Sustainable Construction Relative to a Conceptual Analysis of Sustainable Development

SUSTAINABLE CONSTRUCTION RELATIVE TO A CONCEPTUAL ANALYSIS OF SUSTAINABLE DEVELOPMENT

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Abstract
The concept of sustainable development has been proposed as an appropriate response to the contemporary environmental crisis, although there are a range of opinions regarding what form this notion should take. Sustainable construction, as the construction industry's contribution to sustainable development, has an important role to play in the practical realisation of the concept. Therefore, sustainable development was considered in terms of a range of constituent views, grouped into three categories of perspectives pertaining to the perceived extent of change required to bring about a more sustainable future. These categories were defined as institutional / status quo, academic / reform and ideological / transformation. Reflecting the nascency and complexity of the sustainable development concept, certain views could be grouped in multiple categories. Through this analysis it is averred that sustainable construction can be readily associated with institutional and, to a lesser extent, moderate reforming conceptions of sustainable development. However, practices grounded in transformative notions are required in order to mitigate the severity of outcomes associated with incessant environmental degradation. Although the means exist by which the construction industry can be encouraged to embark on a transformative path, it remains uncertain as to whether sufficient resolve exists generally to enact such an approach.

Keywords: conceptual analysis, sustainable construction, sustainable development.

Introduction
The environmental crisis, as characterised by *inter alia* ozone layer depletion, climate change and the incessant degradation of the natural environment, potentially threatens humanity with dire social and economic consequences, and even catastrophe (Dresner, 2008). In response, the idea of sustainable development, famously defined by the World Commission on Environment and Development (WCED) as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987: 43), has been mooted as a potential solution. Sustainable construction is the construction industry's response to the larger effort of achieving sustainable development (Ding 2005) and is evinced by a range of initiatives. These include an improved focus on health and safety, the reuse and recycling of construction products and raw materials, and the minimisation of pollutant emissions resulting from construction-related activities (Hill and Bowen 1997). Furthermore, building environmental assessment methodologies (BEAMs), such as BREEAM and LEED, have emerged as a means to both transform the market and chart progress towards the achievement of sustainability goals associated with the built environment (Cole 1999, 2005; Ding 2008).

However, despite the apparent vigour with which such practices are being pursued, amid accusations of 'green-washing' and tokenism with regard to sustainable development (Liu 2009) a fundamental uncertainty remains – will the course that the construction industry has embarked upon tangibly contribute towards a sustainable future? In an attempt to address this pertinent concern, this paper seeks to explore the conceptual

basis of sustainable development though a review of its constituent philosophies. Thereafter, current construction practice is aligned to specific notional perspectives. This effort is followed by a discussion regarding whether such contemporary construction approaches are appropriate within the broader scope of sustainable development. The paper concludes with a series of suggestions that aspire to inform the strategic direction of sustainable construction and its related activities.

Conceptual Analysis of Sustainable Development

Mebratu (1998) asserts that sustainable development represents the resolution of earlier responses to the environmental crisis. These ranged from the survivalist/neo-Malthusian perspectives of Meadows *et al.* (1972) to the low expenditure, market-orientated policies favoured by The Establishment. However, the inherent vagueness, or perhaps more kindly interpretational flexibility, of the popularised WCED conception has resulted in multifarious attempts to capture its notional essence (Redclift 2005). Similarly, it has been difficult to infer distinct socio-economic perspectives from attitudes towards the natural environment. Claims by O'Riordan (1987: 77-102) that environmentalist and technocrat/economist outlooks implicitly align with distributive equity and the prevailing economic and political orthodoxy respectively have been challenged (Hopwood, Mellor and O'Brien 2005). In particular, Hopwood, Mellor and O'Brien (2005) remark that relationships between society and nature are often made on a sympathetic or moral basis rather than on a material basis. Moreover, measures applied with the aim of achieving social justice may in practice hinder sustainability due to unforeseen scenarios and impacts, and *vice versa*. Therefore, there is merit in providing a generalised view of the various standpoints within the related discourse.

The diversity of dispositions relating to sustainable development can be arranged into three specific attitudinal categories, labelled institutional, academic and ideological. Here, particular views associated with each category are differentiated from the other perspectives in terms of their motivations, perceived problem source and solution focus, and instruments for realisation (Mebratu 1998). Alternatively, Hopwood, Mellor and O'Brien (2005) propose grouping the outlooks under headings that reflect the fundamental dynamic of each interpretation – status quo, reform or transformation. In effect these classification frameworks are synonymous (e.g. the 'institutional' category maps to the 'status quo' heading) although there is some inconsistency regarding with which group certain perspectives align (Table 1). A further caveat is that not all outlooks can be so unambiguously assigned.

