

# Case Study – The CARES Sustainable Construction Steel Certification Scheme for Steel Reinforcement in Concrete

Lee Brankley<sup>1</sup>, Ayhan Tugrul<sup>1</sup>, Ladin Camci<sup>1</sup> and Dave Knight<sup>2</sup>

<sup>1</sup> CARES, U.K.

<sup>2</sup> One Planet Limited, U.K.

E-mail: leebrankley@ukcares.com

**Abstract.** The expectations of stakeholders across the construction industry value chain have evolved significantly in recent years. Driven by scientific trends, a greater understanding of sustainability impacts and new legislation, construction clients are demanding transparent, reliable data and comparable sustainability information about competing construction materials, management of their production and performance trends. Standard setting organisations and building rating systems are maturing in their requirements and third-party certification bodies have responded with improved certification options that enable the provision of data collection, auditing and reporting to meet construction client demands. The CARES Sustainable Constructional Steels (SCS) scheme is one option that applies to reinforcing carbon steel, reinforcing stainless steel, structural steel and hot rolled flat steel. Frequently specified as part of structural concrete building systems, the accredited scheme has been developed with the inputs of a wide range of stakeholders. It is based on foundations of technical specifications, traceability, product quality and the sustainability principles of inclusivity, integrity, stewardship and transparency. SCS Certification provides confidence to specifiers, designers and wider stakeholders that the sustainability impacts of constructional steel products throughout their supply chain are being actively managed and continually improved.

**Keywords** Steel, Certification; Environmental Product Declarations (EPDs); Life-Cycle Analysis (LCA); Concrete Reinforcement; Socio-Economic Impacts

## 1. Introduction

Constructional steels are a key part of any major construction project and are often used to reinforce concrete construction systems. Its supply chain covers; material sourcing, steel manufacture, distribution, fabrication and delivery to a construction site. It is international and complex. Global purchasing to meet local project specifications requires effective management of the supply chain to ensure projects are delivered on time, on budget and with the required performance.

The last ten years has seen a significant shift in the understanding and application of sustainability across this supply chain. Initially the preserve of greener design specifications and the management of environmental impacts on site, stakeholder feedback has resulted in a broader understanding of



sustainable construction. It now encompasses; labour rights, community considerations, business ethics as well as low carbon, environmentally improved buildings and infrastructure. Additionally, these expectations run across the entire construction value chain from raw material sourcing, through product manufacture and transport to the construction site, use and end of life of construction materials.

This shift has fuelled an increasing demand for accurate, accessible and timely information on the environmental, social and ethical impacts of different materials and construction products. Legislation, a strong business case for efficiency and cost reduction are all supporting this drive for change in construction. BREEAM, LEED, Estidama, Greenstar and other building rating frameworks provide the structure and incentives for the specification of sustainable materials and periodically they introduce new criteria and raise their expected performance standards.

Expanding scope and improving standards has not been without challenges. To achieve the objectives of lower carbon usage, efficient use of natural resources and confidence that labour and welfare standards are maintained in the supply chain, there is a need for relevant, reliable and trusted data. Third-Party Certification Bodies play a key role in providing independent data validation, auditing and reporting. This information not only provides confidence to the designers, specifiers and owners of buildings and infrastructure but also enables them to compare competing suppliers' performance and management practices.

This paper describes how CARES, a not for profit certification body and competent authority set up by the UK government and industry, has worked with its stakeholders to develop and enhance its Sustainable Constructional Steel (SCS) certification scheme to help meet this demand and drive improvements to sustainability performance.

Based on full traceability, through the supply chain, the scheme provides an objective and workable approach to the identification, collection, auditing and reporting of sustainability data and management approaches at a supplier level. It also enables sector performance to be communicated. Companies under the scheme can be confident that their data is being produced in accordance with industry and international standards. Through the CARES Rosette Rating Scheme, they can now demonstrate higher levels of performance. Buyers have the confidence that they are selecting products which are produced under a system seeking to continuously improve sustainability performance.

## **2. Drivers of sustainability – Why act now?**

Sustainability is increasingly well understood, yet still considered in many different ways. For clarity, we refer to the commonly accepted definition of sustainable development from the World Commission on Environment and Development, 1987, which states that “*Sustainable development meets the needs of the present without compromising the ability of future generations to meet their own needs.*”

Whilst legislation is now common in many markets, the UK, the EU and certain American states, including California, have typically been at the forefront of the introduction of sustainability legislation and standards. Recent legislative and standardisation trends indicate a broadening of the range of issues which require systematic management and increased performance expectations.

