



The Eatwell Guide: a More Sustainable Diet

Methodology and Results Summary



Comparing diets - what does this mean?

The Carbon Trust was commissioned by Public Health England (PHE) to help them better understand the environmental impacts of new Eatwell Guide being created. They wished to obtain wide-ranging but well-founded analysis covering complex sets of ingredients. It was considered useful to be able to review the results in light of the current typical UK diet.

We collated data providing the impact of 93% - 97% of the foods (by weight)¹, considering greenhouse gas (GHG) emissions, water consumption and land requirement. Comparisons were simplified by an innovative method for representing sustainable environmental resource use in terms of guideline daily amounts (GDA). This simplified analysis, highlights overall impact, which is similar to how nutritional content is defined with dietary reference values.

The diets compared are each presented as annual per capita consumption.

Drinks other than the nutritionally significant fruit juices and milk are not included.

Food waste

A significant amount of food produced for the UK is not actually consumed. Food waste comes from two principle sources, **farms** and in the **home**.



The available data, particularly for the supply chain, are variable and somewhat uncertain². Consumer waste in the UK has been the target of a series of reports from WRAP³ who have conducted empirical analysis of household waste across the country for several years.

In our model, the amount of food calculated is based upon eaten food. In terms of supply chain waste, the amount that needs to be produced must have been higher as a consequence of the waste.

For data based upon food eaten, consumer waste has already occurred. In this case, the nutritional value is determined by the amount actually eaten. However, farm production must be uplifted twice to take account of both the supply chain and consumer waste.

¹ A common approach to simplifying analysis without changing the meaning is to ignore, or "cut-off", the smallest contributors (e.g. lowest 5%). A similar cut-off process was done by PHE for the NDNS aggregated data, used here to represent the UK's average diet.

² Lipinski et al. (2013) *Reducing Food Loss and Waste*. World Resources Institute. Available at: <http://www.wri.org/publication/reducing-food-loss-and-waste>.

³ Quedstedt et al. (2013) *Household Food and Drink Waste in the United Kingdom 2012*. WRAP. Available at: <http://www.wrap.org.uk/sites/files/wrap/hhfdw-2012-main.pdf>.

Where does the data come from?

Consumption: Derived from the National Diet and Nutrition Survey (NDNS, consumed food)⁴ and the Eatwell Guide (refreshed eatwell plate).

Nutrition: The UK Data Service holds detailed records of government activity, including the nutrition factors used by the NDNS Survey⁵.

Greenhouse Gas (GHG): Derived from a variety of sources including Carbon Trust data held internally and other data from available publications⁶. Efforts have been made to calculate the additional GHG emissions (when not already available) due to distribution, retail, packaging, refrigeration and cooking as applicable. The Carbon Trust tool Footprint Expert⁷ was used and parameters chosen according to expert opinion.

Water: The raw data (per basic crop type) is derived from the Water Footprint Network database⁸. Our analysis only uses consumption (or *blue* water)⁹ for a variety of reasons¹⁰.

Land: Generally available yield per hectare data and Carbon Trust analysis of livestock production.

How do we analyse the impacts in context?

Within the context of the assessment undertaken, the definition of a sustainable and desirable diet for the UK has been defined¹¹ as:

A diet that provides necessary and sufficient food to support an enjoyable and healthy lifestyle, within the planetary, economic and social boundaries that we want to maintain.

This definition includes a number of key aspects that are further expanded below.

- **Necessity:** food needs to meet recommendations for dietary health.
- **Sufficiency:** food needs to be affordable, and should not be excessively consumed or wasted.
- **Enjoyment:** diets should be varied, interesting and attractive.
- **Health and wellbeing:** food should contribute to a healthy lifestyle, balanced with exercise.
- **Planetary boundaries:** food production should not exceed physical environmental limits.
- **Economic resilience:** the long term security of food supply should be maintained.
- **Social acceptability:** the social and ethical impact of food should be acceptable and culturally relevant given the UK's ethnic/religious diversity.

