THE ECONOMIC BENEFITS OF SUSTAINABLE PRIVATE FINANCE INITIATIVE: A CASE STUDY OF NEWPORT SOUTHERN DISTRIBUTOR ROAD

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Summary

The purpose of this paper is to examine the sustainability performance of an individual highway Private Finance Initiative (PFI) scheme in the UK, mainly to scrutinize its economic benefits at three levels: project, local and national. The fieldwork was undertaken through a detailed and specific set of semi-structured interviews in the case study of Newport Southern Distributor Road (SDR). Five main drivers for the sustainability approach are identified and the transferability is analysed. Research finds that the Newport PFI case demonstrates whole life cost savings for both the client and the contractor. The social-economic contribution of the PFI project is critical to the local urban regeneration programs and sustainable community development. Furthermore, effectively applying the government's financial incentives and advanced technology could efficiently reduce the capital cost without negative impact on the project's quality and time. The sustainability aspects of this project could be extracted and transferred to other highway projects, in particular through the PFI procurement system.

1. Introduction

Internationally, sustainable construction has become the hottest research topic in the built environment over last decade. However the argument for the importance of sustainability is now won and the emerging and fundamental issue is how to embrace the practical implication of sustainability into both public and private estates, particularly under a tight budget (Zhou, 2004). In practice, there is a critical economic challenge of sustainable construction (Bon and Kutchinson, 2000 and Zhou and Lowe, 2003). Many projects avoid a sustainable solution because economic benefits are unidentified. Their concern is that the assumed extra cost of sustainable construction might shrink profits and bring extra risks. Although most recent research works express the benefits of whole life costing and highlight that the long-term benefits are more important than the capital cost, there is still a lack of direct incentives and evidence to make obvious short-term financial benefits for both the client and the contractor.

This type of problem commonly appears in the UK too. In order to achieve their ambitions of sustainability, the UK central government employs political and fiscal tools to stimulate the construction industry, particularly through the public procurement practice. Nonetheless, figures reveal public buildings were far short of their sustainability targets (NAO, 2007). One of the main reasons is that there is little clear evidence to demonstrate the short-term business benefits from sustainable construction and it lack of interest in practitioners to promote sustainable innovation in their projects. At the same time it should be noted that traditional procurement methods have failed to support sustainability (Zhou, 2004) while literature reveals that PFI/PPP has natural advantages in delivering sustainability due to the long-term contract and stronger partnership between the client and the supplier (Zhou, 2004). In principle, PFI is predicted as an effective delivery mechanism for sustainable

construction that demonstrates a high sustainability performance along with an acceptable price level (Logan and Mills, 2003).

This paper attempts to fill the knowledge gap and provide demonstrative evidence to prove that a sustainable PFI project would not cost more but at the same time could reduce capital cost and provides a significant contribution to support local economy growth and environment enhancement.

2. The Economic Challenge of Sustainable Construction

In 1994, Kibert defined sustainable construction as *"The creation and responsible management of a healthy built environment based on efficient resources and ecological principles."* Hill and Bowen (1997) then divided Kibert's principles in four 'pillars': social, economic, biophysical and technical and successfully explained the four themes of sustainable construction. In 1998, the International Council for Research and Innovation in Building and Construction (CIB) created a global agenda for sustainable construction – 'Agenda 21 on Sustainable Construction' at the World Building Congress in Gävle, Sweden. Agenda 21 is a conceptual framework that defined the links between the global concept of sustainable development and the construction sector.

In principle, sustainable construction has a number of benefits. Yates (2001) explored the business benefits of sustainable construction and concluded that the benefits are diverse and potentially very significant. Heerwagen (2000) highlighted that green building contributes positively to business performance and organisational effectiveness. First, green buildings are relevant to business interests across the full spectrum of concerns, from portfolio issues to enhanced quality of individual workspace. Second, the high performance of green buildings will influence the outcomes of organisations such as workforce attraction, retention, quality of life, work output, and customer relationships. Third, green building can provide cost reduction benefits and value added benefits.

