sustainable development commission

Schools Carbon Footprinting

Scoping Study – Final Report

April 2006

Table of contents

1 Introduction

The Sustainable Development Commission (SDC) is the Government's independent adviser on sustainability matters. It is currently advising the DfES on how it can accelerate and deepen its contribution to sustainable development.

The SDC has recently coordinated two pieces of work which help us understand better the contribution of schools to national carbon emissions. The studies consider the direct and indirect emissions from procurement of goods and services by schools.

1. The DfES funded the SDC to carry out a scoping study (the *'carbon footprint'* project) into the potential to strategically assess and manage the contribution of UK schools to national carbon emissions. The study has identified that schools represent 15% of public sector carbon emissions from both direct and indirect energy use. The study also identified uncertainty as to the future scale of schools' carbon emissions, but it determined that it would be possible and appropriate to use a resource flow accounting methodology to assess the total (direct and indirect) carbon emissions from the schools estate. The study proposes that this would be a sound basis for a second phase study to develop carbon reduction goals and a route-map for their achievement. We have developed recommendations on the key components of such a next phase.

2. The SDC co-funded (with the Sustainable Procurement Task Force) a study into the energy use of school buildings (the *'buildings energy efficiency'* project) and how this may be reduced through the capital investment programmes for primary and secondary schools. This has shown the wide variety in energy performance of the existing school stock, as well as the potential for carbon savings from energy efficiency and renewable energy installations.

This paper focuses on the findings of the 'carbon footprint' study, but is informed in places by the 'buildings energy efficiency' project.

2 Background

There is currently unprecedented interest in the contribution of schools to sustainable development. Schools play a particular role in implementing sustainable development by being part of the wider public sector and therefore within the Government's commitment to 'lead by example', and also having a key role in promoting behaviour change. As schools often lie at the centre of local communities, they can raise awareness of sustainable practices and technologies to pupils and to the wider community of parents and carers, community groups and businesses.

There are fewer than 3,500 secondary schools in the UK and many of them will be rebuilt or will undergo major refurbishment over the next 15 years. The vast majority of the population will pass through these schools, providing a unique opportunity to inspire pupils about sustainable development through all the major areas of school life – the curriculum (teaching provision and learning), the campus (values and ways of working) and the community (wider influence and partnerships). Critical to this is the design and operation of the school buildings and grounds.

The DfES will shortly launch a consultation on sustainable schools (DfES, 2006a), which will be followed by a year of action on sustainable schools by the DfES. The consultation proposes a national framework for applying sustainable development principles across the curriculum, campus and community, focusing on eight themes or 'doorways':

- Food and drink

- Energy and water
- Travel and traffic
- Purchasing and waste
- Buildings and grounds
- Inclusion and participation
- Local well-being; and
- Global dimension.

The 2003 Energy White Paper committed the UK to reduce carbon emissions by 20% by 2010 and by 60% by 2050. The UK Sustainable Development Strategy commits Government and the public sector to lead progress towards these targets by example. The recently released Climate Change Programme (2006) identifies that we need to do more if we are to achieve our national goals for 2010 and 2050, with renewed action in all sectors.

A number of bodies are calling for the wider public sector to demonstrate leadership in radically reducing carbon emissions. For example, the Sustainable Consumption Roundtable has called on the government to adopt a vision of a carbon neutral public sector by 2015, with a commitment to year-on-year progress towards this (Sustainable Consumption Roundtable, 2006).

However, the Government does not currently have a clear assessment of the level of total emissions arising from the education sector, nor specific sub-sectors like schools. Furthermore it does not know how new initiatives in schools, such as extended working hours, heavy investment in ICT, and the new buildings programmes, will impact on schools' carbon emissions – whether, for example, emissions associated with energy use on-site will continue on their upward trend.

The Government is currently establishing two major buildings programmes which have the potential for significant impact on carbon emissions across the education sector. The Building Schools for the Future programme will rebuild 50% of England's secondary schools, and refurbish many of the others by 2020. The proposed Primary Capital Programme will rebuild or refurbish 50% of England's primary schools. These programmes present prime opportunities to set the schools estate on to the right track towards a low carbon future. This major capital investment can reduce the environmental impact of schools at the same time as creating a rich seam of learning opportunities for staff to engage pupils.

