

ICT footprint reporting tool

Green Digital Charter reporting tools

V1.0 - 28/02/2012

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1 Introduction

The Information and Communication Technologies (ICT) footprint reporting tool for the NiCE (Networking intelligent Cities for Energy Efficiency) project is to be delivered over three phases: first draft of the ICT footprint City Reporting Tool (this document), second draft version due end June 2012 and a final version end June 2013.

This document provides an introduction to ICT footprint reporting for a city, identification of an initial methodology and tool based on work done by Bristol City Council in the UK on the non-domestic footprint (Green Addict), and a roadmap to a more comprehensive tool based on the emerging standards for a city's ICT carbon footprint being developed by the International Telecommunication Union (ITU)¹. The work done by Bristol will provide cities with an introduction to the topic and the final tool will provide practical support in using an internationally recognised standard.

The intention of the ICT footprint reporting tool is to provide a flexible method and technique that is complementary to existing methods already deployed by the cities. Any finalised tool will draw on existing international standards, including work by the ITU on ICT footprints, World Resources Institute (WRI)² on Green House Gas (GHG) protocols for cities and the Carbon Disclosure Project, as well as recognised standards such as ISO14064³. This will enable cities to measure, compare and report on ICT's direct carbon footprint at a city level.

Defining the scope of a city's ICT carbon footprint is important in order to make realistic comparisons between cities and to understand actions needed to reduce the footprint. The intent with the reporting tool is to provide a means of measuring the direct carbon footprint of ICT in a city, or in other terms the 'negative impact of ICT'. This will provide a means by which cities can then measure their progress. Other tools, in particular the Green Digital Charter - Covenant of Mayors⁴ reporting tool, will look at highlighting the positive effect of ICT in terms of reducing a city's carbon footprint.

¹ www.itu.int

² www.wri.org

³ www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=38381

⁴ This Charter-Covenant reporting tool will enable Green Digital Charter signatories (and beyond) to highlight the ICT dimension of their efforts to reach the Covenant of Mayors commitments without creating an extra burden through separate processes. The task will be based on the progress monitoring framework and be developed in close collaboration with the Joint Research Centre (JRC) and key Covenant of Mayors stakeholders.

2 ICT carbon footprint of a city

Regarding the ICT carbon footprint of a city there are a number of points that need to be taken into account in terms of the 'scope' of the footprint being considered. This is important if comparisons between cities are to be meaningful and also, for example, that there is a consistent understanding of the key Charter objective of reducing a city's ICT footprint by 30% over a 10 year period.

The following points need considering when discussing the ICT carbon footprint of a city. See also the documents referenced in section 4.

2.1 Carbon

The term carbon is widely used within the Green Digital Charter, but there are two possible reporting approaches:

- Carbon only;
- All GHGs reported in terms of carbon equivalent.

2.2 Scope

International standards from WRI on measuring GHGs and carbon suggest considering emissions in terms of the so called 'scopes 1, 2, 3' to help both with comparisons and to avoid double counting.

The GHG Protocol⁵ from the United Nations Environment Programme (UNEP)⁶ categorizes these direct and indirect emissions into three broad scopes:

- **Scope 1:** All direct GHG emissions;
- **Scope 2:** Indirect GHG emissions from consumption of purchased electricity, heat or steam;
- **Scope 3:** Other indirect emissions, such as the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, electricity-related activities (e.g. transmission and distribution losses) not covered in 'scope 2', outsourced activities, waste disposal, etc.

The application of this approach to cities is considered in the following UNEP publication:

http://www.unep.org/urban_environment/PDFs/InternationalStd-GHG.pdf

⁵ www.ghgprotocol.org

⁶ www.unep.org

2.3 City sectors

ICT is used across a city and it is important to understand which sectors are being talked about when referring to the whole city. The most common distinction is between that of the city's administration and that of the city as a whole, using the local authority perimeter for delimitation. The Green Digital Charter in particular is referring to the ICT of the administration when calling for a 30% ICT footprint reduction.