While sustainable construction has many potential economic benefits, difficulties and barriers still exist in practice. Literature shows that there is an apparent lack of evidence of market demand for sustainable development that together with a lack of information and expertise are recorded as the most important obstacles to a more sustainable built environment (Zhou, 2004). Keeping (2000) argued that few investors have a significant desire to own sustainable buildings. Moreover Bordass (2000) found that the UK's pioneering green buildings have often been procured by owner-occupiers, who are less constrained by market norms. One of the main reasons causing such market failure is unidentified short-term business benefits. For example the clients widely believe that sustainable construction will cost more and bring high risks (Johnson, 2000; Landman, 1999; Hydes and Creech, 2000; Bon and Kutchinson, 2000, Castillano, et al, 2000 and Zhou 2004) and they believe that cost will increase by using new technologies and green materials. There is little market incentive for clients to put more additional money into the innovation without extra return over the short-term period. Smith et al (1998) argued that developers were encouraged to think of short-term profits rather than the long-term consequences of their action.

3. The UK Approach and the Advantages of PFI

3.1 The UK approach for sustainable construction

In 1999, the UK government published the first sustainable construction strategy and it outlined 10 themes for the industry action plan. In addition to setting up the policy the government also applied the fiscal instrument to motivate the construction industry (Addis and Talbot, 2001), for example:

- The Landfill Tax (1996) is influencing waste management practices by encouraging greater diversion of waste from landfill. Costs of disposing of construction and demolition waste to landfill can be minimised through more efficient construction and innovative re-use and recycled materials.
- The Aggregate Levy (2002) is introduced to reflect the environmental costs of aggregate quarrying and encourages demand for and supply of alternative materials, such as mineral waste and recycled construction and demolition waste.

In addition, the Government's Sustainable Procurement Group recommended setting requirements for recycled content in the procurement of Government construction (for projects > £500K) in 2003 and in particular that a requirement for 10% of the materials value to be derived from recycled content should be in Building Regulations and a higher standard adopted as a minimum requirement in the Code of Sustainable Building (DTI,

2003). However, a recent government survey shows that 80% of public building failed their sustainability target (NAO, 2007). One of the most important reasons is that widespread perception of conflict between sustainability and value for money – partly because the project team fails to access the long-term costs and benefits of more sustainable approaches

3.2 PFI and its Sustainability Advantages

The Private Finance Initiative as a modern public procurement system was firstly introduced by the UK government in 1992. The International Project Finance Association (2002) defined PFI as:

"*The procurement of public services and assets by government and local authorities where the private sector is responsible for the design, construction, finance and operation of an asset or service for a specified period of time after which it is transferred back into the public sector.*."

According to the latest figure from the HM Treasury Website (HM Treasury, 2007), 747 projects had been signed as PFI contracts, amounting to a total capital investment of over £47.56 billion. Almost every central government department and local authority is now using PFI contracts. They include most types of public estates, for example, roads, prisons, hospitals, schools and office buildings, etc. Furthermore, £26 billion of PFI investment across 200 projects is currently in the pipeline to close by 2010 (HM Treasury, 2006).

In terms of sustainability PFI could offer real scope to promote sustainable construction (Addis and Talbot, 2001; Logan and Mills, 2003 and Zhou, 2004). The long-term and integrated nature of PFI contracts offers incentives to the contractors to consider the synergies between the design of an asset and its ultimate operating cost (OGC, 2002). The stronger partnership between the client and the contractor make it possible to apply a holistic approach to achieve their common sustainable objectives. However, as in other sustainable construction studies, most research examine the sustainability performance from the environmental aspects for instance energy efficiency or reducing use of natural resources. In general they lack consideration of economic benefits especially in a short-term life span. For its wider acceptance it is critical to find out what direct business benefits there are from the existing PFI projects.

4 Research Methodology

The previous section of this paper examined the concepts of sustainable construction and the UK's approaches. It highlights that that one of the biggest barriers is the assumed high cost of sustainable construction. Contrasting with traditional methods, literature finds that PFI procurement had the potential to deliver sustainable construction, but there is a lack of practical evidences of its economic benefits.