Institutional / status quo perspectives

Institutional interpretations of sustainable development are concerned with addressing change within the confines of existing political and economic structures. Based on the premise that a sustainable level of consumption is achievable (Stavins, Wagner and Wagner 2003), adherents to this view firmly believe that attendant issues can be overcome through the application a range of initiatives. These include technological and organisational improvements, the employment of manifest instruments of transition (e.g. tax incentives, punitive fines) within an environmental context, and, most importantly, continued economic growth. Perhaps unsurprisingly, proponents of this perspective include most governments and their agencies, supranational organisations (including the European Union and the World Bank) and industrial and business concerns. However, predicting the impact of environmental impact of economic decisions is not the natural theoretical or empirical domain of economists (Goldin and Winters 1995), who commonly equate sustainability with economic viability (Lozano 2008a). Similarly, politicians frequently fail to address environmental and social concerns beyond relatively short election cycles.

An approach commonly identified with this category is ecological modernisation (Mol and Sonnenfeld 2000; Mol, Sonnenfeld and Spaargaren, 2009), which can be defined by its support for moderate environmentalism, market-/consumer-driven change rather than excessive regulation, and the utilisation of progressive technology to increase material and energy efficiency and repulse the (material) barriers to economic growth. The focus of this effort is not purely rooted in the techno-industrial; cultural and governance considerations are considered by many proponents to be essential elements of ecological modernisation (Murphy 2000). However, this course of action tends to have less concern for issues associated with equity, justice and human well-being (Alier 2003) and has been criticised for favouring an unrealistic 'have your cake and eat it' approach which points to the political dissimulation of environmental issues (Dresner, 2008: 38-39). Furthermore, Jänicke (2008) identifies a number of inherent limitations with the ecological modernisation method including a lack of marketable, technical solutions to counteract the loss of non-human species and the neutralising effect that economic growth has on environmental improvements.

<table>
<tr><th>Mebratu (1998)</th><th>Organisation or Movement</th><th>Hopwood, Mellor and O'Brien (2005)</th></tr>
<tr><td></td><td>Ecological Modernisation</td><td rowspan="4">Status quo</td></tr>
<tr><td rowspan="3">Institutional</td><td>Governments and Agencies</td></tr>
<tr><td>Supranational Organisations</td></tr>
<tr><td>Commercial Entities</td></tr>
<tr><td rowspan="2"></td><td>WCED (tending towards Status Quo)</td><td rowspan="3">Reform</td></tr>
<tr><td>Appropriate Technology (tending towards Transformation)</td></tr>
<tr><td rowspan="4">Academic</td><td>Academia</td></tr>
<tr><td>Environmental Economics</td><td></td></tr>
<tr><td>Deep Ecology</td><td rowspan="4">Transformation</td></tr>
<tr><td>Social Ecology</td></tr>
<tr><td rowspan="3">Ideological</td><td>Eco-feminism</td></tr>
<tr><td>Eco-socialism</td></tr>
<tr><td>Eco-theology</td><td></td></tr>
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Table 1: Comparison of organisations and movements ascribed to conceptual groupings of sustainable development per Mebratu (1998) and Hopwood, Mellor and O'Brien (2005)

Reformist / academic perspectives

Reformists are critical of The Establishment's inability to affect genuine change but do not believe in the need for the fundamental revision of existing power structures. Neither do they hold with views that predict impending social and environmental disaster. Associated approaches are techno-optimistic, support appropriate market reorientation (Daly and Cobb 1989) and government intervention for the benefit of the environment,

and identify issues concerning knowledge accumulation and distribution as the principle barriers to sustainable development. Although profound policy and/or lifestyle changes are sometimes advocated (Christie and Warburton 2001), intended impacts are generally ameliorated by prolonged implementation timescales within established social and economic arrangements (Hopwood, Mellor and O'Brien 2005). Typical members of this group are academics, mainstream non-governmental organisations, who have relinquished political agitation in favour of collaborative relationships with those they seek to influence (Rowell 1996), and, less commonly, enlightened governments. According to Hopwood, Mellor and O'Brien (2005), some approaches identified as falling within this category empathise with the ideological vision of other groups. For example, the findings of the Brundtland Report (WCED 1987), despite advocating considerable change, in reality tend towards the status quo whereas appropriate technology (Schumacher 1973) aligns strongly with transformative notions.

