

RESOURCE / WASTE TABLES

July 2004

The following tables show work in progress on assembling basic data on regional resource & waste flows.

The first two tables summarize the material flow and eco-footprint data, first by function and then by material classification. The following tables focus on construction & commercial / industrial waste, rather than municipal, as the volumes are larger, and there is less information available. There are several sources for these:

- Preliminary Footprint for the NW (SEI & CURE for the NWRA, 2004)
- REWARD NW – Towards commercial & industrial waste minimization (CURE, CE, CMS & EA for the NWDA, 2004)
- Environment Agency National Waste Survey

Note on terms:

An assessment of resource flows within a defined boundary is termed a **Material Flow Analysis**. This looks at the material inputs to a region in terms of raw materials and products, and at outputs in terms of waste and emissions, plus any changes in stocks. The analysis focuses on the consumption of goods and services by households and the commercial sector, including materials directly used and consumed. It also looks at 'hidden' material flows including ores and wastes from extraction or harvesting, energy used for extracting, transporting and producing materials: and greenhouse gas emissions from energy use. This kind of data is arranged in terms of 'consumption sectors', i.e. the functional requirements of consumers, rather than the 'production sectors' in the REWARD system and most economic accounts. As a result of these two kinds of analysis a number of key physical indicators can be generated:

- **Direct Material Consumption (DMC)** that is the total amount of materials directly used in the regional economy and consumed in the region, i.e. excluding exports.

- **Total Material Consumption (TMC)** that is the total material use associated with the regional consumption activities, including DMC and the indirect or 'hidden' material flows associated with it. Again, this excludes exports and their associated indirect flows.
- **Carbon dioxide emissions (CO₂)** as the largest single cause of climate change.
- **Ecological footprint (EF)**, usually measured in 'global hectares' ("gha") or 'global hectares per person' ("**gha/cap**"). This is the land equivalent of environmental impact, calculated from the CO₂ emissions, plus other impacts on land use.

Preliminary mass balance results

Below are some preliminary results based on current work in the NW region (SEI & CURE, 2004): here they focus on material flows rather than the ecological footprint:

- The **Direct Material Consumption (DMC)** for the North West region in 2000 was 66 million tonnes, which equates to 9.5 tonnes per person.
- The largest single component of the DMC is the construction sector, with 35 million tonnes per year of bulk materials. This is allocated as below to domestic, commercial services, transport, and industrial construction (the latter being included indirectly in the consumption accounts).
- The **Total Material Consumption** was 160 million tonnes, or 23 tonnes per person, approx 2.5 times the DMC. This corresponds to recent UK data (Wuppertal Institute 2002).

These figures per person in the NW region can be compared with overall waste production per person:

- Industrial waste: 0.87 tonnes per person

- Commercial waste: 0.5 tonnes per person
- MSW, household & other: 0.6 tonnes per person
- Construction: 1.5 tonnes per person

The overall total of all waste streams including agriculture and mining is 5.4 tonnes per person/y,

i.e. over half the total DMC per person of 9.5 tonnes/y.

This suggests a material economy which is working at only 40% overall resource efficiency: i.e. out of every 10 tonnes brought into the economy, only 4 tonnes is utilized.