This paper is based on a part of a PhD research programme which was designed to investigate the sustainability performance level of the whole UK PFI market. It endeavors to develop a sustainability framework for PFI procurement system and its practice. Based on the systematic literature review, the PhD research was designed to use a combined method to gather both quantitative and qualitative data and provide a more complete picture of the sustainability issues addressed in PFI industry. It includes a national level questionnaire survey, follow up in-depth interviews and case studies. The initial national level survey examined over 65 existing PFI projects' current sustainability performance level and then 12 follow up in-depth interviews scrutinized the clients and project directors' willingness; and also value and risks to implement the sustainable approach. Moreover, four representative cases was selected from the national survey to gather information on successful experience in sustainable PFI projects from different aspects (economic, social, environmental and technical). This paper summarizes the findings in the case of Newport Southern Distributor Road. Four interviews were conducted with senior representative from the Newport Southern Distributor Road (see table 1). The first three interviewees are directly involved in the Newport SDR project. The fourth interviewee was indirectly involved with the project but was in charge sustainability strategy plan and day-to-day sustainability business management of the operating company (Ringway). The interview was designed to find out:

- Key stakeholders' experience and attitudes in terms of sustainability
- The project's objectives, client sustainability priorities and how the supplier responded
- The project's sustainability performance level and benefits from social, economic, environmental and technical aspects

A secondary study is used to gather other data to identify the impact of this PFI project on the construction industry and local community.

Table 1: Interviewee's background

No	Type of Stakeholders	Interviewees' occupation	Organisation
1	Client's Project Management Consultant	Project Manager	Capita Gwent
2	Special Purpose Vehicle (SPV)	Project Director	Morgan Vinci Ltd
3	Operator	Operator Manager	Ringway
4	Operator	Sustainability Manager	Ringway

5 Case Study of Newport Southern Distributor Road (SDR)

5.1 The Context

Newport is the third largest city in Wales, a traditional small city on the bank of the River Usk. Following the UK central government's sustainable development strategy the Newport City Council created its own 21 agenda action plan and devised a new sustainable urban regeneration strategy for the residents for next decade in 2000 (NCBC, 2000). However, the existing transport network did not fulfill the demand especially on the south side of the city.

In order to relieve the transport congestion and improve the local transport network, the Newport County Borough Council (NCBC) decided to adopt the PFI model to develop a new road on the south side of the city. The proposed plan was to build a dual carriageway link from Junction 24 of the M4 (Coldra roundabout) to the east Junction 28 (Tredegar roundabout) on the Southern edge of Newport and it includes a major crossing of the River Usk. The Morgan Est, one of the largest civil engineering contractors in the UK, together with Vinci, an international contracting company, formed a joint venture 'Morgan Vince Ltd' which won the £55 million contract and undertook Design, Build, Finance and Operation (DBFO) of the project over a 40-years life span. This project is the biggest local authority PFI project in Wales and also recongised as a pathfinder project by the Welsh Assembly Government. The principal objectives of the scheme are:

- To enable traffic to avoid the town centre and inner residential areas
- To improve the environment of the inner residential areas
- To improve road safety
- To improve access; and
- To contribute significantly to achieving the emerging integrated transport policy for Newport

Construction started during summer 2002 the road was made fully open to traffic in December 2004. As such the Southern Distributor Road (SDR) was finished half year ahead of schedule (May 2005). Ringway Highways Service Ltd has carried out the operation and maintenance work.

The Southern Distributor Road is Newport City Council's highest priority scheme for the improvement of Newport's highway network. The project brings major economic and environmental benefits to the city including improved access to major investment opportunities in the southern areas of the city.

5.2 Perceived Economic Benefits

In brief the Newport SDR project demonstrates outstanding economic benefits. Table 2 categorises the economic benefits at three levels: project, local and national and divides them for different stakeholders and the wider community.

At the project level, approximately £1 million initial cost was saved through the use of around 450,000 tonnes of recycled and secondary aggregates instead of purchasing primary materials. A variety of secondary aggregates is used as granular fill materials and unbound sub-base. In the recycle programmme, specific cost savings included:

- The avoidance of waste disposal charges and Landfill Tax
- The avoidance of Aggregates levy payments, from which recycled and secondary aggregates are exempt

- The lower costs and improved performance of maintenance techniques such as 'crack and seat', Rhinopatch and cold-lay foamed asphalt mix
- Reduced costs of transporting aggregates when recovered materials are available locally