2.4 ICT

As highlighted earlier, it is necessary to distinguish between the positive and negative impact of ICT.

The positive effects of ICT tend to be associated with the sector that they impact within a city and should be kept separate from the negative impact of ICT.

The negative impact of ICT will itself come in a number of forms including the 'scope 2' contribution from the use of ICT within the city, the upstream embedded carbon ('scope 3') in ICT equipment and the use of external services/supply chains (e.g. remote servers). These will all be considered by the ITU work mentioned above, and cities will choose what to report on.

2.5 GDC footprint objective

Our understanding of the 30% Charter ICT carbon footprint reduction is that it relates to carbon (not GHG), 'scope 2' (emissions from energy consumption), the city administration and negative impacts only.

3 ICT reporting

There have only been a limited number of attempts to determine a methodology for ICT reporting in a city and the current work by the ITU is likely to be the most comprehensive. However, given that work is still in progress we have sought to identify a current tool that might provide a city with an initial view of their ICT footprint ahead of the delivery of tools supporting the ITU work.

In this context we have identified the work done by Bristol City Council in the UK, which is discussed below.

3.1 *Green Addict*

The NiCE project has liaised with Bristol City Council in the UK about cities using/adapting the Green Addict website⁷. This would provide cities with an initial insight into ICT reporting and any feedback on its usefulness will be helpful for the development of a tool based on the emerging ITU methodology. The following paragraphs explain the Bristol approach.

Bristol is a leading UK green capital – home to many businesses, universities and organisations at the forefront of developing low carbon solutions and innovative approaches to tackling climate change.

Alongside the other UK core cities, Bristol made a commitment with the government to meet targets set out in the Climate Change Act⁸ – to reduce CO₂ emissions by 34% by 2020 and 80% by 2050 relative to 1990 levels. In 2007 the Bristol Partnership⁹ launched the Green Capital Initiative¹⁰ – encouraging organisations in the city to take action to help make Bristol a low carbon city with high quality of life.

Bristol are supportive of NiCE adopting the Green Addict methodology, and using this as the basis for the first draft version of the ICT footprint reporting tool. As such, the NiCE project will feed back the experiences for not only this draft version, but also how it evolves in the second and third version, to the benefit of Bristol.

Developed by Bristol City Council, the Green Addict project's approach and methodology¹¹ constituted two phases, namely:

Phase 1: developed a methodology for any city or region to calculate its non-domestic ICT emissions (see below). The "scope" of Green Addict in the terms of section 2.2 above is:

Carbon/GHG	Scopes	City Sectors	ICT
Carbon	2	Non-Domestic	Use in the City of ICT equipment

⁷ www.greenaddict.eu

⁸ www.theccc.org.uk/about-the-ccc/climate-change-act

⁹ <http://bristolpartnership.org>

¹⁰ <http://bristolgreencapital.org>

¹¹ www.greenaddict.eu/downloads/bristol_city_ict_report.pdf

Methodology - calculating the ICT carbon footprint:

A methodology was developed to ascertain the carbon footprint associated with the use of ICT in the Bristol area. The footprint was broken down by employment sectors and has been designed so that it can be easily transposed to other UK locations.

The steps that underlie the model are outlined in Figure 1 which provides the carbon footprint for each industry sector. The total footprint is calculated by the sum of all the sector footprints together.



Figure 1 - ICT footprint methodology

The methodology has been designed to be applicable in cities and regions across the UK with all data sources fully referenced.

Step 1 - Data collection

Sector employee figures

Sector employee figures are freely available for all cities and regions in the UK from the NOMIS website provided by the Office of National Statistics¹² and are provided under the following sector breakdown:

- Manufacturing;
- Construction;
- Distribution, hotels and restaurants;
- Transport and communications;
- Finance, IT other business activities;
- Public administration, education and health;
- Other services.

The NOMIS website also provides tourism figures, however this is a subgroup of the above service sectors.

Hardware units per employee

To calculate the energy consumption per employee it is necessary to know both the number of hardware units per employee and the average annual energy consumption of each hardware unit.

