Can ISO 14000 and eco-labelling turn the construction industry green?

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Abstract

A growing awareness of the impact of buildings on the environment has created a greater need to take account of environmental factors. To address this effectively, the environmental impact of a building has to be a primary consideration of the design team. Two approaches are available to the design team to provide clients with assurance that ecological design principles are carried through to construction. These are the comparatively new international environmental management systems standard, ISO 14001, and the slightly older approach of eco-labelling. The two approaches are different but aim at the same goal. This paper explores to what extent these two approaches can achieve their aim of sustainability with the construction industry and questions whether some of the wider issues of sustainability has been ignored.

Keywords: Sustainability; Materiality; Evaluation; Construction; Ecological design; Environmental management; Eco-labelling

1. Introduction

Burgeoning environmental awareness amongst clients and government legislation requires the construction industry to ask itself many questions: How can the industry respond to the increasing urgency and demand for a more environmentally sensitive design? What is the best practice in environmental design and how can this be assured? How can the added, non-monetary, quality of environmentally benign materials and practices be compared with more contemporary norms? Where are the suitable materials? How should environmental issues be managed within the overall design process? How can sustainability be achieved?

This realisation has permeated all fields as research findings are translated into commitments. For instance, the Earth Summit in Rio, which highlighted many pressing concerns of the human interaction with the environment and resulted in Local Agenda 21 [1]. In the UK, like many other countries, this was quickly translated into policy:

“A more holistic approach is called for, involving a comprehensive procedure to identify total environmental and social costs and alternative solutions to construction problems”[2].

By the mid 1990s sustainability was firmly on the political agenda. For instance, the British Government endorsed the need for research into the integration of social and environmental issues that clearly included the construction industry. A more holistic approach to construction problems was called for, which should involve comprehensive procedures to identify total environmental and social costs and alternative solutions [2].

The moves towards urbanisation, industrialisation and cross-cultural design influences have created a greater tendency for individual buildings to be considered in isolation from their traditional local influences. Planning authorities representing the civic interest have the ability to control and direct development through the statement of general guidelines within which development is constrained. While the origins of planning legislation relate to the control of pollution, subsequent planning policies relate more to economic factors and social planning with a more recent move...
to recognise current environmental issues. In addition, the decisions relating to the siting, design and construction of buildings may be distorted by Governmental actions such as subsidies and investment grants, or tax regimes which favour maintenance costs over capital investment influences; commercial influences such as land and property prices, possibly distorted by planning zones; and marketing policies which do not permit comparison of the “real cost” of materials or construction techniques based on sale price. Current structures, therefore, do not favour the promotion of ecologically sound development. Environmentally conscious buildings still tend to be noted as exceptions rather than the commonplace. It is for this reason that the Royal Incorporation of Architects in Scotland (RIAS) initiated their environmental policy charter [3]. Can eco-labelling and/or ISO 14000 contribute to the solution of this problem, or is there still something missing?

2. The in construction benefits of better environmental performance

Since the industrial revolution, various activities are believed to have contributed to a gradual but accelerating decline in the global environment. For example, the Inter-government Panel on Climate Change (IPCC) is convinced that climatic change is taking place that will lead to less predictable weather systems, rising sea levels and rising temperatures [4]. The impact that the construction industry can have on the environment is well documented (e.g. [5–7]). It is also clear that the industry is not ignorant of these impacts [8]. Zhang et al. [9] show that total environmental damage can be significantly reduced by the improvement of environmental performance in the construction industry. Within the scope of environmental damage they include disruption to lives of dwellers juxtaposed to a works site, noise and competition for land with other activities such as agriculture. This is in addition to more conventional damage.

Improvements in environmental performance are often seen as a cost burden to the operator, which they must either absorb to maintain their competitive edge or pass on to the customer if they are to maintain their profit margin. There are cost implications for a business but this is a limited view of why a company should strive for improvements in environmental performance. There are also many benefits in pursuing better environmental performance, not only for the environment directly but also to the industry financially [10]. For example, in the area of waste minimisation and pollution prevention, these include a reduction of operating costs and lower overall costs in comparison to competitors [9]. The further financial motivator for “going green” is the imperative of legislation, usually backed by various forms of financial penalty. Avoiding fines must be a strong incentive in any industry.

According to Keeping and Shiers [11], financial benefits for the client can include lower energy costs, lower maintenance costs and a reduction in employee absenteeism as a result of “healthier” buildings. This strong motivator of financial gain from being seen to be ‘green’ is a factor that has not escaped the marketing community, in which the view is held that market penetration can be increased when an organisation emphasises environmental concerns [12,13]. However, it does not necessarily follow that the introduction of an eco-labelling scheme or environmental management system certification automatically leads to increased sales [13].

