Carbon Footprints

Dr Robin Russell-Jones

Facilitator St George's Climate Consultations

Introduction

The term carbon footprint is the total amount of carbon dioxide plus other greenhouse gases (GHG's) released into the atmosphere as a result of a defined human activity. It may be applied to an individual, a business, a town, a country, a product or a process, and it is expressed in tonnes of carbon dioxide equivalent, written Tonnes CO2e. "Other greenhouse gases" includes methane (CH4), nitrous oxide (N20), and ozone (O3) as well as trace gases such as chlorofluorocarbons (CFC's), Hydro-chloro-fluoro-carbons (HCFCs) and Hydro-fluoro-carbons (HFCs).

The carbon footprint of an individual can be calculated by taking the total GHG emissions of a country (As reported to the UN in the annual "National Inventory Report") and dividing that figure by the population of that country. For the UK, the "official" carbon footprint of an individual is 6.8 tonnes of CO2 equivalent per annum (451million tonnes of CO2 equivalent divided by 66 million; the population of the UK in 2018.)

However this figure does not give the entire picture as shipping and international aviation is not counted in the carbon inventory. The National Inventory also excludes imported goods, such as processed food, clothes and electronics, plus construction materials such as steel and cars manufactured abroad. Any industrial process has a carbon footprint, and the carbon emissions used to manufacture a particular product is known as the "embedded carbon". Over the past 30 years the manufacturing sector in the UK has shrunk, whilst the services sector has expanded. This means that materials and goods that were previously produced by industries based in the UK are now imported from abroad, and do not feature in the UK's carbon inventory. Thus the overseas component of the UK's overall carbon footprint has increased from 14% in 1990 to 46% today (http://wwf.org.uk/carbon-report-2020). This is why Greta Thunberg has described Britain's accounting of its carbon emissions as "creative".

Thus if UK emissions were calculated to allow for the difference between imported and exported goods (so-called consumption-based emissions), then the UK's carbon footprint would have fallen by only 15% over the past 30 years. (http://wwf.org.uk/carbon-report-2020). If international aviation and shipping is included, then the true carbon footprint of a UK individual is roughly 11 tonnes of CO2e per annum.

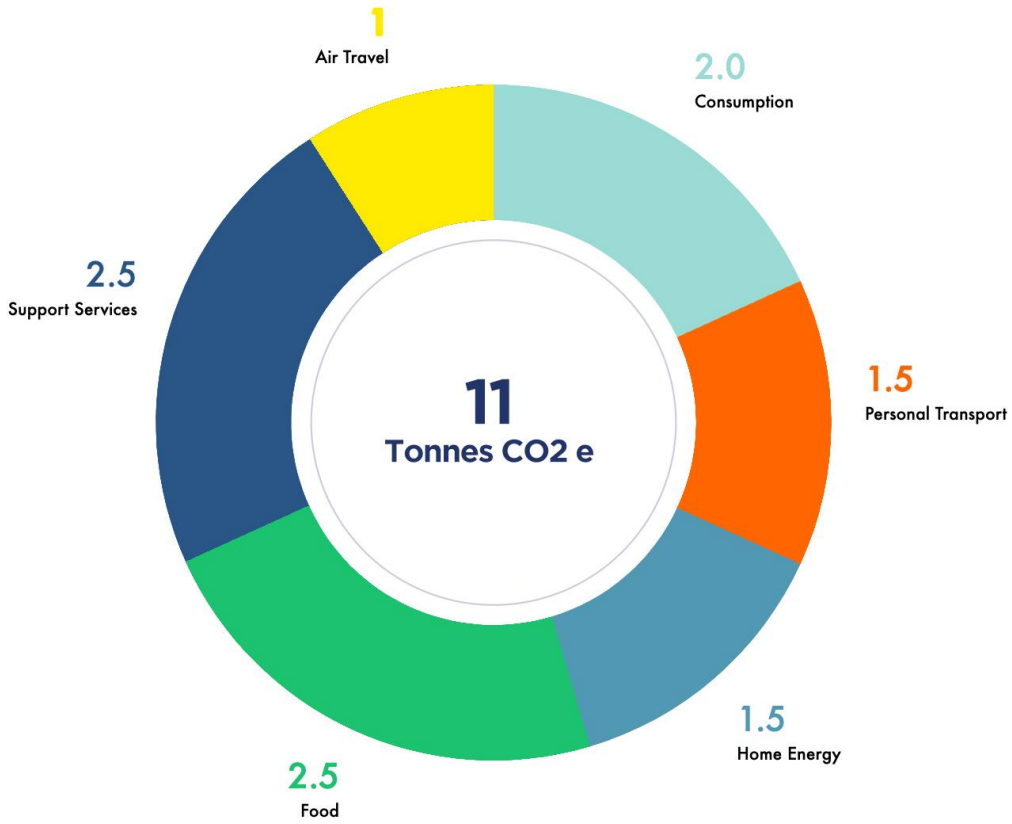

Fig 1. The average UK citizen has a carbon footprint of 11 tonnes CO2e per annum

Best estimates for towns in the South-East such as Marlow in Bucks, which lies in the top 10 per cent for wealth in the UK, indicates that the average Marlow resident has a carbon footprint closer to 15 tonnes of CO2e per annum. The breakdown is shown in the accompagnying doughnut diagrams. Note that the biggest differences between the average UK citizen and Marlow residents is in consumption and air travel. (See article "Carbon Footprints" on the HRTP website for a fuller discussion of these data: https://hrtp.co.uk).

Fig 2. Typical Marlow Resident has a carbon footprint of 15 Tonnes CO2e per annum.

The Carbon Footprint of a Town Council.

