

SUSTAINING THE FUTURE WITH LEGACY: A CASE STUDY ON THE UK GOVERNMENT CARBON EMISSION TARGETS 2025 AND LONDON OLYMPICS 2012

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ABSTRACT

The UK Construction 2025 Strategy states that the UK construction industry should be the world leader in sustainable construction by 2025. The Government views sustainable construction as an opportunity for growth within the UK as the industry seeks new markets across the globe. Mega projects such as the London Olympics 2012 and Glasgow Commonwealth Games 2014 have been viewed by Government as important drivers for innovation and an opportunity for demonstrating good practice to the wide industry. Lessons are emerging from these projects and have been incorporated into the development of the Government's vision for Construction 2025 with a view to further delivering sustainability in product and practice, but also with a view to establishing capacity. This paper mainly focuses on evaluating the Carbon Emission Reduction targets set by the UK Government in order to be in line with the current Sustainable Development practices. The study also includes an analysis of the Legacy set out by London Olympics 2012 which achieved a number of successful outcomes in terms of Sustainable Construction and Procurement. However, a number of traditional barriers within the construction industry are argued to be restricting the ability to progress the construction agenda at the rate intended. The evidence show that the UK is well within the Carbon Emission Reduction targets and the legacy from the London 2012 Olympic Games should provide for better construction practices in the future, provided that they are used in the correct context, and embraced by the key stakeholders from the outset.

Keywords: *Carbon Emissions; Construction; London Olympics; Sustainable Development; UK Government.*

1. INTRODUCTION

'Climate change', 'Carbon emissions', 'Renewable energy sources', 'Waste', 'Green construction' have become the 'hot topics' in the present world gaining the attention of every single person on the planet with regard to Sustainable development. The UK government has identified the construction industry as a major industry in terms of delivering the UK national carbon emission targets and achieving the sustainable development in a broader spectrum. The construction industry is set to face new challenges in line with the new government strategy for construction: 2025, and a change of the vision and strategies for construction is expected as far as sustainable development is considered. The UK construction vision: 2025 targets mainly to develop new plans for sustainability and waste reduction in the UK construction sector and become the world leader in sustainable construction by 2025. There have been significant changes and improvements in government policies and legislation on the construction industry to stay in line with sustainable practices. Major issues such as climate change, carbon emissions, and energy usage have made a significant impact on the construction and related industries and have raised public awareness on these issues. The UK government has made an important decision to make changes to the current practices however; this has been a challenge due to various traditional, technical, and economic barriers (Thomson and El-Haram, 2011).

Both Latham (1994) and Eagan (1998) reports suggested that there is a need for a change in vision, strategies and overall thinking and decision making in the construction process. Since the industrial

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revolution there has been a significant change in human living style, technology and innovations. There have been periods where the governments had to make changes in policies and legislation to overcome potential threats. Issues such as global warming, climate change, carbon emissions and energy usage have shown that there is a need for a 'sustainable development' to retain resources for the future generations.

In the UK recent government action plans and strategies such as Sustainable Development Strategy (2005), Sustainable Communities Act (2007), the Climate Change Bill (2009) and Low Carbon Transition Plan (2009) etc. show a need for setting up policies for driving construction industry towards sustainable development (Thomson and El-Haram, 2011). According to Ding (2008) the construction industry is a major industry that causes impacts on the environment ranging from high consumption of resources during construction and operation, to the environmental pollution. Also Vanegas (2003) has identified construction industry has the responsibility and potential to become a major participant in carbon reduction targets and ultimately drive towards the wider principles of sustainable development made.

2. CARBON EMISSIONS AND UK GOVERNMENT TARGETS

Carbon emissions and climate change have been the most significant threats to humankind as far as the future is concerned. Depending on the emissions there is a threat of rising global temperature by between 1.4°C and 5.8°C between 1990 and 2100 (HM Government, 2005). Reduction of emissions should be accompanied with the support of constructing zero-carbon homes and business premises that consume less energy (HM Government, 2007). According to BRE (2003) buildings are responsible for 50% of the emissions if all the energy is used in constructing, occupying and operating the building. Rohrer (2001) mentions that about 40% of energy consumption and about 25% of material ecological load is carried by the construction of buildings. Although there are visible signs and evidence to prove that the UK government has taken actions to overcome the potential threats, Hall *et al.* (2006) argues that sustainability is given a low priority and the government has yet to make a significant contribution and impact on driving construction towards sustainability.