Table 2 Perceived Economic Benefits of Newport SDR

Outcomes Levels	Perceived Economic Benefits and Business Value	Beneficiaries
Project Level	• Capital Cost saving • Whole Life costing saving	Newport City Council (Client) Morgan Vinci Ltd (Developer) Ringway (Operator)
Local Level	• Support local urban regeneration • Attract new business investment in Newport • New business opportunity between the supplier and Local Authority	Newport City Council Local Community Local Residents Road Users
National Level	• Reducing government borrowing and increasing investment in public infrastructure • Support Wales Economic development • Support Recycle Scheme in the UK • Increasing the PFI firms' competition rate	Welsh Assembly Government Newport City Council UK Central Government Morgan Vinci Ltd Ringway UK Construction Industry Capita Gwent Consultant

The Action Sustainability (2006) has examined both capital cost saving and whole life cost saving of the project in detail. They outline:

"*the use of recycled material did not incur additional capital or maintenance expenditure for the project; however, it did result in direct cost savings in construction costs (£1,034,135), carbon emissions (£106,481), avoiding landfill costs (£941,360) and health benefits from reduced emissions of PM10 (particles measuring 10mm or less).Overall, £2,098,801 was saved, offset by no costs, which amounted to 3.82% of savings of the total project cost or to £219,609 per kilometer of road constructed.*"

At the local level: the Newport SDR helps to release the congestion of Newport Transport Network and reduces the traffic in the city centre. These outcomes provide massive benefits to promote new business investment to Newport. Figure shows that the new attracted business investment is about £1bn after the Southern Distributor Road completed (Newport Unlimited, 2007)

More evidences from the interviewee and secondary data shows that the SDR project also supports the local urban regeneration programme: the Old Town Dock Development and the re-use of Brownfield Land..

'It maximises the potential for the development, enhancement and re-use of inner urban land in order to improve the vitality and attractiveness of area such as town centre and encourages development of the available Brownfield land' – the client's consultant project manager, Capita Gwent,

The current upgrade of the Southern Distributor Road is of significant benefit to Newport. The road provides a main arterial route and is considered to be of vital importance to the future success and regeneration of Newport and also will assist in the creation of a gateway to the south of the City (Knight Frank, 2003)

At the national Level, this project is the first pathfinder PFI project in Wale. It serves as a successful model for future PFI development reducing government borrowing and increasing investment in public infrastructure. It has observed the green standards by using recycled aggregates and winning a number of national and international awards. For instances, the PFI project has been selected by the Department of Trade and Industry as a flagship case study. Newport recently won a Green Apple award – presented for environmental best practice around the world. The Newport SDR has become an exemplary case study on the Waste and Resource

Action Programme (WRAP) website as a shining example of environmental best practice within the industry for other companies to follow (NCC, 2004a). The positive publicity gives Newport city a fresh image as a sustainable city and also improves the Morgan Vinci Ltd's business opportunities in the high competitive PFI market.

5.3 Perceived Social and Environment Benefits

In addition to environmental benefits derived from the construction process that has been already noted the project reduced traffic in the city centre. In addition using recycled materials reduced local waste and use of natural resources. Green Transport plan and video meeting technique helped to reduce energy use and cut down on CO2 emissions. Moreover, the road project relieved the traffic congestion problem in the city centre and reduced air pollution and noise level. This is encapsulated by the client's project manager who noted that the aim of the project is to:

'Enable traffic to avoid the town centre and inner residential areas and improve the environment of the Inner Residential Areas: avoid traffic noise and air pollution' – The client's consultant project manager, Capita Gwent

This project provided massive social benefits and support for local sustainable community development too. Firstly it enables the south area of Newport City to be a safe place for all residents to live, work and play. It changed local residents' behaviours and helps to promote sustainable trips to work and school by encouraging alternative modes of transport such as cycling, walking, public transport and car-sharing and avoided the travel route through city centre. Second reduction of traffic noise and air pollution improved the local residents' health and wellbeing. Thirdly the £55 million 40-years project employed local labours and increased the local employment rate. And finally, the SDR project regenerated the community spirit. Without this project, both the city centre regeneration and Old Town Dock regeneration programmes could not be established. They are vital to support Newport City Council's strategic ambition in building a sustainable community and economic growth.