1. Material consumption & ecological footprint

Summary table from the SEI & CURE study for the NWRA

Heading	Units	FOOD		SHELTER			GOODS					MOBILITY		Public Services	TOTAL North West	
		HH Food	Food eaten out	HH Energy	Com. Energy	Construction	HH Durables	Cars	Furniture+	ElectEquip	HH Consumables	Pass. Transport	Freight Transport			Com. Services
DMC per cap	(t/cap)	0.62	0.09	0.99	0.41	5.07	0.11	0.06	0.04	0.01	0.22	0.38	0.86	0.68	0.09	9.52
TMC cap	(t/cap)	2.85	0.33	1.73	0.94	10.10	1.44	0.73	0.23	0.47	1.48	0.42	0.87	2.62	0.54	23.30
CO2 per cap	(t/cap)	2.78	0.27	2.66	1.19	3.99	0.37		0.11	0.26	0.73	1.61	2.71	1.56	0.28	18.15
EF per cap	(gha/cap)	1.43	0.17	0.62	0.26	1.03	0.14		0.05	0.08	0.37	0.43	0.71	0.85	0.16	6.18
Total DMC	(Mt)	4.26	0.62	6.80	2.83	34.99	0.74	0.40	0.25	0.09	1.53	2.63	5.93	4.69	0.64	65.65
Total TMC	(Mt)	19.68	2.02	11.91	6.46	69.60	9.92	5.05	1.60	3.27	10.21	2.88	5.99	18.03	3.72	160.42
Total CO2	(Mt)	19.17	1.87	18.34	8.19	27.49	2.58	a)	0.78	1.80	5.04	11.08	18.72	10.76	1.91	125.14
Total EF	(million gha)	9.89	1.24	4.25	1.82	7.11	0.95	a)	0.37	0.58	2.56	2.94	4.92	5.86	1.09	42.63
DMC per cap	(t/cap)	6%	1%	10%	4%	53%	1%	1%	0%	0%	2%	4%	9%	7%	1%	100%
TMC cap	(t/cap)	12%	1%	7%	4%	43%	6%	3%	1%	2%	6%	2%	4%	11%	2%	100%
CO2 per cap	(t/cap)	15%	1%	15%	7%	22%	2%	0%	1%	1%	4%	9%	15%	9%	2%	100%
EF per cap	(gha/cap)	23%	3%	10%	4%	17%	2%	0%	1%	1%	6%	7%	12%	14%	3%	100%

2. Material consumption inputs / waste outputs

Summary table using the Combined Nomenclature (CN) system, based on National Waste Survey and the SEI & CURE study for the NWRA

CN code (2-digit)	Direct Material Consumption (DMC)	Total Material Consumption (TMC)	Inert/C &D	Paper & card	Food	General industrial commercial	Other general & biodegradable	Metals & scrap equipment	Contaminated general	Mineral wastes & residue	Chemical & other	% of total DMC	
Section I Live animals; animal products	1,288	7,802			1,288							1%	
Section II Vegetable products	1,079	3,462			1,079							1%	
Section III Animal / vegetable fats / oils	32	141			32							0%	
Section IV Food products	3,535	13,895			3,535							3%	
Section V Mineral products	72,088	101,723	72,088									66%	
Section VI Chemical products	14,635	29,901									14,635	13%	
Section VII Plastics, rubber etc	1,114	5,472				1,114						1%	
Section VIII Hides & skin products	28	217					28					0%	
Section IX Wood products	2,504	6,224				2,504						2%	
Section X Paper & board products	3,409	16,368		3,409								3%	
Section XI Textile products	237	2,735				237						0%	
Section XII Footwear, headware etc	27					27						0%	
Section XIII Stone, cement, ceramics etc	7,470	9,711								7,470		7%	
Section XIV Semi/precious stones & metals	3	3	3							3		0%	
Section XV Base metal products	1,752	20,486						1,752				2%	
Section XVI Machinery, appliances	306	6,873						306				0%	
Section XVII Vehicle products	0	0										0%	
Section XVIII Optical, medical etc	2	6										0%	
Section XIX Arms products	0	0										0%	
Section XX Misc manufacture	89	551				89						0%	
excl water	TOTAL DIRECT MATERIAL INPUT	109,598	225,572	72,091	3,409	5,933	3,971	28	2,058	0	7,473	14,635	
	TOTAL C&I WASTE BY TYPE	9,578		374	674	423	3,686	1,547	554	671	490	1,158	
	TOTAL C&D WASTE			9,913									
	Indirect resource efficiency: inputs / waste	11		7	5	14	1		4		15	13	