4 Available at: <https://www.gov.uk/government/statistics/national-diet-and-nutrition-survey-results-from-years-1-to-4-combined-of-the-rolling-programme-for-2008-and-2009-to-2011-and-2012>.

5 Available at: <http://discover.ukdataservice.ac.uk/catalogue/?sn=7272&type=Data%20catalogue>.

6 See the Bibliography section for publically available data sources.

7 Available at: <https://www.carbontrust.com/software>.

8 Mekonnen and Hoekstra. (2011) *The green, blue and grey water footprint of crops and derived crop products*, Hydrology and Earth System Sciences, 15(5): 1577-1600.

9 The Water Footprint Network have defined three types of *water*, *green*, *blue* and *grey*. In simple terms, *green* water corresponds to rain water, *blue* water to fresh water and *grey* water is wastewater from sources other than toilets, such as sinks and washing machines.

10 See for example a summary of this on-going discussion in Hess et al. (2015) *The impact of healthier dietary scenarios on the global blue water scarcity footprint of food consumption in the UK*. Food Policy, 50: 1–10.

11 Cumberlege et al. (2015) *The Case for Protein Diversity*. The Carbon Trust. Available at: <https://www.carbontrust.com/resources/reports/advice/the-case-for-protein-diversity/>.

A methodological framework was developed to take the available data and quantitatively assess the environmental sustainability impact of the diets. The Eatwell Guide is based on commonly consumed foods in relevant settings so some analysis on the health and nutrition aspects has been conducted. The environmental impact of the diets, covering the sufficiency and planetary boundaries aspects, were assessed against various metrics, assuming each describes a year's food, dealing with per-person annual quotas¹². The quotas applied are whole-lifestyle carbon emissions (80% reduction on current UK levels), water consumption (approximately 400,000 litres), and land use (about 0.23 hectares)¹³. These were based on boundaries set around the UK's 2050 climate change targets, global freshwater availability and current global agricultural land area.

Sustainable diets

The comparison has been made on an equivalent energy basis, with the greenhouse gas (GHG), land use and water consumption footprints calculated for a 2,250kcal (9,400kJ) per day diet. The environmental impacts were assessed against metrics dealing with sustainable annual per capita quotas or guideline daily amount (GDA), according to an equitable share of world-wide resources¹⁴:

- Carbon emissions – an **80% reduction** on current UK levels, to progress from the current **11.9 tonnes** (from all activities, including travel, food, heating etc.) down to **2.4 tonnes CO₂e** per person by 2050¹⁵
- Water consumption – the share of the **400,000 litres** available per person¹⁶
- Land use – the share of the **0.23 hectares** available per person¹⁷

These metrics are based on boundaries set around the UK's 2050 climate change targets and dividing the global freshwater availability and current global agricultural land area by the global population.

¹² For a fuller analysis that included social and economic aspects, see Cumberlege et al. (2015) *op. cit.*

¹³ Rockström et al. (2009) *Planetary Boundaries: Exploring the Safe Operating Space for Humanity*. Nature 461: 472-475.

¹⁴ For an example of research where GDAs are represented as "carrying capacity" see Bjorn et al. (2015) *Strengthening the Link between Life Cycle Assessment and Indicators for Absolute Sustainability to Support Development within Planetary Boundaries*. Environ. Sci. Technol 49: 6370–6371.

¹⁵ Defra's data on consumption-based emissions can be found here: <https://www.gov.uk/government/statistics/uks-carbon-footprint>.

¹⁶ The specific definition of water consumption and amount of available fresh water is an active area of scientific research. The consumption as measured here may be revised in future.

¹⁷ Bringezu et al. (2014) *Assessing Global Land Use: Balancing consumption with sustainable supply*. UNEP-IRP.

What diets have been analysed and compared?