The UK Modern Slavery Act<sup>1</sup>, for example, introduced in March 2016, requires any business with a worldwide annual turnover above £36m to publicly report, in a statement, its efforts to eradicate slavery and human trafficking across its entire value chain. The statement, signed by a Director, must be easy to find from the home page of companies' website. This has similar requirements to the California Transparency in Supply Chains Act<sup>2</sup>, which took effect in 2012.

The EU Non-Financial Reporting Directive (2014/95/EU)<sup>3</sup>, which should have been transposed into national legislation by 31<sup>st</sup> December 2016, obliges large public-sector organisations, listed companies and certain other entities with more than 500 employees to disclose in their annual

management report relevant and useful information on their policies, main risks and outcomes relating to at least:

- environmental impacts,
- social and employee aspects,
- respect for human rights,
- anticorruption and bribery issues, and
- diversity in their board of directors.

There is some flexibility in how to report, with allowances for following existing international guidelines and standards in this area, such as ISO 26000<sup>4</sup>, OECD Guidelines for Multinational Enterprises<sup>5</sup> and the Global Reporting Initiative (GRI)<sup>6</sup>.

The Paris Accord<sup>7</sup> regarding climate change is another significant example of increased demands for evidence of sustainability. The agreement of 195 nation states (ratified at time of writing by 174) is to keep a global temperature rise this century well below 2 degrees Celsius (*3.6 degrees Fahrenheit*) and to drive efforts to limit the temperature increase even further to 1.5 degrees Celsius (*2.7 degrees Fahrenheit*) above pre-industrial levels. Additionally, the agreement aims to strengthen our ability to deal with and recover from the impacts of climate change.

Whilst allowing nation states to present their own ‘Nationally Determined Contributions’ (their action plans), it essentially lays the foundations for an accelerated transition towards a low carbon economy and ultimately a fossil free future. Construction companies will have to respond and demonstrate their contribution to national reductions.

Furthermore, major infrastructure and construction projects are increasingly incorporating sustainability into procurement frameworks. For example, High Speed 2, the first new railway to be built north of London, UK, in 120 years, will evaluate all its contractors and their subcontractors against a balanced scorecard<sup>8</sup>. This scorecard incorporates social, environmental and economic management and performance, which is used when selecting suppliers as well as when monitoring performance during project delivery.

Being able to demonstrate sustainability management and performance is becoming a prerequisite of doing business on leading projects.

### **3. The CARES Sustainable Constructional Steel (SCS) Scheme**

In response to these drivers, CARES initially set up a Sustainable Reinforcing Steel Certification scheme in 2012. The scheme initially covered reinforcing carbon steel and reinforcing stainless steel. Its scope was expanded in 2013 to include other structural steels and in 2015, hot rolled flat steel. It applies to primary producers of steel and fabricators who process that steel into building products that are used in a construction project.

The SCS scheme aims to deliver improved sustainability and resilience in the construction sector by providing assurance to construction product buyers that sound sustainability management practices are in place throughout their constructional steel supply chain. It provides full traceability, following the chain right back to the steel scrap or other raw material suppliers. It also provides a way for suppliers to clearly demonstrate sustainability management practice and outcomes.

The SCS scheme is subject to periodic review and further to stakeholder consultation, has recently been enhanced. The scheme criteria have been strengthened and a new rating system has been included - the CARES Rosette Rating System - which enables producers to differentiate their performance against their peers and buyers to benchmark their suppliers.

The SCS scheme is accredited to BS 8902:2009 (Responsible Sourcing Sector Certification Schemes for Construction Products)<sup>9</sup> by UKAS, the official UK accreditation body and is recognised

by BREEAM UK New Construction 2014<sup>10</sup>. Company-specific verified Environmental Product Declarations (EPD's) to EN 15804<sup>11</sup>, which are a requirement of the scheme, are accepted in the USGBC's LEED certification<sup>12</sup>.

3.1 The concept of an extended product and how it applies to CARES SCS certified reinforcing bar

The concept of the extended product can be used to illustrate the demands placed upon a modern construction material supply chain, as shown in Figure 1.

At the centre of the diagram is the product's core benefit: the reinforcement of concrete within a construction project. Shown around the core are other attributes relating to that product's performance, e.g. strength and ductility. These attributes are stated in a product standard, e.g. BS 4449<sup>13</sup> and hence constitute the 'specified product'. All companies in the CARES-approved supply chain must have an environmental management system certified to ISO 14001: 2015<sup>14</sup>, a quality management system certified to ISO 9001<sup>15</sup>, a Health and Safety Management System certified to OHSAS 18001 or ISO 45001<sup>16</sup>, a traceability mechanism and an independently verified environmental product declaration (EPD to EN 15804).