The Prime Minister has stated (Sept 2004):
"Sustainable development will not just be a subject in the classroom: ***it will be in its bricks and mortar and the way the school uses and even generates its own power****. Our students won't just be told about sustainable development, they will see and work within it: a living, learning place in which to explore what a sustainable lifestyle means."*

The UK Sustainable Development Strategy (2005) states:
"Sustainable development principles must lie at the core of the education system, such that ***schools, colleges and universities become showcases of sustainable development*** *among the communities that they serve."*

The DfES Sustainable Development Action Plan (2006) states:
"The Government is committed through its Energy White Paper to reducing UK carbon emissions by 20% (on 1990 levels) by 2010. School buildings must play their part in achieving this objective, and reduce their carbon emissions accordingly."

3 Methodology, findings and trends

The SDC proposed to DfES in 2005 that research is needed into the 'carbon footprint' of schools, including:

(a) schools' current contribution to UK carbon emissions
(b) the impact of known policy measures on future carbon emissions
(c) a strategy that enables schools to fully meet the Government's carbon reduction goals.

In 2005, the SDC proposed a two-part study comprising: Phase 1 (initial scoping study) to assess the options open to the DfES to address issues (a) to (c) above; and, Phase 2 to research and develop solutions to issues (a) to (c) above. The DfES agreed to fund Phase 1 to be completed by April 2006.

3.1 Methodology

The SDC commissioned a desk-based scoping study by contractors (Stockholm Environment Institute and Global Action Plan) into the carbon impact of the schools estate. The scoping study covered the following areas:

1) Literature review to establish the evidence base on carbon emissions and schools, including:

- Environmental policy – data on related policy targets, legislation relevant to the schools estate.
- Emissions data – school energy consumption, transport, procurement etc., with assessment of availability and quality of data.
- Measurement systems / indicators – review of carbon accounting methods.
- Good practice guidance – carbon reduction measures, relating to direct and indirect emissions
- Trends – drivers that will affect direct and indirect emissions in the future

2) Analysis of evidence base collated: Identify the scale of carbon footprint of the schools sector in the context of national carbon emissions and reduction goals.

3.2 Summary of findings

The 'carbon footprint' scoping study identified data sources and a methodology for assessing the carbon emissions of UK schools. The study proposes a resource flow accounting methodology to produce a 'carbon footprint' based on a hybrid database of top-down and bottom-up data that is needed to give the appropriate level of detail for analysis.

For the first time, the study has estimated carbon emissions from both direct and indirect energy use by schools. **It estimates that the schools estate is responsible for 10.4MtCO_2 (million tonnes of carbon dioxide) from direct and indirect sources per year.** This is made up of 26% direct emissions (burning of fuels on site), 22% electricity (in schools and in the supply chain), 14% private transport commuting to school, and 28% manufacturing of chemicals, furniture, paper and other goods (see Figure 1).