Mebratu (1998) identifies three principle academic interpretations of sustainable development, namely environmental economics, deep ecology and social ecology. However, Hopwood, Mellor and O'Brien (2005) ascribe the last two perspectives to their transformation heading, which effectively maps to the Mebratu's ideological category (Table 1). A similar inconsistency exists between these papers in relation to the category to which the findings of the WCED (1987) are assigned. This is illustrative of the classification problems that exist where a branch of knowledge is immature, complex and contentious, as in the case of sustainable development. Regardless, the assignment of these two approaches either to the reform / academic class or the transformation / ideological class is somewhat arbitrary. What is relevant is that they are both perceived to be external to conventional proposals for the realisation of a sustainable future and that they are subsumed and influence the related debate accordingly.

The most practically applied academic interpretation of sustainable development is the neo-classical, reductionist approach of environmental economics (Pearce, Markandya and Barbier 1989). This technique seeks to commoditise and price the natural environment (i.e. in the parlance of economics, internalise it) based on the market conventions of supply and demand such that an optimum level of environmental protection can be adopted (Jacobs 1996). Advocates of this approach acknowledge that natural resources have spatial and temporal availability constraints, the innate carrying capacity of the planet and the need to preserve environmental capital (Lozano 2008b). Frequently, environmental economics is actualised as cost benefit analysis (CBA), a protocol for assessing the financial feasibility and efficient allocation of resources among competing project and policy options (Pearce, Markandya and Barbier, 1989; Boardman *et al.* 2006). CBA is commonly used in the public sector (Fuguitt and Wilcox 1999; HM Treasury 2003). Notwithstanding philosophical and practical objections to the attempted monetisation of the natural environment (Harding 1998; Bartlemus 1999) and criticisms of its pro-Western stance on environmental protection (or rather access to natural resources), there remains a strong sense that environmental economics is a fundamentally robust way of addressing the environmental crisis. However, this assertion is predicated on the proper valuation of natural resources and services (Redclift and Benton 1994). Otherwise the overuse and attrition of these assets is sure to follow (RICS 2001).

Ecological conceptions of sustainable development are commonly expressed as deep ecology. Deep ecology, as originally espoused by Naess (1973), commends biocentric egalitarianism as the means to resolve the environmental crisis. This approach denies humanity the right to degrade or further reduce the sum of non-human entities present on Earth except where required to fulfil essential needs. Furthermore, it encourages

social and cultural diversity, deemed necessary for the continued survival of the human species (Jacobs 1961), and has led to the development of Gaia theory (Lovelock 1979), which conceives the Earth as "a total self-organizing and self-reproducing, organic, spatio-temporal, and teleological system with the goal of maintaining itself" (Mebratu 1998). On such an intellectual basis, it is perhaps more appropriate to align this perspective with the ideological group (Hopwood, Mellor and O'Brien 2005) as the fundamentally protean nature of deep ecology has allowed it to assume a more activist platform (Devall and Sessions 1985, Drengson and Inoue, 1995). While deep ecology has been criticised by some commentators as anti-human and even fascist (Bradford 1989) others regard it as mere self-interest (Lovelock 1988) and, when logically concluded as ecosophy (i.e. personal wisdom that seeks ecological harmony and equilibrium), necessary for human self-realisation (Naess 1987 1989, Drengson 1999). In this context, self-realisation can be considered as "involving the transition not only from ego to social-self, but from social-self to eco-logical self" (Mathews 2001: 221).

Transformative / ideological perspectives

According to Hopwood, Mellor and O'Brien (2005), transformative approaches are grounded in the view that "environmental degradation, poverty and a lack of justice are not a historical coincidence". Identifying disenfranchising governance structures and the erosion of humanity's relationship with nature as the principle causes of the environmental crisis, proponents are usually indigenous or minority interest groups, external to The Establishment, who may or may not regard sustainable development as the means by which to achieve their revolutionary ends.