Raising client and design team awareness of ecological issues to a level where these issues are ranked as priority factors is a precursor for the wider development of environmentally benign buildings. In many cases this will require clients to recognise long-term interests in favour of short-term benefits. The perception of ecologically sound design as something to be aimed for and valued has to be popularised rather than it being considered unusual, idiosyncratic and possibly ‘cheap and nasty’. However, even when a client has a commitment to ecologically sound design it is not easy for them to confirm whether their objectives have been achieved. When considering the financial implications of a building’s design the client has the relatively simple measure of price, which is stated in monetary terms and can be compared directly with other options. Although some approaches have been developed to measure various environmental and ecological aspects they tend to relate to component parts and no single or simple measure is available which popularly conveys the ecological worth of a particular design solution.

3. Overview of ISO 14001 and the ISO 14000 “family”

There are many “cook-books” for the implementation of ISO 14001 (e.g. [14–16]) so this section will restrict itself to an overview of ISO 14000. Development of the “ISO 14000 family” set of standards began in 1996 and continues. The focus is often on ISO 14001 because this is the specification and guidance for use of environmental management systems (EMS). ISO 14001 bears many similarities to the British Standard BS 7750. An important contrast to eco-labelling is that it is not a product standard and ISO actively discourages attempts by organisations to use their certification in this way [17]. The same applies for the ISO 9000 standards. ISO 9000 is often mentioned in the same breath as ISO 14000 as the former is primarily concerned with quality management. ISO 9000 does not relate to quality in environmental terms however [18] but there are many similarities both in terms of management implications and also the registration process [19].

‘Environmental management’ in the context of ISO 14000 means what an organisation does to minimise harmful effects on the environment caused by its activities [18]. It is a stated objective of the ISO to support the objective of “sustainable
The process of implementing ISO 14001 EMS can be achieved in a step-wise approach and can be divided into 15 steps and is summarised in Table 1 with reference to Rezaee and Elam [20], Sheldon [16] and ISO [21]. The purpose of the ISO 14000 family is the integration of better environmental management practices into business. It fosters self-organisation and self-regulation, which represents the groundwork from which it is hoped that continuous improvement of environmental performance can be sustained. ISO 14001, in particular, tries to encourage a different and more effective environmental ethic to the design of products and processes from the selection of materials and the logistics of transportation [15].

Within the ISO 14000 family, there is a set of standards specifically aimed at life cycle assessment (LCA). LCA purports to analyse the environmental impacts of a material from “cradle to grave”. Full LCAs have four stages, which are: goal definition, inventory, impact analysis and valuation [22]. The accuracy or usefulness of LCA depends on...
accurate and available data on both a global and local basis for each stage. LCA also needs a clear definition of system boundaries which, in itself, raises questions as to whether those boundaries have been set appropriately [22]. Despite the potential problems of LCA, it is still an extremely useful technique and therefore one that sits well within the ISO 14000 family.

A significant positive environmental aspect of ISO 14001 from the perspective of a “green” construction industry is the encouragement it provides for the protection of non-renewable natural resources. It aims to foster the development of a reverse distribution system driven by economics. This has always presented problems for the construction industry but the most often cited reason is that there is little demand for recycled and reclaimed materials, particularly in a low-cost, low-profit industry [8]. That demand is perhaps now being instituted by ISO 14001.

However, Zhang et al. [9] assert that very few construction companies have actively pursued certification particularly in Australia. This is slightly at odds with the ISO survey, which shows the construction industry as having the fifth highest growth area for certification [23] with almost double the number of certificates in 1999 as 1998. Whatever the number of individual companies currently certificated, certification is being actively pursued. The five countries most actively pursuing the ISO 14000 standard, in order, are Japan, UK, Sweden, Spain, Australia and the USA; with the UK accounting for over 20% of all the European ISO 14000 certificates and over 10% of worldwide certificates [23]. In comparison with the uptake of ISO 9000 certificates, ISO 14000 appears to be the less attractive of the two schemes with ISO 9000 attracting 16 times the number of certifications as ISO 14000 in the first 5 years since the respective introductions of the two schemes (accounting for the fact that the ISO cycles only stabilised to a calendar year end in December 1995). This is quite a positive picture and it is reasonable to expect that the ISO would want to portray the ‘new’ standards in their best light. In terms of actual number of certificates (as opposed to rates of growth), there appears to be more justification in the assertion of Zhang et al. that there is sluggishness in the industry with regard to certification [9]. Clearly, the awareness of environmental issues, whether on the design side or the client side, still needs to be addressed. The evidence from ISO 14000 certification would suggest that there is a lag in appreciation by the industry in the benefits of better environmental performance.

