

# UK Per Capita Emissions, Carbon Cut Targets and Wealth.

I recently came across an article that linked to data for various analyses of carbon emissions. Of particular interest was the per capita emissions data for each nation in 2006. Why was it of interest? Well simply, it shows a very different picture to that normally presented regarding national emissions levels.

Generally, emissions levels are given as those for the entire country taking no account of the number of people. Thus those countries with the highest populations will tend to have the greatest emissions.

But does it make sense to look at the emissions in that way? Here in the UK, like most of the West, we are being told by government to change our life styles in major ways to combat the claimed Anthropogenic Global Warming (AGW). Does this argument withstand scrutiny?

Is it fair for some people to be forced to cut back more than others just because they live in countries with higher populations? Some lobbyists have stated there should be an allocation per person. How might this idea affect the UK population?

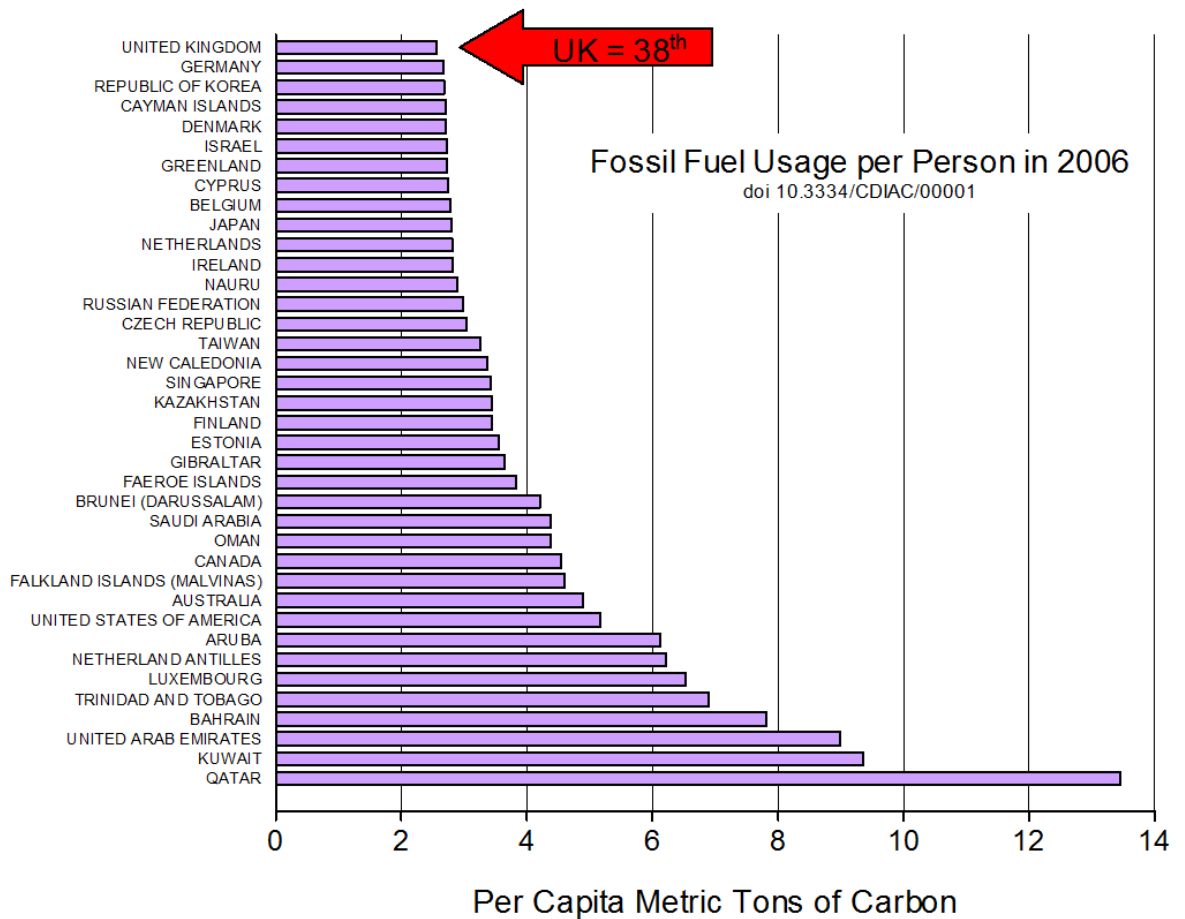
Let us start by checking the position of the UK in the League of Nations by per capita emissions; you might be surprised:

Data source:

Tom Boden, Gregg Marland, and Bob Andres  
Carbon Dioxide Information Analysis Center  
Oak Ridge National Laboratory

doi 10.3334/CDIAC/00001

<http://cdiac.ornl.gov/trends/emis/top2006.cap>



Did you realise that the UK ranks 38<sup>th</sup> and that the USA is not top but 9<sup>th</sup>?

