

Environmental Impact on the Construction Industry

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Before studying the particular problems facing the construction industry with regard to the impact of environmental changes it is essential to look at a wider perspective. The World Commission on Environment and Development (Brundtland in 1987) stated that the pursuit of sustainable development requires:

- o a **political** system that secures effective participation in decision making
- o an **economic** system that can generate surpluses and technical knowledge on a self-reliant and sustained basis
- o a **social** system that provides solutions for the tensions arising from disharmonious development
- o a **production** system that respects the obligation to preserve an ecological base for the development
- o a **technological** system that can search continuously for new solutions
- o an **international** system that fosters sustainable patterns of trade and finance
- o an **administrative** system that is flexible and has the capacity for self correction

Any proposals for action by the construction industry should reflect these ideals.

Philosophers such as Heidegger,

Wittgenstein and currently Amartya Sen have believed that science has influenced our ways of thinking, our judgements, perceptions and attitudes to such a degree that it has spread into areas of life which really have nothing to do with science. Technology can undervalue those things which cannot be measured or quantified. Tomlinson (1989) appealed for a more holistic attitude in dealing with problems to meet society's demand for a more meaningful and caring relationship between people and nature.

Population growth, economic growth and rising living standards have meant erosion of world resources and the denial for future generations of what they might rightfully expect us to leave them. The concept of sustainability implies meeting present needs without compromising future ones, but there are radical implications which will affect every nation and set responsibilities for all people whether they be producers or consumers. Pearce (1991) shows data from the United Nations Development Programme which concludes that there is no automatic link between economic growth and human progress. The Human Development Index links literacy, life expectancy and gross income and shows, for example, that the United Kingdom ranking eighteenth with regard to the gross national income has a human development index of ten; Canada with a GNP ranking of seven has an HDI rating of five. A nation is developing sustainably if its human development index rises systematically over time.

Environment is a key issue in discussing the sustainable development of a nation. Pearce (1991) defines the capital base of sustainability as comprising three types of capital that which is **man-made**, such as, buildings, roads and machinery; **human** capital arising from knowledge and health; **natural** capital which includes the plant and animal species, tropical forests, the ozone layer and natural energy balance around the earth.

The design and construction of buildings is a major part of civilisation. The impact of buildings on the external and internal environments is much more important than was originally thought. About half of the carbon dioxide build-up in the atmosphere, which partly causes the greenhouse effect, is due to the emission from buildings. Likewise chloro-fluorocarbons are used in airconditioning and refrigeration systems whilst halons are commonly employed for fire extinguishing systems. World-wide 80% of energy consumption involves burning fossil fuels.

With the increasing world population and the realisation of how people stress the environment with waste products, as well as wealth encouraging the individual to consume more non-renewable resources, concern is now acute about our failure to have appreciated the finite and finely balanced nature of the biosphere at an earlier period of time. Designers and contractors are responsible for the resource demands of the environment they create, whereas owners and occupants are accountable for the waste products they produce. Buildings have to be designed to take into account ecological principles, such as the reduction of pollution, sustainable

growth, recycling of waste and energy, energy effectiveness and conservation of resources.

A new age of biological architecture is dawning which considers the balance of needs and values. The principal aim is to design and construct buildings which offer a high quality environment for the occupants, besides spiritual peace and harmony with the environment. Passive and active designs can evolve low energy buildings which take into account not only the building physics, but the expectations and lifestyle of the occupants in the building. Buildings should be designed using a human eco-system model and should be reconceived as total environments (Croome 1990, Wilkes 1991).

Building owners and developers, consultants, contractors and component manufacturers, all have a role to play in minimizing the impact of buildings on the environment. A host of ideas and developments need to be pursued and these include those described in the following table.

New Processes and Products

Green labelling of buildings
Environment friendly materials
Alternative energy sources
Integration of building fabric and systems
Localized systems of environmental control
High information, density, storage and distribution of information systems
Use of chemical materials
Total environmental approach to design

Modification of Existing Processes

- More efficient combustion processes with less CO₂
- Recycling and reuse of waste
- Passive and active design
- Effective commissioning, operating and maintenance procedures
- Improved design and construction process
- Effective management at design, construction and in-use stages
- Effective feedback control systems

Clean-up Existing Technologies

- Elimination of chloro-fluorocarbons
- Improved environmental standards and codes
- Improved energy efficiency wherever possible
- Heighten awareness of industry concerning environmental matters
- Better education and training about environmental matters

The development of chemical materials and biochips during the next decade will revolutionize building design so that polyvalent building envelopes will incorporate data and environmentally responsive transmission and control systems. Fresh air may be introduced into spaces via capillary sensitive materials, and occupants will have increasingly more localized forms of environmental control.

There are many manifestoes and charters being published at present which aim to be a blueprint for action by the building industry. The use of insulation in existing and new buildings; the use of efficient boiler plant with combined heat and power; the elimination of halons

and CFCs are some of the well-known ideas. But is this sufficient? How are all these issues going to change decision-making at the planning, design, construction and operative stages of building?

A new vocabulary is becoming evident. Specifications are now using the term 'sustainably produced' materials, for example, and there are many more instances where close attention is being paid to the effect of buildings and their environments on people. Some examples of how specifications are changing to include the use of organic paints which are free of petrochemicals, lead and biocides; the use of organic insulation materials such as cork and wood; the use of special glass to admit recommended levels of ultra-violet radiation; the use of low radioactivity construction materials; suspended insulated timber floors to deflect microwaves from geopathic zones; ventilated sub-floor cavities to prevent pressure building up in buildings and to aid dispersion of radon; the need to reduce electric and magnetic fields in sleeping areas; the need for fragrance in buildings.

It is not only the design of buildings that needs a sensitive analysis of environmental needs, but also the process of procurement, construction and buildings in use. There has to develop a green ethic by consultants, contractors and manufacturers; it is likely that developers will have to abide by a green code before a project can be developed. At every stage of the production for a building there will need to be an environmental impact analysis and statement. Energy consumption in use is one factor but the energy required to produce the materials and systems will

also have to be considered.

New decision-making systems will have to be developed which acknowledge that social as well as financial profit is important. Inter-disciplinary working will be paramount. Analysis, synthesis and evaluation will be vital if a holistic approach to environmentally responsive building, engineering and architecture is to be achieved.

There is a social responsibility for the construction industry to deal with the environmental impact of buildings and with advancing technology, rising expectations of the public for quality human environments and better building performance thus offering a great opportunity to improve the balance of sustainable development between man-made, human and natural capital.

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