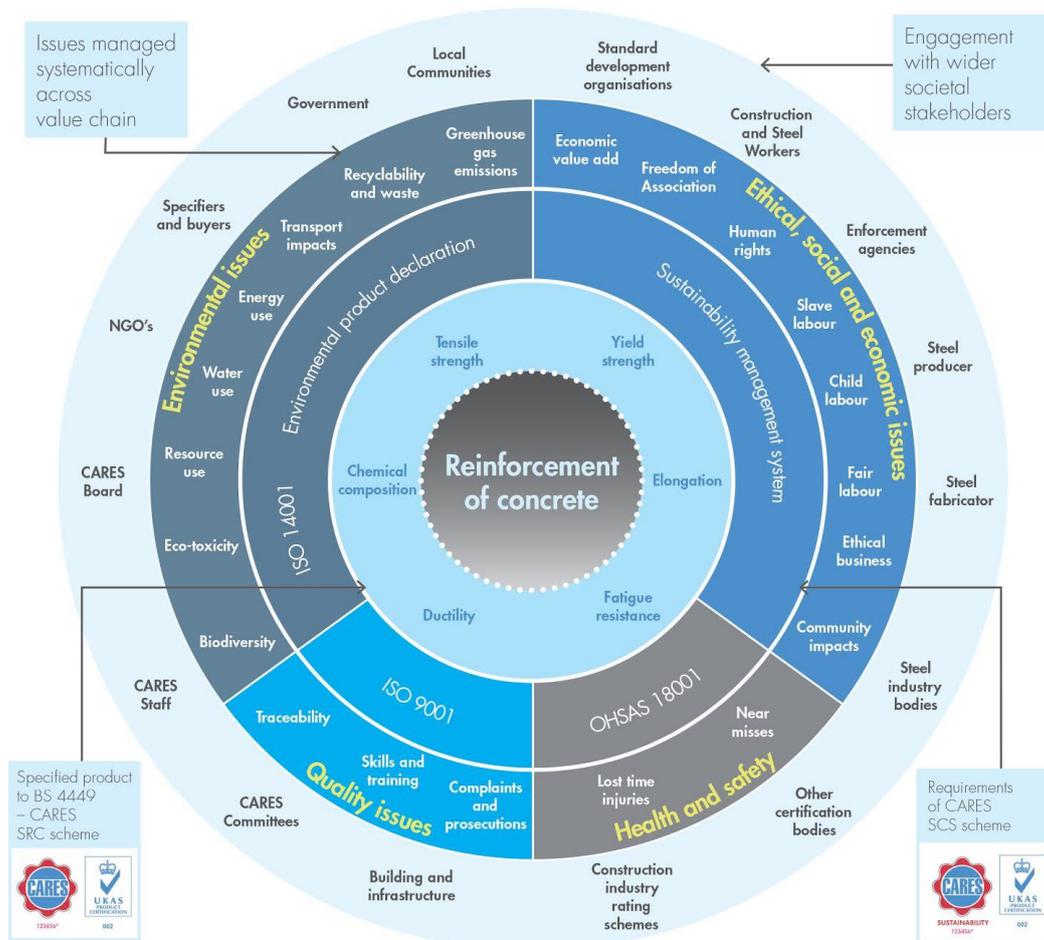


Figure 1. Concept of the 'extended' product applied to reinforcing steel

Beyond the physical product, buyers must be able to assess the broader impacts of its supply chain. The concept of ‘Materiality’ – the issues and impacts that are most significant and relevant to the organisation and its stakeholders along the entire value chain - is used to inform the selection of issues shown in the outer rings of Figure 1. Companies must demonstrate effective management of these (and other issues) as well as improving performance in these issue areas, as buyers are increasingly making purchase decisions based on these factors.

Finally, the whole construction network, and specifically in this case, the steel supply chain, is informed by the inclusion and consideration of a wide range of stakeholder opinion. This should be actively sought, to promote continual improvement towards sustainability performance. This is represented as the background outermost circle in Figure 1.

### *3.2 Basis of the scheme*

The principles of; inclusivity, integrity, stewardship and transparency provide the basis for the CARES SCS Scheme. Companies must be able to demonstrate how these are incorporated into their management practices. They are also measured against a series of criteria covering the issues illustrated in Table 1 below and required to report and demonstrate continual improvement of sustainability performance.