3. Waste arisings in the NW by management route:

Extract from REWARD database: Source AEAT 2002: Units in 1000 tonnes

	Active	Inert	Hazardous	Recycling	Composting	Thermal	Other	Total
Agriculture	16	0	0	4	7975	3	19	8016
Basic metals	18	10	39	70	1	2	46	186
Chemicals	85	59	267	202	5	13	284	913
Pharmaceuticals	18	19	83	60	1	4	83	268
Clothing & leather	33	1	8	18	2	1	27	90
Construction	0	2044	5	3240	0	0	4936	10225
Domestic	3231	0	0	154	154	2	0	3540
Education	166	3	1	55	2	4	64	296
Electrical engineering	9	1	1	21	0	0	7	41
Electricity	8	197	5	111	0	0	36	358
Electronics	20	2	2	35	1	0	15	76
Metal goods	40	1	9	103	2	1	34	190
Drink	29	1	10	18	2	1	27	88
Food	394	53	81	239	21	7	319	1115
Tobacco	8	0	3	5	0	0	8	25
Gas supply	5	2	3	7	0	0	6	24
Health & social work	146	7	20	68	4	4	83	332
Hotels & catering	257	5	5	90	3	6	101	467
Manufactured fuels	12	4	7	15	1	0	14	54
Aerospace	12	0	38	41	1	2	39	132
Instruments	10	0	1	6	1	0	7	24
Manufacturing & recyc	54	2	12	34	3	1	44	149
Mechanical engineering	33	6	27	113	2	2	46	227
Motor vehicles	29	1	38	89	1	2	51	211
Other transport equip	3	0	8	9	0	0	9	29
Coal	0	1314	0	0	0	0	0	1314
Oil & gas, etc								
Other mining	0	2492	0	0	0	0	0	2492
Miscellaneous services	108	2	2	38	1	2	43	196
Non-metallic min prod	35	123	12	88	2	1	49	311
Paper, printing & pub	349	8	24	174	19	4	238	816
Public admin & defence	45	1	2	17	1	1	19	86
Distribution	290	2	11	126	3	7	117	556
Retailing	391	1	30	146	5	10	166	748
Rubber & plastics	82	2	8	50	4	1	58	205
Banking & finance	25	0	0	8	0	1	10	45
Communications	49	0	13	31	3	1	41	138
Computing services	7	0	0	2	0	0	3	13
Insurance	21	0	0	7	0	0	8	37
Other business serv	53	0	1	18	1	1	21	95
Professional services	235	7	14	90	4	5	107	462
Textiles	60	1	12	32	3	1	47	156
Air transport	8	0	2	5	0	0	7	22
Other land transport	40	0	10	26	2	1	34	114
Other transport serv	33	0	9	21	2	1	28	94
Rail transport	13	0	3	8	1	0	11	36
Water transport	2	0	1	2	0	0	2	7
Unallocated								
Waste treatment	518	0	0	23	23	14	76	654
Water supply	1	0	1	1	0	0	1	4
Wood & wood products	65	2	0	31	4	1	41	142
TOTAL	7068	6373	829	5752	8259	108	7431	35819

