GREEN CONCEPT IN BUILDING CONSTRUCTION

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ABSTRACT

Buildings have a major, wide ranging impact on the environment. The features which a building must have in order to be described as 'green' or 'sustainable' are now well known. Whereas a wholly sustainable building cannot be attained, there is need for action to minimise the adverse impacts of buildings. This contributes to the attainment of sustainable development. In most countries, some efforts are being made by governments, professional institutions and companies to realise sustainable buildings. However, it is evident that much more needs to be done. The effort to attain sustainable buildings has several drivers, including mandatory legal requirements, incentives, benchmarking and labelling schemes, and action by professional institutions. It is suggested here that focus should be on the responsibility of the individual practitioner to work towards the design or construction of sustainable buildings in the normal course of the practitioner's work. This responsibility is considered from the perspective of the ethics and professionalism of such a practitioner. The roles of various parties in setting out and strengthening this responsibility are discussed.

Keywords: *sustainable development, sustainable building, ethics, professionalism, new specialisations*

ABSTRAK

Bangunan memiliki dampak yang besar dan luas dalam lingkungan. Fitur-fitur yang harus dimiliki bangunan agar dapat disebut 'hijau' atau 'berkelanjutan' saat ini sudah terkenal. Sementara bangunan yang sepenuhnya berkelanjutan tidak dapat dicapai, butuh tindakan untuk meminimalisir dampak merugikan dari bangunan. Hal ini berkontribusi terhadap pencapaian pembangunan berkelanjutan. Di sebagian besar negara, beberapa upaya dilakukan oleh pemerintah, institusi-institusi profesional, dan perusahaan-perusahaan untuk mewujudkan bangunan berkelanjutan. Namun, jelas bahwa lebih banyak yang harus dilakukan. Usaha untuk mencapai bangunan berkelanjutan memiliki beberapa driver, termasuk persyaratan wajib hukum, insentif, skema benchmarking *dan pelabelan, dan tindakan oleh institusi-insti-tusi profesional. Disini disarankan bahwa fokus seharusnya ada pada tanggung jawab praktisi individual untuk bekerja pada rancangan atau konstruksi*

bangunan berkelnjutan dalam kegiatan normal dari pekerjaan praktisi. Tanggung jawab ini dipertimbangkan dari perspektif etika dan profesionalisme praktisi tersebut. Peran berbagai pihak dalam menetapkan dan memperkuat tanggung jawab ini sedang dibahas.

Kata kunci: *pembangunan berkelanjutan, bangunan berkelanjutan, etika, profesionalisme, spesialisasi baru*

INTRODUCTION

Sustainable Development in Context of Building

Attaining sustainable development is a crucial global concern which is at the top of the policy agenda in most countries, and should be, everywhere. Businesses and practitioners in all sectors, as well as individuals are being called upon to act, and many have indicated their intentions to do so, and proposed appropriate strategies. The Royal Institute of British Architects (RIBA) declares that it is committed to the principle of sustainable development which it defines as (RIBA, 2000, p. 1):

> *"Development which raises the quality of life and serves the goal of achieving global equity in the distribution of the Earth's resources whilst conserving its natural capital and achieving significant and sustained reductions in all forms of pollution especially emissions of greenhouse gases."*

What does "sustainable development" mean in practice, and why does it concern building practitioners? The UNCSD (2012) notes that: "Sustainable development emphasizes a holistic, equitable and far-sighted approach to decision making at all levels. It emphasizes not just strong economic performance but intragenerational and intergenerational equity. It rests on integration and a balanced consideration of social, economic and environmental goals and objectives in both public and private decision-making."Thus, decision making and action should involve all sectors of the economy (including the building industry) and society.

Sustainable development is perceived to have several key component issues. The United Nations Environment Programme (UNEP) (2013) outlined its medium term priorities in the attainment of sustainable development as: (i) climate change; (ii) resource efficiency; (iii) disasters and conflicts; (iv) environmental governance; (v) harmful substances and hazardous waste; and (vi) ecosystem management. It should be emphasised that these factors are closely inter-related; a failure to make progress in one leads to further adverse impact in other areas, and also to an impairment of the capacity and capability of the relevant actors to pursue the others. A glance at the list of UNEP's priorities shows that all of them are relevant to the building industry.

Climate Change as an Example

Climate change can be used to illustrate how the issues relating to sustainable development are being, or should be, pursued, and the current and potential role of the building industry in these efforts. Skea (2012) notes that the built environment plays a critical role in energy and climate change policies. He observed that the European Union (EU) Energy Performance of Buildings Directive (EPBD) sets the framework for the pursuit of energy efficiency in the UK and other (EU) member states. Guided by this framework, the broad goals of UK energy policy are: to reduce greenhouse gas (GHG) emissions, by a legally binding figure of 80% by 2050; to ensure reliable supplies to consumers; and to ensure that energy is 'affordable'. To attain the 2050 GHG emissions target, four "carbon budgets" covering 2008-12, 2013-17, 2018-22 and 2023-27 have been set by law. The fourth carbon budget requires emissions to fall by as much as 50% by 2025 relative to 1990 levels. Radical changes to the energy system are needed to attain such deep cuts.

Skea's (2012) research is among many works which show that if the UK's ambitious climate policy targets are to be achieved, the building industry must make a significant contribution. Rashid and Ofori (2013) made similar observations with regard to the attainment of Malaysia's commitment to reduce its emissions. These are in line with the observation by the Inter-Governmental Panel on Climate Change (2007) that buildings offer one of the most cost-effective ways of addressing the challenge of climate change. Thus, like many officials, researchers and commentators, Skea (2012) notes that the way that buildings are designed, built and used will have to change significantly if the nations' goals in contributing to efforts to address climate change and targets of GHG emissions are to be achieved.

Research Objectives

The objectives of this study are to:

1. discuss the impacts of building activity on the environment, and the nature of "green building" or "sustainable building" as suggested by the literature and in the context of sustainable development, as well as their practical meaning
2. consider the courses of action at the construction stage to attain sustainable building
3. discuss the possibility of the practitioner's personal responsibility being a major thrust in green architecture and building programmes in Asian countries
4. suggest approaches to courses of action towards sustainable being; and propose a research agenda.