Per capita emissions (PCE) for the UK are 2.56 metric tons of carbon (2006) and the ranking +/-5% is:

Rank	Nation	Per Capita Emissions (metric tons)
36	REPUBLIC OF KOREA	2.68
37	GERMANY	2.67
38	UNITED KINGDOM	2.56
39	ST. PIERRE & MIQUELON	2.5
40	TURKMENISTAN	2.46

Well, so far, so good. It is encouraging that the UK is burning less fuel than Germany especially considering the German reputation for efficiency.

Now using the same criteria, which countries would the UK be on par with, assuming all other things are constant, if there was a 10% reduction in emissions. This table lists them:

Rank	Nation	Per Capita Emissions (metric tons)
41	BERMUDA	2.41
42	SEYCHELLES	2.39
43	EQUATORIAL GUINEA	2.39
44	SOUTH AFRICA	2.39
45	AUSTRIA	2.37
46	GREECE	2.36
47	NORWAY	2.35
48	POLAND	2.28
49	LIBYAN ARAB JAMAHIRIYAH	2.26
50	ITALY (INCLUDING SAN MARINO)	2.19

If it is reasonable to link average life-styles to emissions this way, then clearly the UK population could expect some hit on their daily lives. It would probably be noticeable but maybe acceptable to the public.

However, the government is not talking about a 10% cut by 2020, but one of around 30%. What effect would this have? Which nations might the UK end up mirroring? Let's look at the data again:

Rank	Nation	Per Capita Emissions (metric tons)
60	UKRAINE	1.86
61	ISLAMIC REPUBLIC OF IRAN	1.81
62	BAHAMAS	1.78
63	VENEZUELA	1.73
64	FRANCE (INCLUDING MONACO)	1.71
65	MALTA	1.71

Obviously, there is a bit of an anomaly here. France has an unusually high proportion of its electricity generated by nuclear power which almost certainly accounts for the ranking. Similarly, the Ukraine has high levels of nuclear energy. This level of nuclear generation is extremely unlikely to be available in the UK by 2020.

Excluding the two countries just noted, the remainder are in warmer climates and therefore would not be expected to use as much energy for heating.

Would the UK population accept changes in life-style that would bring them in line with the nations in this group? It wouldn't be an easy sell that is certain.

However, this is not the end of the story. Many lobbyists are calling for even greater cuts. What might it be like in the UK if PCE were cuts by 50%? Again, let's return to the data:

Rank	Nation	Per Capita Emissions (metric tons)
78	BARBADOS	1.33
79	SURINAME	1.32
80	MARTINIQUE	1.27
81	GUADELOUPE	1.27
82	CHINA (MAINLAND)	1.27
83	ROMANIA	1.24
84	JAMAICA	1.24

Now, it should be recognised that this is an extreme projection for little more than 10 years in the future. It would take unprecedented action to achieve a 50% in this time frame and therefore unlikely happen. Again, it needs to be remembered that most of these states are close to the Equator and as such have more consistent warm climates compared to the UK. In turn, this means that they do not require as much heating and therefore require less fuel. Also, with the exception of China, they are not major industrial nations, again lowering their fuel usage.

Taking the above qualifications into account, it is nonetheless certain that very few people in the UK would tolerate a standard of living similar to the average Chinese or Romanian.

