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# Elsewhere in *ICE Proceedings*

S. K. Fullalove, *Editor*

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**Design and construction of Bukit Panjang LRT, Singapore**
Y. W. Leung, J. S. Button, A. Y. Y. Yap and K. N. Ng
*Proceedings of the Institution of Civil Engineers, Bridge Engineering*, **161**, No. 2, June, 79–87, **doi**: 10.1680/bren.2008.161.2.79

The Bukit Panjang light rapid transit (LRT) system, a ground-breaking project for the Land Transport Authority of Singapore, was designed to serve as a feeder to the existing mass rapid transit network and the Bukit Panjang bus interchange. The main civil engineering elements consist of 7·8 km of twin-track elevated guideway, 14 stations and a maintenance depot with an operation control centre. The system was completed and opened to the public in November 1999. This paper discusses the design and construction of the LRT guideway, which consists mainly of precast prestressed concrete segmental box girder bridges with epoxy glued joints and internally prestressed tendons. The bridge decks are predominantly simply supported spans ranging from15 to 34m; however, a few special decks are made continuous due to stability requirements. Two overhead launching girders were employed for erecting the guideway. Due to specific site constraints and system requirements, the alignment was characterised by numerous tight curves with a minimum horizontal radius of 60 m. The geometry control method and construction equipment, such as the casting cells and the launching girders, were tailor-made in order to tackle the unconventional situation. Some operation and maintenance aspects of the system are also covered in this paper.

**Air link: building London's elevated light-rail extension**
A. Alder, J. Best, A. Sharpe and J. Cronje
*Proceedings of the Institution of Civil Engineers, Civil Engineering*, **161**, No. 2, May, 87–95, **doi**: 10.1680/cien.2008.161.2.87

The Docklands Light Railway in London has been extended to London City Airport, providing an essential public transport connection between the airport and the London Underground rail network. This paper describes the design and construction of the challenging 4·4 km, twin-track extension—two-thirds of which had to be built above congested urban space on a viaduct—and its four new stations. The viaduct typically consists of post-tensioned concrete segments with span lengths of up to 37 m, with three longer spans being built using the balanced-cantilever method.

**Engineering civilisation from the shadows**
P. Jowitt
*Proceedings of the Institution of Civil Engineers, Civil Engineering*, **161**, No. 4, November, 162–168, **doi**: 10.1680/cien.2008.161.4.162

This paper discusses the key issues, opportunities and obligations facing civil engineers to engineer civilisation from the shadows cast by world poverty and global climate change. Almost all of the 1·5billion population increase occurring by 2025 will be in urban slums in the developing world, with little in the way of civil infrastructure to protect them from disease, famine, drought and flooding. The provision of effective infrastructure, and with it the delivery of the UN millennium development goals, is vital if they are to survive. The paper is based on the author's ice Brunel international lecture, which was presented in 16 countries during 2007.

**Heathrow Terminal 5: gaining permission**
R. Pellman
*Proceedings of the Institution of Civil Engineers, Civil Engineering*, **161**, Special Issue 1—Heathrow airport Terminal 5, May, 4–9, **doi**: 10.1680/cien.2008.161.5.4

When Terminal 5 at London's Heathrow airport opened on 27 March 2008, it was almost 23 years since the publication of the 1985 Airports Policy White Paper that had encouraged its development. This paper explains the challenges inherent in trying to deliver a major infrastructure project through the UK planning system, and describes how the absence of clear and updated government policy contributed to the record 525 days spent at the planning enquiry before consent for the £4·3 billion airport expansion could be granted. It also recognises that the project involved issues of national importance that affected many thousands of people, particularly those living under the flight paths.