RESULTS AND DISCUSSION

Current State of Sustainable Building

Building and the Environment: the Problem

The adverse impact that a building can have on the environment and therefore, the process of sustainable development, is evident when one considers the entire building process (see, for example, Ofori, 1992). It starts from the extraction of the raw materials for the processing and manufacturing of the materials used in buildings, and include the raw materials (which is often non-replaceable) and energy used (which can be substantial in the case of some materials such as steel and aluminium) and waste produced. The materials, components and equipment are then transported to sites where they are required. In the globalised era, this can be over several thousand kilometres. During building on site, the likely impacts are the energy and water used, wastes generated, spillages which might pollute ground water, and the production of dust and noise. The impact with regard to energy usage and hence, global warming potential is greatest during the operation of the completed facility (from energy used to cool or warm the building). Another possible impact lies in the demolition of the building and disposal of wastes.

The Chartered Institute of Building (CIOB) (2013a) notes that it takes one third of the world's resources to build the homes, offices and factories; and the energy to run these facilities is responsible for 40% of GHGs. To relate just one research work, Huang and Bohne (2012) examined nine types of air pollutants emitted by the Norwegian construction industry using input-output and time-series analysis techniques. Their results showed increasing air emissions from this industry, but lower emission intensities (except for NH3), between 2003 and 2007. The industry's GHGs, acidifying gases, ozone precursors and PM10 grew to 127%, 119%, 108% and 114% from a 2003 baseline level to 2007 respectively. On the other hand, the total GHGs, acidifying gases, ozone precursors and PM10 intensities annually decreased 2.7%, 4.3%, 6.5% and 5.0% respectively during the period. Intensities of all air pollutants except NH3 are expected to decrease in future; total GHG emissions intensities in 2020 are predicted to decline by 13% compared with 2007. The results also showed that indirect emissions form the largest proportion of the total emissions: thus optimised material use and selection of materials with low embodied emissions is key to further reduce the building industry's air emissions.

Green or Sustainable Building: Definition

"Green architecture" can be considered to result in "green building" or "sustainable building". These terms have become part of first the professional vocabulary, and then common language. Commission for Economic Cooperation (2009) notes that "Green building refers to the use of environmentally preferable practices and materials in the design, location, construction, operation and disposal of buildings. It applies to both renovation and retrofitting of existing buildings, and construction of new buildings, whether residential or commercial public or private". The definition

of the International Organisation for Standardisation (ISO) (2008) is that sustainable development of buildings (and other construction works) creates the required performance and functionality with minimum adverse environmental impact, while encouraging improvements in economic and social (and cultural) aspects at local, regional and global levels.

The United States Green Building Council (USGBC) Research Committee (2007) notes that:

> *"Green buildings depend on the continuous improvement of building processes, technologies and performance to minimise negative environmental or health impacts and contribute to environmental restoration and sustainable resource management. Objectives of green buildings ... include (a) climate conditions decoupled from human activities; (b) stable, sustainable energy supplies; (c) clean, renewable and sufficient water resources; (d) restorative use of land for the long-term sustainability of habitats; (e) restorative use of materials and assemblies that account for life-cycle impacts; and (f) enhanced human safety, health and productivity in the built environment."*

The Green Building Index SdnBhd of Malaysia (2009: 2) states that 'a green building focuses on increasing the efficiency of resource use – energy, water and materials – while reducing building impact on human health and the environment during the building's life cycle through better siting, design, construction, operation, maintenance and removal'.

The definitions indicate that sustainable (or green) building involves creating buildings using best-practice, clean and resource-efficient techniques, from the extraction of raw materials to the demolition and disposal of its components. It must be noted that building activities will always involve some adverse environmental implications although 'sustainable building' should reduce their extent. Thus, sustainable building is an ideal target. Singapore's case can be used to illustrate a national programme on sustainable building in South-east Asia.

Singapore's Green Building Programme

Singapore wishes to be a global leader in green buildings, with particular expertise in the tropics and sub-tropics, and it believes this can be achieved in the next five years (BCA, 2013a). Singapore's green building programme is pursued with the guidance of a national strategy and set of integrated policies, through the implementation of a benchmarking scheme; legislation setting minimum standards of environmental performance of buildings; financial incentives; and awards. It is estimated that buildings consume about one-third of Singapore's total end-use electricity (BCA, 2013a). Thus, Singapore focuses its efforts on minimising the usage of energy in buildings. To give a stimulus to the efforts to attain energy efficiency in existing buildings and to improve Singapore's energy security, productivity and growth, new legislation for energy efficiency makes it mandatory for existing buildings to attain minimum environmental sustainability standards.

Singapore is making progress in these regards. The number of green building projects in Singapore has grown from 17 in 2005 to about 1,600 in eight years (BCA, 2013a). This translates to 47 million m2 of gross floor area (GFA), or 20% of Singapore's total GFA. Thus, Singapore is on track to meet its goal of greening 80% of its building stock by 2030. This pace of growth also means that Singapore is one of the leading green cities in the world in terms of per capita green building space (BCA, 2013b).

Benefits, Obstacles and Enablers

The benefits of sustainable building are outlined in the literature. Focus is often on the life-cycle savings in energy costs. For example, in Singapore, a study by Building and Construction Authority (BCA) on 36 commercial buildings found that an efficient chiller system can improve energy efficiency by up to 42% after retrofitting (BCA, 2013a). This constitutes overall energy savings of 16% of the total building consumption. The total energy saved was 85 GWh per annum. The owners of the buildings saved a total of $22.7 million per year.

Many wider benefits of sustainable buildings are also highlighted. For example, Aho (2013) suggests that both scientific research results and anecdotal business evidence exist to make a convincing business case for sustainable buildings and built environments. The investment performance of sustainable buildings has been shown to be better in the long- and medium-terms than standard practice buildings due to lower risk levels, lower operating and maintenance costs, less vulnerability to changes in the tariffs of energy and other utilities, better service levels and productivity of end users, attractiveness to owning or occupying organisations because of enhanced corporate image, and so on.