In accordance with the Kyoto protocol the UK government has set targets to:

- Reduce UK greenhouse gas emissions by 12.5% below base year (1990) levels over the period of 2008 – 2012.
- Reduce UK carbon dioxide (CO₂) emissions by 20% below base year (1990) levels by 2010.

In addition to the above targets the government is committed to reduce at least 80% of the UK carbon dioxide (CO₂) emissions by 2050 compared to the levels in 1990 (Figure 1) and achieve real progress by 2020. Figure 1 shows the estimated Carbon Emissions Reduction targets from 1993 to 2050. However, it mainly concentrates only on CO₂ emissions rather than the Carbon emissions as a whole. For regular review and to advise the government on the optimum pathway to the 2050 carbon emission targets a Climate Change Committee was established under the Climate Change Bill (2009). Further, the Carbon Reduction Commitment (CRC) is responsible to mandate the large commercial and public sector organisations to reduce carbon emissions by at least 1.1 MtC / year by 2020 (HM Government, 2008)

The UK Government has set out a policy stating that new homes should be zero-carbon from 2016 and respectively from 2016, 2018 and 2019 all new schools, public sector non-domestic buildings and other non-domestic buildings will also expected to be zero-carbon (HM Government, 2008). Also the Government has issued the Approved Document L1A and L2A (Conservation of fuel and power) to provide practical guidance for energy efficiency requirements of the Building Regulations. The main purpose of Approved Document L is to calculate and ensure CO₂ emissions rate from the building as built, is the same to the Target CO₂ Emissions Rate (TER), set as a target by the Building Regulations (Approved Document L1A, 2010). Also there is a Sustainable Development Commission formed to independently assess the role and the performance of the UK government organisations against the targets of the sustainable development.

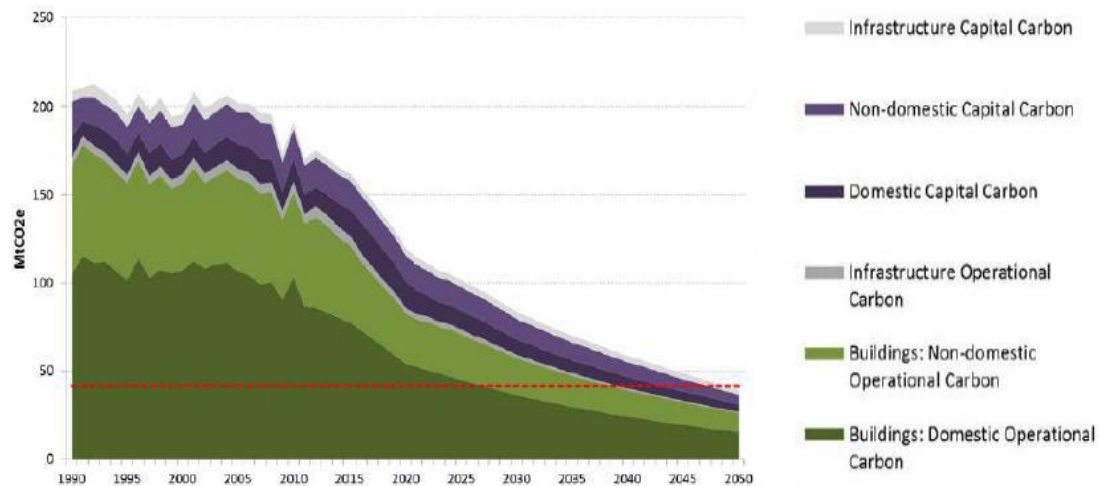


Figure 1: Carbon Emissions Target for 2050
Source: Green Construction Board (2013)

The latest statistical evidence and projections show that UK is well inside the limits to meet Kyoto targets (HM Government, 2009). However, still there are certain actions have to be taken in order to achieve the 2010 carbon dioxide (CO₂) reduction goal. According to the estimate carried out by Climate Change Programme (CCP) in year 2011 showed that only about 14.8% of carbon dioxide emissions were reduced in year 2010 compared to the initially predicted 1990 levels (20%). This clearly shows that the government should take additional actions and procedures in order to stay in line with the carbon emission targets. Also Rees (2009) argued that the government has failed to address the true scale of problems other than implementing policies and regulations. There is a need for a rethink of construction in order to change the processes and traditional and cultural barriers. The government should be involved on these aspects to change the image of the general public and make them aware of what is happening. Bringing in policies one after another would not achieve the ultimate success of any agenda but a mind winning process is required to retain the targets. Rees (2009) also mentioned that there is a need for a cultural shift to address the traditional barriers of implementing sustainability from the inception to the delivery of a project.