**Generation and alleviation of sonic booms from rail tunnels**
A. E. Vardy
*Proceedings of the Institution of Civil Engineers, Engineering and Computational Mechanics*, **161**, No. 3, September, 107–119, **doi**: 10.1680/eacm.2008.161.3.107

The origins of sonic booms emitted from railway tunnel portals are described, and simple design expressions are provided to

enable their amplitudes to be estimated, especially for the common case of relatively short tunnels. The paper is targeted primarily at designers wishing to make initial assessments without any need for specialist software or specialist expertise. However, many references are provided to sources of more advanced information. It is shown why the amplitudes of the disturbances tend to increase with tunnel length in the case of slab-track tunnels, but to decrease with length in the case of ballast-track tunnels. The potential effectiveness of various remedial measures is described, especially at tunnel entrances and exits. Some remedial methods would also improve comfort levels for passengers on trains in tunnels, but this is largely fortuitous because the sonic boom effect is influenced primarily by rates of change of pressure whereas passenger comfort is influenced primarily by absolute changes in pressure.

**Transforming impact assessment for sustainable development and poverty eradication**
T. J. Downs
*Proceedings of the Institution of Civil Engineers, Engineering Sustainability*, **161**, No. 1, March, 39–53, **doi**: 10.1680/ensu.2008.161.1.39

Sustainable development and poverty eradication are global challenges that require a systematic, transformative approach for action on the ground, with enhanced environmental impact assessment (EIA) at its core. Traditional EIA has been criticised for being a top-down regulatory method biased in favour of the sponsor of a development action. The purposes of this paper are to describe how to transform EIA into a process that enables sustainable development and poverty eradication, and to stimulate much-needed dialogue among engineers, scientists and policy makers. The paper argues for the synthesis of four components to create a new approach: (a) an adaptive social learning process at the core for multi-stakeholder assessment, planning, implementation and monitoring; (b) a trans-disciplinary, knowledge-partnership, systems-based approach to assessment that identifies priority problems and drivers using risk and vulnerability theory; (c) multi-criteria sustainability assessment of alternative solutions that makes socio-political, cultural, economic and ecological trade-offs transparent; and (d) integrated capacity building to sustain the target solution. Deductive reasoning based on empirical evidence from case studies and a literature review supports the argument.

**A comparative analysis of two building rating systems. Part 1: Evaluation**
R. A. Fenner and T. Ryce
*Proceedings of the Institution of Civil Engineers, Engineering Sustainability*, **161**, No. 1, March, 55–63, **doi**: 10.1680/ensu.2008.161.1.55

Buildings are responsible for a significant proportion of world energy usage, raw material consumption, fresh water withdrawals, carbon dioxide (CO2) emissions and municipal waste production. In recognition of these problems, buildings are increasingly being procured through green design principles, and a number of tools have been developed to evaluate their environmental performance. This paper compares the two most widely adopted schemes—the UK Building Research Establishment Environmental Assessment Method (Breeam) and the international Leadership in Energy and Environmental Design (Leed), as implemented by the Canada Green Building Council. The nature and limitations of these kinds of building rating systems are discussed and their performance is analysed by considering the way credits are allocated, their ability to be customised, the complexity involved in the assessment process and the accessibility of the information they generate. The paper indicates some limitations in current practice. Emerging trends that will shape the development of future building rating systems are discussed.

**A comparative analysis of two building rating systems. Part 2: Case study**
R. A. Fenner and T. Ryce
*Proceedings of the Institution of Civil Engineers, Engineering Sustainability*, **161**, No. 1, March, 65–70, **doi**: 10.1680/ensu.2008.161.1.65

The results of an assessment of a building incorporating a number of sustainability features using two different building rating systems (the UK Building Research Establishment Environmental Assessment Method (BREEAM) and the international Leadership in Energy and Environmental Development (LEED), as developed by the Canada Green Building Council) are described. The building scored well under both systems, although the credits achieved were more equally distributed in the Leed Canada assessment than under Breeam. A number of differences between the schemes are highlighted; the categories achieving the highest percentage credits under both tools were water, energy and occupant health. The paper concludes that, while the two schemes may differ in name, applications style and ranking mechanisms, the tools are more similar than dissimilar and provide broadly comparable assessments.