4. Waste arisings in the NW by type:

Extract from REWARD database Source AEAT 2002: Units in 1000 tonnes

Detailed Sector	Inert	Non-inert bio degradable	Non-inert non-bio degradable	Hazardous	Total
Agriculture	0	7990	11	15	8016
Basic metals	16	37	47	86	186
Chemicals	98	179	45	591	913
Pharmaceuticals	32	38	14	183	268
Clothing & leather	2	70	0	18	90
Construction	9913	205	102	5	10225
Domestic	230	2404	896	11	3540
Education	4	286	3	3	296
Electrical engineering	2	19	17	2	41
Electricity	327	17	3	11	358
Electronics	4	41	26	6	76
Metal goods	2	82	87	19	190
Drink	2	63	1	22	88
Food	89	839	8	180	1115
Tobacco	1	18	0	6	25
Gas supply	3	11	2	7	24
Health & social work	11	269	6	45	332
Hotels & catering	7	442	7	10	467
Manufactured fuels	7	25	5	16	54
Aerospace	0	24	24	84	132
Instruments	0	21	2	2	24
Manufacturing & recycling	3	115	5	26	149
Mechanical engineering	10	66	91	60	227
Motor vehicles	1	58	67	85	211
Other transport equipment	0	5	5	18	29
Coal	1314	0	0	0	1314
Oil & gas, etc					
Other mining	2492	0	0	0	2492
Miscellaneous services	2	186	2	5	196
Non-metallic mineral products	204	75	5	27	311
Paper, printing & publishing	13	744	5	54	816
Public administration and defence	1	78	2	5	86
Distribution	2	498	30	25	556
Retailing	1	671	7	69	748
Rubber & plastics	3	175	10	17	205
Banking & finance	0	43	1	1	45
Communications	0	104	5	28	138
Computing services	0	12	0	0	13
Insurance	0	36	0	0	37
Other business services	0	91	1	2	95
Professional services	10	415	6	31	462
Textiles	1	128	1	26	156
Air transport	0	17	1	4	22
Other land transport	0	86	4	23	114
Other transport services	0	71	4	19	94
Rail transport	0	27	1	7	36
Water transport	0	5	0	1	7
Unallocated					
Waste treatment	34	487	131	1	654
Water supply	1	2	0	1	4
Wood & wood products	3	138	1	1	142
TOTALS	14848	17416	1694	1861	35819

5. C&I waste by business sector and waste type

Environment Agency National Waste Survey:

Black borders indicate significant items. Figures in 000s tonnes

Business sector / waste type	Inert/ C&D	Paper & card	Food	General indust & commercial	Other general & biodegradable	Metals & scrap equipment	Contaminated general	Mineral wastes & residues	Chemical & other	Total	total output as % of regional total
Industry											
1 Food, drink and tobacco	7%	3%	27%	14%	30%	1%	5%	0%	12%	100%	13%
2.1 Textiles	0%	13%	0%	53%	15%	1%	14%	0%	2%	100%	2%
2.2 Wearing apparel	0%	5%	0%	82%	8%	0%	3%	0%	0%	100%	0%
2.3 Leather, luggage, handbags and footwear	3%	2%	0%	26%	40%	0%	18%	0%	11%	100%	1%
2.4 Wood and wood products	2%	2%	0%	22%	72%	1%	0%	0%	0%	100%	1%
2.5 Pulp, paper and paper products	0%	14%	0%	15%	62%	0%	0%	2%	7%	100%	7%
2.6 Publishing, printing and recording	0%	51%	0%	38%	6%	2%	1%	0%	2%	100%	2%
3.1 Chemicals and chemical products	6%	0%	0%	5%	9%	5%	21%	5%	47%	100%	11%
3.2 Cleaning products, man-made fibres etc	2%	8%	1%	22%	18%	3%	12%	2%	32%	100%	2%
3.3 Rubber and plastic products	1%	8%	0%	44%	33%	5%	3%	1%	5%	100%	2%
3.4 Other non-metallic mineral products	44%	1%	0%	17%	5%	1%	5%	21%	3%	100%	3%
4.1 Basic metals	4%	1%	0%	17%	1%	25%	21%	5%	25%	100%	2%
4.2 Fabricated metal products	1%	1%	0%	38%	3%	46%	4%	0%	7%	100%	2%
5.1 Machinery and equipment	3%	2%	0%	24%	4%	40%	12%	1%	14%	100%	2%
5.2 Office machinery, computers & electrical	2%	4%	0%	40%	4%	43%	3%	2%	3%	100%	1%
5.3 Radio, television and communication	9%	7%	0%	45%	21%	4%	1%	0%	12%	100%	0%
5.4 Medical and optical instruments and clocks	0%	5%	0%	79%	2%	8%	3%	0%	3%	100%	0%
5.5 Motor vehicles	1%	2%	0%	22%	4%	32%	2%	0%	38%	100%	2%
5.6 Other transport equipment	0%	1%	0%	15%	2%	18%	61%	0%	3%	100%	2%
5.7 Furniture and other manufacturing	0%	6%	0%	36%	35%	3%	16%	2%	2%	100%	2%
6 Coke, oil, gas, electricity, water	4%	1%	0%	9%	2%	3%	0%	73%	8%	100%	5%
7 Transport, storage, communications	0%	10%	6%	51%	9%	4%	3%	0%	18%	100%	4%
8 Miscellaneous	3%	5%	0%	55%	7%	1%	1%	3%	24%	100%	2%
Total	5%	6%	6%	22%	20%	8%	9%	8%	17%	100%	68%
Commerce											
9 Wholesale	0%	17%	2%	63%	10%	4%	1%	0%	3%	100%	4%
10 Retail - motor vehicles, parts and fuel	1%	6%	0%	60%	16%	11%	1%	0%	6%	100%	1%
10.2 Retail - others	0%	17%	5%	62%	5%	1%	9%	0%	1%	100%	8%
11 Hotels, catering	1%	4%	0%	85%	6%	2%	2%	0%	0%	100%	5%
12 Finance	0%	19%	1%	77%	1%	1%	1%	0%	1%	100%	1%
13 Education	1%	4%	1%	76%	16%	1%	0%	0%	1%	100%	3%
14.1 Travel agents, other business and others	1%	6%	0%	80%	9%	1%	2%	0%	1%	100%	6%
14.2 Real estate and computer	0%	6%	0%	85%	5%	1%	1%	0%	1%	100%	1%
14.3 Social work and public administration	1%	10%	1%	73%	7%	2%	1%	0%	5%	100%	3%
Total	1%	10%	2%	72%	8%	2%	3%	0%	2%	100%	32%
Regional total	4%	7%	4%	38%	16%	6%	7%	5%	12%	100%	100%