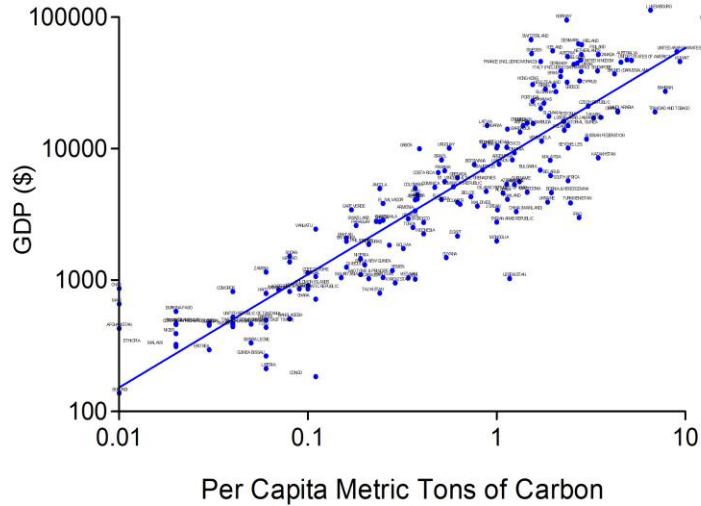
What can be concluded from this? Well, if the UK government is insistent upon the emissions cuts proposed, which are not PCE but overall, national cuts, they will most likely run into public opposition as the reality begins to hit home. The proposed cuts will not only be unfair to UK residents, relative to other countries, but even at the 10% might incite civil unrest, or at very least additional social problems.

So far, this analysis has been anecdotal in as much as no evidence has been presented to show a link between standard of living (lifestyle) and carbon emissions. In the following part of this study it is assumed that wealth is a good indication of lifestyle. The measure of wealth chosen here is per capita GDP since it should indicate an average prosperity and more importantly can be compared to per capita carbon usage (CO2 emissions).

The data set used here for per capita GDP (\$) is from International Monetary Fund, World Economic Outlook Database, April 2009.

Firstly, it is necessary to determine if there is any relationship between GDP and carbon usage. So the GDP was plotted as a function of carbon usage:

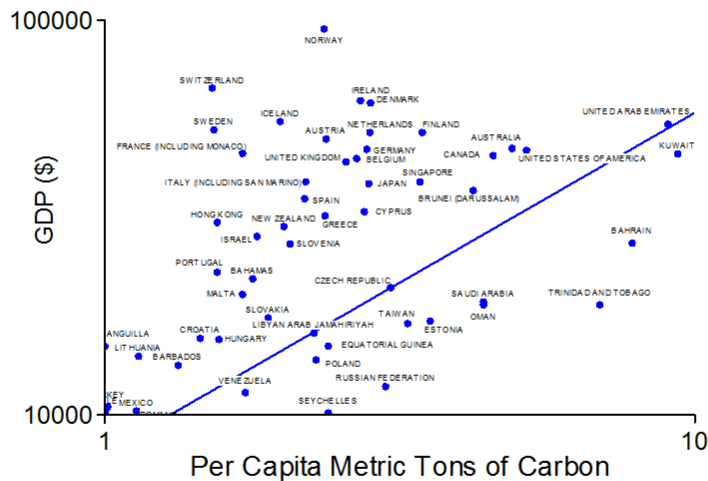
Per Capita GDP plotted against Per Capita Hydrocarbon Usage



Data Sources:  
 International Monetary Fund, World Economic Outlook Database, April 2009  
 Carbon Dioxide Information Analysis Center, doi 10.3334/CDIAC/00001

Due to the dynamic range of the figures, both axes have been plotted on log scales. There is a clear relationship between the two variables and is it quite linear. The UK is in the top range and so the next chart zooms in on that region:

