

## **Sustainable Construction: Private Finance Initiative (PFI) Road Cases in the UK – The Theory**

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### **Abstract**

The construction industry is concerned primarily with the planning, design, production, alteration, maintenance and demolition of the built and human environment. The construction, maintenance and use of buildings and infrastructures impacts substantially on our environment and is currently contributing significantly to irreversible changes in the world's climate, atmosphere and ecosystem. The construction industry is facing ever-increasing demands to improve its sustainability performance. Public sector clients are increasingly asking for a sustainable approach in their specification and procurement decisions. It is hard to define sustainability exactly, but arguing over definitions does not advance the debate. Concern over the sustainability of the world we pass on to future generations will continue to grow. A more sustainable future will mean a cleaner environment, a safer, and more cohesive and inclusive society and will be economically more successful and resourceful. These key concerns represent the three legs of the sustainability ‘stool’ – environmental, social and economic (BRE, 2001). Sustainability is still seen as a novel concept within the construction industry in many parts of the world with no settled definition. The industry has to understand what sustainability really is in its context and focus on creation, sustaining and dissemination of knowledge for sustainable construction across the many and diversified stake-holders in the construction projects.

This paper, based on case study research, will explain the sustainability implementation in a PFI road project in the UK.

### **Keywords**

Built environment, Construction, Economy, PFI, Sustainability

### **1. Sustainability**

In 1987 the Brundtland Report, also known as *Our Common Future*, alerted the world to the urgency of making progress toward economic development that could be sustained without depleting natural resources or harming the environment. The report was published by an international group of politicians, civil servants and experts on the environment and development, and provided a key statement on sustainable development defining it as: “*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*” (Brundtland Report, 1987).

The Brundtland Report was primarily concerned with securing a global equity, redistributing resources towards poorer nations whilst encouraging their economic growth. The report also suggested that equity, growth and environmental maintenance are simultaneously possible and that each country is capable of achieving its full economic potential whilst at the same time enhancing its resource base. The report also recognised that achieving this equity and sustainable growth would require technological and social change.

The report highlighted three fundamental components to sustainable development: environmental protection, economic growth and social equity. The environment should be conserved and our resource base enhanced, by gradually changing the ways in which we develop and use technologies. Developing nations must be allowed to meet their basic needs of employment, food, energy, water and sanitation. If this is to be done in a sustainable manner, then there is a definite need for a sustainable level of population. Economic growth should be revived and developing nations should be allowed a growth of equal quality to the developed nations.

In June 1992, the Rio Earth Summit declared that *"the right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations."* Sustainable Development is not just about the environment, but about the economy and society as well. The Earth Summit which took place over 12 days in June 1992 in Rio de Janeiro, Brazil, was the largest environmental conference ever held, attracting over 30,000 people including more than 100 heads of state. The objectives of the conference were to build upon the hopes and achievements of the Brundtland Report. In the centre of the summit was among other the question of how to relieve the global environmental system through the introduction to the paradigm of sustainable development. It emphasises that economic and social progress depends critically on the preservation of the natural resource base with effective measures to prevent environmental degradation (Earth Summit, 1992).

The UN summit focused on three broad concepts: in an "Earth Charter" covering a number of principles. Development and the protection of the environment, was the first focus for discussion. Secondly, "Agenda 21" was intended to be a global action plan for sustainable development; thirdly, developing countries demanded a substantial increase in new "funding from developed countries" to contribute to sustainable development in the South.

Agenda 21 is a comprehensive plan of action to be taken globally, nationally and locally by organizations of the United Nations system, Governments, and major groups in every area in which humanity impacts on the environment. The full implementation of Agenda 21, the Programme for Further Implementation of Agenda 21 and the Commitments to the Rio Principles, were strongly reaffirmed at the World Summit on Sustainable Development (WSSD) held in Johannesburg, South Africa from 26 August to 4 September 2002.

In World Summit 2005 it was reaffirmed that development is a central goal by itself and that sustainable development in its economic, social and environmental aspects constitutes a key element of the overarching framework of United Nations activities. Besides it was acknowledged that good governance and the rule of law at the national and international levels are essential for sustained economic growth, sustainable development and the eradication of poverty and hunger (UN World Summit, 2005).