¹² www.nomisweb.co.uk

The number of hardware units in each sector is provided by purchasing market research data which quantifies how many units a company owns, the company's employee number and their sector. This information combined provides the hardware units per employee figure within each sector. In this case market research data was purchased from Corpdata¹³, but there may be other sources of similar data.

Other data sources were used to complete any missing data on hardware, such as peripherals. Details available on request.

Energy consumption per hardware unit per annum

This data has been pulled together from several sources, such as the Market Transformation Programme¹⁴ (details available on request), and can be applied to footprint calculations in any area of the UK. The calculation of this data includes normal operating hours, standby times and shutdown times.

Carbon emissions calculation

Sector ICT annual energy consumption

The above data is combined in the following way to provide the annual ICT energy consumption for each hardware unit:

Annual ICT energy consumption per hardware unit	=	No. employees	x	No. Hardware units per employee	x	Hardware unit energy consumption per year
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The addition of each hardware unit's annual energy consumption provides the total energy consumption for the sector.

Sector ICT annual carbon emissions

The total energy consumption is multiplied by the official carbon emissions factor for electricity use (0.537 kgCO₂/kWh¹⁵), as previously provided by UK government department.

Total ICT carbon emissions

This is provided by adding all the sector's individual carbon emissions totals.

¹³ www.corpdata.co.uk

¹⁴ <http://efficient-products.defra.gov.uk/>

¹⁵ UK Department of Energy and Climate Change - Consultation on the Draft Order to Implement the Carbon Reduction Commitment : March 2009

Supporting survey

In the case of the Bristol, ICT footprint it was also decided to validate the market research data by undertaking a survey of local organisations. This had the additional benefit of allowing Bristol City Council to engage with a greater number of organisations within its area and promote its Green ICT agenda. This data was not necessary for the accuracy of the analysis as the market research data provided a large enough dataset (280 organisations) to calculate the carbon footprint.

Green Addict website

The Green Addict website - www.greenaddict.eu - provides a green ICT database as an aid for ICT professionals, and other interested parties, to help them consider different methods of reducing the carbon footprint of their ICT use.

In addition the website shows:

- Green ICT map of the city showing those organisations already committed to reducing their ICT related carbon footprint;
- Bristol's ICT footprint broken down by business sectors, and by hardware type;
- Exemplar project case studies from organisations around Bristol;
- Enables organisations to calculate their carbon footprint and understand how their ICT use contributes to this their ICT use.

