DESIGNING FOR NATURAL CAPITAL:

Understanding and communicating the natural capital benefits of built asset design improvements

Executive summary

Prepared by Trucost

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EXECUTIVE SUMMARY

Sir Robert McAlpine, a British construction company, and Hammerson plc, a major owner, manager and developer of retail property, jointly commissioned Trucost to undertake a net impact assessment of two development project sites. Both companies strive to minimise impacts on the environment through collaborative approaches to design new assets using green technologies, resource efficiency, and where possible, renewable or efficient energy – either onsite or through responsible procurement.

The two sites assessed in the report are:

- Brent Cross, London: A natural gas fired combined heat and power (CHP) energy centre
- WestQuay Watermark, Southampton: Photovoltaic panels generating electricity to power energy efficient lighting

This assessment quantifies the environmental impacts associated with the activities of the two sites, including supply chain, use and disposal, compared to a business-as-usual baseline over a 15 and 10-year lifetime. For each activity, Trucost considers the most important environmental key performance indicators (eKPIs) including greenhouse gases (GHGs), air pollution, human and eco-toxicity and water consumption. It uses a combination of primary and secondary data sources to quantify each impact.

Trucost placed a monetary value on each impact including both the new technologies and the baselines. This represents the external non-marketed costs (externalities) that would need to be paid for the impacts caused and the services nature provides that enable companies to produce and distribute their products and services. Sir Robert McAlpine and Hammerson can benefit from using monetisation of externalities to identify potential business risk in the future. Increasingly, these externalities are being internalised by business through environmental taxes, penalties, as well as less tangible factors such as reputational risk. In particular, supply chain vulnerabilities can be identified and these may create operational challenges and increased cost of supply in future developments.

The Brent Cross site was modelled using available data on the planned energy centre that will provide heat and energy to local residents, retail and other non-residential organisations in the vicinity. CHP is a more efficient means of energy production than many conventional power plants, as the heat that would typically be lost to the environment is captured and utilised.

In the UK, electricity is increasingly produced from renewable sources as part of the commitment to reduce GHG emissions by at least 80% compared with 1990 levels by 2050. It is therefore likely that the GHG emission factors of the UK electricity grid will change over the course of the modelled period. To account for this, the Brent Cross CHP was compared to both scenario forecasting from the

Department for Energy and Climate Change (DECC), as well as known capacity generation planning, to determine potential lifetime implications of the technology. Based on the conservative decarbonisation scenario, CHP offers a 20% lower natural capital cost when including construction, installation, operation and disposal of CHP technologies[1]. The avoided natural capital cost of CHP over a 15-year life expectancy of the technology is £2.6 million. However, as the grid becomes increasingly decarbonised, the benefit reduces, and after 15 years the net benefit is significantly reduced. After 15 years, transition towards non-fossil fuel based feedstock for CHP is recommended.

The assessment identified that through the use of onsite solar generation of electricity, the WestQuay Watermark retail site has a potential reduced natural capital cost of £53,000 in a 10-year project life, or 93% of the total natural capital costs were the electricity to be supplied from the National Grid[2]. If the site were to be powered using electricity sourced using a green tariff (using an electricity supplier and selecting renewable energy electricity supply), the use of onsite solar generation still provides over £11,000 of avoided natural capital cost.

The natural capital cost of the production, use and disposal of lighting was also calculated, comparing scenarios of energy efficient lighting with electricity from the National Grid, onsite PV generation, and renewable energy tariff, alongside the use of business-as-usual lighting, in which standard lighting such as T5 lights and compact fluorescent lamps (CFLs) were modelled for impacts. Through the use of energy efficient lighting, production costs were significantly reduced, with project lighting replaced 10-25 times less frequently than conventional lighting. As a result, the project site with efficient lighting and PV over a 10-year life expectancy provides £48,300 reduction in natural capital costs over 10 years.

Table 1 displays the natural capital costs of one unit of energy, as assessed in the different scenarios within the report.

Energy scenario	Natural capital cost of energy supply (p/kWh)
Grid (current)	5.4
Grid (forecast[3])	3.01
Purchase of green electricity	0.90
Natural gas fired CHP (average thermal and electric energy)	2.41
Onsite PV	0.20

Table 1: Comparative natural capital costs of energy produced in different scenarios

[1] Including CHP engines, boilers and pipes, but excluding building to house energy centre.
[2] Accounting for forecast decarbonisation – if taken as current grid mix, the avoided natural capital cost is £89,000
[3] Average cost per unit over 10-year forecast

Current grid impacts have the greatest natural capital cost, though this is reduced by 44% when considering the decarbonisation forecast for the UK national grid over the next 10 years. Onsite PV has the lowest natural capital cost of all scenarios, with energy generation over its lifetime compensating for the impacts associated with manufacture of equipment.

Quantifying the reduced environmental costs achieved by different technologies, as well as trade-offs over developing efficiencies demonstrates how Sir Robert M^{c}Alpine and Hammerson can continue to improve whole-life performance of assets. Analysing the long-term environmental implications of key items of infrastructure early in the design phase will support more informed decision-making and lead to better outcomes, reducing both environmental damage and business risk.

To download the full report, please visit either the Hammerson or Sir Robert M^{c}Alpine webites:
http://sustainability.hammerson.com/stories/328/natural-capital-report.html

http://www.sir-robert-mcalpine.com/