## **2. The Construction Industry and Sustainability**

The construction industry and the built environment must be counted as two of the key areas if we are to attain a sustainable development in our societies. In the European Union (EU) buildings are responsible for more than 40% of all waste. In addition, the construction sector is the EU's largest industrial sector, contributing approximately 11% to the GNP and having more than 25 million people directly and

indirectly engaged (Agenda 21 on Sustainable Construction CIB, 1999). Sustainable construction adopts different priorities in different countries. There are widely different views and interpretations between developed and transition and developing countries. The developed economies are in a position to devote more attention to creating a more sustainable building stock by upgrading, by new developments or the use of new innovative technologies (ibid).

All public procurement should be made consistent with Government policies for delivering sustainable development, most notably in terms of carbon reduction, waste minimisation, water efficiency, community regeneration and social inclusion. PFI has a key role to play within procurement due to the scale of investment involved; the greater ease of influencing the small number of actors involved; and the way in which PFI contracts secure the long-term engagement of contractors. Sustainability considerations are not sufficiently embedded in the PFI process to ensure consistent delivery, and success is highly reliant on the motivation and expertise of individual public sector clients and private contractors (Green Alliance, 2004).

Sustainability is still seen as a novel concept within the construction industry with no settled definition and no settled body of existing practice and processes. The industry has to understand what sustainability is in its context and focus on creation, sustaining and dissemination of knowledge for sustainable construction across the multiple stake holders involved in construction projects. There is a growing realization and acceptance throughout different societies that there is a need for a more responsible approach to the environment. This new trend embraces societal and economic issues, under the umbrella concepts of sustainability and sustainable development.

The construction industry has been identified as the focus for attention since creating and running the built environment accounts for about half of all energy used and approximately half of all landfill (CIRIA, 2001). DETR (2000) states that UK construction sites and demolition produce 72 million tonnes of waste each year, representing 17% of the UK's total waste burden. Commercial waste from construction adds up to 30 million tonnes, a further 7% of the UK total. Poor design and site management leads to 10 million tonnes of non-used materials each year that are delivered to vacant sites (Crossely, 2002). Globally, the construction industry is arguably one of the most resource-intensive and environmentally damaging industries in the world. Construction accounts for 40% of the total flow of raw materials into the global economy every year – some 3 billion tons. The majority of these materials are stone, gravel, sand, clay, iron ore and other quarried material (Rodman and Lenssen, 1995).

The construction industry needs to develop and implement innovative design and construction methods to reduce the social effects of its business. It needs to consider the economic impact of sustainable project implementation, environmental and social impacts of large scale projects, the efficiency of the resources and sustainable building and infrastructure design and materials.

In the 1980s the emphasis was placed on the more technical issues in construction such as materials, building components and on energy related design concepts. Starting from the mid 1990s an appreciation of the significance of the non-technical issues was growing and it is realized that these so-called “soft” issues are crucial as well for a sustainable development in construction.

CIB (1999) Agenda 21, paragraph 25 states that governments should encourage the construction industry to promote “locally available, appropriate, affordable, safe, efficient and environmentally sound construction methods and technologies in all countries.... To emphasize optimal use of local human resources and to encourage energy saving methods that is protective of human health”. Paragraphs 69, 70 and 71 specifically set out actions for government and the construction industry regarding planning, design, construction, maintenance and rehabilitation; the procurement, use and promotion of sustainable building materials and the production of sustainable materials.

Construction has an immense contribution to make to everyone's quality of life and in enabling the positive impacts of its work to be achieved in a more sustainable manner. Construction outputs alter the nature, function and appearance of the towns and countryside. The construction industry is characterised by its extensive supply chain and its numerous stakeholders. The sustainability issues of concern to construction firms are wide-ranging and include such matters as health and safety, multiple environmental aspects, community development, social accountability, ethics and integrity, labour rights and corruption, and stakeholder engagement. The fact that the construction industry is Europe's largest industrial employer implies that it has specifically more extensive social responsibilities than all other industrial sectors. Moreover, the fact that construction accounts for around 50% of Europe's annual capital investment, implies that its immense environmental impacts need to be carefully managed. The construction industry is able to provide solutions for most of these economic, social and technical challenges resulting from these impacts, but at the same time it emphasises that a joint effort of all actors concerned is necessary in order to achieve more realistic and sustainable results (FIEC 2005).