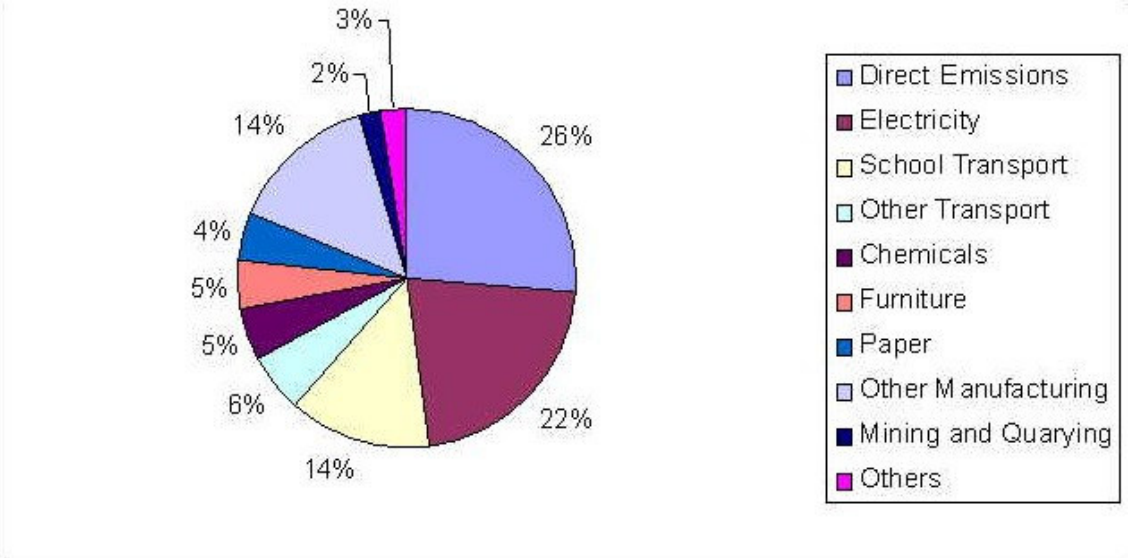

Figure 1: Schools Carbon Footprint broken down according to major consumption categories (Ref GAP, SEI, Eco-Logica 2006)

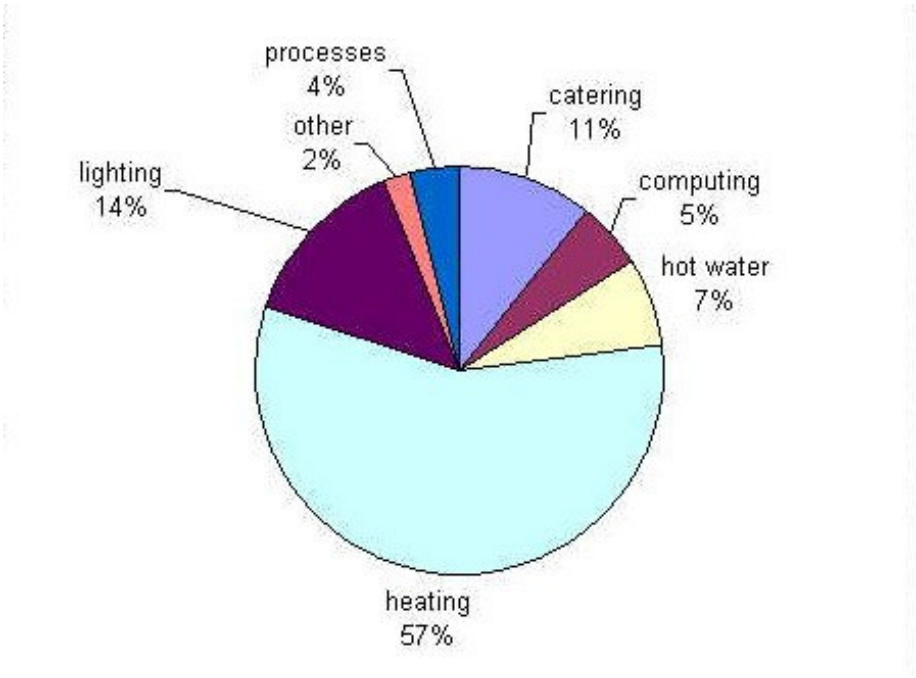

Figure 2 - Carbon emissions from direct energy consumption in education buildings (adapted from BRE 2002)

These emissions represent less than 2% of UK carbon emissions, but almost **15% of carbon emissions attributable to the public sector**[1]. If the Government is to demonstrate leadership through deep cuts in public sector carbon emissions, schools will be a key component.

The 'building energy efficiency' study (BRE, 2006) enables us to further disaggregate the electricity use in Figure 1, and suggests that the direct electricity use in schools accounts for approximately 18% of carbon emissions, leaving 4% from electricity use in the supply chain.

[1] This assumes emissions are calculated using the same methodology.

Figure 2 shows the breakdown of direct energy use in education buildings (data for school buildings is not available, but is unlikely to differ significantly). This shows that education buildings' carbon emissions are dominated by space heating, hot water, computing and lighting – all elements that will be directly influenced through the capital investment programmes.

