

How Welsh emissions are to be calculated

Allocation of energy emissions between Wales & the rest of the UK.

Within the UK, two sets of based emissions accounts are produced to inform the UK Greenhouse Gas Inventory. The methods to calculate emissions and the totals for the whole of the UK are the same in each set; however they differ in the way that they attribute the emissions from the energy sector (namely, electricity generators & fuel producers) to different categories within the accounts. The two formats for reporting are called 'point of release' and 'end user'. Both are reported to the UNFCCC, however the Environment Bill would need to stipulate which format was to be used as for Wales the totals would differ.

Both 'point of use' and 'end user' reflect Wales' responsibility for emissions in different ways. The 'point of use' format recognises the economic & employment contribution of the electricity generators to Wales; whereas 'end of use' recognises the responsibilities of Welsh residents and businesses for the upstream impacts of their energy use.

In addition to considering responsibility, the choice of format should also be informed by how well it can monitor progress in mitigation activities undertaken by the WAG. My recommendation when choosing one or the other would be to consider the mitigation measures that the WAG can put in place & the expected contribution to targets and budgets from measures undertaken elsewhere in the UK.

For example using the end-user format, the accounts would show the effect of measures that:

- Reduce energy end use in total (e.g. efficiency, or demand reduction)
- Promote fuel switching to renewables or low carbon sources (e.g. uptake of biomass; PV)
- Reduce the carbon intensity of electricity generation & fuel supply chains in the UK

For Wales to meet emission reduction targets the country would be reliant on the upstream emissions associated with the energy it uses. These upstream emissions are based on the average emissions intensity of electricity and other fuels produced across the whole of the UK. On those grounds, collaboration would be needed to ensure that UK wide measures to decarbonise the energy supply chain were compatible with Wales' emission reduction targets.

Using a 'point of use' allocation method, the accounts would show the effect of measures that:

- Decarbonise the electricity generators in Wales
- Limit the emissions from any fuel refineries or leakage from gas storage sites in Wales
- Reduce fuel (gas, coal, oil) use in Wales (for transport and buildings) via efficiency or fuel switching
- Encouraged switching heating and transport from fossil fuels to electricity (e.g. encouraging the uptake of hybrids & EVs and heat pumps)

I'm not familiar with all the current and planned future devolved powers to say whether one method better reflects the mitigation measures available to the Welsh Government than another.

Allocation of international aviation emissions

Emissions from international aviation are currently allocated to the UK based on the fuel sold for international flights. This equates well to the fuel used by departing flights from UK airports and is generally accepted as a fair way of allocating international aviation emissions between countries.

When considering dividing up these emissions between Wales & the rest of the UK there are a number of ways that can be considered.

The fuel used during a flight can be broken down into that used in the 'landing and take-off cycle' and the cruise phase.

Options of allocation to Wales include:

1. The emissions from flights departing from airports in Wales
2. A proportion of the emissions from UK flights that are used by Welsh residents
3. A hybrid approach by which Wales is allocated the emissions from the landing and take-off cycle of flights from Welsh airports and the cruise emissions from flights taken by Welsh residents elsewhere in the UK (for example, users of Manchester, Birmingham International and Heathrow).

The first option is consistent with the 'point of use' above and the latter two with the 'end user' basis. Mitigation measures under the first & third method would include:

- Encouraging best practice taxiing, landing & take-off routines to minimise fuel burn at airports in Wales
- Stipulating air craft efficiency standards when allocating slots at Cardiff Airport
- Demand management, reducing the numbers of flights that have less economic value to Wales

The second and third options would track mitigation measures including:

- Encouraging Welsh residents to fly less e.g. having weekend breaks, celebrations & holidays in Wales rather than flying to their destinations.
- Encouraging & supporting with appropriate infrastructure, the use of ICT in place of business travel (where suitable)
- Any UK wide measures that encourage the use of more fuel efficient aircraft fleet & airport operations.

Emissions from sources that are more difficult to reduce

Sources of CO₂ such as aviation, shipping, cement and steel manufacturers are more difficult to reduce than others. Similarly it would be difficult for agriculture to reduce its N₂O and CH₄ emissions to 80%.

With an overall objective to reduce total emissions by 80%, it would be reasonable to expect that sectors have differing levels of contribution according to their ability to mitigate. Sectors unable to deliver an 80% reduction should be compensated for by greater efforts in other sectors to reduce their emissions by an equivalent amount above 80%. For example, there are readily available solutions to reduce the emissions from both electricity generation and the energy used for heating and cooling buildings & arguably this sector could reduce emissions by >80%.

For further information regarding pathways to reduce emissions from the steel & aluminium sector were considered by a comprehensive research project led by Prof Julian Allwood at the University of Cambridge (details here: <http://www.csap.cam.ac.uk/network/julian-allwood/>)

For both steel and cement, measures of resource efficiency, the reuse and recycling of materials and their replacement by alternative materials where practicable are all part of the solution together with the use of carbon capture and storage (CCS) technology retrofitted to existing plant and incorporated into new build. *(The different components of CCS have been demonstrated globally (e.g. separation of CO₂ from other gases is routine in the gas industry; piping CO₂ is conducted by the fizzy drinks industry & CO₂ has been pumped & stored into the Sleipner oil field for the purpose of enhanced oil recovery), the technologies are being assembled at commercial scale in projects in Saskatchewan in Canada, and Peterhead Scotland. While at an early stage in commercialisation – the technology is advancing requiring now the incentives – including clear long term carbon reduction targets - to develop further for sources such as cement & steel plant as well as Bio-CCS).*

For aviation and shipping, alternative fuels are being explored alongside novel designs and technologies to reduce their reliance on fossil fuels. These include blended wing designs and electric aircraft and the use of fletner rotors and kites on ships. Demand management is fundamental in the interim – particularly for aviation.

4. On what basis should Welsh emissions be calculated e.g. on a consumption basis; production basis; or both?

I would suggest both are used for monitoring purposes, with targets set on a production (including international aviation and shipping) basis.

The production basis provides a good foundation on which to understand emissions within the direct influence of the Welsh Government. There are measures that can be taken in Wales which can reduce them.

Consumption based emissions and eco-footprinting techniques in general are very helpful for understanding the wider impact of the population of Wales on the environment. In addition they can indicate whether emissions reductions in Wales are occurring at the expense of those overseas – for example to track our responsibility for China's emissions growth.

Reducing these overseas impacts could be delivered through a number of different mechanisms, including public procurement policies that require suppliers to meet environmental credentials. However, the success of these actions would not be captured using the techniques currently used to calculate consumption emissions – complementary monitoring metrics would be necessary to do this.

Consumption based accounting methods, are usually based on expenditure by members of the population on goods and services broken down by the country from which they're imported. While more sophisticated methods can distinguish between the emissions associated with goods and services imported from different countries (capturing the carbon intensity of production in different areas of the world), they are not sufficiently sophisticated as yet to capture the success or not of incentivised actions by Welsh residents to actively purchase more eco-friendly products. In addition the datasets that underpin these calculations are not all annually updated.

From my experience in using consumption emissions accounting methods - they are useful for giving a broad understanding of Wales' indirect effects, but as it stands would be difficult to use to monitor the success of the plethora of policies that could be aimed at reducing these indirect impacts. I'd suggest using consumption emissions accounts for periodic monitoring, but measuring the success of

mitigation policies that target Wales' indirect carbon footprint with more readily updateable metrics.