Common obstacles as well as enablers of the pursuit of sustainable building are indentified. For example, Hakkinen and Belloni (2011) outlined the following process-related barriers: (i) rules of competition and tendering processes; (ii) functioning of value chains; (iii) possibilities to apply integrated design processes; (iv) lack of knowledge of existing efficient sustainable building technologies; (v) lack of demand; and (vi) drawbacks in sustainable building marketing processes. The issues that promote the adoption of sustainable building concepts include: beneficial operational costs of sustainable buildings; improved well-being and productivity of occupants and users of buildings due to improved building performance; and long-term benefits for the national economy because of reduced emissions and use of natural resources.Thus, Ofori (1992) argues that ‘the environment’ should be the fourth client objective of construction projects (after the traditional criteria of cost, time and quality).

The respondents to the study by Hakkinen and Belloni (2011) addressed the lack of awareness of clients, competence of designers and other actors, availability of tools, lack of economic incentives, lack of sustainable renovation concepts, and relevant services for maintenance and energy supply. With respect to design, they noted the following factors (in descending order of importance): (1) there are not adequate incentives for designers in order to support them to develop knowledge and methods for sustainable building design; (2) there is a lack of adequate knowledge to

enable practitioners to consider potential new alternatives (such as renewable energy); (3) the process lacks an actor or a team who manages the overall design of the building; (4) there is a lack of integrated design methods; (5) sustainable building solutions may have unknown risks, for which the designer may become responsible; and (6) designers are not able to interpret the sustainable building requirements set by the client to establish them as design criteria. Concerning contractors, the factors were (in descending order of importance): (i) main contractor is not able to take care that the operation and use of the sustainable building is adequately guided in order to ensure the intended performance; (ii) there is no knowledge to set adequate criteria in the procurement process of products to ensure the intended overall performance of the building; (iii) design documents do not show adequate performance and capacity requirements for the products (leading to competition on the basis of price); (iv) there are no methods to verify the compliance of subcontractors' work with sustainable building requirements; (v) contractors are not able to explain the sustainable building criteria to subcontractors; and (vi) there are no resources to supervise the realisation of sustainable building requirements.

It is evident that, to attain sustainable building in a routine manner, much need to change. What change is required? What do these definitions of sustainable building mean in practice? What is the designer's role? What does the building construction process on site involve?

Indicators of Sustainable Building

The RIBA (2000, pp. 2-3) offers the following Key Indicators for Sustainable Design:

1. Minimising the use of fossil-based energy in terms of the energy embodied in the materials, transport and the construction process, and the energy used during the lifetime of the building.
2. Making best use of recycled materials and renewable materials from a verifiable source.
3. Avoiding all ozone-depleting chemicals in terms of manufacture and system operation, including HCFCs.
4. Where possible using alternatives to materials containing volatile organic compounds.
5. Designing to make maximum use of natural light whilst also being aware of its limitations.
6. Exploiting the potential for natural ventilation in the context of an overall climate control strategy which minimises energy use and maximises comfort.
7. Making best use of passive solar energy whilst employing heating/cooling systems which are fine-tuned to the needs of the occupants.
8. Ensuring that building management systems are user-friendly.
9. Identifying opportunities to generate on-site renewable electricity (embedded systems).
10. Identifying the potential for exploiting the constant ground temperature for evening-out the peaks and troughs of summer and winter temperature.

11. Minimising the use of water; harvesting rainwater and grey water and purifying for use other than human consumption.
12. Minimising rainwater runoff by limiting the extent of hard external landscape.
13. Creating an external environment which is both a visual amenity and also offers environmental benefits such as summer shading from deciduous trees and evaporative cooling from water features.
14. Whilst taking account of these key indicators, ensuring that designs meet the highest standards of technical proficiency in combination with aesthetic excellence.

The Singapore Institute of Architects (SIA) (2013) proposed these attributes of a sustainable built environment, it:

1. …seeks to conserve its natural capital which encompasses natural resources and ecosystem services that sustain life
2. …seeks to minimise its contribution to the underlying causes of climate change. In addition, it is designed to adapt to the predicted local consequences of this global phenomenon
3. …opts for renewable resources over non-renewable ones. This principle extends to its demand for energy, water and materials
4. …optimises the use of non-renewable resources by managing demand, minimising waste and optimising resource efficiency
5. …is designed for adaptability and reuse, with a view to extending the life of whole buildings and their components. It seeks to reduce the risk of obsolescence by anticipating changes in programme, technology and land use
6. …has in place principles and infrastructure that support an efficient use of resources and a low-carbon lifestyle
7. …is in harmony with its setting; acknowledging and responding to the pre-existing conditions that physically define a site or describe its social and cultural context
8. …ensures the wellness of its inhabitants, taking into account the physiological and psychological needs of its users, addressing their expectations and preferences relating to comfort and health
9. …integrates greenery and other landscape elements into urban master plans, site design and building envelope
10. …is a product of a collaborative framework known as the integrated design process which seeks to bridge the gap between the various stakeholders across all phases of the design-construct process, driven by a focus on targets and performance.
11. … must factor in the ecological literacy of the population (its awareness of the consequences of its behaviour and/or inaction towards the environment). It can conversely, through its design and interfaces, seek to promote it.

SIA (2013) gives detailed instructions to building practitioners on what must be done to attain a sustainable building at all stages of the development process.

Action at the Construction Stage

The aim of the CIOB's Carbon Action 2050 is to provide the industry with guidance to reduce the UK's carbon emissions to 80% of its 1990 level by the year 2050 (CIOB, 2013a). The institution notes that much of it can be applied globally, although it is based on UK policy. The strategy of the initiative "is to find practical ways of saving energy and carbon that can be implemented straight away, and then spread the word among project teams, in particular project managers, clients, architects, building control personnel and environmental specialists, who can act as green champions" (CIOB, 2013a).The proposals of various work groups on Carbon Action 2050 related mainly to contributing to meeting the UK's GHG emission reduction target for 2012. The actions proposed for the construction stage are outlined below (CIOB, 2013b).