Phase 1 of the 'carbon footprinting' study has identified the main sources of publicly available top-down data (all-inclusive estimates) needed for developing a database. It also includes proposals for how bottom-up data (school-specific information) may be collected and used to disaggregate top-down data to a level that can be used by individual schools or local authorities. Some bottom-up data is readily available in existing databases. However, some further data will need to be collected from a representative sample of schools using a questionnaire. A sample questionnaire was piloted on a small number of schools, and the study proposes how this may be used on a wider scale to collect relevant data.

The 'building energy efficiency' study shows that carbon emissions from building energy use have increased on average by about 1% per year driven by a strong increase in electricity consumption (see Figure 3).

3.3 Trends

The 'carbon footprinting' study has also identified a number of key trends which are likely to influence carbon emissions from the school estate, including declining numbers of pupils, extended schools, building energy performance standards, building space standards, increase in provision of ICT equipment, and upward trends in private car commuting. Some of these trends will tend to reduce overall carbon emissions, but others will tend to increase carbon emissions. Consequently, we do not yet understand if, for example, the Building Schools for the Future programme in its current form will increase or decrease direct carbon emissions from the secondary schools estate.

The 'carbon footprinting' study also identified a range of good practice guidance that is available to schools to help them reduce their carbon emissions from the various direct and indirect sources. This information has been found from a range of sources and is currently fragmented. For a national programme to tackle carbon emissions, this information needs to be amalgamated, quality assured and any gaps should be identified.

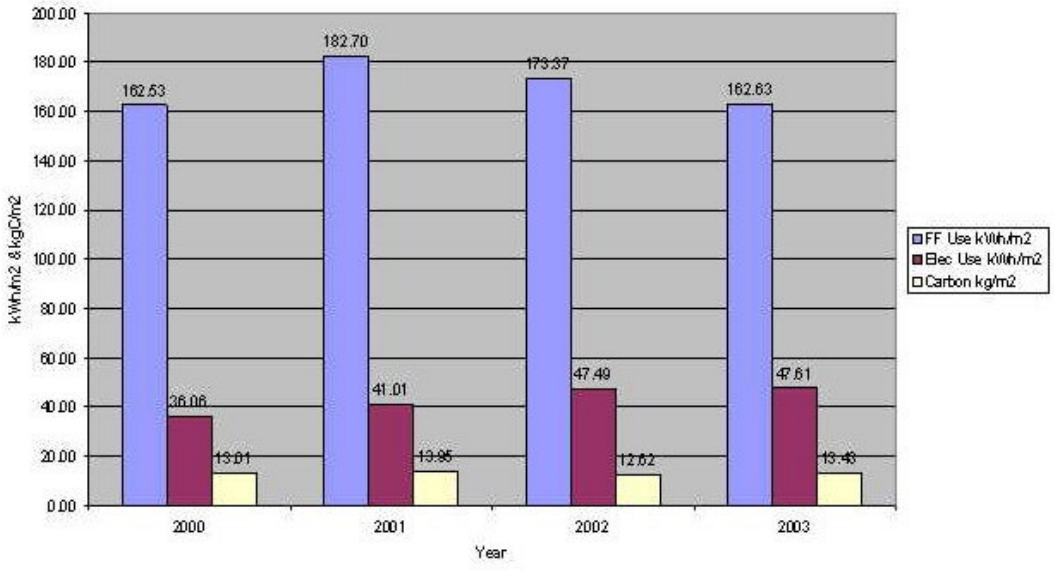

Figure 3 – Fossil fuel, electricity and carbon emissions trends from school building energy use (BRE 2006)

The Budget 2006 announced a new revolving loan fund of £20m for the whole of the public sector, to finance investment in energy efficiency. This provides the opportunity to fund energy efficiency improvements that are identified in Phase 2 of this project, and should particularly be used to fund minor energy efficiency works in the short term for schools which will not be refurbished or rebuilt in the early stages of the capital programmes.

4 Recommendations for Phase 2

We recommend on the basis of this scoping study that a full carbon analysis is undertaken of the schools estate, and that measures are developed to reduce the 'carbon footprint' in line with national priorities.

Below we have provided a list of specific steps that could be taken to achieve this.

1. A **full carbon footprint database** is developed for the schools estate. This should be based on a hybrid estimation framework that combines both all-inclusive estimates (top-down approach) and detailed school-specific information (bottom-up approach). Available 'bottom-up' data from existing surveys should be complemented with data from an additional school survey. While the data availability in schools for such a survey is encouraging, it is recommended that a larger trial is commissioned before a full survey is initiated due to the small sample size of the scoping study pilot.

