A BASIX TOOL FOR ENVIRONMENTAL ASSESSMENT OF RESIDENTIAL BUILDINGS – AN AUSTRALIAN APPROACH

Grace K C Ding and Goran Runeson

School of the Built Environment, University of Technology, Sydney, PO Box 123, Broadway, NSW 2007, Australia

The rapidly growing population in New South Wales (NSW) is the driving force behind the growth in new housing. The environmental impact in terms of land use, energy and resource consumption will significantly impede the supply of new housing. In NSW, sustainable housing has become an important focus of the government's housing policy. In response to the need for sustainable housing, the government launched a sustainability assessment tool called BASIX in July 2004 to assess and establish indoor thermal comfort, water and energy efficiency targets, and sustainability levels. The introduction of BASIX has had a profound impact on the construction industry. In order to ascertain the extent of impact, an online survey was conducted among construction professionals in NSW in March 2006. The tool has played a significant role in providing a general guideline for the sustainability performance of proposed developments. It serves as a means to make people think about water and energy saving initiatives, and to encourage good design practice without excessive additions to the cost of a new building. However, there is the opinion that there is more to be done such as control of waste and energy usage in the manufacturing of building materials.

Keywords: sustainability, performance evaluation, environmental impact, sustainable building.

INTRODUCTION

Global economic growth has increased the overall demand on energy and other resources. Unless the demand reduces significantly, resource scarcity will become a major issue in the international market and a major threat to the survival of the planet (IEA 2006). In response to the global environmental problems, the Kyoto Agreement was signed in 1990. The agreement requires countries to reduce greenhouse emissions by an average of 5% below their 1990 levels from 2008 to 2012 (McGovern 2006).

Buildings are major contributors to the environmental deteriorations and are uncaring to the environment (Levin 1997; Kein *et al*. 1999). Buildings consume approximately 30%, 10% and 40% respectively of the world's resources, water and energy (OECD 2003). Indeed, the construction and property industries have significant irreversible impacts on the environment across a broad spectrum of off-site, on-site and operational activities that alter the ecological integrity (Uher 1999). Sustainable housing has found its place in the construction industry. Local and international authorities have put environmental issues of housing development high on their agenda. The European Union will implement stricter regulations as well as financial incentives to promote sustainability in the housing sector. In other regions, similar initiatives have been introduced (IEA 2006).

The population in Australia is predicted to rise from 20 million in 2005 to 25 million in 2021 (Australia Bureau of Statistics 2005), and continue to create demand for new housing. According to the Department of Infrastructure, Planning and Natural Resources (DIPNR), currently a new dwelling is built every 14 minutes in the state of New South Wales (NSW). The increasing demand for new dwellings will no doubt increase the effect on the environment and sustainable housing has become a main focus of the government's housing policy (DIPNR 2004a). In terms of sustainability and environmental performance, these new houses were no different from houses built in the previous decade. In response to the need for sustainable housing, the NSW government therefore launched a sustainability assessment tool called BASIX in July 2004 to assess and establish indoor thermal comfort, water and energy efficiency targets and sustainability levels.

This paper provides an overview of the importance of sustainable housing in NSW and discusses the introduction of BASIX as the first government-implemented environmental assessment tool in Australia. This paper is based on an online questionnaire survey undertaken in March 2006 in NSW. The survey reviews the impact of BASIX in the construction industry since its introduction in July 2004. This paper also discusses the principles of BASIX, its implementation and its affect on sustainable housing in NSW.

BASIX – THE SUSTAINABILITY ASSESSMENT TOOL

Definition of sustainable housing

In recent years, a growing number of sustainable housing projects have been completed and sustainable construction is increasingly becoming part of the common building practice. Sustainable housing was one of the issues addressed in the United Nations Conference on Environment and Development at the Earth Summit in Rio de Janeiro in 1992 (Li and Shen 2002). Bhatti (2001) states that sustainable housing can make major contributions towards our environmental future. The methods by which housing is produced, consumed and managed, and the way it contributes to social and cultural life, have major impacts on the environment.

The issue of how housing can be made more sustainable has become a main focus of the government in Australia in relation to minimizing adverse effects on the natural environment (Gurran 2003; Department of Planning 2005). The purpose of sustainable housing is to raise the standard of living and to offer an opportunity for people to have a decent home, to enhance social unity, well being, economic growth and social improvement without adverse environmental impacts. Sustainable housing affects not only the fabric of buildings but also the social and environmental context of construction practices.

Due to population growth, the houses constructed during the next 15 years will form a considerable part of the future housing stock and there is therefore an important opportunity to improve the environmental performance of housing. Conventional housing construction has a far higher environmental impact than have new methods. Housing development is just as important as any other type of construction. The environmental impact of an individual house may be minimal but the construction of all houses together will make a significant impact on the environment. Continuous improvements are required to reduce the environmental impact of housing.

There is an increasing recognition that buildings cannot be designed without consideration for social impact (Cole 1999). Sustainable housing construction, as

defined by Klunder (2004), reduces the environmental impacts of material use, energy and water consumption during the whole service life of the building. IEA (2006) further discusses how sustainable housing can be achieved in three main aspects:

- Low impact – preservation of global environment.
- High contact – harmony between the house and the environment.
- Health and amenity – health and pleasant living.

From this viewpoint, a sustainable house is characterized by futurity and equity issues which aims to ensure that everyone today and the generations to come have a decent place to live and one that is cheaper to run than most existing homes. In addition to considering land use, orientation, shadows and light, our concerns need to focus on the long-term costs: social, environmental and economic. Environmental impact depends on the population size, the average prosperity per person, and the environmental impact per unit of prosperity (Klunder 2004). In sustainable housing construction, the concept of eco-efficiency is important and implies that a reduction in the environmental impact of housing construction can be undone by trends such as an increase in the average size of houses, or a decrease in the average number of persons per house (Ding 2004; Klunder 2004).