3. RESEARCH METHODOLOGY

Research design is the systematic process of converting identified research questions into the realistic research project in order to answer the questions (Yin, 2009). This simply means that there should be strategies, methods, and techniques involved in the process of answering the research questions to make the research viable.

Research approaches can be interpreted and described in various ways depending on the type of research question and area. This research paper has adapted the Case study method as the suitable research approach based on the Legacy of London 2012 Olympics. Case study research has become an extremely common research strategy for inquiry within property and construction research in the current research trend among researchers. Case study research involves the study of an issue explored through one or more cases within a bounded system (Yin, 2009). Case study research therefore naturally lends itself to built environment research themes.

This paper has selected Documentation/Archival records as the data collection and analysis method for the case study. Documentation/Archival records method refers to the data that been already published by someone else (Barakat, 2009). This is also known as “Secondary data”. Many researchers have mentioned that secondary data is considered as the data being reused in a different context. The main data for the case study were collected with reference to the various Government and UK Olympics Committee publications on London Olympics 2012. The analysis of the data takes the form of a qualitative critical review than a quantitative analysis. A critical review of the information was required in order to evaluate

the outcomes of the London Olympics 2012 project in terms of sustainability. The evaluation includes major sustainability themes including procurement, selection of materials, supply chain, and carbon emissions. The analysis of the case study is presented in the next section.

4. CASE STUDY: LEGACY OF LONDON 2012 OLYMPICS FOR A SUSTAINABLE FUTURE

Following the completion of the London 2012 Olympics and Paralympics Games the attention has turned to ensuring that an effective legacy from the games is provided. This legacy takes a number of different forms, from an obvious sporting and health legacy through to playing an active role in the future regeneration of the Stratford and East London in a physical and socio-economic sense.

According to the LOCOG (2013) the Olympic park represented the biggest construction project in Europe and the UK Government has been keen from the outset to stress its importance in providing a legacy for driving improvement within the construction industry both in terms of product and process. The park represented a number of high profile sports facilities (stadium, swimming pool, indoor arena etc.) and an athlete's village. These were planned to realise a number of ambitious sustainability targets in terms of environmental targets (e.g. energy, contaminated land, reuse of building materials, waste generated); but also number of economic targets (e.g. reducing cost and ensuring multiplier affects) and social targets (e.g. related to health and safety, creation of apprenticeships and local employment). In the two years since the games has finished a number of reports have emerged to evaluate the legacy of the Games, and many have focused heavily on the legacy for the construction industry with emphasis on Sustainable Construction. Indeed, the lessons have helped to shape the UK Governments Construction 2025 vision and strategy for growth.

During the bidding process London Olympics' bid team affirmed their commitment to form the vanguard of sustainable development standards, whilst correspondingly creating a lasting sustainable legacy benefiting local communities and securing economic growth by concentrating on the extensive regeneration of East London (LOCOG, 2013). It was the responsibility of the Olympic Delivery Authority (ODA) to reflect this pledge into the delivery of infrastructure, venues and facilities within budget and time constraints. The ODA engaged with a comprehensive suite of expertise including; Government Organisations, NGO's and industry as well as the local community to develop ambitious, yet achievable, sustainability targets for each project associated with the programme. In 2007 the ODA published the Sustainable Development Strategy placing the onus on the project teams to meet its firm criteria. Sustainable procurement of materials was integrated into the framework's procurement policy and from the outset; there was an emphasis on responsible sourcing of materials, use of secondary materials, minimizing embodied impacts and the use of healthy materials (DEFRA, 2013).