This is reflected in the council's aspiration for the project when they write:

Old Town Dock will be transformed into a new neighborhood, creating a new gateway into the City Centre from the south. The completion of the Southern Distributor Road (SDR) and the new bridge, along with improvements to Usk Way will provide a significant new level of connectivity in southern Newport. Old Town Dock and Pill provide an excellent opportunity for development close to the City Centre building on the land assembly work carried out previously by the Newport Development Board. (Newport Unlimited, 2007)

5.4 Main Drivers for success

The reasons for the perceived success of the Newport SDR PFI are many and varied. Five main drivers are discussed below:

Client Demand

The Newport City Council has a strong commitment to sustainability and implements this in its transport policy. The City Council also provides a strong demand in sustainable construction. Waste Minimisation and Recycling has a high priority in its Local Agenda 21 as all recyclable waste should be recycled (NCBC, 2000). Secondly it is recognized that an integrated transport network is crucially to support the local economic development and to reduce the city centre pollution level. The SDR is recognized by Newport City Council as its highest single priority scheme for the improvement of Newport's principal highway network as an essential component of its integrated transport policy and as key project which will enable its delivery.

Financial Incentives

Evidence shows that this project utilized both Aggregates Levy and Landfill Tax extremely efficiently. As WRAP (2004) highlights:

"*The Landfill Tax and Aggregate Levy together provide a tangible financial incentive. In effect, an authority can save money twice: by recycling highways waste to eliminate waste charges, and by using this recovered materials on new schemes to cut the cost of buying virgin materials*"

In this project effectively using financial incentives and achieving maximum cost saving has been seen as the biggest internal driver for both the main contractor and the operator to achieve sustainable development.

Whole Life Costing

Whole life costing was employed in this project to test value for money by examining the public sector comparator (The PSC is the total whole life cost of the project if procured through the traditional route). This unique route ensures the PFI project is at an acceptable price level and would not increase the expenditure of Newport City Council in the long term. Secondly whole life costing is used in choosing the alternative material, for instance the selection of street light columns. As one of interviewees highlights:

The use of whole life costing can provide cheaper solutions in the long term e.g. the use of stainless lamp columns which have a residual life of approx 70 years whereas conventional galvanized columns although cheaper in terms of initial capital have a life only of approx 25-30 years

Advanced Technology

Another exceptional feature of this project is that it applies an advance green technology: foam base to deal with the recycled aggregate. Foambase is a new type of cold-mix plant. It uses recycled materials in premium bituminous mixtures that take the place of hot mixes in the base and binder layers of highways. Effectively use of advanced technology could stimulate the business benefits of sustainable construction.

Use less bitumen and energy, fewer lorry movements and we divert waste from landfills. We also save taxpayers up to 25%, material using crushed asphalt, concrete and recycled aggregates. Most Foambase is laid as road base now. It's proved a very economical form of construction - Sustainability manager, Ringway

Effective Procurement Model

Without PFI funding, Newport City Council could not afford the highway project and would not be able to design, build and operate it over 40 years as a small local authority. Hence Newport City Council did both 'value for money' test and the affordability test in the early procurement stage. Through the options appraisal they identified that PFI is the most suitable option for the delivery of this project (NCBC, 2002). Moreover, in PFI the project's profit is at risk depending on private sector performance. Therefore, there is a very strong incentive for the private sector to maintain high and reliable service standards throughout the life of the contract. It forces the contractor involving earlier and working closer with the client and building a robust partnership to deliver the best outcomes and add value to this project. On the other hand, the partnership has aligned both its objectives and benefits, so it allows all parties - client/designer/contractor - to work together early in the scheme's development and design towards a shared sustainable goal till the end of the contract.

6. Discussion

a) Capital Cost vs. Whole Life Cost

Interestingly, through this case, evidence shows that capital cost saving is extremely important. Making initial cost saving is one of the ultimate motivations for applying the sustainability principles. The Client project manager argues:

In my limited experience in the PFI field it appears that contractors are only interested in the bottom line of their accounts and are not interested in sustainability unless it improves their financial position!

More interestingly, after comparing the capital cost saving, whole life cost saving and predicted new business investment the capital cost saving (£1m) is equal to the long term saving (£1m), but the social-economic value (£1bn) appears at the highest level. The total project cost saving becomes relatively tiny at the local outcome level (See figure 1, figure sourced from ActionSustainability 2006 and Newport Unlimited, 2007).

b) Transferability

Comparatively, economic benefits can be easily checked against valid financial figures and the cost-benefit analysis and risk management models can easily demonstrate to both client and developers willing to use of recycled materials and the advanced technology: *Foambase*. Evidence shows that those successful sustainable construction practices, for example the use of the new technology Foambase at highway project are directly transferred to the operator's daily business due to its massive economic benefits. As the Ringway's internal magazine (Ringway, 2006) highlights:

There is a big marketing push on (Foambase) and a big opportunity to recycle the huge amount of waste generated by our term maintenance works

Furthermore, the best practice in this project is currently disseminated by the UK central government through its sustainable construction initiatives, such as WRAP, the UK government recycle scheme (WRAP, 2004).