**Application of sustainability indicators in decision-making processes for urban regeneration projects**
D. V. Hunt, D. R. Lombardi, C. D. Rogers and I. Jefferson
*Proceedings of the Institution of Civil Engineers, Engineering Sustainability*, **161**, No. 1, March, 77–91, **doi**: 10.1680/ensu.2008.161.1.77

Birmingham Eastside, an area of 170 ha, is located to the eastern side of Birmingham's city centre in the UK. Over a 10-year period this once-deprived inner city area is being regenerated through public and private finance estimated at £6 billion. The regeneration scheme is bringing about changes to the local environment, economy and society. The key players (e.g. landowners, developers and planners) involved in the decision-making processes for Eastside have the power to see that these changes are brought about in a more sustainable manner. To achieve this it is necessary to assess in which direction the development should go, and to provide benchmarks for implementing and measuring sustainable changes along the way. The process can be facilitated by the use of sustainability indicators, of which there are many. This paper outlines a variety of sustainability indicators (e.g. Spear, Breeam, sustainability checklists and other benchmarks), including those used within the decision-making processes for Eastside. In particular, it details those indicators operating at city level, quarter level and then individual development site level. Several case study sites are included (Masshouse, City Park Gate, the learning and leisure quarter, the new technology institute and Warwick Bar). The paper discusses the role of indicators in achieving a more sustainable development (SD). The development timeline framework (DTF) is used to analyse

how and when indicators have formed an integral part of the decision making process for various sites in Eastside. The responsibility for implementing SD and the role of participation are discussed and generic lessons learned for the application of indicators, including aspects of timing, are set out.

**Fit for purpose: evaluating walkability**
S. Reid
*Proceedings of the Institution of Civil Engineers, Engineering Sustainability*, **161**, No. 2, June, 105–112, **doi**: 10.1680/ensu.2008.161.2.105

This paper describes the challenges associated with assessing the quality of pedestrian networks and facilities, in particular the diverse nature of pedestrians and their sensitivity to subjective influences. It describes the ways in which those challenges were addressed during development of the pedestrian environment review system (PERS) by the Transport Research Laboratory (TRL). The paper describes PERS and gives examples of its application and use to conduct pedestrian network quality analysis. The benefits and limitations of the approach and lessons learnt in applying pedestrian reviews are discussed in a number of contexts. The paper concludes that the diversity of pedestrian capabilities and purposes in the public realm requires that subjective factors be incorporated into a review system; this, however, poses substantial difficulties for an objective and replicable review system.

**Sustainability of land remediation. Part 1: overall analysis**
M. J. Harbottle, A. Al-Tabbaa and C. W. Evans
*Proceedings of the Institution of Civil Engineers, Geotechnical Engineering,* **161**, No. 2, April, 75–92, **doi**: 10.1680/geng.2008.161.2.75

A comparative assessment was carried out of the technical and environmental sustainability of five different contaminated land remediation projects completed in the UK between 1997 and 2002. The remediation technologies employed were in situ stabilisation/solidification, soil washing, ex situ bioremediation, cover system and excavation, and disposal to landfill. A further objective of the assessment was to highlight areas of sustainability concerns for the individual technologies and projects. The assessment is based around four principal criteria defined by the authors. Each project was assessed using both an overall multi-criteria analysis, detailed in this paper (Part 1), and a study of the detailed impacts on an individual project basis, detailed in Part 2.

**Crossrail**
M. Gannon
*Proceedings of the Institution of Civil Engineers, Management, Procurement and Law*, **161**, No. 2, May, 45–46, **doi**: 10.1680/mpal.2008.161.2.45

Crossrail, one of Europe's largest infrastructure projects, received royal assent on 22nd July 2008. Construction of Crossrail is forecast to start in 2010 and become operational in 2017. This mega rail project is expected to provide a significant boost to the UK's economy in terms of direct and indirect employment benefits. The scheme has taken nearly a decade to achieve this significant milestone having had its private bill rejected in the early 1990s. The UK's central government has at long last provided 'genuine' political support and commitment to Crossrail, a critical factor during planning that is essential despite the scheme having a technically robust business case.