1. Energy-efficient site accommodation "It is claimed that the use of energy efficient site accommodation has the potential to reduce CO2 emissions from the construction process by 50% or possibly more"...;
   a. Insulation and type of glazing;
   b. Heating and lighting;
   c. Motion sensors to control energy usage;
   d. Metering of heat and electricity usage;
   e. Use of a master switch to control energy system;
   f. Occupant awareness;
   g. Behaviour change.
2. Efficient use of construction plant;
   a. Choosing the correct, or most suitable, machine for the task in hand, avoiding where possible the use of oversized plant (when employing large machinery, it might be preferable to use it for one-off operations);
   b. Use of fuel-efficient plant;
   c. Use of properly maintained and serviced plant;
   d. Low-carbon fuelling of plant;
   e. Efficient operation of plant, avoiding idling and inappropriate use of power. Plant-operator training and reinforcement of skills (such as toolbox talks);
   f. Planning and monitoring of plant use (such as telematics).
3. Earlier connection to the grid;
4. Good practice energy-management on site;
   a. Control of generating plant to ensure only essential power is produced;
   b. Control of lighting (such as accommodation, night security);
   c. Use of energy-efficient technology for security and task lighting;
   d. Effective server management of computers;
   e. Energy-efficient site accommodation (as before);
   f. Efficient use of plant and equipment (as before);
   g. Monitor and collect data and disseminate results to other stakeholders in the supply chain. This could be implemented in part by a contractor appointed energy advisor for each construction project.
5. Fuel-efficient driving – freight,
6. Fuel-efficient driving – waste removal,

7. Renewable Transport Fuel Obligation (RTFO) – freight and waste removal;
   a. Increased use of fuel-efficient vehicles;
   b. Reducing the weight of freight moved;
   c. Reducing the distances travelled;
   d. Use of carbon-light fuels;
   e. Increased utilisation rate of vehicles (i.e. maximised use of vehicles' load capacity, avoiding part-loads where possible);
   f. Improved driving to conserve fuel including the use of vehicle performance control units.
8. Construction consolidation;
   a. Initiate measures to facilitate the consolidation of small deliveries to construction sites;
   b. Development of financing models for establishing and running a regional consolidation centre and the implications for instigating an urban congestion-charge for construction vehicles;
   c. Engage with stakeholders to develop flagship consolidation centres for a number of major projects, or development areas (within five years);
   d. Through stakeholder engagement, implementation of strategic planning for future consolidation centres.
9. Reducing the transport of waste;
10. Renewable Transport Fuel Obligation (RTFO) – business travel,
11. Smart-driving training for business travel,
12. Fleet conversion to fuel-efficient passenger vehicles,
13. Restricting domestic flights;
14. Good practice energy-management of corporate offices.
    a. Corporate energy-reviews of premises to establish solutions for reducing consumption;
    b. Undertake review of existing ICT stock and replace where required with more energy-efficient equipment;
    c. Where viable, install automatic switch-off technology;
    d. Review computer-server arrangements and, where necessary, seek alternatives that are more energy-efficient;
    e. Engage with Carbon Trust programmes: Carbon Management (CM) and Carbon Management Energy Efficiency (CMee) programmes.
15. On-site measurement, monitoring and targeting;
16. Sharing knowledge about alternative sustainable fuels – for example, "it is estimated that the use of 100% biodiesel for powering generators on site would reduce emissions from site activities by approximately 25 %").

How should practitioners in the building industry respond to this need, and call, for sustainable building?

Professional Ethics and Professionalism as A Pivot

It is argued here that the individual practitioner, of any background, has the responsibility to act to attain sustainable building. The individual practitioner's professional ethics and professionalism can serve as a pivot in these regards

Professional Ethics

The responsibility of a practitioner in the pursuit of the person's work is partly guided by the ethics of the profession the practitioner belongs to. The Royal Institution of Chartered Surveyors (RICS) Working Party (2000) suggested that five basic assumptions underpin the understanding of ethics as covered by professional organisations. The first is that *Professional ethics is a process, a way of reviewing behaviour against constantly changing standards*. What may be ethical today, or in a particular society, may be viewed differently by others or at another time. This view is echoed by Duffy and Rabeneck (2013). The second assumption is that *Human behaviour is caused*. There is a motive for all human behaviour; examples of the underlying reasons for the actions of practitioners are financial gain and career advancement, whereas examples for general human behaviour are power and compassion. The third assumption is that *Actions have consequences*. The fourth is that *What is perceived as ethical depends on the viewpoint of the individual*. However, this can be influenced by many factors including codes and statements, such as those of professional institutions. There may also be differences among societies. The final assumption is *The foundation stone for good ethical business practice is mutual vulnerability*. That is, humans are each susceptible to actions of others and the way a person is treated depends on how the person treats others.

The RICS Working Party (2000) proceeds to define professional ethics as: "giving of one's best to ensure that clients' interests are properly cared for, but in doing so the wider public interest is also recognised and respected". This provides a succinct statement of the professional's personal responsibility.

To guide their members in "giving of their best", professional institutions have prepared "codes of ethics", or "codes of conduct". The codes tend to be based on certain principles dealing with: (a) meeting the client's requirements; (b) the professional's integrity, independence, objectivity; (c) responsibility to the profession and to the institute; (d) responsibility to society; and € commitment to continuing professional development.

An extract from the Code of Ethics and Professional Conduct of the Project Management Institute (2013), obtained from its website states that project managers are committed to doing what is right and honourable. They set high standards for themselves and aspire to meet these standards in all aspects of their lives. The purpose of the code is to instil confidence in the project management profession and to help an individual to become a better practitioner.

As yet, the codes do not cover sustainability, although some refer to health and safety. For example, clause 15 of the CIOB's(undated) Rules and Regulations of Professional Competence and Conduct states: "Members shall at all times have comprehensive knowledge of, and due regard for, legislation in respect of Health,

Safety and Welfare as it affects all parts of the building process". However, the code is silent on environmental issues and sustainability.

Individual companies have also formulated their own codes of conduct for the professionals and others they employ. These codes may run into many pages or paragraphs, or be very short. For example, the code of conduct of the American company, Nordstrom, is: "Use your own best judgment". Many companies highlight their adherence to good ethical principles and practices as the bedrock of their existence and competitiveness.