The scheme now also includes a maturity matrix, which provides characteristics that demonstrate an evolution of management practices, enabling organisations to track their progress over time.

### *3.3 Certification process and operation*

To achieve SCS certification, a company’s product, quality, environmental, health and safety and sustainability management systems are all examined. A two-stage audit process is completed based on checking evidence on site against a self-completed Sustainability Key Performance Indicator (KPI) workbook and Environmental Product Declaration. CARES auditors audit over 100 criteria and performance indicators for each approved supplier under the headings shown below in Table 1. If all requirements are met, SCS certification is then awarded.

While the supplier remains responsible for compliance with legal requirements and standards, the scheme enables credits to be obtained from going beyond compliance. Credits can be gained for performance that meets specified criteria above the mandatory certification level as part of the ‘Rosette Rating System’. Beyond basic certification, there are 3 additional performance levels reflecting good, better and best practices – 1 Rosette, 2 Rosettes and 3 Rosettes.

CARES conduct annual audits to ensure the scheme requirements are being maintained and performance continually improved. It collects, audits, collates and reports the sector sustainability performance data in line with requirements set out in BS 8902 - Responsible Sourcing of Construction Products and the Scheme Principles. The scheme itself is subject to accreditation audits by UKAS, which confirm its independence and that it meets all requirements of BS 8902. The Environmental Product Declarations are valid for three years and subject to an additional layer of independent verification by The UK Building Research Establishment (BRE).

### *3.4 Sustainability criteria alignment*

A set of sustainability indicators are used within the audit and assessment framework of the SCS scheme. These are a result of extensive engagement with stakeholders, including with the construction industry, the steel industry, academics and government and have been approved by the CARES Sustainability Committee. They are aligned to those used in leading private and public-sector initiatives and standards as shown in Table 1, below.

Table 2 breaks out two of the CARES headline indicators to show how they work. In this case the indicator relates to Global Warming Potential (GWP) covering greenhouse gas emissions in production and transport.

**Table 1.** Comparison of relevant sustainability indicators across selected initiatives and standards (summarised)

ISO 26000 Social Responsibility Standard	BS 8902:2009 Responsible sourcing of products	Responsible of construction	BES 6001:2015 <sup>17</sup> Framework Standard for Responsible Sourcing	CARES SCS scheme Indicator areas
Human Rights	Workers' conditions		Fundamental rights at work	Human Rights
Human Rights	Workers' conditions		Fundamental rights at work	Human Rights
Labour practices	Freedom to join trade unions		Fundamental rights at work	Freedom of Association
Labour practices	Slave labour		Fundamental rights at work	Slave Labour
Labour practices	Child labour		Fundamental rights at work	Child Labour
Labour practices	Safe and healthy working conditions		Health and safety	Safe and Healthy Working Conditions
Fair operating practices	Equality re. gender, ethnicity, religion, politics		Fundamental rights at work	Fair Labour Conditions
Fair operating practices	Fair wages		-	Fair Labour Conditions
Fair operating practices	Working hours and holidays		-	Fair Labour Conditions
Fair operating practices	Ethical business practice		Business Ethics	Ethical Business Practices
The environment	Recyclability, recycled content, renewability. Eco-t		Life-cycle assessment Ecotoxicity	Biodiversity and Ecotoxicity
The environment	Waste management		Waste prevention and management	Waste, Recyclability and Recycled Content
The environment	Harvesting or extraction impacts		Resource Use	Primary Material Use and Materials Efficiency
The environment	Greenhouse gas emissions		Greenhouse gas emissions	Greenhouse Gas Emissions/GWP
The environment	Energy usage		Energy Use	Energy and Water Use
The environment	Transport impacts		Transport impact	Transport Impacts
The environment	Water usage		Water abstraction	Energy and Water Use
The environment	Biodiversity		Site stewardship	Biodiversity and Ecotoxicity
The environment	Land remediation		-	Land remediation
-	Skills and training		Employment and skills	Skills and Training
-	Complaints and prosecutions		Complaints and prosecutions	Stakeholder Complaints and Prosecutions
-	Contribution to the built environment		Contribution to the built environment	
Community involvement	Community relations		Local Communities	Community Relations and Initiatives
-	Diversity and stability of the local economy		-	Diversity and Stability of the Local Economy
-	Long-term financial viability		Financial stability	Long-term Financial Viability