Notwithstanding previous assignments by Mebratu (1998), those that eschew sustainable development include deep ecologists and so-called social cornucopians. Those who embrace sustainable development tend to take a more balanced view of the sustainability problem; they share a common understanding of the complex relationships that exist between the natural environment and society but nonetheless consistently acknowledge the grave consequences that would ensue should the associated issues not be timeously addressed (Rees 1995). Here, social equity and distributive governance feature strongly as valid ripostes to the ceaseless destruction of nature. This ideological view of sustainable development is substantially rooted in 'green' adaptions of existing doctrines, such as feminism, socialism and liberation theology (Mebratu 1998). Hopwood, Mellor and O'Brien (2005) also include social ecology (Bookchin 1980, 1982) within this group and further note that among its constituents "there is a constant interchange of ideas and cross-fertilization, which sometimes makes classification difficult, but enriches both ideas and practice". For example, deep ecology, as made explicit in its original exposition by Naess (1973), and social ecology place a strong emphasis on local autonomy and decentralisation (Mathews 2001: 218-219) while Pepper (1993) identifies a symbiosis between deep ecology and eco-socialism.

Eco-feminism regards overpopulation and the degradation of the natural environment as symptomatic of a prevalent andocentric epistemological outlook (Buckingham-Hatfield 2000; Mellor 1997). Those who subscribe to its principles perceive the domination of nature as ideologically inseparable from the suppression of woman by men (Merchant, 1983; Warren, 1990). Furthermore, eco-feminism is regarded as a means to interrogate and understand the dualisms of Enlightenment thinking and parallels that exist in oppression of animals, minorities and the populations of developing countries (Davison 2001). As highlighted by Hopwood, Mellor and O'Brien (2005), this position encompasses a range of approaches from cultural/biological associations of woman with nature (Collard 1998) through to social analysis (Salleh 1997). Through the conflation of the critical and transformative potentials of ecology and practical feminism, its supporters

maintain that dominant power structures should be supplanted by a benevolent, feminised value system.

Eco-socialism conceives the inherent conflict that exists between capitalism and ecology as the essential root of the environmental crisis (Pepper 1993). While acknowledging the importance of non-material interactions with nature, this ideology remains distinctly anthropocentric, regards adverse human activity as the product of inappropriate socio-economic systems rather than hereditary predisposition, and contrives to re-establish humanity's dominion over nature through planning and control. This final requirement is to be specifically achieved by harnessing the once unalienated productive capacity of industry, through common ownership of the means of production and by the application of technology in a socially and ecologically sensitive manner. Per traditional socialist theory developed by Marx and Engels, adherents to eco-socialist principles reluctantly (if at all) recognise near-term natural resource limits (Dresner 2008) but, in agreement with the WCED (1987), accept that technological and organisational restrictions exist to human transformative power. Citing 20th century Italian communist Antonio Gramsci's modern and ostensibly more ethical interpretation of Niccolò Machiavelli's 'The Prince' (1515) (Nowell Smith & Hoare 1971: 123-202), Burton (2009) believes that the proponents of change through eco-socialism will not be the proletariat but rather 'organic' (i.e. developed from within the eco-socialist movement itself) intellectuals who exhibit qualities including foresight, adaptability and resourcefulness.

In a similar vein, social ecology, as developed by the libertarian socialist Murray Bookchin, acknowledges the dialectic relationship that exists between nature and society and the need to found concern for the environment "in social criticism and a vision of social reconstruction" (Bookchin 1989: 13). In partial accord with Enlightenment notions of rationality, Bookchin claims that humanity has evolved out of and is apart from nature yet remains inextricably continuous to it (Mathews 2011: 227). Thus, through the disestablishment of hierarchical structures that the inhibit self-determination and participation, associated notions of the dominance over material world are discarded as favour of a reality where mankind becomes free to create ecologically sympathetic societies (Bookchin, 1982).

Democracy and critical tendencies established through scientific advancement and philosophical discourse have led directly to a demonstrable decline in literal interpretations of religious texts. As a result, humanity's inexorable right of mastery over nature, as typified by the Judeo-Christian tradition (Whyte 1967), has been questioned. Moreover, there is a growing appreciation of the environmental sensibilities of other spiritual practices (Bell and Morse 2005). Thus, eco-theology has emerged as both a synthesis and an extension of established religious beliefs applied in a non-human context such that, in effect, nature itself becomes a deity and the solution to the contemporary environmental crisis is reached through accordant reverence.

Sustainable Construction and Conceptions of Sustainable Development

From the forgoing conceptual analysis it is the authors' opinion that contemporary sustainable construction is primarily grounded in the institutional / status quo interpretation of sustainable development while also displaying some features of academic / reformist perspectives. (Not unexpectedly, attributes associated with ideological / transformative notions of sustainable development are deemed to be absent.) As such, sustainable construction exhibits many of the limitations associated with each of these outlooks.

