AN INVESTIGATION INTO THE MANAGEMENT OF ENVIRONMENTAL RISKS ON INTERNATIONAL CONSTRUCTION PROJECTS

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ABSTRACT

The construction industry is one of the largest consumers of natural resources and its activities have a major impact upon the natural environment. With growing public interest in environmental issues, the industry is being held increasingly accountable for the environmental impact of its activities. Recently, because of increased public and political interest in the social impact of globalization, increasing attention has been paid to the industry’s environmental record on very large international construction projects in developing countries. The process of globalization has led to the industrial emergence of developing countries, which with limited construction capacity, are increasingly reliant on overseas construction expertise to help in upgrading their support infrastructure at a pace which does not restrict economic development. This paper explores this vulnerability and describes a research project (funded by the RICS Research Foundation) which investigates the environmental risk management practices of major international contractors on such projects. The rationale and methods underpinning the research are explained. It is hoped that the proposed research will produce a set of recommendations that will improve the construction industry’s performance in this area, enabling it to improve its environmental image and thereby, to make a positive contribution to the process of globalization.

Keywords: Globalization, developing countries, environment, risk management, stakeholders, perceptions.

INTRODUCTION

An emerging area of concern within the construction industry is how environmental issues can be incorporated into existing work practices on construction projects to make them more sustainable and environmentally friendly. The construction industry is one of the largest exploiters of natural resources, both mineral and biological, and its activities often cause an irreversible transformation of the natural environment [WCED (1987), UNCHS (1993), Thompson (2000)]. For example, large construction projects can easily destabilize fragile hill slopes; deforestation associated with construction can cause loss of land by soil erosion, silting of reservoirs and disruption of aquatic ecosystems [CIRIA (19930, UNCHS (1993), Tedd (2000)]. With growing public interest in environmental
issues, the industry is being held increasingly accountable for the environmental impact of its activities [Owens et al. (1991), Post (1991)]. This is exacerbated on large international construction projects because of increased public and political interest in the social impact of globalization. For example, Greenpeace is currently targeting the construction industry and particularly firms involved in large international infrastructure projects. Indeed, as a result of their activities, both Balfour Beatty and Skanska have recently pulled out of the Llisu Dam project in Turkey in fear of bad publicity and share price implications [Richards, 2002].

While there has been research into risk management practices on international construction projects [Yeo (1990), Lowe (1996), Lam (1999)], none has focused on environmental risks. In the context of increased environmental consciousness and globalization, this is a deficiency which needs to be addressed. For this reason, the research reported in this paper aims to investigate environmental risk management practices on large international construction projects.

More specifically, its aims are:

• To investigate the nature of environmental risks that can arise on international construction projects.
• To assess varying stakeholder perceptions of environmental risks of international construction projects.
• To determine if environmental risks are adequately identified, assessed and managed by construction companies working on international projects.
• To establish the impediments, if any, to the adoption of efficient strategies for managing environmental risks on international projects.

The objective of this research is to produce a set of recommendations to help managers better manage the environmental risks that may arise on international construction projects. It is hoped that the recommendations will aid in improving the construction industry’s performance in this area, enabling it to improve its environmental image and thereby, to make a positive contribution to the process of globalization.

An Imbalance in Risk Management Research in managing Environmental Risk

It has taken a considerable amount of time for the construction industry to take greater responsibility for managing the environmental risks that arise from its activities. Indeed, while the concept of sustainable construction is not new to the industry, it is only recently that construction companies are realizing that the adoption of environmentally sound work practices will provide competitive advantages and significant improvements to corporate image [Owens et al. (1991), Ishino et al. (1992)]. This is prompting construction firms to rethink the corporate environmental decision-making process and to manage their environmental risks more effectively.

While there has been some research into environmental risk identification, assessment, impact and management strategies on domestic construction projects, there has been no research into how these strategies are applied on international construction projects. Currently, the key instrument for understanding the environmental effects of proposed projects is the environmental impact assessment (EIA). Yet the EIA has been widely
criticised as often being too technical and narrow in scope and failing to take into account the cumulative and indirect environmental effects and their time horizons, as well as the wider and far-reaching social and cultural effects of these developments [Flyvberg et al., 2003]. Indeed, a significant problem within the construction industry relates to its unhealthy reliance on technical solutions to solving environmental risk problems while neglecting the broader social and cultural implications of environmental risks. In particular, little is understood about the environmental risk perceptions and assessment processes on international construction projects, how this differs on a country-to-country basis and how these risks are prioritized, managed or mitigated. While an understanding of the principles of sustainability and risk management may aid environmental risk management processes on domestic projects, this approach may be insufficient for construction firms seeking to work on international projects. These projects pose special problems, related to their size and complexity, particularly in terms of the stakeholders involved, procurement approaches, legal arrangements, diverse cultural considerations and political and social sensitivities.