There are also efforts at the international level to encourage appropriate behaviour by businesses and thus, executives and professionals. Examples include the United Nations Global Compact (www.unglobalcompact.org); Global Sullivan Principles of Social Responsibility (www.globalsullivanprinciples.org/); the Organisation for Economic Cooperation and Development's (OECD) Guidelines for Multinational Enterprises (www.oecd.org/dataoecd/56/36/1922428.pdf); and Caux Roundtable Principles for Business (www.cauxroundtable.org/principles.html). It is pertinent to note that although they tend to focus on actions by businesses, these international conventions are relevant in the context of this paper because they cover environmental issues. For example, Principles 7 to 9 of the United Nations Global Compact are on the environment; and they state that: "Businesses should (i) support a precautionary approach to environmental challenges"; (ii) undertake initiatives to promote greater environmental responsibility; and (iii) encourage the development and diffusion of environmentally-friendly technologies. The other subjects of the compact are also related to sustainable development. They are: Human Rights; Labour; and Anti-corruption.

How can these concepts and principles of professional ethics be operationalized? Since professionals work in organisations, it is appropriate to consider the issue from that perspective. Carroll and Buchholtz (2006) suggest that measures for improving an organisation's ethical climate include:

1. Top leadership management (Moral Management; providing Ethical Leadership)
2. Effective communication
3. Ethics programmes and Ethics Officers
4. Setting realistic objectives
5. Ethical decision-making processes
6. Codes of conduct
7. Disciplining violators of ethics standards
8. Ethics 'hotlines' and whistle-blowing mechanisms
9. Business ethics training, to: increase managers' sensitivity to ethical problems; encourage critical evaluation of value priorities; increase awareness of organisational and societal realities; examine ethical facets of business decision making; and bring about greater honesty and fairness in the organization
10. Ethics audits and self-assessments – to evaluate, with the view to improving, the organisation's ethical climate by reviewing its ethics programme, codes of conduct, hotlines, training programmes
11. Corporate transparency – making corporate policies, practices, procedures visible to all
12. Board of director leadership oversight – in the US, this is now required by law.

Professionalism in the Building Industry

The responsibility of a practitioner is also influenced by the professionalism of the person. Low (1999) notes that 'professional' services differ from 'normal' services; they: involve externality effects which impinge upon society whereas other services are internalised by clients; and carry some moral responsibility and invoke some public interest or public good argument. Wilensky (1970), one of the foremost authors on professionalism, noted that the professions are distinguished from other occupations by: the application of a specialised technique supported by a body of theory; the transferability of the skills applied; a group which regulates and supports the persons in the occupation; and an objective and fair set of rules and standards. Moore (1970) ranked these attributes in the following ascending order: motivation; established professional organisation; specialised body of knowledge; evaluative skills; and autonomy of judgment.

The concept and essence of 'professionalism' has been of greater interest in many other professions than those of the built environment. For example, the American Pharmaceutical Association Task Force on Professionalism (2000) concluded that one acts professionally when one displays 10 traits: accountability for his/her actions; commitment to self-improvement of skills and knowledge; conscience and trustworthiness; covenantal relationship with client; creativity and innovation; ethically sound decision-making; knowledge and skills of a profession; leadership; pride in the profession; and service oriented. Hall's (1968) professionalism scale measures five attitudinal attributes of professionalism: (i) use of professional organisation as a major referent; (ii) belief in public service; (iii) belief in self-regulation; (iv) sense of calling; and (iv) belief in autonomy. Again, this scale has been applied in many fields. However, again, the notion of environmental responsibility has not yet assumed importance in any of the studies.

A group of UK professional institutions in the UK, led by the RIBA led a study of the UK building professions. Introducing the report, Worthington (2003, p.8) noted: "The professions are at a watershed. It is timely to set out the background to the origins of professionalism and, within the current social, economic and political context, explore alternative scenarios for the future".

A special issue of the international journal, Building Research and Information, on professionalism in the building industry has recently been published. In one of the papers, Duffy, and Rabeneck (2013) observe that (p. 117) architects, in general, have: (a) focused on the delivery of individual projects; (b) not amassed a body of shared knowledge based on the ever accumulating experience of designing many types of buildings; (c) failed to speak out strongly enough for the interests of clients and users of buildings; (d) not created an adequate body of professional knowledge based on researching, testing and articulating clients' requirements; (e) neglected to take advantage of what should have been (and can still be) the profession's principal source of power – the systematic, measurement of the performance of buildings and classes of buildings over time."

Enhancing Professionalism in Building Industry

The experience of Singapore around the turn of this century can be used to illustrate the possible importance and relevance of developing high levels of professionalism in practitioners in the building industry. In Singapore, the "Construction 21" study undertaken by a government-appointed committee, reviewed the construction industry in Singapore (C21 Steering Committee, 1999). After analysing the problems facing the industry, and the desirable outcomes, the study proposed a radical restructuring of the industry, offering 39 recommendations under six strategic thrusts. Thrust One was: "Enhancing the Professionalism of the Industry". Among the issues relating to professionalism in an industry which the committee envisioned as: "To be a world-class builder in the knowledge age" were: a poor image of the industry; variance in the professional standards of industry practitioners; lack of managerial skills and expertise among many practitioners; and fragmentation of the industry which militated against the effective integration of the contributions of the members of the design and construction teams. Thus, the industry fell below world-class standards.

Among the recommendations for enhancing professionalism in the building industry in Singapore were: (i) revision of academic syllabi of the tertiary academic institutions in Singapore to introduce common modules for the education of construction professionals-to-be (specifically, architectural and engineering students), and to include the coverage of soft skills; (ii) continuing university education and introduction of compulsory continuing professional development for professionals renewing their registration certificates; (iii) formulation of a national code of conduct and guidelines for professional practice; (iv) institution of awards "to promote, recognise and reward creativity, quality work and innovation" (p. 27); (v) licensing contractors; and (vi) harnessing of information technology (IT). These proposals were implemented; for example, the Professional Engineers Board and Board of Architects introduced such requirements. It can be noted that the effectiveness of such a requirement is reduced by the very few numbers of the professions whose members need to be registered, and the fact that no specific requirements for the subjects to be studied are made. The C21 report aptly noted that: "The road to greater professionalism will not be an easy one. It will require a change in attitudes, behaviours and mindsets" (Construction 21 Steering Committee, 1999, p. 26).

Many professional institutions and other organisations in the building industries in several countries seek to enhance professionalism. For example, among the objectives of the Project Management Institute Indonesia Chapter (2013) are: (i) to foster world class project management; (ii) to advocate acceptance of Project Management as a profession and discipline throughout Indonesia; (iii) to promote PMI Certifications and continuing competence development; and (iv) to promote the Project Management Institute's Professional Code of Ethics and Conduct.