Institutional / status quo interpretation of sustainable construction

The construction industry can be generally characterised as having an unwavering commitment to continued growth, an aversion to fundamental change and only a dim perception of hard limits to natural resource consumption. All of these features are consistent with an institutional / status quo view of sustainable development. Moreover, although representative bodies espouse 'green' rhetoric that somewhat acknowledges the severity of the environmental crisis and express a techno-positive surety that the attendant issues will be timeously resolved, there is little evidence to suggest that the required actions are being undertaken at a sufficient pace. For example, consider the acknowledged slow rate of and somewhat piecemeal approach to the refurbishment for low energy operation of the UK's existing housing stock, estimated as of 2011 to be approximately 25 million homes (ONS 2011). Based on this figure, the Existing Homes Alliance calculate that 600,000 whole-house refurbishments per annum from 2010 onwards (Honour 2010) are required in order to substantively contribute towards the government-imposed target of an 80% reduction in greenhouse gas emissions compared with 1990 levels by 2050 (The Climate Change Act 2008). Recent announcements in the UK pertaining to the 'Green Deal' (DECC 2010) offer some encouragement that the extent of the problem is beginning to be understood in practical terms by both government and industry. Under this scheme, due to launch in October 2012, energy efficient improvements to buildings are facilitated by low interest loans tied to the properties the upgrades are performed on rather than the loanees. However, critics of the Green Deal claim that more still needs to be done (Carrington 2011), particularly with regard to alleviating fuel poverty (Monbiot 2012, Guertler 2012).

Instruments of transition have had mixed or, due to the complexity of sustainability issues, unintended results. In addition, as recently witnessed in the UK through reductions in feed-in tariffs relating to electricity generated from photovoltaic panels (Press Association 2012; Pitt 2012), such measures can be subject to undermining political intervention and revision as well as the vagrancies of the market. Methods endorsed by the construction industry and its clients as the primary means of driving sustainability, including BEAMs and product labelling schemes, are criticised for being devised and controlled by vested and commercial interests (Ball 2002) and for having overly prescriptive formats that fail to facilitate necessary innovation (Cole 2005). Furthermore, evidence is emerging to suggest that a convincing business case for ecological modernisation has still to be made to small and medium-sized construction firms (Revell 2007). Crucially, there is an increasing realisation that a solution platform that focuses almost exclusively on technology (e.g. in a construction context, micro-generation technologies), oblivious to its inherently uncertain development trajectory, is unlikely to yield the desired results (Huesemann and Huesemann, 2012). Complementary measures, such as the promotion of behaviour change and institutional reform, will almost certainly be required in order to induce sufficient change.

Academic / reform interpretations of sustainable construction

The existence of associations between academic / reformist notions of sustainable development and contemporary construction practices are less easily inferred but nonetheless do exist. Clearly, sustainable construction exhibits a pro-technology bias and, through the support and employment of BEAMs, attempts to go beyond the regulatory requirements governing construction such that new 'reformed' norms are established (Burnett 2005). As with institutional / status quo perspectives, commercially disadvantageous, doom-laden visions of the future are avoided. Furthermore, construction organisations are increasingly forging partnerships with academic institutions in order to develop solutions that fulfil perceived corporate social responsibly

obligations and, less altruistically, facilitate 'green' differentiation in an increasingly competitive market.

Although more ideological academic notions of sustainable development, such as deep ecology and eco-feminism, are ostensibly far removed from contemporary construction practice, there is arguably worth in the seeking to further apply environmental economics to construction-related activities. In attempting to more fully understand the environmental impacts of construction, albeit (in the first instance, at least) in order to monetise associated damage for the purposes of risk assessments, trade-off analysis and regulatory levies, such an approach mirrors the endorsed and progressive trend towards understating the whole life impacts of construction activities through life cycle assessment. However, environmental economics as a disciple is not without its detractors, in particular when performed as cost benefit analysis (Seghezzo 2009), and the aforementioned implementation issues may never be satisfactorily resolved within a construction, or indeed wider, context.

Conclusions

The original goal of this paper was to establish whether or not sustainable construction will enable the achievement of sustainable development. A notional analysis of sustainable development and a brief reflection on contemporary construction industry practice would appear to indicate that it does, but with notable caveats. Most would agree that the measures already mentioned, and in particular the greater deployment of BEAMs, are a step in the right direction – a valid approach in itself. However, perhaps the question should be recast as 'do sustainable construction practices contribute *sufficiently* towards a sustainable future?' When the question is framed thus the answer becomes less apparent.