**Sustainable construction and UK legislation and policy**
H. Waddell
*Proceedings of the Institution of Civil Engineers, Management, Procurement and Law*, **161**, No. 3, August, 127–132, **doi**: 10.1680/mpal.2008.161.3.127

This paper provides a brief overview of why sustainability has become important and will continue to influence construction and engineering practices. It takes a brief look at current UK legislation and government policy relating to sustainability, future proposed legal reforms and the risks of non-compliance. The paper will highlight the importance of adopting approved practice now. Legal and political reforms will affect the way in which buildings are designed and constructed and will also provide new business opportunities for the construction and engineering industry, so it is important for businesses to plan ahead. Legal and political measures will not be the only factors influencing the sustainable practices of the construction and engineering industry. The paper will also briefly consider other such factors, including corporate social responsibility, market forces, funding and taxation. Although the paper concentrates on measures in the UK, it also notes that the sustainability of buildings is a global issue.

**Political risk in light rail transit PPP projects**
N. J. Smith and M. Gannon
*Proceedings of the Institution of Civil Engineers, Management, Procurement and Law*, **161**, No. 4, November, 179–185, **doi**: 10.1680/mpal.2008.161.4.179

Since 2003 public–private partnerships (PPPs) have represented between 10 and 13.5% of the total investment in public services in the UK. The macro-economic and political benefits of PPPs were among the key drivers for central government's decision to promote this form of procurement to improve UK public services. Political support for a PPP project is critical and is frequently cited as the most important critical success factor. This paper investigates the significance of political support and reviews the treatment of political risk in a business case by the public sector project sponsor for major UK-based light rail transit PPP projects during their development stage. The investigation demonstrates that in the early project stages it is not traditional quantitative Monte Carlo risk analysis that is important; rather it is the identification and representation of political support within a business case together with an understanding of how this information is then used to inform critical project decisions.

**Advancing sustainable urban development in China**
J. H. Wang, A. Koizumi and X. Liu
*Proceedings of the Institution of Civil Engineers, Municipal Engineer*, **161**, No. 1, March, 3–10, **doi**: 10.1680/muen.2008.161.1.3

Chinese urban life is improving rapidly in line with the country's economic growth. However, public services are not able to meet the needs of the improving urban life due to insufficient urban infrastructure. How to provide good public services is a question that needs to be considered further, as well as how to continue sustainable urban development in China. This paper examines the current state of urban development and investment conditions in China. The characteristics of urban infrastructure construction and the associated problems are also investigated. Considering the

conditions of urban development in China and similar experiences worldwide, the utilisation of underground space for urban infrastructure construction is suggested as the main direction for sustainable development. Underground utilities, utility tunnels and stormwater systems are recommended for rationalising urban infrastructure construction and city flood prevention, as well as for providing new water resources. In addition, general strategies are proposed for sustainable urban development. If underground space is effectively utilised and general strategies implemented, public services can be improved rapidly and sustainable urban development can be realised for all cities in China.

**A road safety management system for medium-sized towns**

C. G. Carvalheira and L. Picado-Santos

*Proceedings of the Institution of Civil Engineers, Municipal Engineer*, **161**, No. 2, June, 111–116, **doi**: 10.1680/muen.2008.161.2.111

Of all the EU countries, Portugal has one of the highest rates of fatalities and injuries per 1000 inhabitants as a result of road accidents. Most (60%) of the accidents involving personal injury occur in urban areas. The main reason for this is the chaotic road environment, resulting in complete confusion for vulnerable road users and vehicles. All users need a road network that they can better understand. A road safety management system has been developed in Coimbra, which is a medium-sized Portuguese town of 200 000 inhabitants. The system is basically a road accidents database that is linked to the road network model, the main piece of the geographical information system used to track road accidents. After identification of accident accumulation spots, infrastructure treatment is prioritised by the use of a 'risk index' for each site. Each spot is audited, focusing mainly on road layout and signs. As a result, low-cost countermeasures can be proposed to city councils as away of reducing road accidents. The paper describes the relevant features of all the procedures and presents results for two spots, with a before/after effectiveness analysis.