Sustainable development is a pattern of resource use that aims to meet human needs while preserving the environment, ensuring that these needs can be met not only in the present but also into the future. 'Sustainability' is becoming a central concern for all. It is a concern that has grown out of a wider recognition that rising populations and economic development are threatening a progressive degradation of the earth's resources. The construction, maintenance and use of buildings impacts substantially on our environment and is currently contributing significantly to irreversible changes in the world's climate, atmosphere and ecosystem. Striving for sustainability is a continuous process of change. The construction industry is facing ever-increasing demands to improve its sustainability performance. Public sector clients are increasingly asking for a sustainable approach in their specification and procurement decisions. The UK sustainability strategy identified four main aims:

- social progress which recognizes the needs of everyone;
- effective protection of the environment;
- the prudent use of natural resources;
- maintenance of high and stable levels of economic growth.

For the construction sector, these aims can be translated into specific goals including maintaining the health and well being of the construction workforce, pollution control, waste minimisation, and efficient construction processes leading to projects that are delivered to time and budget, and efficient to operate. However, considerations need to go beyond the construction phase to cover lifetime sustainability of buildings and infrastructure, including the requirements of owners, operators and users. (CIRIA, 2006)

Achieving sustainability in the UK property sector means more than just reducing its environmental impacts. Property developers and constructors are perfectly placed to become active partners in social progress, community regeneration and initiatives for 'a better quality of life'. Concern over the sustainability of the world we pass on to future generations will continue to grow. A more sustainable future will mean a cleaner environment, a safer, more cohesive and inclusive society and will be economically more successful and resourceful. These key concerns represent the three legs of the sustainability 'stool' – environmental, social and economic (BRE, 2001).

### **3. Sustainable Development**

Sustainable development applies at the political and macro economic level to communities. Sustainability is addressed on an individual project. In this paper we will concentrate on two infrastructure projects sustainability. The clients and stakeholders of the construction industry demand improvements of its practices and its public image.

The fundamental core value for any firm should be to maximise stakeholder value, notably that of shareholders. This is easily identified but involves complex demands, such as: Developing strategies for competitive advantage and so creating value; Building a sustainable organisation operating in a sustainable world.

Sustainable Development is a concept based on a structure which stands on 3 pillars: namely economic, social and environmental (FIEC, 2005).

**The Economic Pillar:** The construction industry accounts for an estimated 9.9% of GDP and provides 50.8% of Europe's gross fixed capital formation. In order to develop in a sustainable manner, legislators and public authorities should ensure that firms are able to operate within an adequate and balanced regulatory framework and a fair competitive environment. A prerequisite for sustainable development is a healthy economic environment, in which enterprises can develop their commercial activities and raise their profitability.

**The Social Pillar:** Its 2.4 million enterprises (EU 22) (Figures for 2004 excluding Latvia; Lithuania and Malta), of which 97% are SMEs with fewer than 20 employees, makes the construction industry Europe's largest industrial employer. This implying significant responsibility for social issues, in particular training, health and safety of its estimated 14 million operatives (EU 22) accounting for 7.2% of total employment.

**The Environmental Pillar:** About 50% of the raw materials taken from the Earth's crust are used in construction and the built environment produces approximately one third of all greenhouse gas emissions. The waste arising from construction and demolition activities constitutes one of Europe's largest waste streams, the larger proportion of which is however recycled.

Waste from construction and demolition materials and soil equals 70 million tonnes and includes material delivered to sites but never used. The industry produces annually three times the waste produced by all UK households combined (DTI, 2004, p. 19). The construction industry is facing pressure to increase the sustainability of its practice (Parkin, 2000). This pressure implies a major change in the industry's understanding of the demands of society and its clients and in its own sense of corporate social responsibility in its work practices. Kibert (1999) summarises the aims of a sustainable construction practice in the following principles:

1. Minimisation of resource consumption;
2. Maximisation of resource reuse;
3. Use of renewable recyclable resources;
4. Protection of the natural environment;
5. Creation of a healthy and non-toxic environment; and
6. Pursuit of quality in creating the built environment.

The UK government's encouragement for more sustainable construction is by means of several economic instruments (CIRIA, 2001, Report C 571):

1. *Landfill Tax (1996):* Influences waste management practices by encouraging greater diversion of waste from landfill – greater and more innovative re-use and recycling of materials. The UK Government introduced the Landfill Tax in 1996 to provide a fiscal incentive to minimise waste as well as to identify opportunities for dealing with waste in a more productive way. When launched, for active waste the cost was set at £7 per tonne while inactive waste attracted a tax of £2 per tonne. In 1999 the rate for active waste was increased to £10 per tonne and through an annual escalator this higher rate rose to £15 per tonne by 2004. Such taxes continue to add costs throughout the industry, and are best avoided.