Having considered distinct approaches to sustainable development aligned to one or other of the three broad themes identified previously, Hopwood, Mellor and O'Brien (2005) commend a transformative course of action or, where this is not immediately feasible, reform leading to transformation. The authors concur with this assessment in terms of its application to sustainable construction. Room for improvement is a characteristic of any emerging discipline and it would be churlish to expect sustainable practices within contemporary construction to be beyond augmentation or even significant revision. However, in order to address the issues associated with the environmental crisis, urgent and extensive change should be embraced on a hitherto unseen (and previously unimaginable) scale. This presents a considerable challenge to the construction industry as a whole. Revolutionary approaches as advocated by the more uncompromising transformative notions will almost certainly be unpalatable to staid commercial concerns but even the more ardent reformist perspectives represent unknown territory for the majority of construction professionals. In the light of a historical reluctance to adequately engage in considerably less radical agendas (Latham 1994; Egan 1998), such a metamorphosis will doubtlessly take a period of many years, or even decades, to implement. By that time it may be too late to avoid the worst negative impacts of ongoing environmental degradation.

However, substantive transformation does not necessarily require the adoption of anarchistic approaches; change can be effectively introduced through increasingly stringent and challenging regulations and more effective incentives – the classic carrot and stick approach. But such efforts must be undertaken on a grander scale than current implementations, and may be inhibited by the long service life / slow replacement rates of the construction sector (Cooper 1999). Furthermore, it is uncertain, short of a

catastrophic trigger, whether or not the political and/or public will exists for such a course of action. Regardless, the current momentum established within the industry in relation to sustainable development should be maintained and enhanced. As the future is immanently uncertain, who is to say that ideas that appear impossibly foreign to the construction industry today will not act as tangible catalysts in the years to come for the achievement a more sustainable future?

References

ALIER, J., 2003, 'Problems of ecological degradation: environmental justice or ecological modernization', Capitalism Nature Socialism, 14(1), pp. 133-138.

BALL, J., 2002, 'Can ISO 14000 and eco-labelling turn the construction industry green?', Building and Environment, 37(4), pp. 421-428.

BARTELMUS, P., 1999, Sustainable development – paradigm or paranoia? <http://www.wupperinst.org/uploads/tx_wibeitrag/WP93.pdf> retrieved October 18, 2011.

BELL, S. and MORSE, S, 2005, 'Holism and Understanding Sustainability', Systems Practice and Action Research, 18(4), pp. 409-426.

BOARDMAN, A., GREENBERG, D., VINING, A. and WEIMER, D., 2006, Cost-Benefit Analysis: Concepts and Practice (3rd edition), Prentice Hall, Upper Saddle River, NJ.

BOOKCHIN, M., 1980, Towards a ecological society, Black Rose Books, Montreal, Canada.

BOOKCHIN, M., 1982, ecology of Freedom: The Emergence and Dissolution of Hierarchy, Cheshire Books, Palo Alto, CA.

BOOKCHIN, M., 1989, Remaking Society, Black Rose, Montreal, Canada.

BUCKINGHAM-HATFIELD, S., 2000, Gender and Environment, Routledge, London.

BURNETT, J., 2007, 'City buildings – Eco-labels and shades of green!', Landscape and Urban Planning, 83(1), pp. 29-38.

BURTON, M., 2009, Sustainability: Utopian and Scientific <http://greendealmanchester.files.wordpress.com/2009/07/sustainability-utopian-and-scientific1.pdf> retrieved July 26, 2011.

CARRINGTON, D., 2011, Green deal' will fail, government's climate advisers warn, The Guardian <http://www.guardian.co.uk/environment/2011/dec/20/green-deal-fail> retrieved January 18, 2012.

CHRISTIE, I. and WARBURTON, D., 2001, From Here to Sustainability, Earthscan, London.

COLE, R., 1999, 'Building environmental assessment methods: clarifying intentions', Building Research and Information, 27(4/5), pp. 230-246.

COLE, R., 2005, 'Building environmental assessment methods: redefining intentions and roles', Building Research and Information, 33(5), pp. 455-467.

COLLARD, A., 1988, The Rape of the Wild, Women's Press, London.