Sustainable housing will be a growing part of the housing industry, making it a business opportunity waiting to be explored. There are multiple advantages to sustainable housing. Sustainable housing directly brings energy cost savings to owners. The lower energy consumption during the operating period contributes significantly to saving energy bills in the long run and will further save energy cost if energy prices continue to increase in the future. According to DIPNR (2004b), for the first 10 years after the introduction of BASIX, there will be accumulative saving of 9.5 million tonnes of greenhouse gas emissions, which is equivalent to removing 2.6 million cars from the roads. As compared to conventional housing, energy saving for sustainable housing can be as high as 75% with a payback period within two years (IEA 2006).

Other non-energy benefits include better indoor air quality, more marketability, reducing global warming and better living quality. Based on research in New Zealand and the USA in 2004, the non-energy benefits are more than twice as much as the energy savings (IEA 2006). Sustainable housing helps to address more directly social, economic and ecological realities. They also help to set up benchmarks for future projects as examples of best practice by moving into a social and ecological market of housing (Crabtree 2005).

Significance of BASIX in sustainability assessment of housings

Local governments in NSW have advocated sustainability in housing development for a long time (Department of Planning 2002). However, each local authority has its own environmental assessment measures in local planning tools, which vary greatly across the state. Some local authorities may be more pro-active than others, while some are still struggling to develop a single tool. The inconsistencies have caused frustration within the construction industry.

The rapid population growth in NSW has caused increasing demand for new dwellings with significant impact on water and energy consumption (Standing Committee on Public Works 2004). Design characteristics of individual homes can have a dramatic effect on the environment as well as water and energy use. For new

homes, local government can specify design features including the use of insulated roof and external walls, sun shading and energy efficiency designs via its development approval powers (Department of Planning 2002).

BASIX was developed in response to the need for local governments to address these issues. BASIX was the first integrated web-based sustainability planning and assessment tool (http://www.sustainability.nsw.gov.au for full details on the BASIX assessment for new buildings as well as additions and alterations.). It was developed by DIPNR in consultation with industry and councils and is now a mandatory component of the development approval process in NSW under the Environmental Planning and Assessment Act 1979, through the Environmental Planning and Assessment Regulation 2004 and State Environmental Planning Policy.

BASIX is designed to provide a systematic assessment of the sustainability components of residential development, including regional sensitivity where appropriate and as a means of raising the awareness of sustainability in construction (Department of Planning 2002). BASIX measures energy efficiency in homes along with measuring other sustainability factors such as water usage and thermal comfort. BASIX assists councils, architects, builders and developers to standardize development practices in areas such as water, energy and land use. BASIX simplifies and improves the planning process and provides an easy and effective tool to enhance better sustainability outcomes in residential development. It also assesses the potential performance of residential developments against a range of sustainability indices. (In order to complete an assessment, log on to BASIX website at www.sustainability.nsw.gov.au and the website provides details of the proposed development as prompted by the BASIX tool. The project is assessed against the existing average and given a score. The project must demonstrate a reduction of 40% mains water and 40% energy to qualify for a BASIX certificate.)

It was first introduced in July 2004 with the aim to reduce water consumption by dwellings by 40% and energy use by 25%. In July 2005, it was applied to all new residential developments in NSW including new houses, dual occupancy and apartment buildings. In July 2006, BASIX has increased the energy reduction target to 40% and since October 2006 BASIX has become mandatory to alterations and additions to residential development across NSW.

SUSTAINABLE HOUSING – ASSESSING THE IMPACT OF BASIX

Research method

BASIX has been a mandatory requirement for development approval for all residential projects in NSW for over two years and yet no attempts have been made to ascertain its impact in the construction industry. In order to examine the impact of BASIX in promoting sustainability in residential developments, an online questionnaire survey was undertaken to investigate its role and impact. The survey was designed and distributed online so that it could obtain a wider coverage and provide a quick and easy platform for the return of the completed survey. The purposes of the survey were to examine the level of acceptance of BASIX since its introduction in July 2004 and to explore the role of BASIX in the construction industry in enhancing sustainability in residential developments. The survey also assesses the impact of its implementation as mandatory to development application for residential projects.

The questionnaire was divided into three parts. The first part was intended to obtain general details of the respondents and contains four questions. Information about the demographics of respondents and details of their professions and organizations are the main outcomes of this part. Part two was intended to obtain the viewpoint of respondents in respect to their understanding and acceptance of the tool, and it contains nine questions. The questions were designed as a standard Likert scale where respondents were asked to rate each questions from low to high or from strongly disagree to strongly agree. Part three contained 16 questions and was designed to identify the level of expertise the respondents have in the operation of the tool. The questions in this part were also on a standard Likert scale similar to the questions in Part two.

The online survey was assisted by the Association of Building Sustainability Assessors (ABSA) and Timber Development Association (TDA) in distributing the survey to their members. The anonymous questionnaire was sent to ABSA and TDA as well as to 85 practitioners in the construction industry in NSW via email with a URL containing the online survey in March 2006. Many participants also forwarded it to URLs of other practitioners in the industry. Therefore it was difficult to determine the exact response rate. At the end of May, 120 completed questionnaires had been received via online.

Observations and analysis

Generally

Of the 120 returned surveys, 80% were from male respondents. Although females are seriously under-represented, this is not surprising as construction has always been a male dominated field. Therefore, the survey results may predominantly represent opinions from male building professional but this should not have a significant impact on the outcomes. Approximately 40% of the participants have over 10 years work experience.

Respondents came from a variety of background. The design consultants and sustainability assessors contributed 56% and 24% respectively of the total returned questionnaires whilst the remaining 21% of the respondents were distributed amongst contractors/sub-contractors, project managers, developers and others. The sustainability assessors comprise of 89% of BASIX assessors and 11% of the energy assessment assessors. The design consultants are the main users for the tool and the participation of BASIX assessors can offer important feedback and opinions on the impact of BASIX in the construction industry due to their knowledge and expertise in the tool.