4. Overview of eco-labelling

There have been a number of attempts to initiate eco-labelling schemes around the world as a response to the need to provide information on and evaluation of the environmental performance of products and services. A weakness from which many eco-labelling schemes suffer is an over emphasis on politically driven value judgements rather than scientific data [24]. The European Community Eco-labelling scheme attempted to answer this need but requires some reinterpretation if it is to fully embrace the principles of environmental design [25]. The scheme was a generic pass/fail system, which raises questions particularly for construction materials.

Many early eco-label schemes suffered from a number of problems [26] to which their lack of success, as it was first introduced, might be attributed. The lessons that are still being learned from these attempts can be distilled as their lack of credibility. Eco-labelling boards have often been over represented by the groups whose products they assess and have no representation by consumers. Manufacturers were able to influence the criteria to be set at levels that they can already meet as it happened in the case of the EU eco-label for washing machines. Such a lack of representation of consumers in the process is in contravention of the principles of stakeholder inclusion promoted by Agenda 21. Top-down imposition does not recognise the variety of non-transferrable local influences and standards, particularly in the building industry, established through local cultural responses to local resources. Negotiation between regions is not possible with generic criteria. For example, in 1992 the Nordic Council (covering Finland, Norway, Iceland and Sweden) set strict criteria for the limits of the amount of fresh fibre that could be used in the manufacture of tissue paper and specified chlorine free chemicals to bleach the pulp. The European Tissue Symposium considered the criteria to be too restrictive and merely withdrew from the Nordic scheme.

The first eco-labelling scheme for buildings was begun by the Building Research Establishment (BRE) in the UK [27]. This scheme tried to assess the overall impact of the building on the environment. The assessment included not only energy but also other factors such as the emission of ‘greenhouse gases’, recycling and indoor air quality. The US Environmental Protection Agency (EPA) building energy scheme (“Energy Star”; [28]) is another more recent scheme and is undergoing beta-version trials. However, clearly, the BRE scheme attempts to be more holistic as it includes many more factors than energy. The holy grail of low energy has mesmerised many assessments of ecological design to the virtual exclusion of other environmental impacts. Energy is probably the most easily measured and addressed in the construction industry but it is by no means the only factor of sustainability. Indeed, it is probably the very fact that energy is an easily quantified commodity that it is such a popular measure of the environmental credentials of a material or building. Nonetheless, the savings in energy are often achieved at the expense of an equal or greater environmental impact elsewhere, for instance in the manufacture and eventual disposal of synthetic insulation material like polystyrene. The EPA scheme could contribute a valuable energy assessment protocol to a building eco-labelling scheme but it cannot be considered as a true eco-labelling scheme in its own right. In Hong Kong, the more holistic BRE model (UK BREEAM) has been adopted in the prepa-
ration of the Hong Kong building environmental assessment model (HKBEAM) not least because of the additional administration costs and confusion that the amalgamation of a number of labelling schemes needed for a holistic approach tends to cause [29].

There are many eco-labelling schemes in operation worldwide. Many countries have their own schemes running alongside other schemes. For instance, in addition to the EU eco-labelling scheme, Germany has the “Blue Angel” and “Green Dot” programmes. France has the “NF-environment mark” and Spain has its “AENOR Medio Ambiente” scheme. Regional schemes have positive benefits in identifying regional appropriateness in cultural and economic responses to the environment [25] but they also can lead to confusion and reduce the scope for comparisons between products labelled by different schemes.

The constant introduction of new schemes also has a tendency to move away from the original ideals of holism and towards further fragmentation as evidenced by the plethora of schemes currently in existence, the USA having no less than 21 separate groupings of labels [28]. The net result is a dilution of the very information that the schemes aim to provide and which is a premium in addressing environmental concerns [25]. The basis on which eco-labels are awarded is usually some form of life cycle analysis (LCA). In the discussion of ISO 14000, it was mentioned that there can be pitfalls for LCA and this is highlighted by the fact that LCA was one of the areas of the major revision the European Commission instigated in the beleaguered EU Eco-label Award Scheme [30].

