to implement appropriate policies and strategies and encourage the participation of all actors involved.

Developing countries must also be supported to deploy the necessary capacity within research, business, government, and civil society to participate in and benefit from better environmental management.

Therefore, it is essential that the potential of AI is within the reach of our countries. Establishing a national system of Responsible Ecology with environmental responsibility for the protection of nature through the conversion of waste into energy is a huge task, and this must be complemented by all the possibilities that we presented to avoid the waste of valuable resources of all kinds. We hope that with the help of the international standard, private and state companies that provide these services will be able to raise money from development organizations such as the World Bank ex multis, to finance the projects.

AI can better promote environmental care in the development of the circular economy model. This requires the collaboration and participation of civil society in the process, to ensure that its implementation is fair and equitable for all, since the circular economy is a promising approach to address the environmental challenges facing society.

The model that we have pre sented throughout the chapter is based on principles of regenerative design, economics of cycles and preservation of natural resources, and offers a sustainable alternative to the traditional linear approach to production and consumption.

The circular economy provides us with a sustainable and innovative approach to address the environmental challenges facing society. While its implementation presents significant challenges, the long-term benefits to the environment, economy and society are considerable. Government policies can play an important role in promoting the circular economy and should be considered as part of a comprehensive strategy to address environmental challenges. Further research is needed to explore how the circular economy can be integrated into existing economic and production systems and to assess the environmental, economic, and social impacts of its implementation.

Achieving the highest and most ambitious goals is possible with the cooperation of many countries around the world to build a better world for current and especially future generations.

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