COOPER, I., 1999, 'Which focus for building assessment methods environmental performance or sustainability?', Building Research and Information, 27(4/5), pp. 321-331.

DALY, H. and COBB, J, 1989, For the Common Good: Redirecting the Economy towards Community, the Environment and a Sustainable Future, Green Print, London.

DAVION, V., 2001, Ecofeminism, in A Companion to Environmental Philosophy, Jamieson, D. (ed.), Blackwell Publishing, Oxford, pp. 233-247.

DEPARTMENT FOR ENERGY AND CLIMATE CHANGE (DECC), 2010, The green deal: A summary of the government's proposals, <http://www.decc.gov.uk/assets/decc/legislation/energybill/1010-green-deal-summary-proposals.pdf> retrieved January 17, 2012.

DUVALL, B. and SESSIONS, G., 1985, Deep Ecology: Living as if Nature Mattered, Gibbs M. Smith, Layton, UT

DING, K., 2005, 'Developing a multi-criteria approach for the measurement of sustainable performance', Building Research and Information, 31(1), pp. 3-16.

DING, G., 2008, 'Sustainable construction – The role of environmental assessment tools', Journal of Environmental Management, 86(3), pp. 451-464.

DRENGSON, A., 1999, Ecophilosphy, Ecosophy and the Deep Ecology Movement: An Overview <http://www.ecospherics.net/pages/DrengEcophil.html> retrieved December 24th, 2011.

DRESNER, S., 2008, The Principles of Sustainability (2nd edition), Earthscan, London.

EGAN, J., 1998, Rethinking Construction, HMSO, London.

FUGUITT, D. and WILCOX, S., 1999, Cost-benefit Analysis for Public Sector Decision Makers, Greenwood Press, Westport, CT.

GOLDIN, I. and WINTERS, L. (eds.), 1995, The economics of sustainable development, Cambridge University Press, Cambridge.

GREAT BRITAIN, 2008, Climate Change Act 2008: Elizabeth II, The Stationery Office, London.

GUERTLER, P. (2012) 'Can the Green Deal be fair too? Exploring new possibilities for alleviating fuel poverty', Energy Policy, In press, corrected proof.

HARDING, R. (ed.), 1998, Environmental decision-making: the role of scientists, engineers and the public, Federation Press, Annandale, NSW, Australia.

HER MAJESTY'S TREASURY (HM Treasury), 2003, The Green Book <http://www.hm-treasury.gov.uk/d/green_book_complete.pdf> retrieved January 5th, 2011.

HONOUR, J., 2010, Sustainable Housing Refurbishment – An update on the current guidance and sources of information (IP 19/10), BRE Trust, Watford.

HOPWOOD, B., MELLOR, M., O'BRIEN, G., 2005, 'Sustainable Development: Mapping Different Approaches', Sustainable Development, 13(1), pp. 38-52.

HUESEMANN, M. and HUESEMANN, J., 2012, Techno-Fix: Why Technology Won't Save Us or the Environment, New Society Publishers, Gabriola Island, Canada.

JACOBS, J., 1961, The Death and Life of Great American Cities, Random House, New York

JACOBS, M., 1996, The Politics of the Real World, Earthscan, London.

JÄNICKE, M., 2008, 'Ecological modernisation: new perspectives', Journal of Cleaner Production, 16(5), pp. 557-565.

LATHAM, M., 1994, Constructing the Team, HMSO, London.

LOVELOCK, J., 1979, Gaia: A new look at life on Earth, Oxford University Press, Oxford.

LOVELOCK, J., 1988, The Ages of Gaia: a Biography of our Living Earth, Oxford University Press, Oxford.

LOZANO, R., 2008a, 'Developing collaborative and sustainable organisations', Journal of Cleaner Production, 16(4), pp. 499-509.

LOZANO, R., 2008b, 'Envisioning sustainability three-dimensionally', Journal of Cleaner Production, 16(17), pp. 1838-1846.

LIU, L., 2009, 'Sustainability: Living within One's Own Ecological Means', Sustainability, 1(4): 1412-1430.

MACHIAVELLI, N., 1515, The Prince <http://www.constitution.org/mac/prince.pdf> retrieved July 26, 2011.

MATHEWS, F., 2001, Deep Ecology, in A Companion to Environmental Philosophy, Jamieson, D. (ed.), Blackwell Publishing, Oxford, pp. 218-232.

MEADOWS, D., Meadows, D., Randers, J. and Behrens, W., 1972, The Limits to Growth, Earth Island, Earth Island.

