

## The per-person daily Energy Balance Sheet

- Energy Consumption and Renewable Supply per UK person per day.
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- From “Sustainable Energy – without the hot air” by David JC MacKay (2008)
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- “Stuff” means consumer goods excluding food.
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- The red stack adds up to 195 kWh per day per person.
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- The green stack adds up to about 180 kWh/d/p.
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- (To relate to Greenhouse Gas emissions 240 grams of CO<sub>2</sub> is associated with 1 kWh of chemical energy, so:
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- 195 kWh per day per person = 17 tonnes CO<sub>2</sub> per person per year )

## Carbon/Energy Footprints and Waste Management

Debit Categories  
Transporting Stuff

Stuff

Food, Farming, Fertiliser

Gadgets

Light

Heating, Cooling

Jet Flights

Car

	Geothermal: 1kWh/d	
Transporting stuff: 12 kWh/d	Tide: 11 kWh/d	
Stuff: 48+ kWh/d	Wave: 4 kWh/d	
Food, farming, fertilizer: 15 kWh/d	Deep offshore wind: 32 kWh/d	
Gadgets: 5	Shallow offshore wind: 16 kWh/d	
Light 4 kWh/d	Biomass: food, biofuel, wood, waste incin'n, landfill gas: 24 kWh/d	
Heating, cooling: 37 kWh/d	PV farm (200 m <sup>2</sup> /p): 50 kWh/d	
Jet flights: 30 kWh/d	PV, 10 m <sup>2</sup> /p: 5	
Car: 40 kWh/d	Solar heating: 13 kWh/d	
	Wind: 20 kWh/d	

Renewable Credit Categories

Tide,  
Wave

Deep Offshore Wind

Shallow Offshore Wind

Hydro  
Biomass, Waste incineration, Landfill Gas

Photovoltaic Farms

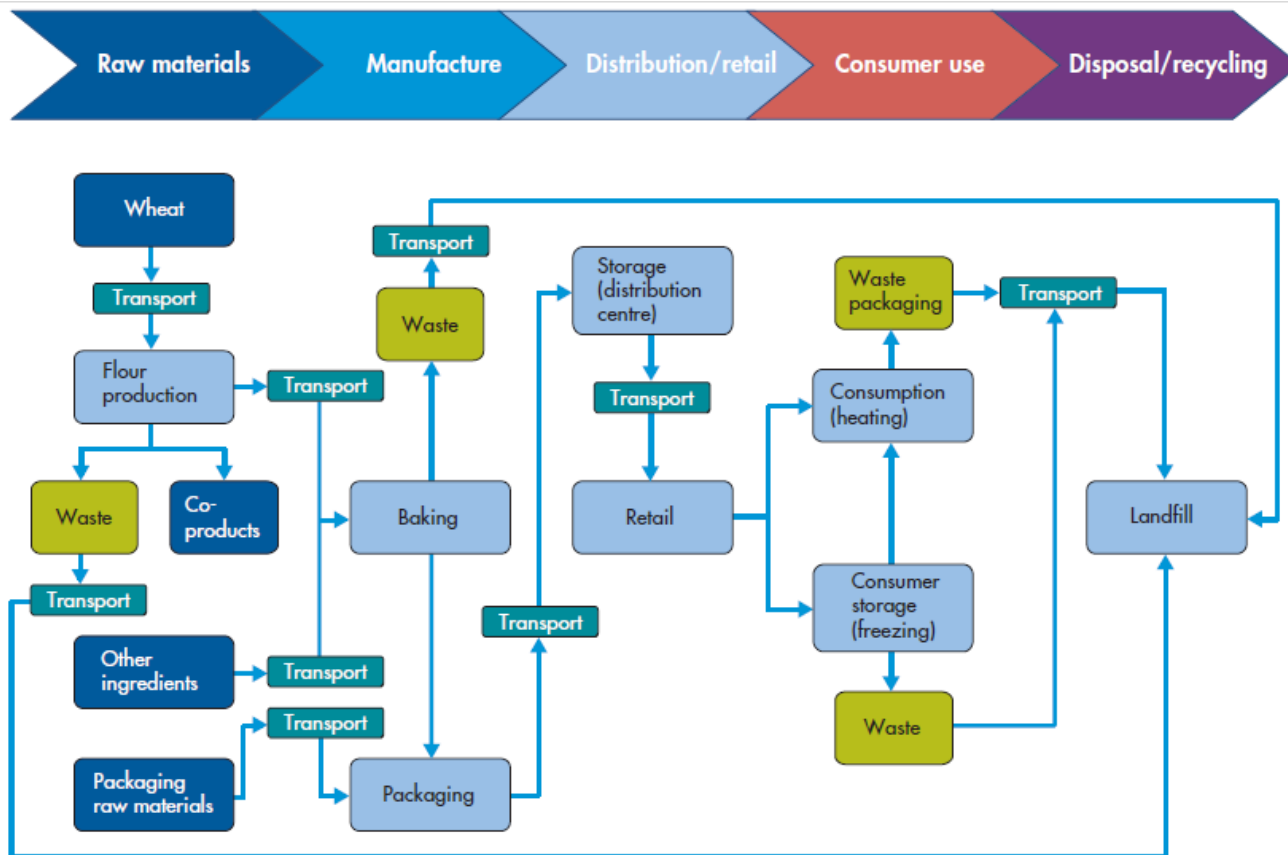
Other Photovoltaic  
Solar Heating

Wind

### Standards in use

PAS2050: Standards used to assess Embodied Energy for certification/consumer advice purposes. Published in the UK in 2008 by BSI.