The vision of the Singapore Contractors Association Ltd (SCAL) (2013) is: "To facilitate members in becoming world class builders". The association "aims to position its members to achieve greater professionalism and quality in the construction business" (SCAL, 2013). Among its objectives are: (i) to secure the recognition of the Association as the official representative of the building and engineering construction industry by all persons, professional bodies and authorities whose interest

extends to and embraces the building and engineering construction and allied trades; (ii) to promote and encourage uniformity in the customs and practice in the conduct of the building and engineering construction industry to promote just and honourable practice in the conduct of business and to suppress malpractice; (iii) to promote means and measures to maintain and improve the standards of the building and engineering construction industry and to enhance the status of members thereof with the general …. The mission statement of Indonesian Contractors Association (ICA) includes: "To enhance ICA members' competency and professionalism as players in the construction industry".

Professionalism, Ethics and Sustainable Design

In the context of sustainable building, Aho (2013) notes that professionalism could be defined as a work ethic aiming at promoting and ensuring decisions and outcomes which balance both the short-term benefit of the company and its direct stakeholders, the value expectations of end customers, and the long-term broader good of the society. He introduces the notion of "sustainable professionalism" which means consistency and integrity in applying one's skills and competencies for the benefit of the community.

Ofori (2012) highlights leadership and actions by the professional institutions as one of the drivers of the pursuit of sustainability in the building industry. Most of the leading institutions have formulated manifestos or strategy documents in these regards. Examples are those of the RIBA (2000) and SIA (2013). The Singapore Green Building Council (SGBC), a joint initiative by the public and private sectors, with membership from all sections of the construction industry, was formed in 2009. Its mission is 'to propel the Singapore building and construction industry towards environmental sustainability by promoting green building design, practices and technologies, the integration of green building initiatives into mainstream design, construction and operation of buildings as well as building capability and professionalism to support wider adoption of green building development and practices in Singapore' (www.sgbc.sg/index.php/green/about/mission/). The 'key focus areas' of SGBC are: (a) profiling Singapore as a leading Sustainable Hub in the tropics; (b) enhancing professionalism and knowledge in sustainable development; and (c) functioning as a dedicated certification body for green building-related products and services.

RIBA urges practitioners "to ensure that every intervention into the built environment not only improves the quality of life but also uses all available means to eliminate waste, curb pollution and conserve energy and natural resources" (RIBA, 2000, p. 1). It also provides the RIBA Environmental Checklist for Development to guide designers (RIBA, 2000).

Twinn (2013) suggests that to make a meaningful contribution in society and to sustainability, building professionals must: (i) fill the communications gap in society's appreciation of sustainability; and (ii) develop reasoned and rounded views about the complex world in which they work. He proposes that a new approach to professionalism is needed. This would entail: (i) being relevant to politicians and the public; (ii) a single authoritative voice for communication; (iii) tailoring the res-

ponse to a specific audience to present information in ways that speak directly to different and wider audiences; (iv) acting to build confidence across society. For built environment professionals to progress with this, they will need: (i) a unified arrangement that can pull together all the existing professional institutions; (ii) independence to take a balanced, long-term view of society's needs and to be the defender of the inhabitants of the built and natural environment; (iii) transparency, so that the public can see what gives professionals and their institutions their authority and wisdom; (iv) a service that is more integrated and cross-discipline aware, including the economic and social side of implementing technical issues; (v) institution(s) that become the repositories of collective knowledge to benefit everyone, avoiding the gaps, overlaps and misfits that occur today; (vi) free public and research access to this knowledge; (vii) every professional must be required by their institution to dedicate a mandatory proportion of their time to the common good of society; and (viii) the professions should endeavour to become key players in formulating policy recommendations, and initiating technical standards and regulatory frameworks for the built environment.

Duffy and Rabeneck (2013) note that the concept of public good embodied in the professional principles of trust and mediation between demand and supply is socially valuable, and is now urgently required to address the challenges of sustainability. They note that, in the context of sustainability, the reduced influence of government (owing to privatisation and reduced public-sector budget), the failure of the design professions and the construction industry to relate client aspirations to building performance over time is risking future vulnerability of the building stock and the environment as a whole.

Aho (2013) points out that some change is taking place. For example, some younger professionals do not accept opportunities to work for companies whose business model, value drivers and objectives do not match their own value systems. The emerging interest of many clients in seeking to 'future-proof' their investments by specifying rating levels in building assessment schemes is a sign of this.

A few codes of professional conduct at the national, institutional or company levels make specific reference to practice with regard to the protection of the environment. In South Africa, the objectives of the Rules of Conduct for Registered Persons: Engineering Profession Act, 2000 (Act No. 46 of 2000) are to ensure that Registered Persons: apply their knowledge and skill in the interests of humanity and the environment; execute their work with integrity, sincerity and in accordance with generally accepted norms of professional conduct; respect the interests of their fellow beings and honour the standing of the profession; continuously improve their professional skills and those of their subordinates; and encourage excellence within the engineering profession.

Further Action

The Emerging Professionalism

As discussed above, more needs to be done. Hakkinen and Belloni (2011) highlight three main pre-requisites for sustainable building: (a) availability of sustainable

building technologies; (b) availability of methods and knowledge for sustainable target setting, design, procurement, monitoring and management of buildings; and (c) the development of sustainable building processes and adoption of new building technologies, methods and working models. They concluded that the most important measures towards sustainable building include the development and delivery of sustainable building information for clients and end purchasers, development and use of tools for assessment, monitoring and comparison of sustainable building solutions, support for designers to enable competence improvement, development and use of economic incentives to increase the attractiveness of sustainable building investments, and the development of sustainable renovation concepts, maintenance services and energy services. The following issues were important in Finland: the need to increase the expectations and awareness of, and thus, demands by, end users about the potential of sustainable building; adoption of methods for sustainable building requirement management; mobilisation of (integrated) sustainable building tools; the development of designers team working, competence and the role of chief designer; and the development of new concepts and services.

