Guest editorial

Sustainable development, adaptation and maintenance of infrastructure

Background

The role of sustainable infrastructure delivery (SID), adaptation and maintenance towards achieving sustainable development cannot be ignored. Infrastructure can contribute to the socio-economic development of society both directly and indirectly through improved productivity (Neumann, 2009). SID that considers the economic, social and environmental impacts throughout the project cycle from the design stage, through construction to the operation and maintenance stages should be the new policy direction (Ostrom *et al.*, 1993).

Infrastructure refers to the traditional types such as transport networks (roads, bridges, railways, airports, etc.), the energy sector, water supply and sanitations, digital communications networks (telephone and internet) to the natural infrastructure including forest landscapes, wetlands and watershed protection. Sustainable infrastructure has been defined as "infrastructure that is socially inclusive, low carbon and climate resilient" (Bielenberg *et al.*, 2016, p. 2). Infrastructure has a crucial role towards the sustainable development agenda due to its ability to generate and sustain economic growth (Fay *et al.*, 2011), therefore delivering and maintaining infrastructure system that is robust and can adapt to climate change with minimal disruption to essential services is key. This will ensure that society delivers more efficient infrastructure with lower-emissions and resilience to the negative effects of climate change such as heatwaves, flooding, more extreme winter weather, etc. (Bhattacharya *et al.*, 2012).

It is believed that a sustainable built environment could greatly affect the realisation of the sustainable development goals (SDGs) (Opoku, 2016). The universal adoption of the 2030 agenda for sustainable development, which set out 17 SDGs, 169 targets and underpinned by 232 indicators is one major initiative towards socio-economic development globally. The delivery of sustainable infrastructure projects could greatly help with the realisation of SDG2 (End Hunger), SDG3 (Good Health & Well-Being), SDG4 (Quality education), SDG6 (Clean Water & Sanitation), SDG7 (Affordable & Clean Energy), SDG8 (Decent Work & Economic Growth), SDG9 (Industry, Innovation & Infrastructure), SDG10 (Reduced Inequalities), SDG11 (Sustainable Cities & Communities) and SDG13 (Climate Action). Maintaining sustainable and resilient infrastructure systems that can withstand floods, keep road systems and the reliability of building structures is crucial for guaranteeing essential services such as energy and water supplies (Boyle *et al.*, 2013). The paradigm shift towards a low-carbon society cannot be achieved without sustainable and efficient infrastructure that can withstand the effects of climate change.

Sustainable and resilient infrastructure can help with the global effort in tackling the effects of the climate change (Qureshi, 2016). The adoption of the Paris COP21 Agreement to tackle climate change on a global level will require the delivery of resilient infrastructure that offer minimum whole life cost. The built environment should lead the fight against climate change towards low carbon sustainable future. The UK Government's construction strategy target of reducing carbon emissions by 50 per cent by 2025 based on the 2 degree target temperature increase need to be reconsidered if the built environment can contribute significantly to the 1.5 degree future. A sustainable built environment designed with energy efficient infrastructure can contribute meaningfully to reducing the demand for energy and eventually reducing the impact of climate change. Retrofitting existing infrastructure can also increases urban resilience to disaster and

International Journal of Building Pathology and Adaptation
Vol. 37 No. 1, 2019
pp. 2-5

2398-4708
DOI 10.1108/IJBPA-02-2019-074

ensure sustainable cities and communities. Wright *et al.* (2018) argue that, the realisation of the Paris Agreement and the 2030 agenda for Sustainable Development aimed at tackling the risk of climate change impact will greatly depend on the delivery of sustainable and resilient new infrastructure.

This special issue

The theme for this special issue is "Sustainable Development, Adaptation and Maintenance of Infrastructure"; the issue presents high-quality research papers on best industry practices and case studies relating to the adaptation and maintenance of infrastructure towards sustainable development. The special issue is based on contributions from authors' response to an open call for papers; the papers went through a very rigorous double-blind review process. It started with 20 submitted abstracts through 12 full papers to 7 accepted papers for this special issue.

Sweis and Jandali present the first paper by assessing the factors affecting maintenance management performance from the perception of public and private hospitals in Amman, Jordan. The study identified 70 factors affecting maintenance management performance from literature and compared public and private sector hospitals performance using Mann-Whitney U test. The study revealed that 98.1 per cent of hospitals were implementing more improved practices than private hospitals with a percentage of 93.3 per cent. The perception of maintenance staff in both sectors regarding the factors affecting maintenance management performance varied. This study provides an original review of the factors affecting maintenance management in public and private hospitals in Amman, Jordan. The identified factors provide a useful reference to maintenance departments to improve maintenance performance and practices.

Tade *et al.*'s paper examine best practice in managing legacy drainage assets to support sustainable urban regeneration with particular attention to current reactive maintenance approach for sewers that accommodates long-term operational and town planning needs. The development of an improved sewer deterioration model provided an important tool for this. The study develops an improved sewer deterioration model using a mixed method approach to analyse a total network length of 24,252 km which represents 703,156 records of historic sewer structural condition inspection data. The research present a review of the new issues raised by intensive development, particularly for the London region, but applicable elsewhere, and how these must lead to a modified risk, and novel incentive-based approach to asset management, if the system is not to fail.

