

**DATA FOR FIGURE 4**

*Multiple sources as detailed in the literature review in Section 2*

	Large scale			Small scale			Home scale		
	Electricity	Fuel/thermal	Total	Electricity	Fuel/thermal	Total	Electricity	Fuel/thermal	Total
q1-min	0.22	1.67	1.95						
q1 LS	1.43	1.67	3.25						
median-q1 LS	0.22	0.50	0.73						
q3-median LS	0.60	1.10	1.46						
max-q3	1.75	2.74	0.68						
q1-min				-	0.57	0.09			
q1 SS				1.06	0.57	3.44			
median-q1 SS				1.36	2.42	1.03			
q3-median SS				2.82	1.35	2.08			
max-q3				-	0.22	0.44			
q1-min							5.09	1.25	2.64
q1 HS							10.84	5.49	6.88
median-q1 HS							9.17	2.69	3.97
q3-median HS							13.87	2.24	15.95
max-q3							20.88	5.63	27.98
			5.4			6.5			26.8
			1.3			3.4			4.2
			6.1			7.0			54.8
cases	22	23	25	3	3	4	7	6	13
unique studies	6	7	8	3	3	3	2	2	2

## DATA FOR FIGURE 5

Primary energy consumption					
gasoline		34.20 MJ/l			
diesel		38.60 MJ/l			
gasoline per km car		3.34 MJ/km			
gasoline per km LDV		4.65 MJ/km			
diesel per km HDV		14.28 MJ/km			
energy per km electric		8.09 MJ/km			
Distances					
km	Large scale	Medium scale	Small scale		
phase	Fossil fuel	Fossil fuel	Electric	Fossil fuel	Electric
Mill to bakery	13,800	17,940	17,940		
Mill to flour distribution centre				17,940	17,940
Flour distribution centre to bakeries				20,010	20,010
Bakery to retail	145,635	53,655	53,655		
Retail to consumer	28,900,629	28,900,629	28,900,629		
<b>Total</b>	<b>29,060,064</b>	<b>28,972,224</b>	<b>28,972,224</b>	<b>37,950</b>	<b>37,950</b>
Energy consumption					
GJ	Large scale	Medium scale	Small scale		
phase	Fossil fuel	Fossil fuel	Electric	Fossil fuel	Electric
Mill to bakery	197	256	256		
Mill to flour distr. centre				256	256
Flour distr. centre to bakeries				286	162
Bakery to retail	2,080	766	434		
Retail to consumer	96,459	96,459	96,459		
Bread baking	9,916	13,256	13,256	13,256	13,256
<b>Total</b>	<b>108,651</b>	<b>110,737</b>	<b>110,405</b>	<b>13,798</b>	<b>13,674</b>

### DATA FOR FIGURE 6

UK grid emission	0.41205 kgCO <sub>2</sub> e/kWh				
<b>Based on 62g CO<sub>2</sub>/tonnes-km</b>					
CO <sub>2</sub> emissions (tonnes/year)	Large scale	Medium scale	Small scale		
	Fossil fuel	Fossil fuel	Electric	Fossil fuel	Electric
Mill to bakery	33	43	43	0	0
Mill to flour distr. centre	0	0	0	43	43
Flour distr. centre to bakeries	0	0	0	16	7
Bakery to retail	114	42	19	0	0
Retail to consumer	6,616	6,616	6,616		
Bread baking	690	922	922	922	922
<b>Total</b>	<b>7,453</b>	<b>7,623</b>	<b>7,600</b>	<b>981</b>	<b>972</b>
<b>CO<sub>2</sub> emissions</b>					
HDV	870.00 g/km				
LDV	319.07 g/km				
Car	228.91 g/km				
Electric	0.35 g/km				

Carbon Trust data		Carbon Trust					
Energy type	GWh	CO <sub>2</sub> (tonnes)	Report kg/kWh	New kg/kWh	kg CO <sub>2</sub>	percentage	kg CO <sub>2</sub> /kWh
Electricity	560	300,000	0.536	0.412	230,748,000	28%	0.115
Natural gas	1,400	260,000	0.186	0.186	260,000,000	70%	0.130
Fuel oil and Liquid Propane Gas	40	10,000	0.250	0.250	10,000,000	2%	0.005
	2,000	570,000	0.285		500,748,000		<b>0.250</b>