**Finding safe routes to school using optimisation methods**

P. Wackrill and C. Wright

*Proceedings of the Institution of Civil Engineers, Municipal Engineer*, **161**, No. 2, June, 117–127, **doi**: 10.1680/muen.2008.161.2.117

Encouraging children to walk to school has become an important issue. Government agencies are therefore keen to reduce child pedestrian casualties associated with the school journey. One way forward is to provide each catchment area with a system of designated routes that minimise road accident risk for pupils on foot. However, there is no accepted modelling procedure for identifying safe routes. This paper reviews the obstacles and assesses the potential for ad hoc solution methods, using the road network surrounding a primary school in north London as a test bed. Solutions close to the optimum were obtained by transforming the network to a simpler form and by modifying the objective function, which effectively linearised the problem. This paper assesses the sensitivity of the results to various assumptions and uncertainties in the data, and concludes with a brief comment on the prospects of finding safe routes on a routine basis at local authority level.

**Dweller perception using fuzzy logic for slum upgrading**

O. B. Moraes and A. K. Abiko

*Proceedings of the Institution of Civil Engineers, Municipal Engineer*, **161**, No. 3, September, 151–161, **doi**: 10.1680/muen.2008.161.3.151

A large number of initiatives in cities in Brazil—including slum clearance and upgrading—have been undertaken over the years in an effort to ameliorate the problems arising from informal occupation; unfortunately, however, little is known about the related performance outcomes. Careful appraisal of the results of such initiatives is thus called for, covering evaluations of dwellers' perceptions of the upgraded environments. Among the available evaluation methods, post-occupancy evaluation (POE) is commonly employed, although it fails adequately to reflect prevailing subjective concepts of quality. The present paper contains the partial findings of a research exercise aimed at developing an original method, using fuzzy logic, for urban environmental quality evaluation in informally occupied areas on the basis of combining quantitative indicators and dweller perception. It combines POE with fuzzy logic in order to develop tools that can better model the uncertain information that emerges from that kind of study. This paper aims to introduce an uncertainty measure used in order to identify the strengths and weaknesses of slum upgrading projects. The results show that it is possible to quantify certainty degrees in the findings and to define if additional information is needed.

**Socio-environmental impact of Cairo Metro line 2**

O. W. Massoud

*Proceedings of the Institution of Civil Engineers, Municipal Engineer*, **161**, No. 3, September, 175–182, **doi**: 10.1680/muen.2008.161.3.175

The impact of metro projects cutting through densely populated metropolises in developing countries on local communities and inhabitants is investigated. Cairo Metro line 2 is used as a case study. The Egyptian capital is a populous metropolis and the only African and Arab city to operate a fully fledged metro system. This paper aims to determine the socio-environmental impact of the Cairo Metro project and to identify measures to mitigate this impact. Face-to-face structured interviews were conducted with local people living and working close to the project and semi-structured interviews were conducted with a senior official from the client organisation and a senior manager from the contractor organisation. Quantitative and qualitative analysis of the interviews gives insight into the actual socio-environmental impact of the project on those living and working close by, including loss of business and fear for the structural safety of homes. The analysis also reveals some locally conceived ideas to mitigate this impact and a need to engage with local authorities and decision makers.

**Improving and optimising road pricing proposals for Copenhagen**

M. K. Larsen and O. A. Nielsen

*Proceedings of the Institution of Civil Engineers, Transport*, **161**, No. 3, August, 123–134, **doi**: 10.1680/tran.2008.161.3.123

The question whether to introduce toll rings or road pricing in Copenhagen has been discussed intensively during the last 10 years. The main results of previous analyses are that none of the systems would make a positive contribution at present,

when considered from a socioeconomic view. Even though quite a number of proposed charging systems have been examined only a few pricing strategies have been investigated. This paper deals with the optimisation of different designs for a road pricing system in the Greater Copenhagen area with respect to temporal and spatial differentiation of the pricing levels. A detailed transport model was used to describe the demand effects. The model was based on data from a real test of road pricing on 500 car drivers. The paper compares the price systems with regard to traffic effects and generalised costs for users and society. It is shown how important it is to evaluate different temporal and spatial charge settings for a given road pricing system. In particular, the kilometre-based system could be considerably improved. By optimising the system it became profitable with regard to generalised user costs. However, even though the best toll ring could be considerably improved, it did not reach break-even with regard to generalised user costs.