However, some special conditions in this project are not able to transfer to others; for instance, the local availability of cumulated recycled materials might not exist in other circumstances. In addition the reward from the financial incentive from both aggregate levy and climate change tax will be limited if applied to building projects due to the additional need of the quantity of secondary aggregate.

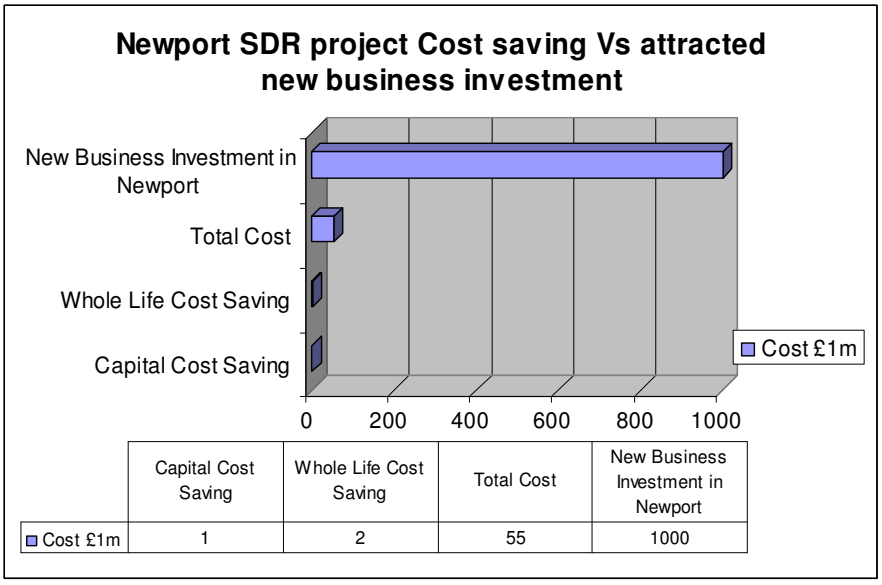

Figure1. Comparing of the direct cost saving in the Newport SDR and the value of new business investment

c) Research Limitation

The case study provides significant evidence to prove that sustainable construction could save money if applied effectively within the government financial incentive and advanced green technology. The transferability of the economic benefits is also identified. However due to research findings based on the individual case it is difficult to generalise in terms of the average sustainability performance level in the whole PFI industry.

7. Conclusion

The analysis in this paper has highlighted the successful experience of Newport Southern Distributor Road in cost saving and five main internal and external drivers of the sustainable approach in the context of this project. Without PFI model, New City Council could not afford this project and the main contractor and its suppliers might not have the motivation to adopt the advanced green technologies and financial incentives to achieve the maximum financial return. It also demonstrates that financial incentives could be the most important internal driver for both the main contractor and its suppliers to push themselves towards more sustainable and innovative solutions. This paper also discusses the economics at three levels: project, local and national. Sustainability has different meanings to different stakeholders. For the private sector, the positive impacts of sustainable solution could increase the business profit capacity and win new business opportunity. For the public sector and its service users, the economic benefits could save taxpayer's money. For the central government, sustainable PFI project could ensure reducing their short-term financial expenditure, increase investment in infrastructure and assist in achieving their ambitious sustainability target in public buildings within a longer period. In addition to economic benefits, the PFI project has also made a major contribution to local sustainable community development and environment enhancement. Moreover, the Newport PFI project provides qualitative evidence to support the PhD study's in-depth investigation, particularly in the economic impacts. Comparing with traditional procurement methods it concludes that PFI is undoubtedly the best mechanism to delivery sustainable development in the public building. As a result, this paper adds value to the existing limited work on the capital cost of sustainable construction. It demonstrates the cost of sustainable construction is lower than conventional method and also for the first time demonstrates in detail that PFI has practical advantages to lead the sustainability revolution in public procurement.

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