From PAS2050 guide: Example (croissants) (Indicates how complex it can get)



Other Standards:

- HCC/DBC required to report Climate Change National Indicators:
  - NI 186 – per capita CO<sub>2</sub> emissions. (Mixture of National and LA area data. )
  - NI 185 – CO<sub>2</sub> emissions from the Council's estate

HCC Waste Management facility uses WRATE methodology. WRATE is a tool used in the life cycle assessment of waste systems and technologies and has been developed by the EA, specifically for Waste systems. Includes pollution indices as well as Greenhouse Gas/Energy estimates.

DBC assessment for collections based "on environmental, economical and social demographical factors".

## How to get a handle on the contribution of Waste tonnages to the Energy Balance Sheet



### "Embodied Energy"

(From "Sustainable Energy – without the hot air")  
, plus GWE Tonnes CO2 per Tonne column using 240 grams of CO2 per Kwh)

	Embodied Energy (kWh per kg)	Ditto Tonnes CO2 per Tonne
fossil fuel	10	2.4
wood	5	1.2
paper	10	2.4
glass	7	1.7
PET plastic	30	7.2
aluminium	40	9.6
steel	6	1.4

**What proportion of Energy/CO2 emissions can be saved by Recycling?**

From "Future Recycling and Landfill Diversion Targets for Wales"  
prepared in 2009 for the Welsh Assembly Government:

from Table 1-3: plus GWE percent column.

Material	Abatement per tonne of waste treated, tonnes of CO2 equ	Percent Recycling Saving compared with comparable category above
Glass to recycling	0.29	20%
Wood to recycling	0.57	50%
Paper / card to recycling	1.41	60%
Dense plastics to recycling	1.40	25% (Assume like PET)
Metals to recycling	3.56	70% (assume 50/50 Al/Steel) Steel only: 20%
Food to AD: compressed biogas used in vehicles	1.04	80% (assume similar to wood)
Green to Windrow	0.92	75% (assume similar to wood)

**How does this work out for Household Waste Collection?**

From the study “Composition of Household Waste” for the Cabinet Office Strategy Unit (WRAP 2002) one can derive:

Household Waste	Percentage	UK million tonnes p.a.	kwh/Kg*	UK Energy Million kWh p.a.	of which, savable through recycling**
Garden waste	20%	6	5	30,000	22,500
Paper and board	18%	5.4	10	54,000	32,000
Kitchen waste	17%	5.1	5	25,500	18,500
Household sweepings	9%	2.7	5	13,500	9,500
Glass	7%	2.1	7	14,700	3,000
Wood/Furniture	5%	1.5	5	7,500	3,250
Scrap metal /white goods	5%	1.5	6	9,000	1,800
Dense plastic	4%	1.2	30	36,000	9,000
Soil	3%	0.9	0	0	0
Plastic film	3%	0.9	30	27,000	(Assume like Dense) 7,000
Textiles	3%	0.9	10	9,000	(Assume like paper/card) 5,400
Metal cans/foil	3%	0.9	40	36,000	25,000
Disposable nappies	2%	0.6	10	6,000	(Assume like paper/card) 3,600
					0
Total	100%	30		268,200	140,500
Total Per person per day				12	6

\* From “Sustainable Energy – without the hot air”; \* \*\* Including GE assumptions

Carbon/Energy Footprints and Waste Management  
Comments and Conclusion

6 kwh pp p day seems modest compared with total pp p day of 195, but a lot of major components e.g "Stuff" (48 kwh pp pd) and "Cars" (40 kwh pp pd) do not appear in the household waste tonnage, but are nevertheless recycled or recyclable.

Issues in Dacorum. Message for the O&S committee - for DEF comment:

General

1. Waste management CO<sub>2</sub> reduction as a component of NI 186 – per capita CO<sub>2</sub> emissions. Benefits of re-use/extend life over recycle.

## Specific

### 1. Non-bottle Plastics



14/6 10 Response to GE enquiry from Gareth Wildig, Assistant Waste Manager HCC. Explained that there is a consortium contract to recycle these plastics, to include potentially all Herts. Councils plus HCC who manage the Household Waste Recycling Centres (HWRCs). Three Rivers started. HCC hopes to join "in the next few months." **What about Dacorum?**

## 2. Kitchen Waste/Composting for small dwellings

Possible usage of Green Cone/Green Johanna kitchen waste composters in the Bennets End allotment regeneration project, currently the subject of a Performance Reward Grant (PRG) via Dacorum Partership.

**DBC: please consider Rocket Composters: for larger-scale use in neighbourhoods - require more management in use. Warwickshire schools example:**

Earlier this year, Warwickshire County Council, already themselves operators of a Rocket Composter at the main Council Halls, commissioned a number of **A500 Rockets** for their schools throughout Warwickshire.

The initial stage of the project is set to divert 25 tonnes of food waste per year from landfill (cf UK total 5 million tonnes of kitchen waste = say 100 thousand tonnes for Warwickshire.)