The third paper by Blay *et al.* seeks to explore the behaviours of occupants manifested to manage dampness in residential buildings using qualitative research method. Occupants in households in the northern and southern parts of England were interviewed to identify the actions, attitudes and beliefs in managing dampness. The study shows that dampness instilled attitudes such as anger, moodiness and unhappiness. The identification of these behaviours creates the awareness for occupants on their roles in managing dampness and how dampness affects their behaviours in addition to the health impact. This research also contributes to existing debates on dampness reduction specifically in residential buildings.

Myeda *et al.*'s paper focus on the impacts of adaptive reuse of historical building on museum service quality by analysing the visitor's expectations and perceptions through the HISTOQUAL model. The study collected data from two case studies using quantitative method; the results shows positive feedbacks on the level of service quality provided at both museums. This paper highlights the implications of users' feedbacks towards building usability and functions. It provided imperative findings from users' point of view relating to the services provided.

Sweis *et al.* present the results of a survey undertaken to identify and rank factors that delay the schedule of strategic industrial projects. The survey covered 40 factors identified by literature review and field investigation modified by 20 project experts using brainstorming technique to fit Iranian industrial culture. The study revealed that "sanctions" from political group, "cash flow problems" from financial group, "equipment availability and failure" from technical group, "project manager competence" from managerial group, "material procurement" from procurement group and "unqualified workforce" from human resource group were ranked as the highest contributing factors. The findings of this study are of practical use for project professionals and experts seeking to improve the schedule performance of industrial projects.

A paper by Agyekum *et al.* explores treatment mechanisms that can be used to prevent rising damp in new building infrastructure. A total of 14 test walls are constructed, conditioned, subjected to various treatments and monitored for four years. The treatments applied to the walls include the use of polyethylene damp proof courses, damp proof coatings and dense concrete bases. The walls are then monitored with reference to the two climate seasons in Ghana. The findings revealed that within the four-year period, the walls treated with the damp proof coatings, together with those with the dense concrete bases performed better than those treated with the polyethylene damp proof courses. Series of studies worldwide have been conducted in laboratories to simulate the capillary rise of water in walls of buildings. This is among the few studies that look at how water rises from actual ground conditions into the walls of buildings.

Finally, Adewumi *et al.*'s review selected neighbourhood sustainability assessment frameworks using the Bellagio STAMP with the aim of identifying areas for improvement, while also exploring the possibilities of adopting the Bellagio STAMP as a consensus approach and reference to sustainability assessment at the neighbourhood level. Findings from the study revealed that some of the selected assessment frameworks align partially with the Bellagio STAMP in their development while areas for improvement were identified. The study recommends that the Bellagio STAMP could offer helpful guidelines and procedure in conceptualising sustainability assessment at the neighbourhood level especially in developing countries where such a framework is yet to be conceived. The study adds to the sustainability assessment literature by operationalising the Bellagio STAMP leading to its better understanding and application in sustainability assessment either in practice or in theory.

Alex Opoku
The UCL Bartlett School of Construction and Project Management,
The Bartlett Faculty of the Built Environment, University College London, London, UK

References

Bhattacharya, A., Romania, M. and Stern, N. (2012), "Infrastructure for development: meeting the challenge", CCCEP, LSE, G24.

Bielenberg, A., Kerlin, M., Oppenheim, J. and Roberts, M. (2016), *Financing Change: How to Mobilize Private-Sector Financing for Sustainable Infrastructure*, McKinsey Centre for Business and Environment: McKinsey & Company, New York, NY.

Boyle, J., Cunningham, M. and Dekens, J. (2013), "Climate change adaptation and Canadian infrastructures", report for International Institute for Sustainable Development (IISD).

Fay, M., Toman, M., Benitez, D. and Csordas, S. (2011), "Infrastructure and sustainable development", in Fardoust, S., Yongbeom, K. and Sepúlveda, C. (Eds), *Post-Crisis Growth and Development*, World Bank.

Neumann, J.E. (2009), *Adaptation to Climate Change: Revisiting Infrastructure Norms*, Issue Brief No. 09-15, Resources for the Future, Washington, DC.

Opoku, A. (2016), "SDG2030: a sustainable built environment's role in achieving the post-2015 United Nations Sustainable Development Goals", in Chan, P.W. and Neilson, C.J. (Eds), *Proceedings 32nd Annual ARCOM Conference*, Association of Researchers in Construction Management, Manchester, 5–7 September, pp. 1101-1110.

Ostrom, E., Schroeder, L. and Wynne, S. (1993), *Institutional Incentives and Sustainable Development: Infrastructure Policies in Perspective*, Westview, Boulder, CO.

Qureshi, Z. (2016), *Meeting the Challenge of Sustainable Infrastructure: The Role of Public Policy*, The Brookings Institution, Washington, DC.

Wright, H., Dimsdale, T., Healy, C., Orozco, D., Williamson, S. and Mabey, N. (2018), "Sustainable infrastructure and the multilateral development banks: changing the narrative", briefing paper, Third Generation Environmentalism Ltd (E3G), London, June.