6. C&I waste by type and management method

Environment Agency National Waste Survey 1999:

Black borders indicate significant items. Figures in 000s tonnes

Waste type / waste management method	Land disposal	Land recovery	Re-used	Recycled	Thermal	Transfer	Treatment	Unrecorded	Total	total as % of regional total	NW / E&W ratio
Industry											
Inert/C&D	61%		0%	27%	0%	11%	0%	0%	100%	4%	126%
Paper and card	8%		1%	90%	0%	0%	2%	0%	100%	4%	102%
Food	10%	1%	55%	24%		0%	10%	0%	100%	4%	130%
General industrial & commercial	92%	0%	0%	3%	0%	3%	0%	2%	100%	15%	110%
Other general & biodegradable	18%	26%	23%	28%	1%	0%	4%	0%	100%	14%	147%
Metals & scrap equipment	2%		2%	95%		0%	1%	0%	100%	5%	90%
Contaminated general	53%		10%	33%	0%	0%	3%	0%	100%	6%	138%
Mineral wastes & residues	59%		6%	35%			0%		100%	5%	
Chemical & other	41%	3%	8%	6%	3%	1%	39%		100%	12%	
Total	45%	6%	11%	28%	1%	1%	9%	0%	100%	68%	101%
Commerce											
Inert/C&D	73%		1%	15%	0%	12%	0%	0%	100%	0%	90%
Paper and card	6%		1%	91%	0%	0%	1%	0%	100%	3%	99%
Food	13%	0%	34%	33%		1%	19%	0%	100%	1%	115%
General commercial	71%		0%	6%	1%	2%	0%	19%	100%	23%	97%
Other general & biodegradable	22%	14%	21%	36%	1%	0%	4%	0%	100%	3%	104%
Metals & scrap equipment	2%		2%	95%		0%	1%	0%	100%	1%	91%
Contaminated general	52%		6%	38%	0%	0%	4%	0%	100%	1%	97%
Mineral wastes & residues	64%		5%	29%			2%		100%		
Chemical & other	30%	3%	4%	7%	7%	1%	49%	0%	100%	1%	99%
Total	57%	1%	3%	21%	1%	2%	2%	14%	100%	32%	98%
Regional total	49%	4%	8%	25%	1%	2%	6%	5%	100%	100%	100%
NW / E&W ratio	105%	213%	109%	85%	45%	90%	114%	97%	100%		