According to the European Commission (2013), sustainable concrete supply for the extensive site was identified to be a significant means to alleviate the environmental impact of development. Concrete remains the most predominant building material supplied to the UK construction industry and the cement constituent accounts for around 2% of UK CO₂ emissions with an average embodied carbon content of 830kg CO₂e/tonne (AECOM, 2011). Coupled with a significant environmental and social impact in the sourcing, extraction and distribution of aggregate to batching plants and construction sites, it soon becomes apparent the carbon footprint of concrete processing is substantial (European Commission, 2013). During the design phase, it was estimated that 500,000m³ of ready-mix concrete and a parallel 1 million tonnes of aggregate would be required for construction of the Olympic venues and the subsidiary infrastructure. The ODA evaluated supplier credentials with a thorough tender process and a balanced score-card approach in which sustainability made up 20% of the assessment (in comparison to a typical average of around 5%) only appointing a company whom demonstrated a sustainability commitment (European Commission, 2013).

Furthermore, the ODA identified innovations within the supply chain and coordinated contractor-supplier communication to create a sustainable concrete process which included use of recycled aggregate (22%), efficient design, extensive testing of sustainable mixes and sustainable freight methods (i.e. rail transport and construction of a site batching plant to reduce transport emissions). This contributed to an approximate saving of 50,000 tonnes of embodied CO₂ and 70,000 vehicle movements to the site, not to mention the 289,000 tonnes reduction in quarried aggregate (European Commission, 2013).

Whilst much of the focus has been given to the methods of construction and the systems put in place for a sustainable method of construction to be achieved, the defining measurement of the sustainability of construction and thus the legacy of the Olympic Park (and surrounding area) will be its adaption and subsequent re-use from sports stadia and infrastructure into a revitalized part of East London - the best endeavours of constructing the Olympic Park in the most sustainable manner would have little effect if the development plan did not extend any further than the hosting of the games – note the state of the Olympic stadia and parks built for the Athens Olympics, which had an effective life of the games and have since fell into disrepair (Hackney Council, 2013).

According to Davies (2012) the development of the Olympic Park, the associated area, and the improvements to the transport and infrastructure allowed for complete urban regeneration of former industrial areas of London, which had laid derelict or in disuse for a number of years prior to the winning of the Olympic bid. As part of the bid document the development for the Olympics heralded to extend beyond that of the 2012 games by providing East London with a revitalized community which could further develop and grow. Whilst the building for the games instigated the regeneration of the area, the initial step of providing the sustainable legacy from London 2012 has been in the reallocation of the sports stadia / venues / elements that were developed for the games. Of the eight venues constructed all have been listed for re-use

- Olympic Stadium – to be utilized by West Ham FC
- Media Centre – now occupied by BT Sport
- Arcelor Mittal – tourist attraction
- Eton Manor Sports Park – location for the 2015 Hockey World Championship
- VeloPark / Copperbox / Aquatics – arenas for public use, providing affordable facilities

This has ensured that funding and investment remains in the area, which in turn supports business and development, and provides residents with amenities within the area. In addition to the re-use of the stadia the Athletes Villages have been adapted to form the first in a series of new communities, providing over 2750 homes in the area demarked as East Village, of which occupation has since commenced.

A further good example of the UK Government's sustainability agenda being promoted is through the delivery of the athlete's village. The village not only provides affordable housing in London; it also provides housing that is fit for purpose and can be easily adapted in the future through the design of the housing which meets lifetime homes standards (Davies, 2012). Post Games, this allows the properties to be easily adapted and will future proof the properties at the design stage to ensure the buildings meet the future needs of tenants and owners; which could be argued will have a positive effect on increasing the buildings lifespan. HM Government (2008) state that design is a key features of the sustainability strategy and therefore incorporating well designed buildings that can be adapted to meet future needs is an excellent example of the Government's agenda being promoted through the Games.

Within the design element of the strategy HM Government (2008) provide an action point to deliver all publically funded housing to lifetime home standards. Good design is said to include 'sustainable' and 'adaptable' properties (HM Government, 2008, p.14) which ties back to the building lifecycle of the village. The legacy of the Games village will provide homes that are easily adaptable should residents have any health or mobility issues later in life. This could be through the means of a supported joist for the provision of a future hoist, or an aperture between floors which would allow a through floor lifts to be installed, allowing easy access to all levels of the properties. The Olympic Park Legacy Company (2012) have compiled a report on the importance of inclusive design for the village which provides their vision for inclusive design to '...an approach that considers the widest possible audience, addressing the needs of people who have traditionally been excluded or marginalized by mainstream design practices.' A key point to this is addressing the needs of people, which also ties back to the UK sustainable strategy in terms of adaptability.

