Editorial

Technology and Management for Sustainable Buildings and Infrastructures

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According to a report published in 2019 by the United Nations Environment Program (UNEP), the building sector accounts for 38% of all energy-related CO\textsubscript{2} emissions when adding building construction industry emissions [1]. Yudelson (2008) argued that the building sector accounted for 45% to 65% of landfill waste [2].

Given this fact, the building sector must be one of the major causes of global warming and the resulting climate catastrophe. Therefore, research on the technology and management of the entire process including design, construction, O&M, and decommissioning is urgently needed for sustainable buildings and infrastructure that minimize energy use throughout their life cycle. At this point, it is judged that it was timely to hold a Special Issue under the topic of “Technology and Management for Sustainable Buildings and Infrastructures”.

At the time that the world is struggling with the COVID-19 pandemic, this special issue has been published in 27 research papers [3–29], 1 review paper [30], and 2 technical notes [31,32], and with the help of many research colleagues and reviewers. A total of 30 papers were published. A total of 104 authors from 9 countries including Korea [3,5,6,8,12–15,17,19,20,22,23,25–28,30–32], Spain [11,18,21], Taiwan [4,24], USA [16,17,25], Finland [10], China [29], Slovenia [9], the Netherlands [7], and Germany [21] participated in writing and submitting very excellent papers that were finally published after the review process had been conducted according to very strict standards.

Among the published papers, 13 papers directly addressed words such as sustainable, life cycle assessment (LCA) and CO\textsubscript{2} [5–7,11,12,14,16,19,20,22,25,27,28], and 17 papers indirectly dealt with energy and CO\textsubscript{2} reduction effects [3,4,8–10,13,15,17,18,21,23,24,26,29–32]. Sustainability research related to CO\textsubscript{2} and the resulting climate change started in the construction field more than 20 years ago. Although life cycle cost analysis (LCCA) has dealt with the energy use of buildings for more than 40 years, it focuses on cost rather than CO\textsubscript{2} reduction. In the 21st century, research on net zero or near zero energy use of buildings has been conducted, but research on embodied CO\textsubscript{2} resulting from the design and construction stage has been excluded because it is limited to the operation and maintenance stage. Until recently, many design and construction studies focused on maximizing economic benefits, and rarely focused on carbon neutrality or CO\textsubscript{2} emission minimization. As a result, there are not yet many papers directly dealing with energy and CO\textsubscript{2} reduction throughout the construction project life cycle.

Among the published papers, there are 6 papers [4,6,9,18,29,32] dealing with construction technology, but a majority, 24 papers [3,5,7,8,10–17,19–28,30,31] deal with management techniques. The reason is that construction management can be approached more easily than construction technology when considering research cost, time, and effort. Among all the papers, 15 studies focused on buildings [7,8,10,12,14–16,18,19,22,25–27,31,32], 9 studies on infrastructures [6,9,11,13,17,20,24,28,29], and 6 papers could apply to both [3–5,21,23,30]. With the development of science and technology, there is a tendency for buildings to become taller, larger, and more luxurious, and the energy use tends to increase rapidly. In particular, this trend is conspicuous in the developed countries where most of the papers...
have been submitted. In addition, in the developed countries, infrastructures such as roads, bridges, seaports, airports, and power plants are sufficiently established. Therefore, it is presumed that there are more papers on sustainable buildings than on sustainable infrastructures.

The authors of the published papers used various analysis techniques to obtain the suggested solutions for each topic. Listed by key techniques, various techniques such as Analytic Hierarchy Process (AHP) [3,12], the Taguchi method [4], machine learning including Artificial Neural Networks (ANNs) [5,28], Life Cycle Assessment (LCA) [6,7], regression analysis [15,17,19,25,28], Strength–Weakness–Opportunity–Threat (SWOT) [11], system dynamics [16,26], simulation and modeling [10,19,22–24,29,31,32], Building Information Model (BIM) with schedule [21,24,27], and graph and data analysis after experiments and observations [8,9,14,15,18,20,27,29–32] are identified.