7. Construction & demolition waste by type and management method

From: Environment Agency National Waste Survey 1999:

Region	North West	component as % of total	England & Wales	NW as % of E&W
Specific component parts				
Total tonnes of C&D waste crushed as aggregates	2,624,853	26%	20,467,469	13%
Total tonnes of mixed C&D waste/soil screened as aggregates	280,035	3%	2,231,013	13%
Total tonnes of mixed C&D waste/soil screened as soil	242,306	2%	1,643,497	15%
Total tonnes of useable crusher fines/soil from crushing C&D waste	92,903	1%	790,187	12%
Total tonnes of C&D waste for landfill restoration	15,245	0%	110,831	14%
Total tonnes of C&D waste for landfill engineering	216,492	2%	1,228,576	18%
Total tonnes of soil for landfill restoration	448,408	4%	2,662,766	17%
Total tonnes of soil for landfill engineering	271,709	3%	2,334,721	12%
Total tonnes of mixed C&D waste/soil for landfill restoration	191,318	2%	2,691,918	7%
Total tonnes of mixed C&D waste/soil for landfill engineering	35,595	0%	504,746	7%
Total tonnes of C&D waste/recycled aggregates on registered exempt sites	1,582,150	15%	8,552,161	19%
Total tonnes of soil and rock on registered exempt sites	2,059,425	20%	11,132,029	18%
Total tonnes of other materials on registered exempt sites	116,500	1%	629,732	18%
Total tonnes of clean, unmixed C&D waste disposed of to landfill	5,595	0%	65,863	8%
Total tonnes of mixed/contaminated C&D waste disposed of to landfill	218,200	2%	2,568,670	8%
Total tonnes of clean soil/rock disposed of to landfill	263,020	3%	3,041,519	9%
Total tonnes of mixed/contaminated soil/rock disposed of to landfill	389,636	4%	4,505,675	9%
Total tonnes of mixed/unspecified C&D waste/soil disposed of to landfill	1,172,052	11%	7,318,337	16%
Total production/uses of C&D waste and soil	10,225,442	100%	72,479,709	14%
Region's share of England & Wales	14.10%		100.00%	14%

Uses / destinations				
Total tonnes of recycled aggregates and soil	3,240,097	32%	25,132,166	13%
Total tonnes of C&D waste and soil beneficially re-used on landfills	1,178,767	12%	9,533,558	12%
Total tonnes of materials on registered exempt sites	3,758,075	37%	20,313,921	18%
Total tonnes of C&D waste and soil disposed of to landfill (or unspecified)	2,048,503	20%	17,500,064	12%
Total production/uses of C&D waste and soil	10,225,442	100%	72,479,709	
Recycled as % of all in region	31.70%		34.70%	91%
Beneficially re-used on landfills as % of all in region	11.50%		13.20%	87%
Used on registered exempt sites as % of all in region	36.80%		28.00%	131%
Disposed of to landfill as % of all in region	20.00%		24.10%	83%

Arisings				
Total C&D waste production in region	4,755,438	47%	33,783,757	14%
Total soil production in region	3,432,198	34%	23,676,710	14%
Total mixed C&D waste/soil production in region	2,037,806	20%	15,019,243	14%
Total production/uses of C&D waste and soil	10,225,442	100%	72,479,710	
C&D waste production as % of all	46.50%		46.60%	100%
Soil production as % of all	33.60%		32.70%	103%
Mixed C&D waste/soil production as % of all	19.90%		20.70%	96%