Hughes and Hughes (2013) note that the sustainability agenda will require high levels of technical expertise and professional judgment in cross-disciplinary groups of many different stakeholders. The built environment professions must rise to the challenges and evolve new conceptions of professionalism. CIOB (2013b) established the Sustainability Scholarship scheme in 2007 to encourage its members' companies to carry out research, each using one of its employees. The subject of the research must benefit both the company and the wider building industry.

Huang and Bohne (2012) conclude that the most important potential for reduction of embodied air emissions in the Norwegian construction industry relies on the industry's up-stream suppliers. Policies to drive stakeholders to select low emissions materials and material suppliers to release information on embodied emissions will play a key role in the reduction of the construction industry's air emissions. There should be cross-sector and global co-operation on providing transparent data on embodied air emissions of materials.

Role of Education

The level of knowledge of sustainability among building professionals needs to be enhanced. Hakkinen and Belloni (2011) observe that a number of designers still lack wide competence in sustainable building. Designers also lack powerful and integrated sustainable building design tools. To overcome this barrier, it is important to improve professional education on sustainable building. Attention should be paid to the competence and collaboration of the whole design team and the competence of the chief architect and his/her ability to lead sustainable building design. On the other hand, there should also be a readiness to compensate the professionals for the new tasks and competences required.

In Singapore, there is training to create a Green Workforce: professionals who are educated on aspects of sustainable building. CIOB has encouraged its members or fellows "working on projects where sustainability is important" to seek the quali-

fication of chartered environmentalist. By 2013, some 7,000 professionals had gained the qualification from the Society for the Environment.

Duffy and Rabeneck (2013) propose the use of systematic, well planned and executed case studies of projects to create knowledge for teaching and the professions. Such case studies would take into account client aspirations and resources, social and economic contexts, the parties involved, the management of the decision making process, project delivery, user feedback, and the financial and other consequences of the project. They suggest that construction professionals should place more emphasis on the public good "by creating and sharing an open-ended, disinterested, interdisciplinary body of knowledge about buildings and their use" (p. 115).

Aho (2013) believes that valuing individual professionalism will be a prerequisite for the industry being able to attract and retain talent in future. Given the nature of the building process, no single profession can do it alone. As noted by Singapore's Deputy Prime Minister, RADM Teo Chee Hean at the opening of an international conference of engineers recently (Ministry of Home Affairs, 2013) "The magnitude and complexity of the issues posed by climate change require a multidisciplinary response, at the systems level, and also for specific solutions. For example, we need mechanical and electrical engineers to develop and deploy innovative energy efficient solutions in buildings; … engineersto develop renewable energy systems and smart grids; create flood-resilient drainage systems, and protect our coasts from erosion or inundation".

Indeed, there appears to be a need for new specialisations in the building industry. Ofori and Rashid (2011) highlighted the need for professionals who are particularly knowledgeable on how a building can be 'greened' .Hakkinen and Belloni (2011) note that the findings from their study showed that one of the roles that should be strengthened and developed in sustainable building is that of the design manager.

Recommendations

Progress in sustainable building can be attained through the motivation of building industry practitioners who, in their normal activities as professionals or managers, recognise their personal responsibility as good citizens doing their part to contribute to the efforts by their societies to address the impacts of human action on the environment, and to attain the broad goals of sustainable development. This attribute should be nurtured. Thus, the educational institutions have a key role to play. Environmental responsibility should permeate the whole academic programme of the education and training of building industry practitioners-to-be.

The syllabi should be designed to put stress on case studies of various types of projects with varying levels of success and their determining factors, and project work and role-play activities which are based on sustainable development scenarios.

The development of appropriate attitudes and mindsets should be an important part of the education. Thus, teamwork, mutual respect and recognition of the merits and contributions of different persons in the project team should be given some attention.

The codes of practice of the professional institutions and the national regulations on professional registration should be formulated to cover the individual social responsibility and ethics of practitioners. The usual definition of "professional ethics" in such documents should be extended to include respect for, and contribution, to the improvement of, the environment.

The professional institutions and trade associations, as well as professional registration councils, should also include in their annual continuing professional development (CPD) requirements, a minimum proportion of environmental courses.

A series of national awards recognising the Responsible Professional of the Year in each field would also encourage progress towards individual professional responsibility.

Research Agenda

From the discussion in the paper, the research agenda outlined below can be proposed.

1. What are the key drivers and obstacles of sustainable building in Indonesia? What is the relative importance of the architect?
2. What are professional ethics in general? Do they change from one society to another, and in the same society, over time? If so, what are the appropriate ethics of the professional in the building Industry in Indonesia?
3. Is there a notion of "professional responsibility" of a practitioner in any particular occupation, or of the national building industry? Can it be the driver of the process towards sustainable building?
4. Is there a notion of "sustainable professionalism" in building construction in Indonesia? If so, how can it be operationalized?

CONCLUSIONS

A sustainable building is one which has been designed and constructed with due consideration of aspects relating to the broader concept of sustainable development which all countries are now pursuing. These aspects include: (a) preservation of land and effective decision making in answer to the fulfilment of the client's need for space (for example, is a new building needed?); (b) resource conservation, and maximisation of utilisation of renewable resources; (c) utilisation of existing natural factors such as daylight, wind direction and sunlight; (d) prevention of pollution all types; (e) protection and preservation of natural ecosystems; (f) effective management of waste; (g) enhancing the durability of the built facilities including safeguarding the fabric of the built facilities in changing atmospheric conditions; (h) promotion of the health and well-being of the workers building the items as well as occupants of nearby buildings (during construction), and of users of the built facilities (upon completion); and (i) development of environmentally conscious lifestyles of the users.

Such a building can only be attained if the professionals involved in its planning, design and construction are knowledgeable about these features, consider them

to be necessary, and are able to provide them on the project. Thus, the responsibility and professionalism of the individual professional are key.

REFERENCES

Aho, I. (2013), Value-added business models: linking professionalism and delivery of sustainability, *Building Research and Information*, **41(1)**, 110–114.

BCA (2013a), *Reinforce strategies on Green Buildings,* says BCA's expert panel, News release, 26 June, <http://www.bca.gov.sg/Newsroom/pr26062013_IG-BC.html> (Accessed on 13 September 2013).