**Globalization of the Construction Industry**

The globalization of the world’s economy, made possible by WTO and other trade associations like ASEAN and APEC, is internationalizing the way business is being conducted around the world. The construction industry and most other goods and services procurement sectors have benefited tremendously from the international trade liberalization process, including access to open market economies that was not possible before [Bryon (2001), Neumayer (2001)]. According to ENR (2000), the world construction market was worth an estimated $3.4 trillion dollars in the year 2000. Out of that, $1.113 trillion dollars, or approximately a third of the world construction spending came from Asia, which is also the world’s largest regional market.

For construction firms within developed countries like Australia, Japan, USA and Germany for example, the prospect of working on international construction projects has become a necessary part of their business strategy, motivated mainly by shrinking domestic market share and economic slowdown in their home countries [Neumayer, 2001]. Indeed, with increasing frequency, foreign firms are venturing overseas to establish market presence in foreign economies. For example, Singapore has an open market economy which does not restrict foreign competition. Foreign contractors, e.g. Australian contractors, have long established a strong local market presence, securing an average of 42% of the overall construction volume in Singapore between the years 1996 to 2001 [SSTI, 2002]. In this sense, trade liberalization and globalization has created many potential commercial opportunities, but has also created a potential minefield for foreign companies that do not effectively manage the environmental risks that can occur on international projects. One of the major problems to be overcome is the different priorities given to the management of environmental risks in developing and developed countries.

**Developing Vs Developed Countries**

The approach and priorities for managing environmental risks differ between countries with developed market economies, transition economies and developing countries [CIB
For example, mature economies are in a position to devote greater attention to creating a more sustainable building stock by the invention and use of new technologies while there is a greater urgency in developing countries to focus on social equality, economic growth, sustainability and infrastructure construction e.g. roads, housing [CIB, 1999]. In this sense, the emphasis on environmental protection in developing economies would seem to be less urgent and in some cases deemed a “luxury good”, compared to developed countries, especially when there are more pressing concerns at hand, like basic survival of its people [Neumayer, 2001]. Developed economies also have in place, a more advanced political, legal and administrative infrastructure that is necessary for the design and enforcement of strong environmental protection. This distinction in economic and social developmental priority between developed and developing economies would suggest that construction firms would have to realign their environmental risk strategies according to the country in which the project is commissioned.

For the above reasons, this research focuses on the understanding of environmental risk assessment processes of projects within developing countries by firms operating from developed countries. This area could make an important contribution to strengthening construction firm’s environmental risk management capabilities and thereby, to increase the contribution that the developed world can make to the environment and sustainability of the developing world.

The Environmental Risk and Impact of the Construction Industry

The construction industry, through its production of physical assets such as buildings and infrastructure which form the basis of virtually every aspect of development, contributes significantly to different areas of environmental stress [WCED (1987), UNCHS (1993)]. This is because its activities have an irreversible impact upon the natural environment by virtue of the very large quantities of resources it utilizes, directly or indirectly, in the construction of buildings, structures, roads and other infrastructure [CIRIA, 1993]. For example, the construction of the Three Gorges dam project in China, arguably the world’s largest water conservancy project, necessitated that 632 sq. km of land, spread out over twenty counties to be flooded, inundating 24,500 hectares of farmland and some 35 million sq m. of housing accommodation, and the resettlement of more than 1.1 million people to new towns located on higher ground [CIOB INS, 2002]. It is also estimated that the volume of water shifted by the dam is so large that it might even slightly alter the tilt of the world’s rotation on its axis. The environmental impact of a project of this scale needs to be studied and better understood so that the stakeholders involved can make more informed decisions that may minimize the negative environmental impact that the project has on the natural environment.