Approximately 85% have used BASIX before and 15% have not used it so far. Of the 85%, approximately 62% have used BASIX up to 15 times since its introduction, 11% between 15 to 35 times and 27% have used it more than 35 times. Approximately 46% of the respondents found out about BASIX from its website and 21% from BASIX consultants, 20% from company internal information and 13% from local councils. The BASIX website has fulfilled its original purpose in promoting the tool and providing information for its application.

The use of BASIX in the construction industry

Since the introduction of BASIX in July 2004, there have been substantial discussions about increased construction cost and time for development approval. However, the impact is yet to be ascertained. On one hand the mandatory use of BASIX in the development application process has created a new role of BASIX assessors and it

will be one of the fastest developing services in NSW and may be throughout Australia in the near future. On the other hand, the design consultants and developers have been busy learning to use BASIX as it was designed for self-assessment on the internet.

Part two and three of the online survey were designed to obtain opinions and feedback from professionals in the industry with regards to the introduction of BASIX and the results are summarized in Table 1. The questions were designed using a standard Likert scale from strongly disagree to strongly agree.

Table 1: Summary of impact of BASIX in the construction industry

Proposition	Responses (%)				
	Strongly Disagree	**Disagree**	**No Opinion**	**Agree**	**Strongly Agree**
Online assessment tool is user friendly	6	21	13	55	6
Online help note is useful	3	13	14	58	12
BASIX helpline is useful	8	9	33	42	8
The resources on the BASIX website are sufficient	11	31	18	38	2
The 40% water target is achievable	8	15	7	58	11
The 25% energy target is achievable	3	14	3	64	16
The thermal comfort target is achievable	7	19	7	57	11
BASIX can help to provide better sustainability outcomes in residential development	12	10	6	56	16
BASIX has increased the overall construction cost	2	8	6	37	48
BASIX has increased the overall time for development application	2	20	36	27	15
BASIX should be applied to other types of construction	22	20	11	32	15
BASIX should be applied throughout Australia	17	8	19	37	19

Based on the returned surveys, the professionals in the construction industry are generally well aware of the importance of BASIX in the development of residential projects. The survey results indicate that 47% of the respondents (not including BASIX assessors) undertook BASIX assessment for the projects themselves, 15% engaged BASIX consultants and 13% used both. The results indicated that BASIX have been widely used by practitioners in the industry and has been successful for its ultimate purpose of self-assessment. Making the tool accessible via the internet has been successful and widely accepted. People can access the site anywhere in the world at any time at no cost. It is not like other energy assessment tools such as NatHERS that requires an accredited assessor and constant updates. The free access and self-assessment are the main features of BASIX that have contributed to the success of its implementation.

BASIX is regarded as user friendly and the resources are sufficient either on the online help notes or the helpline (see Table 1). Approximately 47% of the users that had assessed their projects themselves without engaging a consultant found the structure of the tool clear and 61% found it user friendly. However, some respondents consider the tool too simple and insufficient to capture sufficient sustainability issues.

With regards to the online resources, 70% and 50% found the online help notes and the helpline respectively useful in answering queries on the assessment tool (see Table 1). The helpline is arranged to provide support when needed but only 50% agree that the helpline has provided sufficient support to the use of the tool. Relating to the resources on the website, 40% agree that the resources on the website were sufficient

whilst 42% disagree (see Table 1). However, there is no indication to the type of resources that are missing from the website.

With regards to assessment criteria, 72% believe that BASIX can help to provide better sustainability outcomes in residential developments (see Table 1). The majority of respondents found the assessment criteria of thermal comfort, a 40% reduction in water and 25% reduction in energy consumption achievable (see Table 1). After the survey was completed, in July 2006, the energy target was increased to 40%. There is no information as yet about whether the new target of 40% reduction in energy consumption is achievable and further investigation in this area will be undertaken later. Some respondents worry that they may struggle to achieve the 40% energy saving targets. Others also suggest that embodied energy needs to be addressed in the manufacturing process of building materials and components as well as the on-site process.

As discussed earlier BASIX has impacted on the overall construction cost as additional elements such as sun shadings, insulations to walls and ceilings, water tanks for recycling storm water and so on are required in order to satisfy the requirements. With reference to Table 1, approximately 85% of the respondents agree that the implementation of BASIX has increased the overall construction cost of residential developments by about 10%, which is different from the DIPNR report of BASIX-compliance cost of 3–4% (BMT & Assoc 2005). The economic savings may take a few years to come to fruition and this is why this system is not popular with developers. Only 42% of the respondents agree that BASIX has increased the overall time for development application approvals (see Table 1). They suggest that the time required for approval has increased by about 10%.

With reference to Table 1 only 47% of the respondents agree that BASIX should be applied to other types of construction and 56% agree that BASIX should be applied throughout Australia. However, many believe that the tool needs further development to improve it usefulness. Thermal comfort is one of the variables that are assessed within the BASIX programme. It addresses insulation, heat transfer through glazing, shading and active heating and cooling. There is a field of thought in the industry that this section should have given attention to the thermal mass, which also has a major effect on the indoor environment of a dwelling. In their opinion, the thermal comfort section of BASIX is not a true representation of the actual thermal properties of the building and an accredited assessor may be required in this respect.

SUMMARY AND CONCLUSION

Construction is one of the largest users of environmental resources and one of the largest polluters of the man-made and natural environment. The improvement in the performance of buildings with regards to the environment will indeed encourage greater environmental responsibility and place greater value on the welfare of future generations. There is no doubt that BASIX contributes significantly to achieving the goal of sustainable development within construction. On one hand, it provides a methodological framework to measure and monitor environmental performance of residential development, whilst on the other it alerts the building profession to the importance of sustainable development.