Inevitably, eco-labelling schemes cannot cover all materials, so many fall through the system, including some which have better environmental credentials than others that receive an award. This is evidenced in relation to the reclamation of materials, which is highlighted under the EU Recycling Protocol as a more sustainable option than landfill. A recent attempt to harmonise recycling of materials in Europe has highlighted the important cultural and regional differences in reclamation practice within the EU [25]. Reclamation is not on the agenda for many countries, notably Germany and France. It is part of the culture in the UK where ‘recycling’ however, in the popular context of the term, is still only now gaining some acceptance. No mention of reclamation has been made in the European Community’s own recycling objectives [31]. This effectively outlaws such materials because the Construction Products Directive requires Governments to limit the trade in materials that lack an EU standard in preference for materials which do.

There is a cruel bind with product-based environmental labelling schemes. It is that, to be regionally and culturally appropriate requires a regional network of schemes if the danger of merely replacing the “modern materials homogeneity” seen in speculative building with a “green homogeneity” with no reference to regionality is to be avoided. However, fragmentation of information leads to redundancy and confusion within the system. It is similar to the paradox of the “subtle destruction” brought by universalisation that Frampton discusses in his essay on architectural regionalism [32].

5. Sustainable construction through ISO 14000 and eco-labelling?

The main debate on how to reconcile the needs of economic growth with ecological maintenance has centred on the popular and over-used concept of “sustainable development” above which a question mark hangs. Few people would admit to not being supporters of sustainable development but the phrase has been too glibly used to have much real meaning anymore without carefully considering its definition and context. Sir Martin Holdgate, President of the Zoological Society of London, observed [33]:

“Sustainable development has become one of the politically-correct theses of our era. Everybody is in favour of it—and everybody defines the term, on Humpty Dumpty’s principle, to mean what they want it to mean”.

Indeed, the pedant might argue that, by definition and given the finite nature of the globe, development cannot be maintained indefinitely and is, therefore, not sustainable [34]. Be that as it may, it is clear that the notion of sustainable development is important and therefore rightly high on the agenda.

The concept of sustainability in its modern guise was first developed in response to impacts on the natural environment, where the loss of a certain species or even life as a whole became a threat. One of the most quoted definitions of sustainability comes from the report of the United Nations World Commission on Environment and Development (WCED) usually referred to as the Brundtland Report [35]. Whatever the definition, sustainability is a prerequisite for continued existence, whether human or not. However, sustainable development is a broader concept than sustainability and includes issues on the quality of life [36] and the integration of social, economic and environmental spheres of activity. Indeed, sustainable development need not always be seen as restrictive to choice. The Scottish Office highlighted a need to identify regions within Scotland, what each could offer and how this could be exploited in new ways commercially [37]. Regionality in both sustainability ([25,38,39]) and construction ([40,52,41]) are well documented. The “Rio package” called for community involvement, which is place specific by definition, in environmental management, being desirable and necessary for the formulation of policy and practice in sustainable development. This is the principle of stakeholder inclusion, which the construction industry is increasingly being forced to accept.

The principles that emerge include regionality, inclusion of culture in sustainability and the basis for cultural materiality within the languages of architecture. From these
discussions it is possible to conclude, firstly, that the environment is suffering from unsustainable practices and resource exploitation and these unsustainable practices affect not only the natural environment but communities and their culture as well. It follows that, if regionality is acknowledged, a greater appreciation of regional resources, environmental and social carrying capacities and the interaction of environmental and social systems is necessary for planning a holistic environmental strategy.

To what extent do ISO 14000 and eco-labelling address sustainability in the construction industry? Both schemes have elements of LCA. However, the ‘product’ of the construction industry is too complex to satisfactorily give eco-labels to buildings despite the hopes of the UKBREEAM and HKBEAM schemes. A building is not so much a shelter but the means by which humans enter into negotiation with their environment. A building, and a community development more so, is better thought of as a process than a product. Furthermore, the building when considered as a product, is never finished, evolving and changing as it does through cycles of occupancy. Given the range and nature of the influences on design it is inappropriate to consider buildings and aspects of buildings in isolation, rather, a holistic approach to design is required. However, the ability to integrate the diverse and often conflicting aspects that impinge on building design is at best difficult to achieve.

In his solution space model [42] provided a diagrammatic representation of how a design could develop. The model suggests that all possible design solutions are contained within an area of solution space. The designer imposes various constraints through which the total possible solution space is reduced to a subset of options, which ideally includes the optimum design. The imposition of further ecologically based constraints upon the solution space model may assist in determining the ultimate design. However, the solution space indicated by the ecologically based constraints may not coincide or may not be in balance with the conventional constraints and an imbalance will be created in the design. In other words, the solution space of ecological design is not necessarily a subset of the total conventional solution space. This possibility is illustrated in the results of research cited by Stevenson [43], which showed that the conventional constraint of achieving energy improvement in housing projects was negated by up to 20% by the ecologically based constraint of embodied energy. The point is even more obvious when CO2 emission is considered where the direct saving was negated by up to 80% when embodied energy was considered [43].