As mentioned above, although the construction sector is a key influencer that harms the global environment, many studies have been focused on cost, time, quality, and safety. However, future research should be conducted on the basis of carbon neutrality or CO₂ emission reduction. For example, previous cost minimization studies should be conducted as cost optimization studies based on CO₂ emission reduction or minimization. As such, if all research is conducted in the direction of pursuing sustainable buildings and infrastructures, the global environment will be gradually improved.

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References

1. UNEP. Building Sector Emissions Hit Record High, but Low-Carbon Pandemic Recovery Can Help Transform Sector. Press Release 16 December 2020. Available online: https://www.unep:news-and-stories/press-release/building-sector-emissions-hit-record-high-low-carbon-pandemic (accessed on 12 August 2021).
2. Yudelson, J. The Green Building Revolution, 1st ed.; Island Press: Washington, DC, USA, 2008.
3. Kim, D.; Oh, W.; Yun, J.; Youn, J.; Do, S.; Lee, D. Development of Key Performance Indicators for Measuring the Management Performance of Small Construction Firms in Korea. Sustainability 2021, 13, 6166. [CrossRef]
4. Chen, H.-J.; Lin, H.-C.; Tang, C.-W. Application of the Taguchi Method for Optimizing the Process Parameters of Producing Controlled Low-Strength Materials by Using Dimension Stone Sludge and Lightweight Aggregates. Sustainability 2021, 13, 5576. [CrossRef]
5. Jang, Y.; Son, J.; Yi, J.S. Classifying the Level of Bid Price Volatility Based on Machine Learning with Parameters from Bid Documents as Risk Factors. Sustainability 2021, 13, 3886. [CrossRef]
6. Seol, Y.; Lee, S.; Lee, J.-Y.; Han, J.-G.; Hong, G. Excavation Method Determination of Earth-Retaining Wall for Sustainable Environment and Economy: Life Cycle Assessment Based on Construction Cases in Korea. Sustainability 2021, 13, 2974. [CrossRef]
7. Pujadas-Gispert, E.; Vogtländer, J.G.; Moonen, S.P.G. Environmental and Economic Optimization of a Conventional Concrete Building Foundation: Selecting the Best of 28 Alternatives by Applying the Pareto Front. Sustainability 2021, 13, 1496. [CrossRef]
8. Yang, K.; Kim, K.; Go, S. Towards Effective Safety Cost Budgeting for Apartment Construction: A Case Study of Occupational Safety and Health Expenses in South Korea. Sustainability 2021, 13, 1335. [CrossRef]
9. Bizjak, K.F.; Likar, B.; Lenart, S. Using Recycled Material from the Paper Industry as a Backfill Material for Retaining Walls near Railway Lines. Sustainability 2021, 13, 979. [CrossRef]
10. Kurvinen, A.; Saari, A.; Heljo, J.; Nippala, E. Modeling Building Stock Development. Sustainability 2021, 13, 723. [CrossRef]
11. Fernández-Pérez, V.; Peña-García, A. The Contribution of Peripheral Large Scientific Infrastructures to Sustainable Development from a Global and Territorial Perspective: The Case of IFMIF-DONES. Sustainability 2021, 13, 454. [CrossRef]
12. Kim, J.Y.; Lee, D.S.; Kim, J.D.; Kim, G.H. Priority of Accident Cause Based on Tower Crane Type for the Realization of Sustainable Management at Korean Construction Sites. Sustainability 2021, 13, 242. [CrossRef]
13. Kim, Y.; Oh, J.; Kim, S. The Transition from Traditional Infrastructure to Living SOC and Its Effectiveness for Community Sustainability: The Case of South Korea. Sustainability 2020, 12, 10227. [CrossRef]
14. Lee, D.; Kim, S. Energy and CO₂ Reduction of Aluminum Powder Molds for Producing Free-Form Concrete Panels. *Sustainability* 2020, 12, 9613. [CrossRef]

15. Oh, Y.; Kang, M.; Lee, K.; Kim, S. Construction Management Solutions to Mitigate Elevator Noise and Vibration of High-Rise Residential Buildings. *Sustainability* 2020, 12, 8924. [CrossRef]

