Do-it-Yourself : Saving the Planet

1. Counting the Cost

1.0 Introduction

From the recent discussion on Zoom, it would appear that many people are concerned about climate change but don't really know where to start when it comes to doing anything about it. A good starting point for any rational plan is to first understand the problem.

How much CO2 emissions are each of us actually responsible for? Which of our actions are the biggest causes? Finding answers to these questions can avoid wasting time, effort and money on things which will make little difference and allow us to concentrate on those that will make the most.

A good place to start is to determine the emissions caused by our use of gas, electricity, petrol, diesel and flying. These are likely to account for a major part of our emissions, are more under our direct control than other things and are relatively easy to calculate. I'll cover some other things later. The equipment needed includes some old gas bills and other such records, biro, paper, calculator, a little junior school arithmetic, a spare hour, a big mug of coffee and at least four chocolate digestives.

1.1 Gas

Let's start with gas. We need two gas meter readings taken as close as possible to one year apart and preferably taken in the summer months. If you haven't been in the habit of reading your meter, they can be obtained from old gas bills or statements. All we have to do then is subtract the smaller number from the bigger one to get the volume of gas consumed in a year, then multiply that by 11.1 to convert the volume to its energy value and finally multiply by 0.2 to convert the energy value to kilo grammes of CO2 released into the atmosphere. For my house, the meter reading on 22/07/2019 was 80.070 and on 22/07/2020 was 877.132. The arithmetic is then…

(877.132 - 80.070) * 11.1 * 0.2 = 1769.48Kg

The above calculation assumes you have a modern meter that measures in cubic meters. If you have an old meter that works in cubic feet, you need to do the calculation as above but then divide by the answer by 35.31.

1769 kilos may not immediately mean much. To provide a reference, 1 litre of water weighs 1 kilo, I weigh 75, 1000 is near enough a ton, while my car (a large estate) weighs 1505. It may come as a bit of shock to realise that, every year, your boiler, an innocent looking little white box out of sight and out of mind in a cupboard somewhere, is producing amounts of CO2 you can measure in tons but it's true nevertheless. Just to complete the picture, there are about 24 million houses in Britain alone… that's why the world has a problem.

1.2 Electricity

Having got a figure for our emissions caused by our gas usage, the next thing is to do the same for electricity. Again two readings as near as possible to one year apart are needed. Calculating the resultant CO2 emissions is a bit tricky since the performance of the electricity generation system varies with time and the load on it. For simplicity I have used the 2019 average value of 0.241 kilos of CO2 per kilowatt hour raised to account for the 14% losses in the distribution system. Thus for my house, the reading on 22/07/2019 was 3510.66 and on 22/07/2020 was 5442.42. The arithmetic is then…

(5442.42 - 3510.66) * 0.241 / 0.86 = 541.34kg

Thus, in my case, the emissions caused by my gas usage are over 3 times those caused by my electricity use. This is despite that year's electricity use being unusually high and its gas use unusually low because the boiler was out of action for two weeks in the middle of winter. I can thus draw a useful conclusion about my emissions… I would be pretty much wasting my time trying to further reduce my electricity use; my efforts would be better directed towards reducing my gas use. Your numbers and therefore your conclusions may be different of course.

1.3 Petrol and Diesel

Having got a handle on our gas and electricity emissions the next target is the car. Here we simply need to know how much petrol or diesel we use in a year. In my case this is relatively easy because I keep the fuel receipts. If you haven't been in the habit of doing this, all is not lost, you could estimate your usage by either by determining the annual mileage from the service history and using the longterm mpg figure the car gives or by looking at the money spent on fuel and using a typical fuel price. In my case the car was filled up on 15/07/18 and 17 subsequent occasions

in the following 12 months making the total fuel used 909.59 litres. The calculation is now easy; we just multiply by 2.361 for petrol cars or 2.626 for Diesel cars. Thus for my car…

909.59 * 2.626 = 2389 kg

To put this into perspective, the car's mileage was 11,878 miles and thus its mpg was…

11878 / (909.59 / 4.54) = 59.28 mpg

You can see that, despite the mileage being not that great and the miles per gallon being very high by most standards, the car's emissions are still more than the gas and electricity put together. This is not typical, in Britain as a whole, domestic heating by itself causes more emissions than cars. The last point of interest here is to compare the car's actual emissions per km against the official emissions given in the manufacturer's brochure.

Official	96 gm/km
Actual 2389 * 1000 / (11878 * 1.609) =	125 gm/km

Such differences are widely reported and result from the artificial nature of the old official test. There is now a better test.

1.4 Flying

Now that we know where we stand with gas, electricity and cars, only flying remains to be dealt with. When I investigated this, I found that aircraft manufacturers and airlines were very secretive about how much CO2 they emit. The wall of silence was so complete that one could be forgiven for thinking that planes did not emit CO2 at all. The amounts they do emit certainly depend on the type of plane, the nature of the journey and how full it is. The information I did find led me to believe that one seat on a plane effectively emits about 0.1kg per km. I think this figure assumes the plane is full and so, in daily service, they will emit more. If we take this rough and ready figure, we can estimate the emissions associated with some hypothetical journeys. Let's suppose a couple fly round the world going to New Zealand. As the distance of such a journey is, by definition, at least 40,000km, the arithmetic is…

40000 * 2 * 0.1 = 8000kg

This is a big number. I would have to drive my car for 3 years and 4 months to produce that much. Even a couple going to southern Europe (say 1000km) would produce 800kg… enough to keep my car going for 4 months. The calculation for myself is very simple, no flying produces no emissions.

1.5 Conclusion

We should now be in a position to estimate our emissions caused by our using gas, electricity, petrol, diesel and by our flying. This is the first step on the road to doing something about it.

It should perhaps be noted that the CO2 figures quoted above for gas, petrol and diesel are for the substances themselves and do not include the emissions associated with their manufacture and thus our emissions will be somewhat larger than calculated. The manufacturing emissions of gas are increasing as more is being imported by ship and the process of liquefying it consumes energy and thus causes extra emissions. The manufacturing emissions of petrol are somewhat higher than those of diesel.

I am very happy to give help to anyone who needs it and equally happy to learn from others. I hope this proves to be of some interest.

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