Per Capita GDP plotted against Per Capita Hydrocarbon Usage  
 Top of the Chart

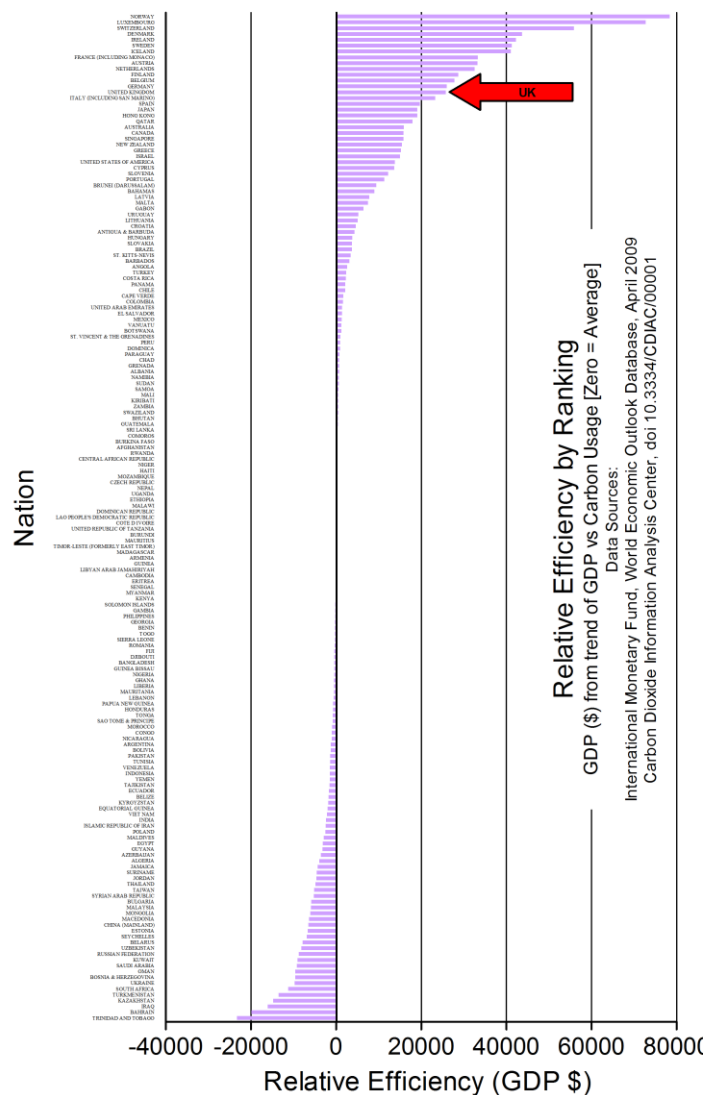


Data Sources:  
 International Monetary Fund, World Economic Outlook Database, April 2009  
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It should be observed at this point that the UK is well above the best fit linear regression line suggesting that good use is made of the carbon compared to other nations.

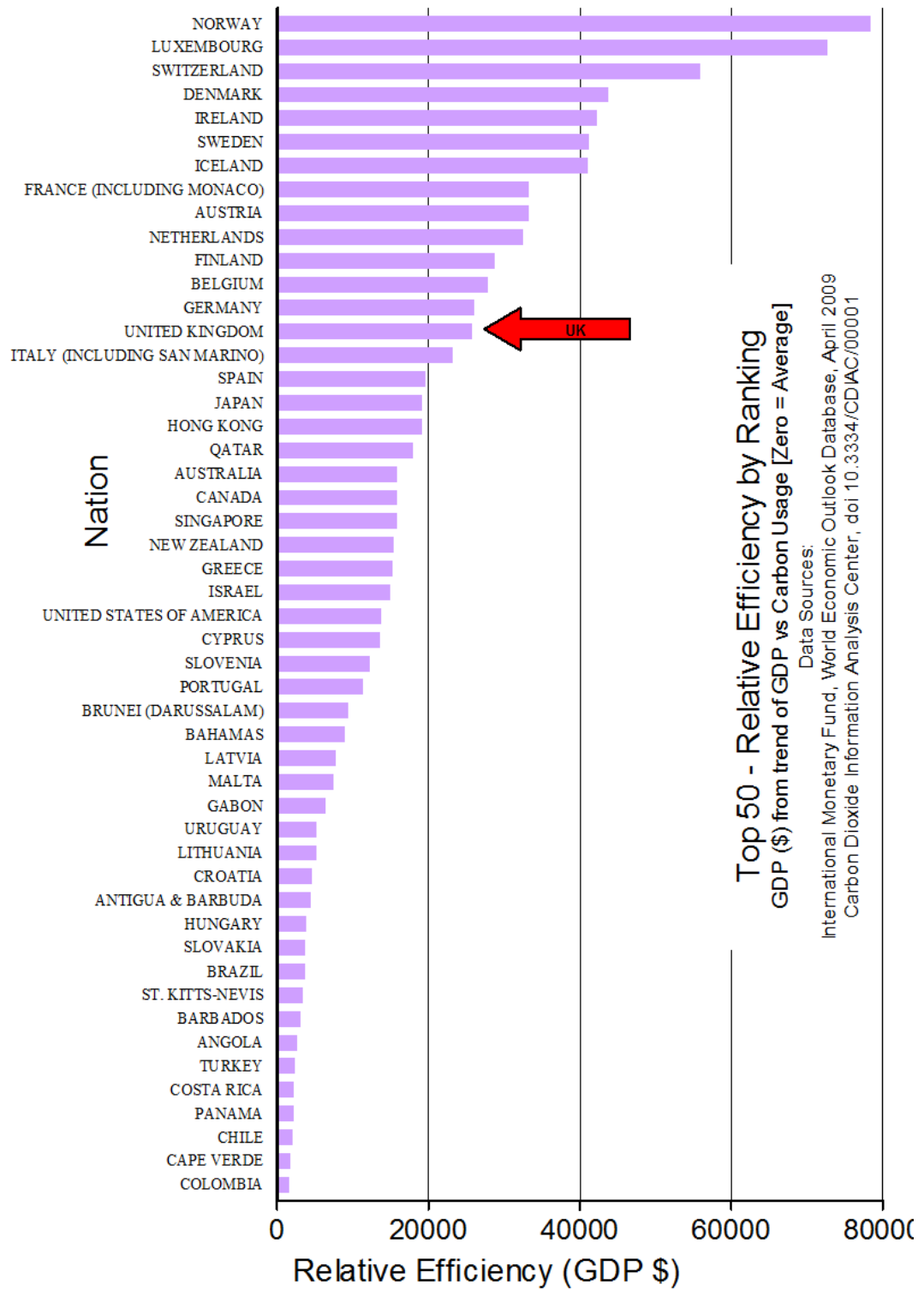
At this point, let us define an Efficiency parameter which is the vertical distance in GDP (\$) of each country from the linear trend. Yes, it is a crude measure for a variety of reasons, not least because it doesn't take into account any variables that may perturb it. However it is good enough to obtain an indication of how efficiently hydrocarbons are used in each state.