Sustainable housing is multidimensional and the evaluation of sustainable housing cannot be achieved using a single criterion and single objective function. The decision-making process for sustainable housing uses multiple criteria and objectives

and needs to be considered on a whole-of-life approach as it is not just considering economic and environmental problems. It also needs to include social and economic evaluations during the service life of the building. Therefore, a set of multiple goals and criteria needs to be considered simultaneously. The sustainable housing industry needs to appreciate the affordability for homebuyers especially those issues relating to design and cost. The reality is that homebuyers will respond to environmental issues providing it is affordable and does not come at a cost penalty compared with houses that deliver inferior environmental performance. Professional designers should maximize the environmental performance and concentrate more on achieving lower costs. If additional cost items are to be included, developers, builders and governments will need to consider introducing innovative financial incentives.

The accessibility of the tool via internet and free access are the main reasons for the success of the tool. It was generally accepted that the tool has played a significant role in providing a general guideline to the sustainability performance of a proposed development. It is a start but there is more to be realized. The key benefit of the tool is that it leads to better thermal comfort to users and to reduced water and energy consumption as well as less greenhouse gases emission. However, there is also the opinion that there is more to be done such as control of waste and energy usage at manufacturing of building materials for future development of the tool to be used in other types of construction. It serves as a means to make people think about water and energy saving initiatives and to encourage good design practice without excessive additions to the cost of a new building.

Irrespective of the advantages and disadvantages that the BASIX system may have, it has come into effect quite smoothly and with continued improvement and updating, it could become one of the most important planning and design tools in the construction industry. There may currently be shortfalls in the system and eventually they will be rectified, but the point is that new residential dwellings will have less environmental impact than their predecessors will. A step forward is better than standing still.

REFERENCES

Australian Bureau of Statistics (2005) *Population projection, Australia, Catalogue No. 3222.* Canberra: Australian Government Publishing Service.

Bhatti, M (2001) Housing/futures? The challenge from environmentalism. *Housing Studies*, **16**(1), 39–52.

BMT & Assoc (2005) *Indicative elemental estimate–Multi-unit residential development–BASIX analysis*. NSW: Department of Infrastructure, Planning and Natural Resources.

Cole, R J (1999) Building environmental assessment methods: clarifying intentions. *Building Research and Information*, **27**(4/5), 230–46.

Crabtree, L (2005) Sustainable housing development in urban Australia: exploring obstacles to and opportunities for ecocity efforts. *Australian Geographer*, **36**(3), 333–50.

Department of Planning (2002) *Partnering BASIX with Local Government*. NSW: Department of Planning.

Department of Planning (2005) C*ity of cities - A plan for Sydney's future*. NSW: Department of Planning. Available online: http://www.metrostrategy.nsw.gov.au/

Ding, G K C (2004) The development of a multi-criteria approach for the measurement of sustainable performance of housing projects. *In:* O Ural, A Frattari and E R Albatici (Eds.) *32nd IAHS World Congress: Sustainability of the Housing Projects*, 21–5 September 2004, University of Trento, Italy.

DIPNR (2004a) *More sustainable homes in NSW*. NSW: Department of Infrastructure, Planning and Natural Resources.

DIPNR (2004b) *Summary of cost benefit study for BASIX*. NSW: Department of Infrastructure, Planning and Natural Resources.

Gurran, N (2003) *Housing policy & sustainable urban development: evaluation the use of local housing strategies in Queensland, New South Wales and Victoria*. NSW: Australia Housing Urban Research Institute.

International Energy Agency (IEA) (2006) *Business opportunities in sustainable housing: A marketing guide based on experiences from 10 countries*. New Zealand: BRANZ.

Kein, A T T, Ofori, G and Briffett, C (1999) ISO 14000: its relevance to the construction industry of Singapore and its potential as the next industry milestone. *Construction Management and Economics*, **17**, 449–61.

Klunder, G (2004) The search for the most eco-efficient strategies for sustainable housing construction: Dutch lessons. *Journal of Housing and the Built Environment*, **19**, 111–26.

Levin, H (1997) Systematic evaluation and assessment of building environmental performance (SEABEP). *In: Second International Conference, Building and the Environment*, June, Paris, 3–10.

Li, H and Shen, Q (2002) Supporting the decision-making process for sustainable housing. *Construction Management and Economics*, **20**, 387–90.

McGovern, J P (2006) *Global warming earth summit fact sheet*. Centre for Environmental and Regulatory Affair of the National Centre for Public Policy Research, Washington. Available online: http//www.nationalcentre.org/KyotoFactSheet.html (accessed 5 January 2006).

OECD (2003) *Environmental sustainable buildings: challenges and policies*. OECD report.

Standing Committee on Public Works (2004) *Inquiry into energy consumption in residential buildings, Report No. 53/02*. NSW: Legislative Assembly.

Uher, T E (1999) Absolute indicator of sustainable construction. *COBRA 1999, RICS Research Foundation*. London: RICS.

Construction Management and Economics

CME 25 Conference
16-18th July 2007
University of Reading, UK

25 years of CME

CME 25 Conference Construction Management and Economics

'Past, Present and Future'

16th–18th July 2007
University of Reading, UK

Volume 1

CME 25 Conference

Proceedings of the Inaugural *Construction Management and Economics* 'Past, Present and Future' conference

Edited by Will Hughes

First published 2008

ISBN 978-0-415-46059-0 (3 vols.)