**Cambridge's experience of road user charging: lessons learned**
S. Ison, G. Hughes and R. Tuckwell
*Proceedings of the Institution of Civil Engineers, Transport*, **161**, No. 3, August, 135–141, **doi**: 10.1680/tran.2008.161.3.135

In the early 1990s Cambridgeshire County Council considered the implementation of a road user charging scheme for the city of Cambridge, UK. This involved the trial of a congestion metering scheme, a form of road user charging. Cambridge presented an ideal opportunity for the implementation of a road user charging scheme not least in terms of its congestion problem, the free-standing nature of the city and the fact that at the time, the local authority in the form of the council was sympathetic to the objectives of road user charging. The scheme did not, however, proceed and many reasons have been put forward as to why this was the case—issues such as not all the alternatives having been exhausted, the level of sophistication of the proposed scheme and the lack of a similar scheme to consider elsewhere. Fifteen years later, Cambridgeshire is once again considering the whole issue of road user charging. As such, the aim of this paper is to assess how the authority is proceeding this time round: what type of technology is being considered; how the politicians are presenting the concept to the local population and what are they doing differently from the first time round, in terms of consultation; and most importantly, what provision for alternative means of transport will be made and how this relates to the potential success of any road user charging scheme? The paper aims to conclude on what lessons can be learnt in terms of other cities considering the implementation of a road user charging scheme.

**Congestion charging in Dublin**
M. Rogers and C. Eagney
*Proceedings of the Institution of Civil Engineers, Transport*, **161**, No. 3, August, 143–147, **doi**: 10.1680/tran.2008.161.3.143

As Dublin, Ireland becomes more congested, the option of imposing a charge for access to central Dublin at peak times has become a realistic option. This paper outlines, in brief, the history of Dublin transportation planning that has led to this point, lists the alternative number of demand management tools which potentially could be used to limit demand for private car travel to the city centre with the implementation of a congestion charge being an option which would be particularly applicable to Dublin city. Estimates of the willingness of road users in Dublin to pay such a charge are put forward. The Dublin Transportation Office's Transportation Model is used to quantify the effect of different congestion charges on car usage into Dublin city centre at peak times. Effective implementation of such a measure is only seen as taking place within the context of improved public transport services within central Dublin.

**Citizens, consumers and the acceptability of road pricing**
D. Halden
*Proceedings of the Institution of Civil Engineers, Transport*, **161**, No. 3, August, 149–154, **doi**: 10.1680/tran.2008.161.3.149

Although road pricing has been shown to provide overall benefits to both the economy and society, widespread public acceptance has remained elusive. By drawing from recent transport research, this paper analyses the conflicts which people face between their desire to be good citizens and their aspirations as consumers. It also shows how evolving social attitudes and consumer behaviour create new opportunities for the delivery of publicly acceptable approaches to road pricing. These approaches could also support emerging carbon trading markets. The debate on the acceptability of road pricing has been dominated by the conflict of views between proponents of schemes and opponents of the principle. There is much greater potential for scheme promoters to target delivery at consumers who support road pricing. Incremental growth in road pricing markets can then allow acceptance of road pricing and its delivery to proceed in tandem.

**How to design effective road pricing cordons**
S. Shepherd, A. May and A. Koh
*Proceedings of the Institution of Civil Engineers, Transport*, **161**, No. 3, August, 155–165, **doi**: 10.1680/tran.2008.161.3.155

This paper describes three approaches to cordon location design, a judgemental approach, an optimisation approach based on genetic algorithms and a short-cut approach which lies between the two. The genetic algorithm optimal single cordon generated benefits that were 80% higher than the best judgemental cordon for a simplified network of Edinburgh. The short-cut approach was developed from an observation that charging on only a few of the highest marginal cost links could result in a high proportion of the system optimum or first-best benefits. Initial results for Edinburgh and York have shown that the approach can achieve 93% of the genetic algorithm optimal cordon benefits with only a few model runs in the case of Edinburgh.