**Table 2.** Example indicators: Greenhouse gas emissions including from transport

Disclosure	Description	Indicator and Evidence required
Does the organization have a system for monitoring and reduction of the Global Warming Potential (GWP) and the Greenhouse Gas Emissions (GHG)?	Description: Global warming potential (GWP 100 years): an impact assessment level with global effect and a relative measure of how much heat a GHG traps in the atmosphere; GWP is mainly caused from CO <sub>2</sub> and CH <sub>4</sub> emissions which account for over 98% of GHG emissions from the steel industry. In exploratory impact assessments, other GHGs account for less than 2% of the steel industry GHG emissions, on a CO <sub>2</sub> equivalent basis <sup>18</sup> . CO <sub>2</sub> is an unavoidable in the steel industry due to energy usage. The process needs to be continually improved to increase energy efficiency and reduce the GWP.	<ul style="list-style-type: none"> <li>kg of CO<sub>2e</sub> per tonne of steel billet</li> <li>kg of CO<sub>2e</sub> per tonne of delivered product</li> </ul> Environmental Product Declaration (EPD) Report.
Has the organization completed "Transport Impact" worksheet within the workbook?	Description: The environmental impacts of transport are significant due to major use of energy and natural resources (e.g. petroleum). This creates air pollution, including nitrous oxides and particulates and is a significant contributor to global warming through emission of CO <sub>2</sub> . The 'Transport Impact' sheet records the number of miles travelled per mode (road, rail or ship) of transport for; raw materials; for billets for further processing and for delivered product.	<ul style="list-style-type: none"> <li>kg of CO<sub>2e</sub> per tonne of delivered product</li> </ul> Completed "Transport Impact" worksheet.

#### 4. Future Developments

A future vision for economic transition to a more sustainable state is gaining momentum. This includes adopting circular economy principles of preserving and enhancing nature capital (finite and renewable resources). This involves the circulation of products, components and materials keeping them at the highest utility at all times and designing out externalities. Industry is realising the benefits of this approach as it increases efficiencies, reduces costs and reduces negative environmental impacts.

Public procurement is becoming more sophisticated with expectations of reductions in embodied carbon from capital assets and operations. The UK's Infrastructure Carbon Review<sup>19</sup> highlighted the importance of the infrastructure sector in carbon reductions. Approximately 16% of UK emissions are associated with construction, operation and maintenance of infrastructure assets and the review says that by 2050, 24mt (26.46 USmt) of carbon can be reduced, saving the economy £1.4 billion. Part of enabling this process is the creation of common standards. This is being codified in the UK through the Publicly Available Specification (PAS) 2080 Carbon Management in Infrastructure<sup>20</sup>.

Social impacts associated with procurement for any large infrastructure project, are not being neglected by the UK Government. It's 'Procuring Growth'<sup>21</sup> white paper encourages all of its departments to adopt a balanced scorecard approach, such as that adopted by the London 2012 Olympics. Many construction firms are seeking to calculate 'Social Value' associated with their projects. Ethical labour issues are also increasingly being codified, for example in BES 6002: Ethical Labour Standard<sup>22</sup>, published in February 2017, which deals primarily with issues of fair employment practices and modern-day slavery.

These new developments will impact upon steel producers in the future. CARES' accreditation scheme will ensure that new expectations such as these will be met.

## 5. Conclusion

The sustainability agenda is maturing, not only in demanding that a broader range of issues are being systematically managed but also to see that performance in these areas is being improved. Independent, third party certification bodies play a key role in enabling industry to clearly demonstrate it is meeting these demands. They help to deliver confidence to construction project designers and specifiers through the provision of more transparent and reliable data and comparable information about competing construction materials.

Whilst there has been a convergence in the scope of international and sector standards relating to sustainable development, there remain significant differences in the structure and approaches taken. Therefore, clearly defined boundaries for construction sector value chain elements and clear methodologies for the collection and collation of material sustainability indicators are crucially important.

CARES, the constructional steel industry and other stakeholders have developed an objective and workable approach to the identification, collection, auditing and reporting of sustainability data and management system processes to deliver continual performance improvement. The Scheme uses industry best practice and International Standards throughout the whole constructional steel supply chain.

Fundamentally, CARES Approved Sustainable Constructional Steel producers and processors are helping to deliver more sustainable construction and infrastructure.