So what do we find when the efficiency of each nation is plotted by rank?



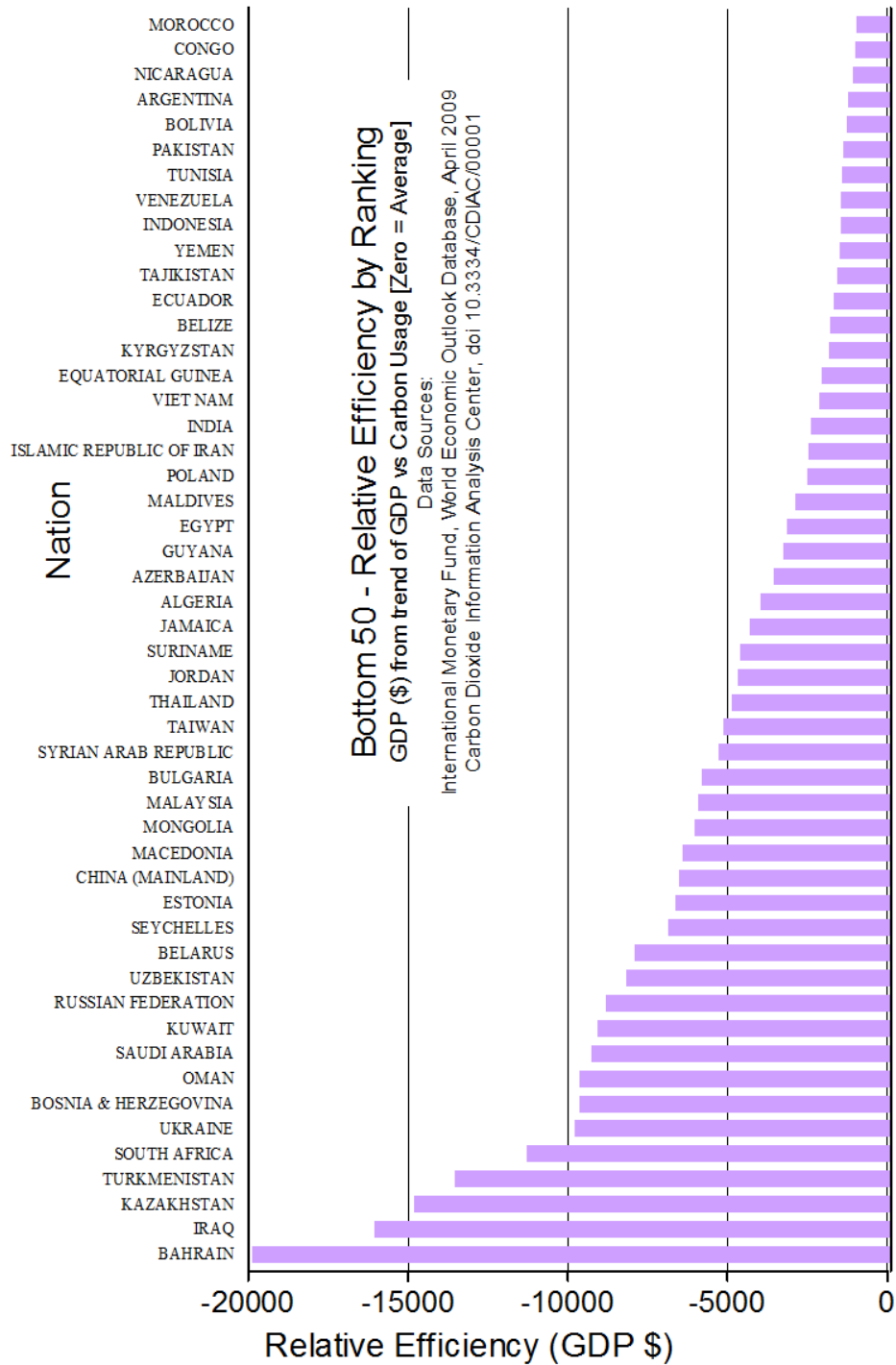
The zero line represents average efficiency and it can be seen that there is a fairly large number of countries that perform well, with the UK being one of them. It is