2. We propose that a **full carbon footprint model** is developed to enable decision makers to understand the consequences of policy decisions which will impact on the carbon footprint, and to track the actual progress on carbon reduction.

3. The **impact of current and future trends** on carbon emissions from the schools estate is fully modelled to develop a forward trajectory for 'business as usual'. This is needed to understand the baseline from which reductions need to be made, and to quantify particular emissions growth sources. Although a range of emissions trends have been mapped in the scoping study, their cumulative effect has not been quantified.

4. The full carbon footprint is broken down into several **key emissions components** in order that these can be tackled strategically. Example emissions components could include: school buildings energy use; school commuting; other school travel; food procurement; consumables procurement; durables procurement and services (i.e. cleaning, maintenance). Analysis of opportunities for carbon reduction should be carried out on each of these distinct components.

5. A **carbon reduction goal** is developed for the schools estate for achieving measurable carbon reductions, in the form of a target if appropriate. This goal should identify the reduction in carbon emissions needed for the schools estate to meaningfully contribute to the UK climate change programme. Ownership of this goal within the DfES should be clearly identified. Carbon reductions should include both direct and indirect emissions, allowing schools to decide how to meet their goals most effectively and efficiently. Developing policies for reducing these indirect emissions will require the DfES to work collaboratively with other government departments.

6. A **series of milestones** is also developed with quantified reductions and dates for the key emissions components of the footprint. The levers that may be used to tackle each key component of the footprint should be identified, including those that may be operated by individual schools or local

authorities and those that are the responsibility of Government departments. A strategy (**route map**) should be developed to show how to achieve the agreed reductions in the carbon emissions including identification of the policy instruments required for implementation. This should include identification of the cost-saving potential for all measures.

7. The overall carbon reduction goal and individual milestones should be relevant to school management teams and local authorities by showing how they such **inter-link with other policy objectives** as sustainable schools, every child matters, extended schools, procurement, higher nutritional standards and crucially higher achievement standards. A suite of coordinated guidance should be prepared aimed at the different audiences who can influence elements of the carbon emissions: for example Heads and teachers, LEAs, building designers, procurement managers, pupils.

The contract for carrying out key elements of Phase 2 should be tendered to the market. It is likely that a number of contracts may be necessary to deliver on specialist work areas – for instance separately considering buildings, transport and procurement. This could be through separate bids or consortia, but in either case a mechanism will be required to co-ordinate and integrate the final products.

It may be possible to identify co-funding for Phase 2 of the project from other government departments, private sector and other research funding bodies. We have identified interest in this project from the Carbon Trust and the Energy Saving Trust. Both these organisations would be interested in ongoing involvement with the project. The Sustainable Development Commission would be keen to maintain ongoing involvement in this project in an advisory role.

5 Conclusion

The 'carbon footprinting' scoping study has identified the scale of the carbon emissions from direct and indirect use of energy in the procurement of goods and services.

The Sustainable Development Commission recommends that the Government takes forward a full carbon footprinting project of the schools estate to optimise understanding of the schools' contribution to the UK Climate Change Programme, and the consequences of schools policies and initiatives.

6 Bibliography

BRE, 2002, *Carbon emissions from non-domestic buildings: 2000 and beyond*, BR442

BRE, 2006, *Review of opportunities for improved carbon savings from spend on education buildings* (report for Sustainable Development Commission)

DfES, 2006, *Learning for the Future: The DfES Sustainable Development Action Plan 2005/06,* London.

DfES, 2006a, *Sustainable Schools: Schools for pupils, communities and the environment.* Consultation Paper

GAP, SEI, Eco-Logica, 2006, *UK Schools carbon footprint scoping study* (report for Sustainable Development Commission)

HM Government, 2005, *Securing the Future: delivering UK sustainable development strategy,* TSO

HM Government, 2006, *Climate Change: The UK Programme 2006,* TSO

Sustainable Consumption Roundtable, 2006, *I will if you will: Towards sustainable consumption*, London