Figure 1 depicts the relationship between the source of an environmental change and its interconnectedness with the surrounding environment in terms of the sphere of influence of its environmental impact locally, provincially, nationally, regionally and globally. In this sense, as long as public fear of the environmental impact of a project is high, political pressure can be effectively exerted on business and government to reduce such perceived risks and its impact on the natural environment [Post, 1991]. In the absence of an effective or concise governmental framework to govern the effects of economical
Management of environmental risks

developments on the natural environment, the onus is on the business community to take on the role of environmental crusader. Consequently, there is a moral obligation on construction companies operating in developing countries to develop more efficient methods for managing the environmental risks that may occur on their projects. As Post (1991) highlighted, all industrialised corporations, including those in construction, have a corporate responsibility to integrate environmental risk concerns into the corporate decision-making process.

![Figure 1 ~ Relationships in global environmental change [Kasperson, Kasperson & Dow, 2000]](image)

**METHOD**

It is important to point out, that until specific propositions have been developed, it is difficult to propose a definitive research method. Never-the-less, in undertaking research, researchers are faced with an array of qualitative and quantitative methods that have contrasting implications for the manner in which data is collected and analysed. Bryman (1992) suggests that qualitative research is exploratory in nature and places strong emphasis on the subject’s interpretation rather than the researcher. In contrast, qualitative research typically focuses upon static relationships among variables, takes place within a highly structured framework and in relative terms, isolates the researcher from the phenomenon being studied. However, according to Ruesch and Bateson (1968), Denzin (1970), Jick (1979) and Bryman (1992), the best social research combines qualitative and quantitative research, treating them as complementary rather than competitive. By combining different methods, a researcher can focus on different dimensions of the same phenomena, producing a mutually corrective effect, which provides the richest, least biased description of a particular phenomenon. It is our intention to combine different methods of data collection and analysis. However, given the behavioural nature of the research, it is likely to have a strong qualitative element.
A CASE STUDY APPROACH

In combining qualitative and quantitative methods, this research will be undertaken in a case-study framework of four large international construction projects which have had a significant impact upon the environment. In line with the exploratory nature of this research and, its focus on behavioural issues, the adoption of the case study approach is particularly appropriate since it permits phenomena to be intensively investigated and encourages insight [Fielding and Fielding, 1987]. According to Yin (1995), case studies can provide a richly detailed longitudinal portrait of a particular social phenomenon in a real life context, and the adoption of a multiple case study approach would aid to increase the robustness of the case study research findings. Also, large-scale projects were of particular interest in this project because of their greater potential for causing damage to the environment [Flyvberg, Bruzelius & Rothengatter, 2003].

At this stage, it is anticipated that data collection will be undertaken retrospectively and that it will employ two phases of data collection and analysis. Retrospective data collection will be necessary because of the timescale of such projects, which can last many years. This makes reliable longitudinal or cross-sectional data collection difficult, if not impossible within the time constraints of a PhD project. The aim of the first stage of data collection and analysis will be to identify issues and themes which can be followed up in a second, more detailed and focused phase of data collection and analysis.

Phase one – Exploratory Survey

The first phase of data collection will involve a preliminary survey of key stakeholders typically involved in large-scale international construction projects. This will be an exploratory survey designed to tease out issues for further, more in-depth investigation in phase two of the method. Blumer (1979) suggests that exploration is a process that develops an accurate picture of the research project and is a central element of qualitative research, offering assistance in the formulation, modification and testing of hypotheses and theories. In this sense, the survey will be designed to provide insights into the following issues:

- To investigate key stakeholders’ prevailing attitudes, beliefs and perceptions of environmental risk.
- Stakeholders’ assessment of their past experience(s), if any, of the environmental risk management processes on international project(s) and its outcome/impact on the environment.
- To determine stakeholders’ knowledge-base, awareness and implication of their roles in the environmental risk management process.

The survey will target both internal and external stakeholders on international projects, ranging from the design and project team that encompasses architects, contractors, engineers, consultants, to external parties like local residents, environmentalists, the mass media, pressure groups and local authorities etc. This will enable a holistic perspective on the range of perceptions of environmental risks and their management processes on each case study project. An important issue of consideration will be the geographical barriers that international projects present, and the high likelihood that the stakeholders of interest in this research would be located overseas. To overcome this, the survey technique was
proposed as a more practical, cost-effective and meaningful method of assessing stakeholders’ attitudes and perceptions of environmental risks. Indeed, surveys have been widely employed and well tested in research on environmentally conscious attitudes and behaviours. The survey data collected will be analysed using the Statistic Package for Social Scientist (SPSS) program to check for significant bi-variate associations and to identify trends or themes which would justify more detailed exploration in phase two of this research that involves case studies.