BCA (2013b), *Welcome address* by BCA Chairman Mr. Quek See Tiat at the opening of the International Green Building Conference 2013, World Engineers Summit 2013 and BEX Asia Exhibition 2013 at Marina Bay Sands Singapore, 11 September, <http://www.bca.gov.sg/newsroom/CMsp11092013_IGBC.-html> (Accessed on 13 September 2013).

Carroll, A.B. and Buchholz, A.K. (2006), *Business and Society: Ethics and Stakeholder Management*, 6th Edition. Thomson, Mason, OH.

CIOB (undated) *Rules and Regulations of Professional Competence and Conduct,* Ascot.

CIOB (2011), *CIOB Buildings in Construction,* Ascot.

CIOB (2013a). *Carbon Action 2010*, <http://www.ciob.org/carbon-action-2050> (Accessed on 16 September 2013).

CIOB (2013b), *Sustainability Scholarship,* <http://www.ciob.org/content/sustainability-scholarship> (Accessed on 16 September 2013).

Commission for Environmental Cooperation (CEC) (2009), *Green Building in North America: Opportunities and challenges*, Montreal.

Construction 21 Steering Committee (1999), *Re-inventing the Construction Industry*, Ministry of Manpower and Ministry of National Development, Singapore.

Duffy, F. and Rabeneck, A. (2013), Professionalism and architects in the 21st Century. *Building Research and Information*, **41(1)**, 115–122.

Foxell, S. (2003), Introduction. In Foxell, S. (Ed.) *The Professionals' Choice: The future of the built environment professions*, Building Futures, London, pp. 12-15.

Green Building Index SdnBhd (2009), *Green Building Index, Kuala Lumpur*, <http:-//www.greenbuildingindex.org> (Accessed on 19 February 2010).

Hakkinen, T. and Belloni, K. (2011), Barriers and drivers for sustainable building, *Building Research and Information*, **39(3)**, 239–255.

Hall, R. H. (1968), Professionalization and bureaucratization, *American Sociological Review*, **33**, 92-104.

Hill, S. and Lorentz, D. (2011), Rethinking professionalism: guardianship of land and resources, *Building Research and Information*, **39(3)**, 314–319.

Huang, L. and Bohne, R.A. (2012), Embodied air emissions in Norway's construction sector: input-output analysis. *Building Research and Information*, **40(5)**, 581–591.

Hughes, W. and Hughes, C. (2013), Professionalism and professional institutions in times of change, **41(1)**, 28–38.

Huovila, P. and Antuña, C. (2012), Lessons fromSB11Helsinki. *Building Research and Information*, **40(5)**, 539–544.

Indonesian Contractors Association (undated), *About us*, <http://www.aki.or.id/?-enaboutus> (Accessed on 05 October 2011).

Intergovernmental Panel on Climate Change (IPCC) (2007), Background paper 2b, Institutional Efforts for Green Building: Approaches in Canada and the United States. IPCC, 2007, Climate Change 2007: Mitigation of Climate Change. In: Metz B, Davidson OR, Bosch PR, Dave R, Meyer LA (eds.) Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, New York, <http://www.ipcc.ch/SPM040507.pdf>.

International Organisation for Standardisation (ISO) (2008), ISO15392. 2008-05-01. *Sustainability in Building Construction – General Principles*. ISO, Geneva.

Ministry of Home Affairs (2013), *Official Opening of the World Engineers Summit at Marina Bay Sands Expo & Convention Centre* - Speech by Mr Teo Chee Hean, Deputy Prime Minister, Coordinating Minister for National Security and Minister for Home Affairs. 11 September, <http://www.mha.gov.sg/-news_details.aspx?nid=MjkwMQ%3d%3d- Y20G93JjyDA%3d> (Accessed on 13 September 2013).

Moore, W.E. (1970), *The Professions: Roles and rules*, Russell Sage Foundation, New York.

Ofori, G. (1992), *The environment: The fourth construction project objective? Construction Management and Economics10*, 369-95.

Ofori, G, and Abdul-Rashid, A. A. (2010), *Energy Efficiency and Green Jobs in the Building Industry in Malaysia*, Report prepared for the International Labour Office, Geneva.

Project Management Institute (PMI) (2013), *PMI's Code of Ethics and Professional Conduct*, <http://www.pmi.org/About-Us/Ethics/Code-of-Ethics.aspx> (Accessed on 17 September 2013.

Project Management Institute Indonesia Chapter (2013), *About PMII*, <http://www.-pmi-indonesia.org/index.php/about-us/chapteroverview> (Accessed on 16 September 2013 5:03:54 PM).

Royal Institute of British Architects (RIBA) (2000), RIBA Environmental Manifesto. London.

Rashid, A. A. and Ofori, G. (2013), Genesis of Malaysia's policy relating to sustainability of the built environment. *Open House International*, **37(4)**, 39-49. Eastern Meditteranean University, Turkey and University College London, UK.

Singapore Contractors Association Ltd (SCAL) (2013), *The Singapore Contractors Association Ltd – Association profile*, <http://www.scal.com.sg/index.cfm?-GPID=1> (Accessed on 16 September 2013).

Singapore Institute of Architects (SIA) (2013), *Attributes of a Sustainable Built Environment*, SIA Press, Singapore.

Skea, J. (2012), Research and evidence needs for decarbonisation in the built environment: a UK case study. *Building Research and Information*, **40(4)**, 432–445.

Twinn, C. (2013), Professionalism, sustainability and the public interest: what next? *Building Research and Information*, **41(1)**, 123–128.

UNCSD (2012), <http://www.uncsd2012.org/index.php?menu=62>

UNEP (2013), *Medium-term strategies*. <http//www.unep.org>

United States Green Building Council (USGBC) Research Committee (2007), *Green Building Research Funding: An assessment of current activity in the United States*, Washington, DC.

Wilensky, H. L. (1970), The professionalization of everyone? In Grusky, O. and Miller, G.A. (Eds.) *The Sociology of Organizations: Basic studies*, Free Press, New York, 483-501.

World Commission on Environment and Development (1987), *Our Common Future*, Oxford University Press, Oxford.

Worthington, J. (2003), Foreword. In Foxell, S. (Ed.) *The Professionals' Choice: The future of the built environment professions*, Building Futures, London, 12-15.