Professor Will Hughes
Head of School of Construction Management and Engineering
University of Reading
PO Box 219
Reading
RG6 6AW, UK

SCIENTIFIC COMMITTEE

Prof Ghassan Aouad, University of Salford, UK
Prof David Arditi, Illinois Institute of Technology, USA
Prof Michael Ball, University of Reading, UK
Prof Hans Björnsson, Chalmers University of Technology, Sweden
Prof Paul Bowen, University of Cape Town, South Africa
Prof Mike Bresnen, University of Leicester, UK
Prof Jan Bröchner, Chalmers University of Technology, Sweden
Ms Elisabeth Campagnac, ENPC, France
Dr John Connaughton, Davis Langdon, UK
Prof Nicola Costantino, Politecnico di Bari, Italy
Prof Andy Dainty, Loughborough University, UK
Dr Peter Edwards, RMIT University, Australia
Dr Richard Fellows, University of Hong Kong, China
Prof Martin Fischer, Stanford University, USA
Dr Sivaguru Ganesan, University of Hong Kong, China
Prof David Gann, Imperial College of Science and Technology, UK
Prof Vernon Ireland, University of Adelaide, Australia
Mr Graham Ive, University College London, UK
Prof Dave Langford, Glasgow Caledonian University, UK
Prof Peter Lansley, University of Reading, UK
Prof Heng Li, Hong Kong Polytechnic University, China
Dr John Miller, Patton Boggs, USA
Prof Ronie Navon, National Building Research Institute, Israel
Prof George Ofori, National University of Singapore, Singapore
Prof Roberto Pietroforte, Worcester Polytechnic Institute, USA
Prof John Raftery, Oxford Brookes University, UK
Dr Malik Ranasinghe, University of Moratuwa, Sri Lanka
Dr Göran Runeson, University of New South Wales, Australia
Prof Frank Schultmann, University of Siegen, Germany
Dr David Seymour, University of Birmingham, UK
Prof Amarjit Singh, University of Hawaii at Manoa, USA
Prof Miroslaw Skibniewski, University of Maryland, College Park, USA
Prof Martin Skitmore, Queensland University of Technology, Australia
Prof Philippe Thalmann, École Polytechnique Fédérale de Lausanne, Switzerland
Prof Paolo Tombesi, University of Melbourne, Australia
Prof Ben Uwakweh, University of Cincinnati, USA
Prof Shou-Qing Wang, Tsinghau University, China
Prof Graham Winch, Manchester Business School, UK
Prof Tomonari Yashiro, University of Tokyo, Japan
Prof Zhong Denghua, Tianjin University, China

Introduction

This conference was an unusual and interesting event. Celebrating 25 years of *Construction Management and Economics* provides us with an opportunity to reflect on the research that has been reported over the years, to consider where we are now, and to think about the future of academic research in this area. Hence the sub-title of this conference: "past, present and future". Looking through these papers, some things are clear. First, the range of topics considered interesting has expanded hugely since the journal was first published. Second, the research methods are also more diverse. Third, the involvement of wider groups of stakeholder is evident. There is a danger that this might lead to dilution of the field. But my instinct has always been to argue against the notion that Construction Management and Economics represents a discipline, as such. Granted, there are plenty of university departments around the world that would justify the idea of a discipline. But the vast majority of academic departments who contribute to the life of this journal carry different names to this. Indeed, the range and breadth of methodological approaches to the research reported in *Construction Management and Economics* indicates that there are several different academic disciplines being brought to bear on the construction sector. Some papers are based on economics, some on psychology and others on operational research, sociology, law, statistics, information technology, and so on. This is why I maintain that construction management is not an academic discipline, but a field of study to which a range of academic disciplines are applied.

This may be why it is so interesting to be involved in this journal. The problems to which the papers are applied develop and grow. But the broad topics of the earliest papers in the journal are still relevant today. What has changed a lot is our interpretation of the problems that confront the construction sector all over the world, and the methodological approaches to resolving them. There is a constant difficulty in dealing with topics as inherently practical as these. While the demands of the academic world are driven by the need for the rigorous application of sound methods, the demands of the practical world are quite different. It can be difficult to meet the needs of both sets of stakeholders at the same time. However, increasing numbers of postgraduate courses in our area result in larger numbers of practitioners with a deeper appreciation of what research is all about, and how to interpret and apply the lessons from research. It also seems that there are contributions coming not just from construction-related university departments, but also from departments with identifiable methodological traditions of their own. I like to think that our authors can publish in journals beyond the construction-related areas, to disseminate their theoretical insights into other disciplines, and to contribute to the strength of this journal by citing our articles in more mono-disciplinary journals. This would contribute to the future of the journal in a very strong and developmental way. The greatest danger we face is in excessive self-citation, i.e. referring only to sources within the CM&E literature or, worse, referring only to other articles in the same journal. The only way to ensure a strong and influential position for journals and university departments like ours is to be sure that our work is informing other academic disciplines. This is what I would see as the future, our logical next step. If, as a community of researchers, we are not producing papers that challenge and inform the fundamentals of research methods and analytical processes, then no matter how practically relevant our output is to the industry, it will remain derivative and secondary, based on the methodological insights of others. The balancing act between

methodological rigour and practical relevance is a difficult one, but not, of course, a balance that has to be struck in every single paper.

Turning to the conference, we have published 168 papers in this conference from 311 abstracts that were submitted in response to the call for papers. Of these, ten were rejected immediately as out of scope and 301 papers were invited, with comments from the abstract review, often making suggestions about how the paper might be focused. By the cut-off date, this resulted in 181 papers being submitted to the conference, of which 168 were finally accepted and published. All of these papers were reviewed by the Scientific Committee, supplemented by other authors from the conference, with at least two referees per paper. The corresponding authors represent 39 countries, which is a tremendously wide geographical spread. In organizing the schedule for the three days, I was presented with the usual problem faced by conference organizers of trying to fit all the papers in, at the same time as making this a meaningful experience for the participants. As well as the usual parallel sessions, I wanted to be sure that there was going to be good opportunities for discussion, and a new approach was tried. Associated with each of the four keynote addresses, I selected 5 papers from among those already accepted, looking for resonances with a keynote. I invited those authors to take part in a plenary session where they would make a two-minute bare bones presentation of their work (with no slides), one after the other. Thus, for each session of the conference, we started with a keynote, immediately followed by five very short presentations, and then a long discussion period picking up the themes of the keynote and the other presentations to tease out an interesting dialogue between panel members and audience. We still had the usual parallel sessions after these plenary sessions, but I felt that these helped to ensure that there was plenty to talk about, and it enabled those whose work was selected for the plenary session to get a much better engagement with a larger audience than might otherwise have been the case. I think that it is important to keep developing our approach to conferences and meetings, as otherwise there is a danger that it all becomes a bit too formulaic.