When considering the carbon footprint of an individual it is conventional to distinguish between direct emissions and secondary or indirect emissions. Thus fuel that is burnt in the home, such as gas or wood, or fuel used in a private vehicle are classified as direct emissions.
Most people also regard electricity usage in the home as an example of direct emissions, but strictly speaking electricity is not a fuel; it is generated at another location, usually by burning fossil fuels, and is then conveyed to the household by means of an electric charge. Businesses, organisations and councils therefore distinguish between Scope 1 (direct emissions) and Scope 2 emissions (electricity usage). When councils or businesses commit to becoming carbon neutral by a particular date, they are normally referring to reducing Scope 1 and 2 emissions to the lowest level possible, and then offsetting the residual emissions by funding a carbon-saving enterprise (eg tree-planting) or by purchasing carbon credits which involves investing in a carbon-saving enterprise which they do not themselves own. Marlow Town Council for example announced that it would become carbon neutral in 2020, but did not say when or how it would achieve carbon neutrality, and refused to discuss their strategy with any of the numerous environmental groups in Marlow.

In addition, any proper analysis of an organisation's carbon footprint has to take account of Scope 3 emissions, which is represented by the carbon that is embedded in infrastructure such as roads and buildings, or a particular product or process. Manufacturing a vehicle, for example, uses raw materials such as steel or aluminium, and produces a large quantity of waste material (29 tonnes per vehicle on average). Direct emissions for a car manufacturer is represented by energy usage in the factory, but Scope 3 emissions are much greater and comprise the energy needed to extract and produce the raw materials, as well as the disposal of waste material.
Consequently, councils need to be cognisant of the carbon embedded and used by the vehicles that they purchase lease or subcontract. Ultra-low emitting vehicles, such as a hydrogen-powered lorry, or an electric car, should be the automatic choice of any council with a carbon neutral strategy.

The Carbon footprint of a Unitary Authority

For a county council, direct emissions might be represented by the bus-fleet that they commission. Since green choices are available, the Council will understand that it has some control over its own direct emissions. Councils might argue, however, that Scope 3 emissions are outside its remit. But in reality choices are still available if the council chooses to exercise them. For example they could insist on low-carbon cement for buildings or bus-shelters; or they could stipulate the use of sustainable materials such as wood. Similarly, they could stipulate steel manufactured sustainably rather than using the conventional fossil-fuel intensive methods. https://www.cisl.cam.ac.uk/resources/sustainability-horizons/january-2019/sustainable-steel-manufacturing

Forward-thinking councils therefore tend to provide two target dates for net-zero. An earlier date for controlling their own direct emissions and a later date for Scope 3 emissions. The City of London Corporation, for example has set a target date of 2027 for Scope 1 and 2 emissions, and 2040 for Scope 3 emissions.

However the situation is very different in places like Buckinghamshire. In 2020, the Bucks Unitary Authority passed a resolution that Bucks would be carbon neutral by 2050, but again there was no strategy as to how this was to be achieved. In addition there was no separate target date for the Council's own emissions. This disappointed some councillors who pointed out that one of the previous District councils had already committed to 2030 for their own Scope 1 and 2 emissions. So the resolution by the Unitary Authority was in reality a step backwards. Further a target date of 2050 was hardly ambitious as that is the legally binding national target; so setting a later date would have placed the Unitary Authority in legal jeopardy. The council has now published a consultation document, but attempts by environmental groups to engage with the Council Leader or the local Wycombe MP have proven unsuccessful as both claim to be pre-occupied with the pandemic. It is a mystery to many environmentalists as to why the pandemic precludes any discussion of Buckinghamshire's climate change strategy, particularly as the NHS requires little input from either the Council leader or the Deputy Chair of the Covid Recovery Group to implement a successful vaccination programme.

Solutions

There is no shortage of solutions to achieving net zero carbon which are existing technologies waiting to be applied at scale particularly in the energy field, but also in the construction and transport sectors.
Increased connectivity is also vital both at the international level (eg a European super-grid that connects different sources of renewable energy), and at the micro-level. In the UK for example it is almost impossible to establish a company supplying electricity to the local community as current legislation requires the company to have a million pounds its bank account. Hopefully the Local Electricity Bill will soon be adopted by HMG so that this senseless roadblock to local solar farms or wind farms is removed.
(For further details of the employment and energy saving benefits of electrification, plus the prospects for carbon drawdown, view this amazing three part seminar by "Beyond Zero Emissions" featuring Saul Griffin (Rewiring America), Heidi Lee (Million Jobs Plan) and Justin Borevitz (Enhanced Earth Systems)

RESET.21 FORUM 6 | BELOW ZERO 2030: EMERGENCY ACTION FOR NEGATIVE EMISSIONS - YouTube
https://www.youtube.com/watch?v=46MMP4fCR0I&feature=youtu.be

There is of course a need for on-going R&D to find more efficient ways of storing energy or drawing down carbon. However implementation and research should proceed in parallel. This consultation is not primarily concerned with the technical aspects of achieving net zero carbon, as it is the subject of innumerable papers, reports and recommendations dating back 40 years. What characterises them all is that they have yet to be implemented, and that is the problem. Not the technologies but a total failure of political vision.

The author is the facilitator of the St George's Climate Consultations. He is Chair of Help Rescue the Planet (hrtp.co.uk) and organiser of the upcoming Mayday C4 events (maydayc4.com) in the run-up to COP 26. He was Scientific Advisor to the All Party Parliamentary Group on Air Pollution in the U.K. from 2017-2021, and is the former chair of CLEAR, the Campaign for Lead Free Air. He is the author of the Gilgamesh Gene (Shepheard-Walwyn 2017) and the updated version is now available to order (The Gilgamesh Gene Revisited). He is a former Director of MEG, a Community benefit Society known as The Marlow Energy Group.