

The effect of home composting and recycling collections on the composition of household waste in Runnymede

Imperial College
London



A. Summer Waste Compositional Analysis

1. Samples collected

All the residual waste samples were collected on the morning of Wednesday 30th June 2004. The number of samples that were collected from each of the treatment groups are shown below:

Group	Code	No. of samples
Control	C	17
Recycling only	R	50
Composting only	CO	12
Recycling and composting	RC	37

2. Summary of results

2.1 Arisings

Waste arisings for each of the treatment groups are summarised as kilograms per household per week (kg/hhld/wk) in Table A1.

National waste arisings are in the range between 15 to 18 kg/hhld/wk for wheeled bin refuse collection areas. The average refuse arising in the Control group was low at 12.4 kg/hhld/wk. Other average waste arisings were 16.7, 14.6 and 13.9 kg/hhld/wk in the Recycling only, Composting only and Recycling & composting (R, CO, RC) groups, respectively. The low arisings from the control group are likely to be related to similar factors to those households not being served by recycling and not participating in home composting.

Arisings from the R, CO and RC groups appear to decrease with increased recycling and composting activity. However, the overall composition of the residual waste from each group is similar, as shown in

Figure A2. It appears that individual recycling activity had little effect on residual waste composition. It is possible that increased awareness of recycling and composting within households lead to waste minimisation of the materials collected as residue.

2.2 Assay

The summary assays for the household waste arising in all groups are illustrated in

Figure A2 alongside the summary assay determined for waste arising in Wales (AEA Technology, 2003). These results show a consistency in the composition of residual waste arising in each of the sample groups. The main difference was the amount of non-combustible material in the sample from Recycling & composting households, 9.06%, the majority of which was construction and demolition waste from one property. It is noted that these data are a snap-shot of the waste assay and that this amount of construction and demolition waste is unlikely to be a consistent feature over a period of time, so it would be valid to omit this anomalous result.

The RC sample also showed a lower percentage content of glass than the other sample groups which all had a similar percentage content of glass, 1.4%, compared to an average of 5.9% for the other sample groups. Again it appears that an increased awareness of recycling and composting within households lead to waste minimisation of the materials collected as residue. In the case of glass it is likely that householders in the RC group made extensive use of the bring systems located throughout Runnymede.

2.3 Putrescibles

The average arisings for putrescibles in the residual waste are shown in Table A3 and illustrated in

Figure A3. This pattern of arisings mirrors that seen for overall waste arisings seen in

Figure A1. The average arisings of putrescibles was lowest for the Control households at 6.31 kg/hhld/wk, while the other areas arisings of putrescibles were 8.81, 7.26 and 6.70 kg/hhld/wk in the R, CO, RC areas respectively.

Similar to the case with the overall waste arisings/composition, although arisings from the R, CO and RC groups appear to decrease with increased recycling and composting activity, the composition of the putrescible waste fractions are similar in for each sample group, as shown in

Table A4.

2.4 Recyclables

The average arisings of recyclables in the residual waste are shown in Table A5 and illustrated in Figure A5. To weights for the recyclable materials were calculated by taking into account that:

100% for all paper and card, except liquid cartons and non-recyclable paper, 0%.

100% for ferrous cans, other ferrous metal, 0%.

100% for non-ferrous cans, other non-ferrous metal, 0%.

100% for all glass, except non-packaging glass, 0%.

0% for all clothing, textiles and shoes.

100% for all dense plastic bottles, 50% for other DP packaging, 0% for other DP.

0% for all plastic film.

0% for all Potentially Hazardous Household Waste.

0% for all Miscellaneous Materials.

0% for all WEEE.

100% for Kitchen compostable waste and Garden Waste, 0% for Other Kitchen waste.

The composition of the recyclable fraction of the waste is shown in

Table A6. These data show that the percentage of recyclable material in the residual waste decreased with increased recycling activity. The control group with no recycling activity showed the highest proportion (30.65%) of recyclables in the residue. The composting only group showed 29.58% recyclables in the residue. The recycling only group showed 24.85% recyclables, while the recycling and composting group showed 22.32% recyclables in the residual waste.

The assay of the recyclable content was similar for all four sample groups with the exception of the RC group which presented markedly less glass in the residual waste.

Table A1 Summary of material arisings, kg/hhld/wk

Material	Welsh figures	Control	Recycling only	Composting only	Recycling & composting
Paper and Card	4.02	2.73	2.97	3.05	2.83
Plastic Film	0.68	0.49	0.59	0.66	0.55
Dense Plastic	1.04	0.84	1.14	0.81	0.94
Textiles	0.41	0.15	0.20	0.00	0.10
Miscellaneous Combustible	1.39	0.60	1.14	1.15	0.75
Non-Combustible	0.47	0.01	0.19	0.18	1.27
Glass	1.22	0.68	0.91	1.02	0.20
Ferrous Metals	0.61	0.32	0.26	0.23	0.20
Non-Ferrous Metals	0.18	0.14	0.22	0.13	0.08
Putrescibles	5.97	6.31	8.81	7.26	6.70
HHW	0.11	0.05	0.02	0.01	0.09
WEEE	0.12	0.02	0.04	0.02	0.15
Fines	0.77	0.09	0.21	0.16	0.16
Total, kg/hhld/wk	17.00	12.43	16.72	14.66	13.99