In conclusion the London 2012 Olympic Games and in particular the Olympic Park have provided a lasting legacy to the area which continues today through the continued use of the buildings and surrounding areas as detailed this has been achieved through foresight in planning and securing new users of the buildings prior to the games commencing. In terms of promoting sustainability throughout the

industry, it is clear to see that the games as a whole was an achievement for the industry however, it is uncertain as to how much of a knock-on effect this has had on the rest of the industry with many major construction companies still only concerned with the immediate demands with regards to sustainability of their client who inevitably pays them.

5. CONCLUSIONS

Through mega projects such as London 2012 the UK sustainability agenda has shown a new direction to the construction industry of UK as well as the world. The government has already identified the construction industry as a key participant of achieving the sustainable development targets in future. Contribution of various parties is essential to achieve the carbon emission targets by 2050. Government could influence the process but it is the duty of the general public to accept the changes for a better future. As an industry, construction sector is accused for high energy and resource consumption and according to Myers (2005) there are several important initiatives that have been implemented by the government specifically on the construction industry.

According to the London Olympics sustainability plan (2011) the London 2012 construction was the largest construction project in Europe. Legacy provided by this project has got many direct and indirect impacts on the Sustainable Construction agenda in the UK. The overall planning and procurement process was a key indicator of the success of the project. As per the guidelines given by the Office for Government Commerce the selection of a procurement route is based on the primary consideration of obtaining value for money. According to the Final Report of the IOC Coordination Committee (2013), some of the major achievements were:

1. Creation of Olympic park – This was the largest new urban parkland in Europe in 150 years. Various state-of-the-art engineering and architectural solutions were used in the construction stage, and polluted soil and waterways were cleaned and most of the waste was recycled and re-used in new constructions.
2. Centrepiece Olympic stadium - According to the report this was the lightest, most sustainable and most adoptable stadium ever constructed and was able to show how games can respond to important themes such as sustainability. The athletics track was retained after the games providing a landmark venue for athletes of all levels.
3. Measurement of carbon footprint – According to the report this project was the first large scale project to measure its carbon footprint over the entire period of the project and achieved a Carbon footprint saving percentage of 66%. The construction works contributed 44% of the savings. Also London 2012 was the first games to commit and deliver a zero landfill waste target.
4. Inspiration for a sustainable management system – This project set an inspiration for the development of a sustainable management system standard for events, and was eventually introduced as a national standard – BS 8901.

At the initial brief of the procurement process ‘sustainability’ was identified as a key performance indicator of the project in terms of achieving value for money. The most significant decision in the procurement process was that ‘sustainability should not be sacrificed in favour of lower prices.’ The main focus on procuring suppliers was on local sourcing and 70% of the suppliers were small and medium sized organisations.

Even though this project has had some significant achievements there were few demerits during the procurement process. The Lessons learned reports (LOCOG, 2012) of the project indicate that: “LOCOG often faced a challenge when balancing the need to satisfy its clients’ expectations with the need to meet its budget objectives.”

Satisfying the client and the other stakeholders is a must to ensure the success of any project. This project specifically aimed at achieving its sustainability goals but often failed to comply with the objectives when managing the financial aspects of the project. The budget considerations delayed the procurement and planning process which eventually delayed the progress of construction and had a negative impact on the

delivery schedule. Therefore the government has a responsibility to review the actual gains of the project rather than discussing the sustainable practices on its own.

Through this case study it is evident that achieving carbon emission reduction targets will be a significant achievement of the UK construction industry along with the energy industry and the government but success of each construction project should also be reviewed as far as sustainability is considered. Being successful in achieving a zero-carbon target does not mean a project, industry or a nation is sustainable in all aspects. It will depend more on the mind-set of the general public and the parties actively engaged in the construction activities. The government should be able to identify and understand the actual gap between the problem and the required solution and set more realistic goals for the construction industry in order to become the world leader in sustainable construction by 2025. And finally that would give a clear answer to the question “whether construction industry has demonstrated a significant step forward in transforming social, economic and environmental features into one that is ‘Sustainable Development’?”.

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