The origins of the journal may not be known to everyone: *Construction Management and Economics* was established in 1982 by Philip Read who worked for a publishing company called E & F N Spon, a company that specialized in construction books and well-known for its price books. Representing a publisher that specialized in construction, Philip Read made it his business to be aware of who was doing what in this field. So he approached Professor John Bennett at the University of Reading to be the editor of this new journal, and the first issue was published in 1983. Under John's editorship, the journal grew from about 240 pages per year to roughly double that size. In 1992, Ranko Bon and I took over as editors. This partnership lasted for 12 years until Ranko's retirement. While the journal continued to grow under my sole editorship, it became clear that the work was too much for one editor, so this year, I invited Andy Dainty and Frank Schultmann to join the editorial team, and between us we now preside over the production of about 1300 pages per year. The growth in the scale of the journal is clear from Figure 1, which shows how many pages have been published in each volume since the journal started.

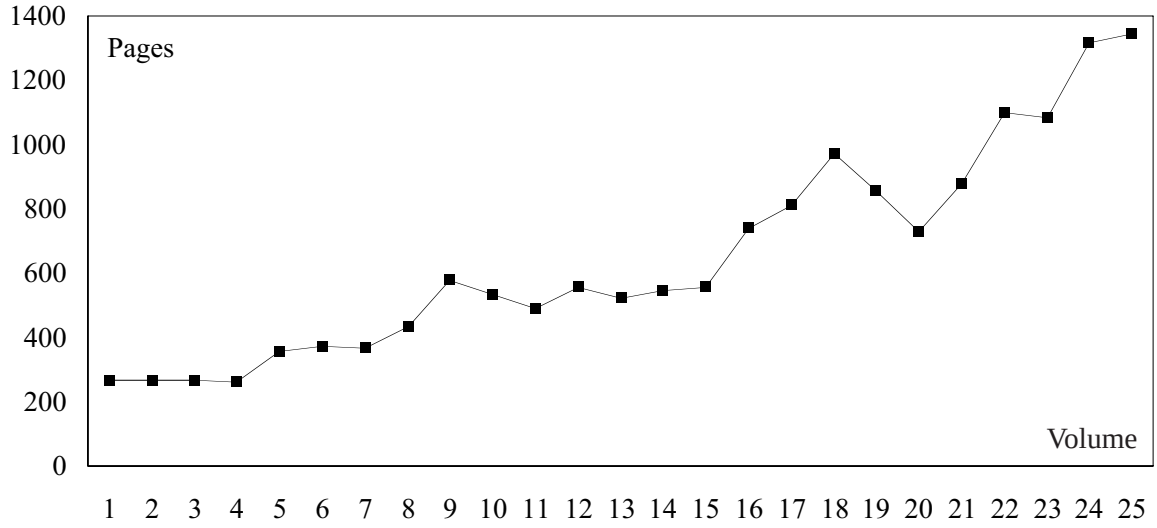

Figure 1: Numbers of pages per volume

The growth of the journal is undoubtedly linked to the growth in academic departments around the world. As academics in these departments develop their research profiles and seek outlets for their work, *Construction Management and Economics* is one of the main journals to which their work is submitted. Figure 2 shows the inexorable growth in the flow of papers into the journal, as well as the changes in numbers of papers accepted/rejected. The rejection rate appears fairly constant, hovering around 50%

One question that often arises when I show Figure 2 to various audiences is about the impact of the occasional Research Assessment Exercises (RAE) in the UK. Observers often assume that there must be a peak in submissions immediately prior to these. The lowest line in Figure 2 shows that number of papers received from UK authors