Two diets have been analysed and compared:

- The National Diet and Nutrition Survey (NDNS) which estimates food and nutrient intake for the UK.
- The Eatwell Guide – refreshed eatwell plate model based upon linear programming of NDNS to meet revised dietary recommendations¹⁸.

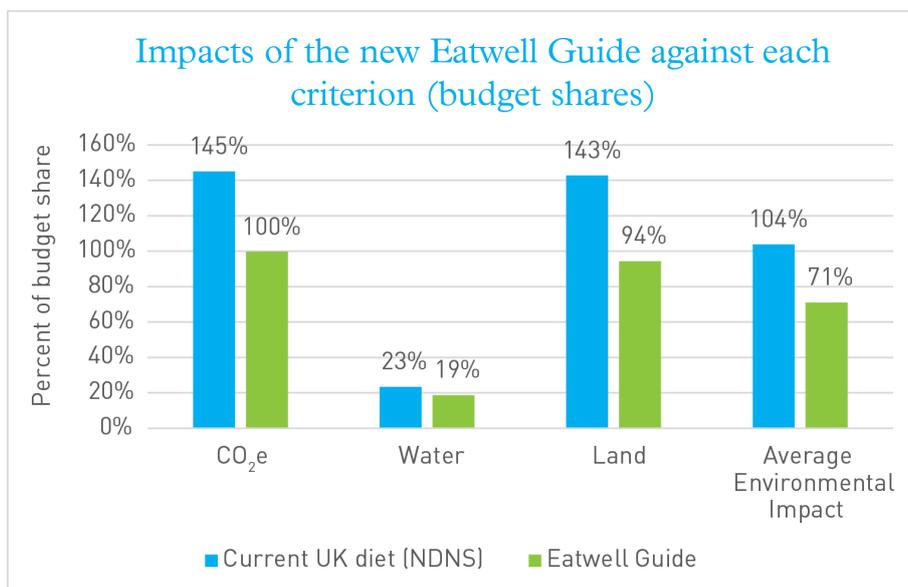
Some assumptions have been made regarding food waste and the specific foods within the broad categories summarised by NDNS, in order to assign common environmental and nutritional values. There are some 60 broad categories in our analysis, representing closely related groups of specific foods.

Results

The percentage quota usage across each metric were averaged to provide a comprehensive environmental footprint measure for each diet. For an equivalent provision of energy, the Eatwell Guide has a 32% lower environmental footprint than the current national (NDNS) diet, having fallen to 71% of our sustainable lifestyle impact.

A summary of the environmental impacts are shown on the following graph. For example, the average person in the UK in 2010 (as per NDNS) emitted 145% of their total lifestyle sustainable greenhouse gas emissions due to their diet. In contrast, a switch to the Eatwell Guide could see a reduction to 100% of sustainable GHG emissions. In terms of the impact upon our current national emissions, if everyone switched to the Eatwell Guide the changes in diet would produce a personal lifestyle footprint measurably lower than at present.

In addition, water and land are shown as the change in utilised share of sustainable fresh water supply and agricultural land area respectively.



It should be noted that water consumption shows an important distinguishing feature. The improvement in water consumption is lower for the Eatwell Guide compared to GHGs or land. The primary reason is an increase in water-intensive nuts and fruit.

Overall conclusions

The Eatwell Guide shows an appreciably lower environmental impact than the current UK diet, according to the Carbon Trust analysis. We also note that parallel improvements in production efficiency and waste reduction will help too.

A number of differences contribute to the reduction, such as increasing potatoes, fish, wholemeal & white bread, vegetables and fruit whilst reducing amounts of dairy, meat, rice, pasta, pizza and sweet foods.

Selected Life Cycle Analysis Bibliography

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The Carbon Trust:

- Advises businesses, governments and the public sector on opportunities in a sustainable, low carbon world.
- Measures and certifies the environmental footprint of organisations, products and services.
- Helps develop and deploy low carbon technologies and solutions, from energy efficiency to renewable power.

www.carbontrust.com

+44 (0)20 7170 7000

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