## References

- [1] Her Majesty's Stationery Office (<http://www.legislation.gov.uk/ukpga/2015/30/contents/enacted>), accessed 22<sup>nd</sup> Feb 2018
- [2] California Attorney General ([https://oag.ca.gov/sites/all/files/agweb/pdfs/cybersafety/sb\\_657\\_bill\\_ch556.pdf](https://oag.ca.gov/sites/all/files/agweb/pdfs/cybersafety/sb_657_bill_ch556.pdf)) accessed 22<sup>nd</sup> Feb 2018
- [3] European Commission ([https://ec.europa.eu/info/business-economy-euro/company-reporting-and-auditing/company-reporting/non-financial-reporting\\_en](https://ec.europa.eu/info/business-economy-euro/company-reporting-and-auditing/company-reporting/non-financial-reporting_en)) accessed 22<sup>nd</sup> Feb 2018
- [4] International Standards Organisation (<https://www.iso.org/iso-26000-social-responsibility.html>) accessed 22<sup>nd</sup> Feb 2018
- [5] Organisation for Economic Cooperation and Development ([www.oecd.org/corporate/mne/1922428.pdf](http://www.oecd.org/corporate/mne/1922428.pdf)) accessed 22<sup>nd</sup> Feb 2018
- [6] The Global Reporting Initiative (<https://www.globalreporting.org/standards/>) accessed 22<sup>nd</sup> Feb 2018
- [7] The United Nations Framework Convention on Climate Change ([http://unfccc.int/paris\\_agreement/items/9485.php](http://unfccc.int/paris_agreement/items/9485.php)) accessed 22<sup>nd</sup> Feb 2018
- [8] High Speed 2, Supplier Guide ([http://assets.hs2.org.uk/sites/default/files/inserts/CS086%20Supplier%20Guide%20V11\\_Web%20-%20Interactive%20-%20final\\_0.pdf](http://assets.hs2.org.uk/sites/default/files/inserts/CS086%20Supplier%20Guide%20V11_Web%20-%20Interactive%20-%20final_0.pdf)) accessed 22<sup>nd</sup> Feb 2018
- [9] British Standards Institution (<https://shop.bsigroup.com/ProductDetail/?pid=00000000030191223>) accessed 22<sup>nd</sup> Feb 2018
- [10] The Building Research Establishment (<https://www.breeam.com/BREEAMUK2014SchemeDocument/>) accessed 22<sup>nd</sup> Feb 2018
- [11] British Standards Institution (<https://shop.bsigroup.com/ProductDetail/?pid=00000000030279721>) accessed 22<sup>nd</sup> Feb 2018
- [12] United States Green Building Council (<https://new.usgbc.org/leed>) accessed 22<sup>nd</sup> Feb 2018
- [13] British Standards Institution ([www.ukcares.com/downloads/guides/PART3.pdf](http://www.ukcares.com/downloads/guides/PART3.pdf)) accessed 22<sup>nd</sup> Feb 2018
- [14] International Standards Organisation (<https://www.iso.org/standard/60857.html>) accessed 22<sup>nd</sup> Feb 2018
- [15] International Standards Organisation (<https://www.iso.org/standard/62085.html>) accessed 22<sup>nd</sup> Feb 2018
- [16] International Standards Organisation (<https://www.iso.org/standard/63787.html>) accessed 22<sup>nd</sup> Feb 2018
- [17] Building Research Establishment ([http://www.greenbooklive.com/filelibrary/responsible\\_sourcing/BES-](http://www.greenbooklive.com/filelibrary/responsible_sourcing/BES-)

- 6001--Issue-3.1.pdf) accessed 22<sup>nd</sup> Feb 2018
- [18] World Steel Association, Methodology report Life cycle inventory study for steel products, 2011 (<http://www.hare.com/wp-content/uploads/2015/11/WHG-Worldsteel-LCA-Report.pdf>) accessed 22<sup>nd</sup> Feb 2018
- [19] Infrastructure Cost Review and Green Construction Board, 2013, (<https://www.gov.uk/government/publications/infrastructure-carbon-review>) accessed 22<sup>nd</sup> Feb 2018
- [20] Construction Leadership Council's Green Construction Board (GCB) (<https://shop.bsigroup.com/PAS2080>) accessed 22<sup>nd</sup> Feb 2018
- [21] Crown Commercial Service and Cabinet Office (<https://www.gov.uk/government/publications/procurement-policy-note-0916-procuring-for-growth-balanced-scorecard>) accessed 22<sup>nd</sup> Feb 2018
- [22] Building Research Establishment (<http://www.greenbooklive.com/filelibrary/ELS/BES-6002-Ethical-Labour-Sourcing-Standard.pdf>) accessed 22<sup>nd</sup> Feb 2018