almost impossible to read the names in a picture of this size, so here is the top 50 alone:



Now we can see that the UK is 14<sup>th</sup> by this efficiency ranking and adjacent to Germany which could be considered a relatively comparable country in many respects.

The next question is rather obvious. Which nations are at the bottom? Thus here we have the bottom 50 in efficiency ranking:



There seems to be rather a lot of oil and gas producing countries, and not surprisingly several fast developing nations in this line-up. Any number of inappropriate conclusions could be jumped on by incorrectly assessing the ranking and demographics. Thus caution is advised in doing such. The only comment that will be made here is the obvious, and that is Bahrain appears at the bottom of the table.

Moving along and back to the original purpose of this piece, it can be seen that on this basis, the UK is more efficient than average already. There appears to be some potential for improvement. Assuming constant GDP, reducing carbon usage by 50% would move the UK to 8<sup>th</sup> place in terms of efficiency, after Iceland (7<sup>th</sup>) and before France. This as has been previously expressed is a highly unlikely scenario within a decade and it needs to be born in mind that France has a considerable nuclear generating capacity and Iceland is almost entirely supplied by geothermal energy. Geothermal is not likely to ever be suitable on such a large scale in the UK for geological reasons. Nuclear power in the UK will struggle to take hold on political grounds.

At the other end of the scale, if the more realistic reduction of 10% is considered, it will move the UK the other side of Germany. That is a single rank increment and hardly something that could be called significant.

Just for completeness, the 30% carbon reduction will place the UK three steps higher, to finish behind Finland.

In summary, the UK ranks 38<sup>th</sup> in terms of highest per capita emissions. It is also the 14<sup>th</sup> most efficient in terms of GDP compared to carbon usage. In both cases it is adjacent to Germany to which it is often compared. The UK does not have significant benefit from either hydro-electric, geothermal or nuclear power generation which is a characteristic of most countries with a higher efficiency rank.

The other important point to remember is that the relationship between per capita carbon usage and wealth is close to linear. Nobody in their right mind wants their standard of living to drop, so until reliable and cost effective energy sources are available to displace carbon usage in the UK, it would be unwise to force cuts. It is even more stupid to progress such policies as a means to address an imaginary problem, Anthropogenic Global Warming.

Jonathan Drake

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