2. *The Climate Change Levy (2001)*: On business use of energy was introduced in April 2001.
3. *The Aggregates Levy (2002)*: Introduced in April to reflect the environmental costs of aggregates quarrying and encourage demand for and supply of alternative materials.

#### **4. The Role of Public Procurement in Sustainability**

The policy and regulatory framework for the environment is likely to be toughened over time. In some cases this might involve change of law provisions within the signed PFI contract. Failure to consider sustainability issues when developing a PFI project, means a company can miss a once in a lifetime opportunity to reduce the whole life costs, since the contract may run for 25-30 years; but potentially even longer given the asset life. Public procurement can also play a key role in driving innovation in environmental technologies, by bridging the problematic gap between demonstration projects and market commercialisation. A commitment by the Government to procure environmental technologies on a significant scale for new public buildings would help unblock investment and hence the innovation chain.

The contract specification for a public private partnership affords the opportunity and freedom to potential contractors to propose innovative solutions which integrate the design, construction, operation and maintenance of a new or existing public facility. It should be expressed in terms of the service outputs and outcomes required rather than a tightly specified list of inputs. In some cases, the main outputs of projects may be sustainable objectives, for example targets for recycling and composting in PFI projects for waste management, may require bidders as part of their method statement, to explain how they will comply with the environmental requirements in the specification. This might involve preparation of an environmental impact assessment by bidders of their proposed work. Throughout the PFI project the project team will be expected to develop and maintain a business case. The final business case will present all the relevant information which will enable a decision to be made about a contract award. The business case will therefore need to take account of the environmental requirements of the project, and in its final form, to provide an assessment of the preferred option with appropriate commentary.

The business case should demonstrate that any specified environmental standards are reasonable, achievable and cost effective. It will also need to present any cost assumptions relating to a Public Sector Comparator (PSC) for the project. The inclusion of sustainable technologies with what might appear to be higher up front capital costs will need to be explained in terms of their cost effectiveness over the lifetime of the contract and the environmental benefits they deliver (Green Alliance, 2004).

Sustainable procurement is about embedding the principles of sustainable development into spending and investment decisions across the whole of the public sector. Efficiency has always been an essential feature of public spending, but better spending decisions – that take into account environmental and social as well as economic considerations – can deliver real value for money for the public purse.

#### **5. PFI and Sustainability**

The Private Finance Initiative (PFI) was launched in 1992 in the UK, as a legal framework for concessions in the UK to encourage private capital investment into the construction industry. In the PFI framework, the public sector defines the output specification for the services to be purchased from the private sector with a predefined payment mechanism. The public purchases a service not an asset.

The aim of introducing the PFI in the UK was to achieve closer partnering between the public and private sectors at both central government and local authority levels. The intention was to increase the flow of capital to projects against a background of restraint on public expenditure by utilizing private sector money and management skills. PFI is not borrowing money from the private sector. It is all about creating

a structure in which improved Value for Money (VfM) is achieved through private sector innovation and management skills delivering significant performance improvements and efficiency savings.

PFI is an innovative procurement route for the development of major highway works. PFI will be considered in the context of each major party of a typical DBFO scheme and set against the key criteria of appropriate quality.

Quality schemes are key drivers in improving performance in the public sector (Highways Agency, 2004). PFI is aimed to formulate the integration between the design, build and service operation, to incorporate innovative design, re-engineering, avoidance of over specification, the implementation of new materials, more efficient management, to guarantee maintenance at the appropriate time (HM Treasury Taskforce, 1999). DBFO encourages good long-term quality due to the concessionaire being bound to an extended term of maintenance (typically 30 years). Previously maintenance was neglected, due to the lack of budget, resulting in the quality of roads deteriorating as a result of the re-surfacing maintenance not being carried out at the appropriate time.

## 6. Case Studies in PFI Road Projects

A follow-up paper Sustainable Construction: Private Finance Initiative (PFI) Road Projects in the UK – The Reality, is also presented at this symposium. It presents two UK road project case studies.

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