Phase two – In-depth qualitative research

Behavioral issues are central to the study of environmental risk management processes because their implementation is dependent on stakeholders' perception of their compatibility with, and contribution to the attainment of project goals. Indeed, it is likely that everyone involved in the environmental decision-making process can influence its outcome in a whole range of ways that can be both helpful and destructive to the environmental risk management process on projects. In this sense, it is only through in-depth insights into the formal and informal group structures, communication patterns, attitudes and behaviors of the stakeholders that the effectiveness of the environmental risk management process can be assessed.

To investigate the risk-related communications that arise on each case study, social network analysis is proposed. This has been applied successfully on other projects relating to risk management practices, although not specifically in an environmental context [Loosemore (1996), Swan et al. (2001)]. Social network analysis provides a useful mechanism to analyze communication patterns in groups of people or organizations. It focuses upon relationships rather than individuals and brings dynamic and structural issues to the fore. It is particularly concerned with the structuring and patterning of those relationships over time and seeks to identify both their cause and consequences. For example, by using social network analysis, it is possible to identify central and peripheral actors within the construction organization, to identify factions and coalitions, to identify gatekeepers of information and thereby to identify those who hold power. In this sense, the social network perspective provides a powerful tool to unscramble the complexities of how stakeholders’ communication patterns, perceptions and attitudes influence the environmental risk management process on projects. Bernard et al.’s (1982) analysis of the reliability of various data collection techniques indicate that a combination of semi-structured interviews, focus group sessions and diaries would be meaningful ways of collecting this relational data.

In addition, the social network analysis will be complemented with a content analysis of risk management interactions and of documents utilized in the construction firm’s environmental risk management practices. Indeed, data about the risk management framework are contained in various locations, including manuals, corporate mission statement, articles of association, statutes, annual reports and so forth. An analysis of information contained herein will allow a more comprehensive assessment of the construction organization’s commitment to environmental risk management efficiency.

The framework for the content analysis will be adapted from Berelson’s (1971) categorization system that utilizes well-defined categories to distil the communication content into meaningful information relating to environmental risk management practices.
The techniques of content analysis have been developed to help researchers examine artifacts of social communication such as written documents or transcripts of verbal discussions in order to derive some meaning from them [Berg, 1989], and has been used with some degree of success in past construction management research to examine design team communication patterns [Wallace, 1987]. Berelson (1971: 18) defines content analysis as “a research technique for the objective, systematic and quantitative description of the manifest content of communication”. According to Berelson (1971), all communication content has subject matter, direction, values, methods, traits, actors, authority, an origin, a target, the communication content and thus can be easily analyzed. The technique is most useful when applied to unstructured data such as that collected in the second phase of this research and essentially involves categorizing communication into its component parts and quantifying it [Smith, 1975]. In this sense, the application of Berelson’s framework will help to reduce analytical bias and result in codified data which could be meaningfully analyzed to provide insights into environmental risk management processes on the case study projects. It also compliments the social network perspective which recognizes that the “transactional content” of network data can complement the “structural content” in providing explanations of social and behavioral phenomena [Tichy et al., 1979].

CONCLUSION

The construction industries of developed countries are coming under increasing pressure to better manage the significant environmental risk factors that may arise on its international projects in developing countries and have a morale obligation to respond effectively. Currently, very little is known about effective practices in this increasingly important and high-profile area of construction activity. The proposed research project is important in meeting this challenge since it will facilitate a better understanding of environmental risks, perceptions and current risk management practices. Utilising a two-phase research method, phase one of this research will use an exploratory attitudinal survey to identify stakeholders’ expectations, perceptions and experiences. Using social network analysis and content analysis, phase two of this research proposed the case study approach to better understand the risk communications between stakeholders on projects and their contribution to environmental risk management efficiency. The result will be a set of recommendations that will improve the construction industry’s performance in this area, enabling it to improve its environmental image and to make a positive contribution to the process of globalisation.

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