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## Adopting Emerging Technology To Promote Circular Economy in the Built Environment

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## **ADOPTING EMERGING TECHNOLOGY TO PROMOTE CIRCULAR ECONOMY IN THE BUILT ENVIRONMENT**

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Technology has long been regarded to be one of the key drivers of economic growth and a major contributor to a nation's competitiveness. Technology is seen as a significant instrument for increasing the value of a product, project, or service while using the same amount of available resources or capital. Rapid technological improvement and invention have contributed to more efficient and innovative output in a variety of areas, including but not limited to construction, healthcare, energy, tourism, and manufacturing. However, many industries are currently under intense pressure to reduce their use of energy, material, and other non-renewable energy resources. The public and society are also demanding practical solutions for addressing sustainability and climate change issues while also improving people's quality of life. Combining technologies and the circular economy concept within the project life cycle is one approach to tackle these issues.

The circular economy concept is based on using as few resources as possible and ensuring that materials used during, for example, the manufacturing process are reused, recycled, or repurposed before becoming product waste. The concept transforms traditional linear economy, also known as open loop systems, in which materials and available resources are reused rather than disposed away, resulting in a closed loop system that allows waste prevention and pollutant emission reduction. Multiple resources, such as plastic, chemicals, metals, and other substances, are frequently used only once before becoming waste. Through various approaches of design development, manufacturing process, technological adoption, and system modification throughout the product life cycle, the circular economy ensures that these materials are preserved in their optimum value for as long as possible.

Numerous technologies can be employed, combined, and deployed to assist the circular economy throughout the project life cycle. For example, the internet of things (IoT) provided automated big data collection through various sensors, which can be utilized to study people's behavior. In the circular economy phase, artificial intelligence ability to perform many functions while processing unstructured data for further analysis is frequently combined with IoT in facilitating the product movement from consumers back to manufacturers. The technologies enable decision makers to identify methods to tackle complicated problems by using specified criteria, rules, and massive amounts of data. Blockchain, a distributed ledger technology, is currently being incorporated from the design and planning stages to better comprehend asset monitoring and management. It provided major benefits to stakeholders by increasing transparency, improving security, improving traceability, increasing efficiency and speed, and lowering costs. The usage of virtual reality is now also being researched to understand how technology may help to raise public awareness of the circular economy and engage individuals in adopting the principles.

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Furthermore, to aid in the development of these ecosystems, supportive policy design, appropriate financing, and program implementation should be provided. The government public policy should adhere to the principles of circularity. It should be designed to assist and encourage entrepreneurs, organizations, scholars, researchers, government agencies, and other stakeholders to embrace circularity as a new norm for innovating production and consumption systems through technology adoption and new business models. The industrial technology revolution has clearly improved the effectiveness and efficiency of production, management, and governance systems. We believe that research conducted to develop innovative approaches by utilizing emerging technology can promote the advancement of a circular economy while also contributing to tackle sustainability and environmental challenges.

### **Promoting Research on the Innovation and Technology Development**

Research discussing the adoption of innovative technology can help disseminate knowledge on creating new approaches to foster sustainability in the circular economy. In this edition, the CSID Journal of Infrastructure Development presents nine papers in this research area.

The first paper, written by A. Popola, determines the patterns of integrating urban farming into city infrastructure development to improve food security sustainability within city spaces. The finding of this study shows that land allocation and water infrastructure provision can be used to enhance urban agriculture and solve the detected issues related to integrating urban farming and the city infrastructure.

The second paper, written by I.A. Diugwu, M.N. Eneje, H.D. Musa, S.O. Yusuf, and J.D. Njoku, evaluates the relationship between the quality of housing infrastructure and the decision of occupants regarding whether to live the urban areas or move to the peripheries. The findings demonstrated the existence of a significant association between them.

The third paper, written by S. Jadidoleslami and M. Azizi, investigates the importance of constructability in Value Engineering (VE) and provides some suggestions on how to improve constructability with VE. Through the systematic review of the related literature and conducted pattern coding conducted in this study, it was found that the proposed VE solutions covering the principles and concepts of constructability focused on the pre-study and the main study phases of VE and the management subgroup. Some significant areas related to environmental solutions, including cultural and legal issues, need to be further discussed to provide an appropriate context for improving constructability using the VE process.

The fourth paper, written by Y. Sanusi, explores the dimensions of the electricity supply problem; assesses adaptations by households to inadequate electricity supply; examines the use of renewable energy-related facilities; and understands the perception of renewables by households in five residential neighborhoods in Minna, the capital of Niger state. The findings indicate that the city is under a situation of extreme inadequacy of electricity supply, with the domination of fossil fuel-driven plants. Furthermore, the paper claims that a more concerted effort to develop renewable energy to improve the availability of electricity in Nigerian urban centers is high, considering the willingness of households to switch to renewable energy.

The fifth paper, written by L. Nwachi, argues that most urban planning systems in many countries still rely on top-down technocratic plan-making processes rather than a people-led process. Therefore, it aims to evaluate the need for public participation in the plan-making process and to highlight the factors that affect public involvement in the plan-making process. The findings indicate that public participation contributed to the plan-making process by identifying the critical urban issues unique to the specific local areas, establishing priorities, and mobilizing resources to meet the identified needs. It also shows that with public participation in the plan-making

process, the plan implementation can be enhanced as the public tend to be more inclined to accept the plan.

The sixth paper, written by Bothlikar and Nanda, reviews the influence of the COVID -19 pandemic on the real estate industry in India and determines the most impacted real estate segments. The result of this study shows that both residential and commercial sectors have been impacted badly. The residential market has recovered to its pre-COVID level after the first lockdown. Meanwhile, in the commercial market, the pandemic led to many innovations in the office and retail segments, accelerating its recovery. On the other hand, the hospitality segment was the worst-hit segment as tourism has effectively stopped.

The seventh paper, written by V. Arteevea and A. Skhvediani, analyzes and systematizes the indicators for assessing the performance of construction companies and projects through a bibliographic review. The results revealed that the satisfaction of all parties involved in a project's construction and operation processes is crucial for the performance indicators of construction organizations and projects.

The eighth paper, written by A. Yuan, D. Pinka, and E. Setyowati, assesses the quality of Solar Home Systems (SHS) installation, the electrification situation, and the usage of the SHS to improve existing and future SHS implementation. The finding of this study shows that the electrification ratio was increasing fast, and SHS has a positive economic impact compared to diesel gen-sets. However, small failures could lead to SHS no longer being used. Therefore, active service is key to increasing working SHS and improving usage; the local people must be trained to improve its usability and decrease its failure.

The ninth paper, written by H. Saputra, F. Azizan, N. Fahmi, integrates Unmanned Aerial Vehicle (UAV) in the Building Information Modelling (BIM) as a technique to digitize building documentation as a 3D model by taking into account a lodging property as the case study. The evaluation test done on the BIM model developed by the BIM-UAV approach confirms the high accuracy of this integration.

We hope this edition may convey new insight and knowledge that benefit our readers. We welcome any comments or inquiries that you may have concerning the direction and the content of this journal. We invite you to join our venture by sending your work for future consideration.

Warmest regards from the Editorial Office,



Prof. Mohammed Ali Berawi  
Editor-in-Chief



Mustika Sari  
Managing Editor



Perdana Miraj  
Managing Editor