MEBRATU, D., 1998, 'Sustainability and Sustainable Development: Historical and Conceptual Review', Environment Impact Assessment Review, 18(6), pp. 493-520.

MELLOR, M., 1997, Feminism and Ecology, Polity, Cambridge.

MERCHANT, C., 1983, The Death of Nature: Women, Ecology and the Scientific Revolution, Harper & Row, New York, NY.

MOL, A. and SONNENFELD, D., 2000, 'Ecological modernisation around the world: an introduction', Environmental Politics, 9(1), pp. 3-14.

MOL, A., SONNENFELD, D. and SPAARGAREN, G., 2009, The Ecological Modernisation Reader: Environmental Reform in Theory and Practice, Routledge, London.
MONBIOT, G., 2012, The Green deal is a useless, middle-class subsidy <http://www.guardian.co.uk/environment/georgemonbiot/2012/jan/13/green-deal> retrieved June 04, 2012.

MURPHY, J., 2000, 'Editorial - Ecological Modernisation', Geoforum 31(1), pp.1-8.
NAESS, A., 1973, 'The shallow and the deep, long-range ecology movement. A summary', Inquiry, 16(1), pp. 95-100.

NAESS, A., 1987. 'Self-realization: a ecological approach to being in the world', The Trumpeter: Journal of Ecology, 4(3), pp. 35-42.

NAESS, A., 1989, Ecology, Community and Lifestyle, Cambridge University Press, Cambridge.

NOWELL SMITH, G. and HOARE, Q. (eds.), 1971, Selections from the Prison Notebooks of Antonio Gramsci, Lawrence & Wishart, London.

OFFICE FOR NATIONAL STATISTICS (ONS), 2011, The 2011 Census <http://www.ons.gov.uk/ons/guide-method/census/2011/the-2011-census/index.html> retrieved January 23, 2012.

O'RIORDAN, T., 1989, 'The challenge for environmentalism', in New Models in Geography, Peet, R., Thrift, N. (eds.), Unwin Hyman, London.

PEARCE, D., MARKANDYA, A. and BARBIER, E., 1989, Blueprint for a Green Economy, Earthscan, London.

PEPPER, D., 1993, Eco-socialism: from Deep Ecology to Social Justice, Routledge, London.

PITT, V., 2012, 'Government downgrades forecast for solar industry', Building, 01 June, p. 15.

PRESS ASSOCIATION, 2012, 'Chris Huhne takes solar subsidy cuts ruling to the court of appeal', The Guardian <http://www.guardian.co.uk/environment/2012/jan/13/huhne-solar-subsidy-cuts-appeal> retrieved January 17, 2012.

REDCLIFT, M., 2005, 'Sustainable Development (1987-2005): An Oxymoron Comes of Age', Sustainable Development, 13(5), pp. 212-227.

REDCLIFT, M. and BENTON, T., 1994, Social Theory and the Global Environment, Routledge, London.

REES, W., 1995, 'Achieving sustainability: reform or transformation?', Journal of Planning Literature, 9(4), pp.343–361.

REVELL, A., 2007, 'The ecological modernisation of SMEs in the UK's construction industry, Geoforum', 38(1), pp. 114-126.

ROWELL, A., 1996, Green Backlash: Global Subversion of the Environmental Movement, Routledge, London.

ROYAL INSTITUTION OF CHARTERED SURVEYORS (RICS), 2001, Comprehensive Project Appraisal: Towards Sustainability, RICS Policy Unit, RICS, London.

SALLEH, A., 1997, Ecofeminism as Politics, Zed, London.

SCHUMACHER, E., 1973, Small is Beautiful, Blond and Briggs, London.

SEGHEZZO, L., 2009, 'The five dimensions of sustainability', Environmental Politics, 18(4), pp.539-566.

STAVINS, R., WAGNER, A. and WAGNER, G., 2003, 'Interpreting sustainability in economic terms: dynamic efficiency plus intergenerational equity', Economic Letters, 79(3), pp. 339-343.

WARREN, K., 1990, 'The power and promise of ecological feminism', Environmental Ethics, 12(2), pp. 125-146.

WORLD COMMISSION ON ENVIRONMENT AND DEVELOPMENT (WCED), 1987, Our Common Future (The Brundtland Report), Oxford University Press, London.

WHYTE, L., 1967, 'The historical roots of our ecological crisis', Science, 155(3767), pp. 1203-1207.