16. Lim, J.; Kim, J.J. Dynamic Optimization Model for Estimating In-Situ Production Quantity of PC Members to Minimize Environmental Loads. *Sustainability* 2020, 12, 8202. [CrossRef]

17. Yum, S.-G.; Son, K.; Son, S.; Kim, J.-M. Identifying Risk Indicators for Natural Hazard-Related Power Outages as a Component of Risk Assessment: An Analysis Using Power Outage Data from Hurricane Irma. *Sustainability* 2020, 12, 7702. [CrossRef]

18. Carretero-Ayuso, M.J.; Rodríguez-Jiménez, C.E.; Bienvenido-Huertas, D.; Moyano, J. Cataloguing of the Defects Existing in Aluminium Window Frames and Their Recurrence According to Pluvio-Climatic Zones. *Sustainability* 2020, 12, 7398. [CrossRef]

19. Kim, J.-M.; Son, S.; Lee, S.; Son, K. Cost of Climate Change: Risk of Building Loss from Typhoon in South Korea. *Sustainability* 2020, 12, 7107. [CrossRef]

20. Kim, K.; Park, Y. Development of Design Considerations as a Sustainability Approach for Military Protective Structures: A Case Study of Artillery Fighting Position in South Korea. *Sustainability* 2020, 12, 6479. [CrossRef]

21. Leicht, D.; Castro-Fresno, D.; Diaz, J.; Baier, C. Multidimensional Construction Planning and Agile Organized Project Execution—The 5D-PROMPT Method. *Sustainability* 2020, 12, 6340. [CrossRef]

22. Lee, D.; Son, S.; Kim, D.; Kim, S. Special-Length-Priority Algorithm to Minimize Reinforcing Bar-Cutting Waste for Sustainable Construction. *Sustainability* 2020, 12, 5950. [CrossRef]

23. Palikhe, S.; Yirong, M.; Choi, B.Y.; Lee, D.-E. Analysis of Musculoskeletal Disorders and Muscle Stresses on Construction Workers’ Awkward Postures Using Simulation. *Sustainability* 2020, 12, 5693. [CrossRef]

24. Wu, I.; Lin, Y.C. Evaluation of Space Service Quality for Facilitating Efficient Operations in a Mass Rapid Transit Station. *Sustainability* 2020, 12, 5295. [CrossRef]

25. Kwon, K.; Kim, D.; Kim, S. Cutting Waste Minimization of Rebar for Sustainable Structural Work: A Systematic Literature Review. *Sustainability* 2021, 13, 5929. [CrossRef]

26. Kang, S.; Kim, S.; Lee, D. System Dynamics Model for the Improvement Planning of School Building Conditions. *Sustainability* 2020, 12, 4235. [CrossRef]

27. Kim, S.; Kim, S.; Lee, D.E. Sustainable Application of Hybrid Point Cloud and BIM Method for Tracking Construction Progress. *Sustainability* 2020, 12, 4106. [CrossRef]

28. Park, S.-S.; Ogunjinmi, P.D.; Woo, S.-W.; Lee, D.-E. A Simple and Sustainable Prediction Method of Liquefaction-Induced Settlement at Pohang Using an Artificial Neural Network. *Sustainability* 2020, 12, 4001. [CrossRef]

29. Gao, X.; Tian, W.-P.; Zhang, Z. Analysis of Deformation Characteristics of Foundation-Pit Excavation and Circular Wall. *Sustainability* 2020, 12, 3164. [CrossRef]

30. Kwon, K.; Kim, D.; Kim, S. Cutting Waste Minimization of Rebar for Sustainable Structural Work: A Systematic Literature Review. *Sustainability* 2021, 13, 5929. [CrossRef]

31. Kang, S.; Kim, S.; Lee, D.; Kim, S. Inter-Floor Noise Monitoring System for Multi-Dwelling Houses Using Smartphones. *Sustainability* 2020, 12, 5065. [CrossRef]

32. Kim, S.; Lee, D.-E.; Kim, Y.; Kim, S. Development and Application of Precast Concrete Double Wall System to Improve Productivity of Retaining Wall Construction. *Sustainability* 2020, 12, 3454. [CrossRef]