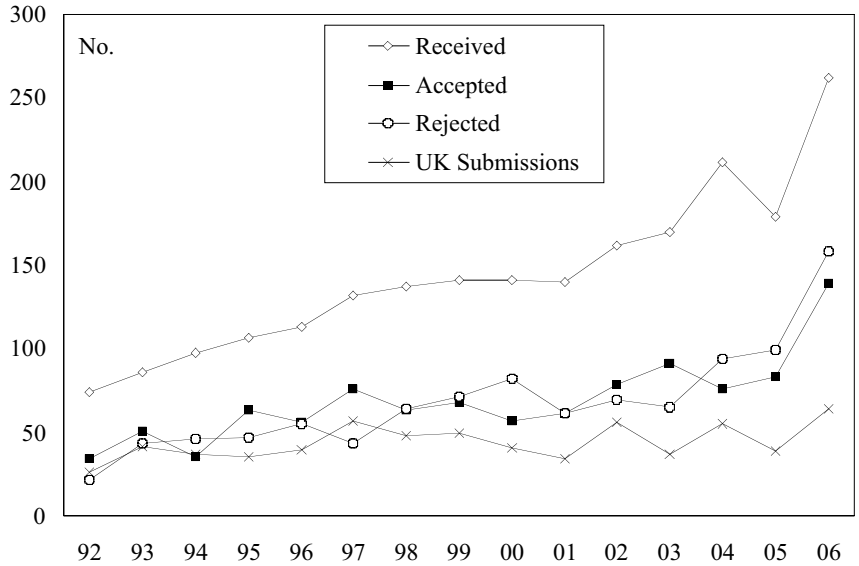

Figure 2: Annual copy flow

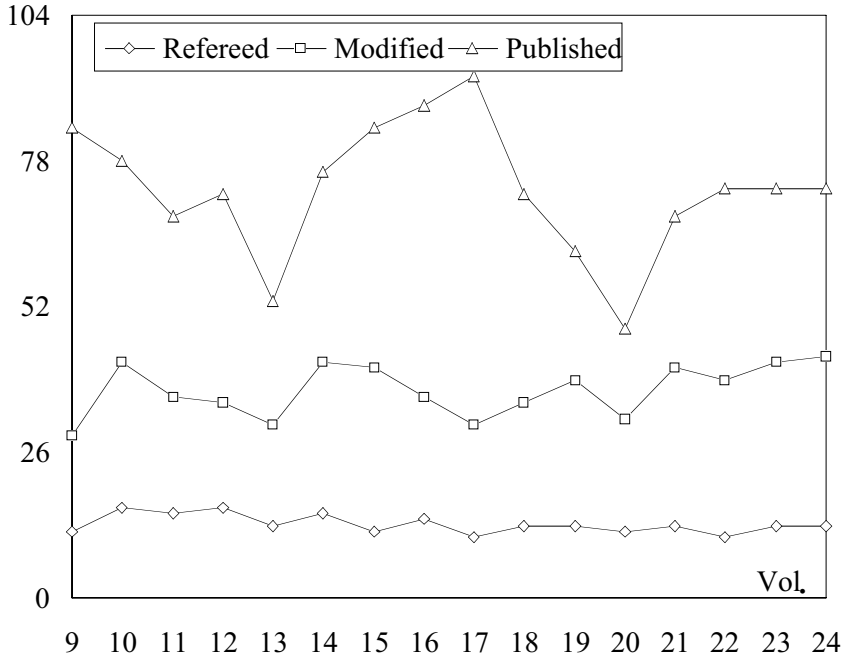

Figure 3: Performance by volume (weeks)

each year. While there is clearly a surge in 2006 (from 39 to 64) there is no similar surge immediately prior to the RAE exercises in 1996 and 2001. Moreover, the surge in submission from UK authors coincides with a surge from all authors, generally. These statistics show that UK authors are not unduly influenced into last minute submissions to this journal, an observation which runs contrary to popular belief, but may be somewhat reassuring for those who feel that the RAE process brings about publication for the sake of it. A more interesting statistic from Figure 2 is the relative constancy of copy flow from the UK, hovering around 50 papers per year, plus or minus about 10. In other words, the intense growth in the size of the journal is accounted for almost exclusively by the international scene.

One important aspect that we review every time we are considering the performance of the journal is the time it takes for papers to pass through the publication process. Figure 3 shows the average number of weeks from date of first submission to each of three points in the process: time to return referee reports after first round of refereeing, time to acceptance (including subsequent rounds of refereeing) and time to publication. The first one of these is primarily under the control of the editorial office. Despite asking referees to turn their reports around in two weeks, and despite being very diligent about sending reminders, it appears almost impossible to get this much below 13 weeks, give or take a couple of weeks. One of the reasons for this is the number of people who either fail to respond, or who let us know that they simply cannot complete the task at the moment, because of their other commitments. Clearly, non-responses slow the process a lot more than negative responses. But the consequence is that we have to invite at least eight referees to get four reports, often inviting more than 20 referees, in order to get the four reports we seek. It is the discovery of four willing and able referees that occupies most of the time in getting the papers reviewed. The distance between the first line and the second line on the graph is primarily the responsibility of authors. If their papers are well-written and

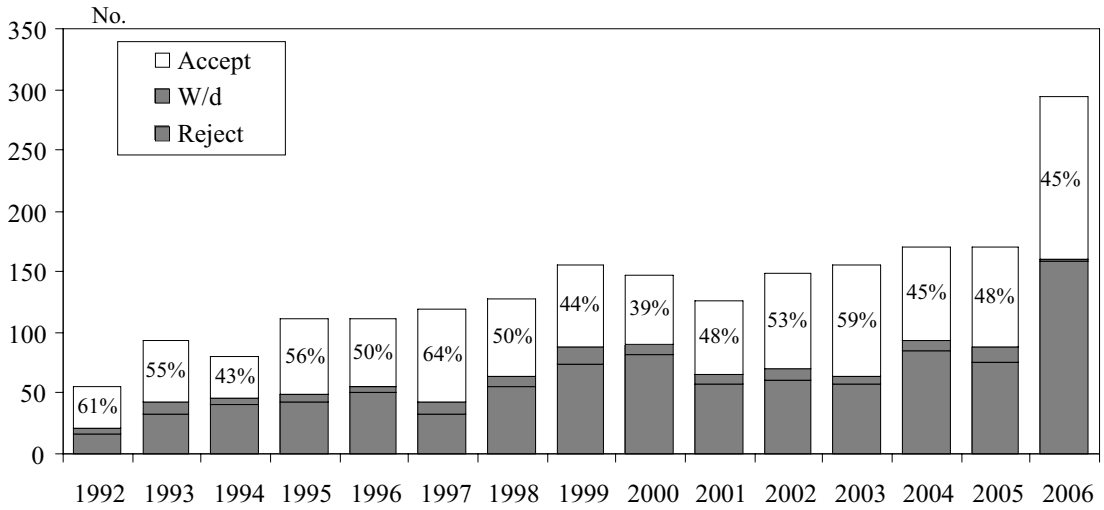

Figure 4: Annual acceptance rates

clear, reporting the results of interesting and useful research, then there will be few revisions, and little need for repeated iterations of the refereeing process. The average time spent in this phase for published papers is around six months. The distance between the second and third lines is largely the responsibility of the publisher, and indicates the length of the queue of papers that have been accepted and await publication. For the last few years this has been fairly stable at around 30 weeks. The whole process is taking 73 weeks, and this has been exactly the same for three years in a row. Relative to others, this is a good record for an academic, refereed journal.