To compound the problem illustrated by the solution space model, both Barrett and Curado [44] and Strachan [45] warn against the pitfalls of a mechanistic over reliance on imposed systems. Significant progress is unlikely where organisations follow a prescriptive quality assurance style approach [45]. Despite this Barrett and Curado warn against putting aside such systems because of the guiding influence they can have in the change process with a company [44]. Organisations that most successfully implement environment management standards are those that treat them as learning frameworks and not as mechanistic control systems [45]. This is a clear danger that faces the implementation of ISO 14000 much more than the adoption of eco-labelling. However, it is not insurmountable if management can adopt the ethos of a learning organisation.

The conflicts between solution spaces illustrated above are inherent in many eco-labelling schemes. Additionally, it is a criterion of a successful eco-labelling scheme that the label and declarations take account of the life cycle of the product [29]. Buildings and complexes have life cycles considerable in excess of that of their constituent parts. If a building eco-label is to take account of maintenance cycles, alterations and other changes associated with occupancy and changes of use, it is more appropriate that all these factors be brought together as an environmental management system. In other words, ISO 14001 appears to offer a better approach for the construction industry than eco-labelling. If labelling is required there are mechanisms within the ISO 14000 family to accommodate it.

6. Conclusions

Environmental management and sustainable development, whatever the definitions applied to them, are usually distilled down to the minimisation of harmful effects on the environment as a result of human activities. At the outset there is a problem that must be raised, whatever the success of the scheme at reducing impacts. This is the choice of language that, in keeping with eco-labelling and most other monitors of environmental impact, excludes restoration. It is about more than just managing what is left or even minimising impact. To really address the concerns raised at the Rio Summit the subject of restoration needs to be addressed. Most proponents of eco-labelling and ISO 14000 would argue that they are pro-active schemes [46]. So they are, but only in as much as they are active in reducing impact. Eco-labelling and ISO 14000 are important steps towards environmental management but, by definition, without restoration they are reactive to the situation of global environmental destabilisation. On a positive note, a restorative culture must first be one that is environmentally aware. A society that is working towards the minimisation of harmful environmental impacts, whether through eco-labelling or EMSs must be considered to be at least environmentally awakening.

There is a strong interest within the construction industry for a single well respected scheme for product labelling and performance standards [8]. Adoption of ISO 14000, and ISO 14001 in particular, seems to be a much better way of steering the construction industry towards improved environmental performance than purely label-based schemes. The former is more holistic in its consideration by tackling
the management and processes of the company rather than comparing a product to a restricted set of quantitative criteria. However, organisations implementing ISO 14000 must try to become learning organisations and avoid treating the standards as a mechanistic control system.

For all the positive steps that ISO 14000 and eco-labelling might be making, there are issues that still remain un-addressed. The most important of these are cultural sustainability, regionality and materiality, environmental restoration and, as far as construction is concerned, the consideration of buildings not just in the environment but as a part of ecological systems. The solution space model illustrates how these important issues are both out with the conventional subset of possible solutions but could be contained within a new paradigm if the boundaries of the subset of possibilities under consideration are moved. To achieve a harmony between the built environment and the natural environment, each must be seen truly as a system within ‘The Environment’ meta system. This is partly a legislative issue, partly an issue of changing the business gestalt and partly an issue for new research, or re-discovery, of materials and construction methods.

Sustainable development of the construction industry and associated businesses would be enhanced by the development of a new vernacular architecture [37] based on a regionally appropriate approach to environmentally benign building materials [25]. This is in opposition to the widely held ethos of globalisation and unification of standards and materials, or harmonisation as the process is often euphemistically called, producing as it does a disharmony with the environment at the local level. The construction industry and planning, impinging as they do directly on peoples’ life-styles and expectations, have a great potential to lead the way in doing more than just reducing their impact on what is left. They have one of the greatest capacities of any major industry to become a proactive force in restoration.

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Vitae

Dr Ball is currently a Research Fellow and Manager of a new research unit focussing on the application of geographical information systems in the School of Construction, Property and Surveying at the Robert Gordon University. Dr Ball has a background in landscape ecology and the processes of communication and information management in environmental policy and planning as part of the progress towards sustainability formed the basis of his doctorate. Other research interests have included masonry conservation and the deterioration of building sandstones and granites.