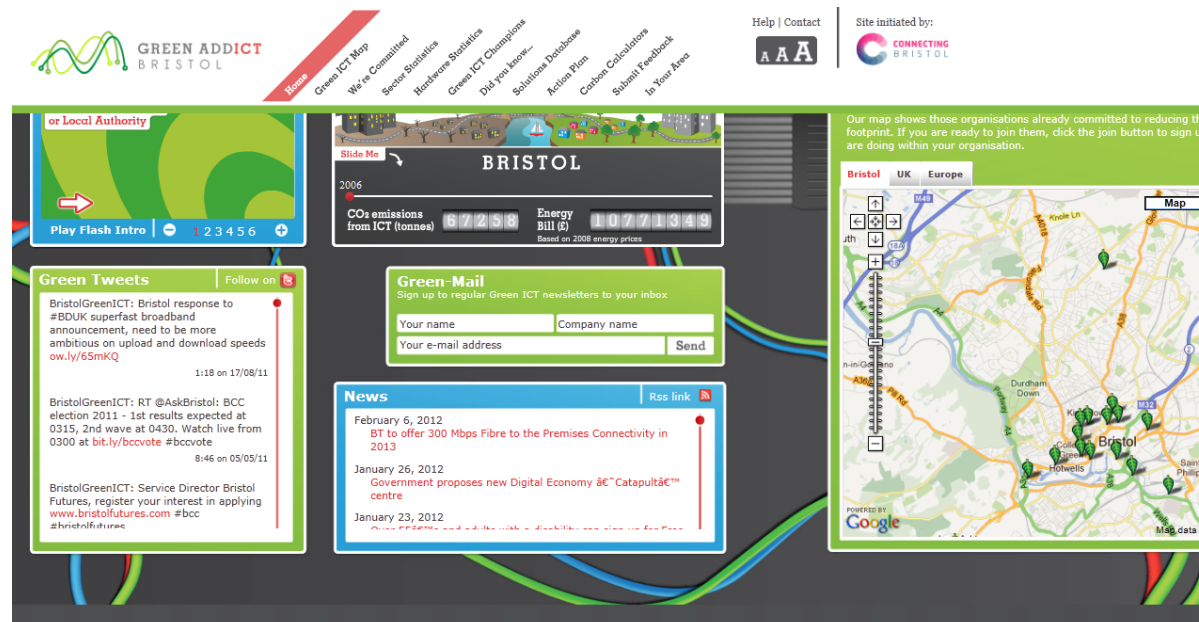


Figure 2 - Green Addict homepage - Bristol

3.2 ITU Methodology framework - ROADMAP

NiCE has been invited to contribute to 'Methodology to evaluate the GHG impact of ICT in Cities' being developed by ITU-T¹⁶ (Study Group 5).

ITU is the United Nations specialized agency for information and communication technologies - ICTs. It is a membership body including countries and commercial organizations, the European Commission is also a member.

Study Group 5 is the ITU-T study group responsible for studies on methodologies for evaluating the ICT effects on climate change and publishing guidelines for using ICTs in an eco-friendly way. Under its environmental mandate, Study Group 5 is also responsible for studying design methodologies to reduce environmental effects, for example recycling of ICT facilities and equipment.

The ITU work on city footprints will provide a firm basis in terms of a common methodology for cities and it is intended that the NiCE project contribute to this work, and as a result develop practical reporting tools based on the emerging methodology. For the second version of this ICT footprint reporting tool due in June 2012, it is likely that the main output will be improved understanding of the scope of a city's ICT footprint, whilst for June 2013 we are planning to develop online tools to help calculate their ICT footprint and show progress to this key Green Digital Charter objective.

NiCE with the support of the European Commission and UK DCMS¹⁷ are contributing to the methodology and will attend subsequent development meetings; for example Geneva in April. Contributions to the ITU discussions come via the members. The intention is that NiCE will be authorized as a European Commission account holder and be able to make direct contributions to both online discussions and physical meetings.

The roles NiCE will play in respect of the ITU work is to:

- Provide comments on the methodology from a practical city perspective;
- Develop a tool that draws on the ITU methodology;
- Provide access to test/reference cities.

The current draft scope for the ITU work is:

- ICT can be an important modulator of the overall GHG emissions attributable to a city. Within the scope of ICT there are four areas to be considered from a perspective of reducing GHG impact of cities. These are:
 - Energy savings which can be made using new generations of ICT (e.g. standby modes, auto power down, etc.);
 - Reduction of 'upstream (embodied) GHG emissions'. Examples of how this can be quantified with reference to a city are described in this recommendation.

¹⁶ www.itu.int/ITU-T/

¹⁷ www.culture.gov.uk

- ICT may be used to reduce the environmental impact of GHGs in other sectors. This can include sustainable urban infrastructure like airports, harbours, buildings, public administration, sports venues, transport, street lighting, water management and security systems. Note: to avoid risk of double accounting, where the impact is in another sector (e.g. transport), this should be reported using the standard tables described in Reference [1] below.
- Where ICT can be used to generate and efficiently route electricity, e.g. solar, wind and water, the GHG emissions reduction is highlighted and the method of quantification of the environmental impact of ICT is described.

The above is under review, but included to give indication of the direction of the work.

4 References

[1] UNEP « "International Standard for Determining Greenhouse Gas Emissions for Cities" Version 2.1 28 June 2010 see http://www.unep.org/urban_environment/PDFs/InternationalStd-GHG.pdf

[2] ITU-T Recommendation L.1400, *Overview and general principles of methodologies for assessing the environmental impact of ICT*