The annual acceptance rates, as shown in Figure 4, are superimposed on the absolute number of papers accepted, withdrawn and rejected. This rate is not a target, but simply a result of the editors' interpretation of referees' reports. It is fairly constant

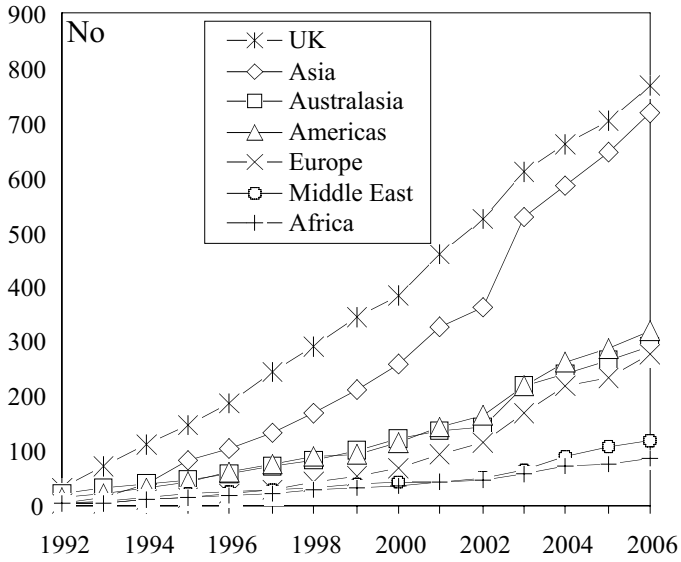

Figure 5: Origin of papers (cumulative)

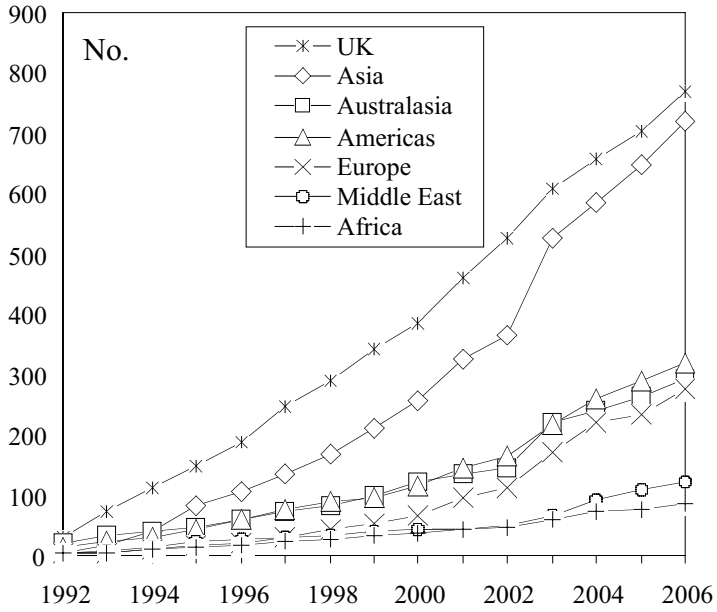

Figure 6: Origin of referees used each year

despite big changes in the numbers of papers dealt with each year.

The final category of statistics routinely produced for the journal are those regarding the origin of papers and referees. Figure 5 shows the cumulative picture of where papers are coming from since 1992. The majority of papers are still from the UK, although the cumulative data shows that the rate of growth in regions like Asia and the Americas, in particular has shown surges in recent years. As the top two lines converge, we will be continuing to see an increasing proportion of papers from outside the UK, as confirmed in Figure 2. There are clearly many diverse and inter-related reasons for the regional balance in terms of where papers are being submitted from. For most parts of Europe other than UK, for example, there is first a language barrier, and second a difference in the way that academic cases for promotion are dealt with. It is not standard practice in all countries for journal papers to play a major role in promotion cases. We are likely to see more papers from those countries where promotion is linked to publication. The huge growth of the construction sector in places like China, and the consequential growth of research and education to support it, would account for the surge in papers from that part of the world. But the large size of the USA market is not reflected in papers to this journal, perhaps because there are several well-established American journals to which American authors would turn first, before considering journals from other countries.

Finally, Figure 6 shows which regions referees are drawn from each year. This graph is not cumulative, and shows that our pool of referees is growing as rapidly as the number of papers submitted. This is bound to be the case, given that all authors are immediately entered into the referee pool. But given the difficulty of finding referees with the time to actually review papers, we are constantly on the look out for new people to add to the database. One way of providing exposure for the journal in places where it may not be well known is to invite academics from such places to

review papers. This is achieved either through existing contacts making recommendations to us, or sometimes just browsing university web pages from places with appropriate academic departments, looking for research-active academics who could fulfil this role.

The statistical review of the performance of the journal provides the context for thinking about our strategy. Clearly, there are perennial questions about regional and topical coverage, quality of papers, presence in citation indexes, role of the editorial board members, and so on. These issues are the things that are regularly dealt with in our annual editorial board meetings. Although we can bring some influence to bear on the spread of papers by, for example, carefully selecting topics and guest editors for special issues, many of these characteristics are emergent, representing where the field is, rather than where the editorial team things it ought to be. We think this is a great strength of this journal. For the future, what we would like to do is to help authors in this field to have more of an influence on academic life in general, not just in construction-related departments. We shall be seeking to extend the citation indexes in which the journal's papers are listed, to help with identifiable impact factors, which seem to be developing in their importance in many countries. We will be encouraging authors to cite definitive sources from outside the journal itself, and continuing to bend every effort to make the papers in this journal the best quality that we can achieve. In this, we need the support of every author and referee in our research community – a level of support that has been constant and reliable since the journal started.

To conclude, I would like to thank the authors, referees, publishers and conference organizers for their tireless support for this excellent journal. And here's to another 25 years of a stimulating and influential journal! I hope you enjoy these conference papers.

Professor Will Hughes
CME 25 Conference Chair
Editor-in Chief, Construction Management and Economics

CONTENTS

INDUSTRY DEVELOPMENT