**DATA FOR FIGURE 7**

Distances times emissions/km				
		HDV	car	electric
Large scale	VOC		0.04	18.57
	THC		0.04	19.34
	CO		0.23	168.81
	NOx		0.85	12.44
	PM10		0.02	0.08
	PM2.5		0.02	0.07
Medium scale	VOC		0.02	18.57
	THC		0.02	19.34
	CO		0.10	168.81
	NOx		0.38	12.44
	PM10		0.01	0.08
	PM2.5		0.01	0.07
Medium scale electric	VOC		0.00	18.57
	THC		0.01	19.34
	CO		0.03	168.81
	NOx		0.10	12.44
	PM10		0.00	0.08
	PM2.5		0.00	0.07
Small scale	VOC		0.01	0
	THC		0.01	0
	CO		0.05	0
	NOx		0.20	0
	PM10		0.00	0
	PM2.5		0.00	0
Small scale electric	VOC		0.00	0
	THC		0.01	0
	CO		0.03	0
	NOx		0.10	0
	PM10		0.00	0
	PM2.5		0.00	0

## DATA FOR FIGURE 8

Scenarios					
Reduced car transport: 5% reduction					
Energy consumption					
GJ					
phase					
Flour distr. centre to bakeries	0	0	0	286	162
Mill to flour distr. centre	0	0	0	256	256
Mill to bakery	197	256	256	0	0
Bakery to retail	2,080	766	434	0	0
Bread baking	9,916	13,256	13,256	13,256	13,256
Retail to consumer	96,459	96,459	96,459	91,636	91,636
<b>Total</b>	<b>108,651</b>	<b>110,737</b>	<b>110,405</b>	<b>105,433</b>	<b>105,310</b>

## DATA FOR FIGURE 10

Data for final energy RDM scenarios graph		Energy Use (TJ)	Energy Use (TJ)	Energy Use (TJ)	Energy Use (TJ)
		SCENARIO 1: Current Situation 98% Industrial baking and 2% RDM (1.5% medium artisan and 0.5% home baking)	SCENARIO 2a: 80% Industrial baking and 20% RDM - medium-small scale	SCENARIO 2b: 80% Industrial and 20% RDM - home baking	SCENARIO 2c: 80% Industrial and 20% RDM -best technology
SOURCE DATA	Scale				
Average misc sources (see Appendix A)	Industrial large scale	8,744	7,138	7,138	7,138
Braschkat et al, 2004	RDM medium-local scale	225	3,006	0	0
Braschkat et al, 2004	RDM Home-baking	103	0	4,100	0
Carbon Trust 2010	RDM best technology	0	0	0	1,012

### 1 GWh = 3.6 TJ

The following assumptions were made to calculate power (GW) per year:

The industrial bakery sector produces 24 h per day 7 days a week, every week of the year.

It was assumed that the small scale sector produces approximately 1.5% of all UK bread produced during 5h per day, 6 days a week, every week except for 2 weeks holiday

0.5% of all UK bread is produced at the home level, in 3 h per day, 5 days per week, every week except 2 weeks of holidays in most households baking their own bread

*Note from the Carbon Trust (2010) study that the most efficient plant is not the one with largest production/largest scale. It produces c. 40000 tonnes per year and has fossil fuel intensity of 0.40 kWh/kg of product, and electricity use of 0.14 kWh/kg of product. Hence, if all bakery plants were to replicate this site and use similar technology and practices, the energy used by the UK's industrial bakery sector, and the associated CO<sub>2</sub>-e emissions, could be reduced significantly*













0.4						
electricity	electricity			total primary	electricity	
	total primary	not primary energy	total primary		primary energy	percentage
kWh/kg	kWh/kg	MJ/kg bread	MJ/kg bread			Percentage
0.18	0.94	1.58	4.31	0.19		37%
0.25	1.20	2.21	5.63	0.21		39%
0.15	0.87	1.35	3.94	0.17		34%
0.14	0.55	1.22	2.69	0.25		45%
0.21	1.07	1.89	4.99	0.20		38%
0.24	0.70	2.19	3.84	0.35		57%
0.22	0.76	1.98	3.92	0.29		50%
0.18	1.01	1.58	4.57	0.17		35%
0.16	0.66	1.44	3.24	0.24		44%
0.16	0.66	1.47	3.27	0.25		45%
0.16	0.72	1.40	3.41	0.22		41%
0.19	0.79	1.74	3.90	0.24		45%
0.16	0.63	1.46	3.13	0.26		47%
0.14	0.55	1.22	2.69	0.17	0.34	
0.25	1.20	2.21	5.63	0.35	0.57	
0.18	0.81	1.65	3.91	0.23	0.43	