Figure A1 Summary of material arisings, kg/hhld/wk

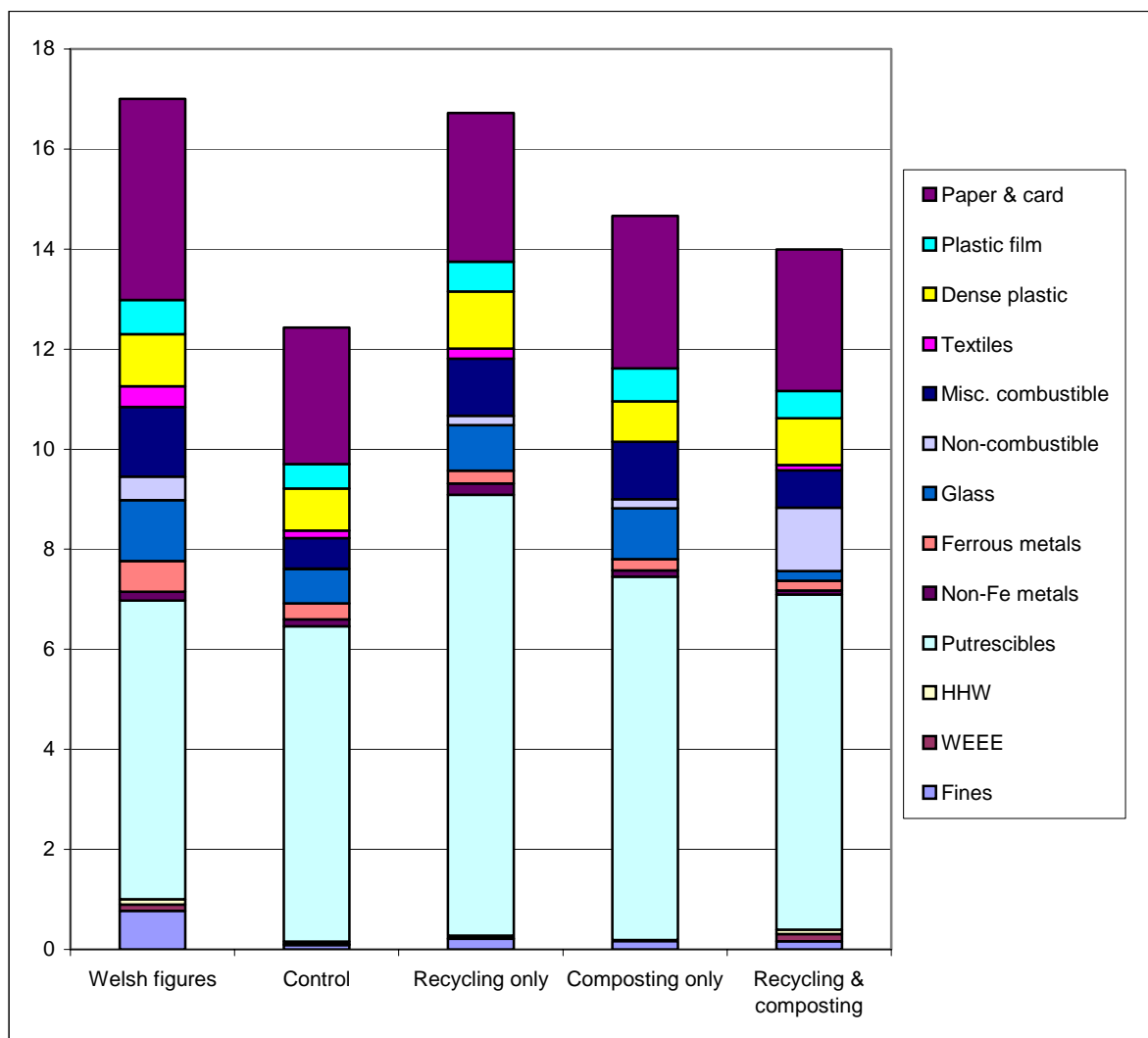


Table A2 Summary of waste assay, weight percent

Material	Welsh figures	Control	Recycling only	Composting only	Recycling & composting
Paper and Card	23.63	21.97	17.77	20.77	20.21
Plastic Film	4.01	3.92	3.55	4.51	3.92
Dense Plastic	6.14	6.78	6.83	5.51	6.68
Textiles	2.42	1.21	1.20	0.00	0.73
Miscellaneous Combustible	8.20	4.86	6.84	7.84	5.33
Non-Combustible	2.77	0.11	1.13	1.23	9.06
Glass	7.15	5.48	5.45	6.95	1.40
Ferrous Metals	3.60	2.59	1.54	1.53	1.41
Non-Ferrous Metals	1.04	1.09	1.33	0.86	0.56
Putrescibles	35.12	50.72	52.72	49.51	47.88
HHW	0.62	0.38	0.10	0.08	0.62
WEEE	0.73	0.18	0.26	0.11	1.04
Fines	4.55	0.70	1.28	1.10	1.17
Total, wt %	100.00	100.00	100.00	100.00	100.00

Figure A2 Summary of waste assay, weight percent

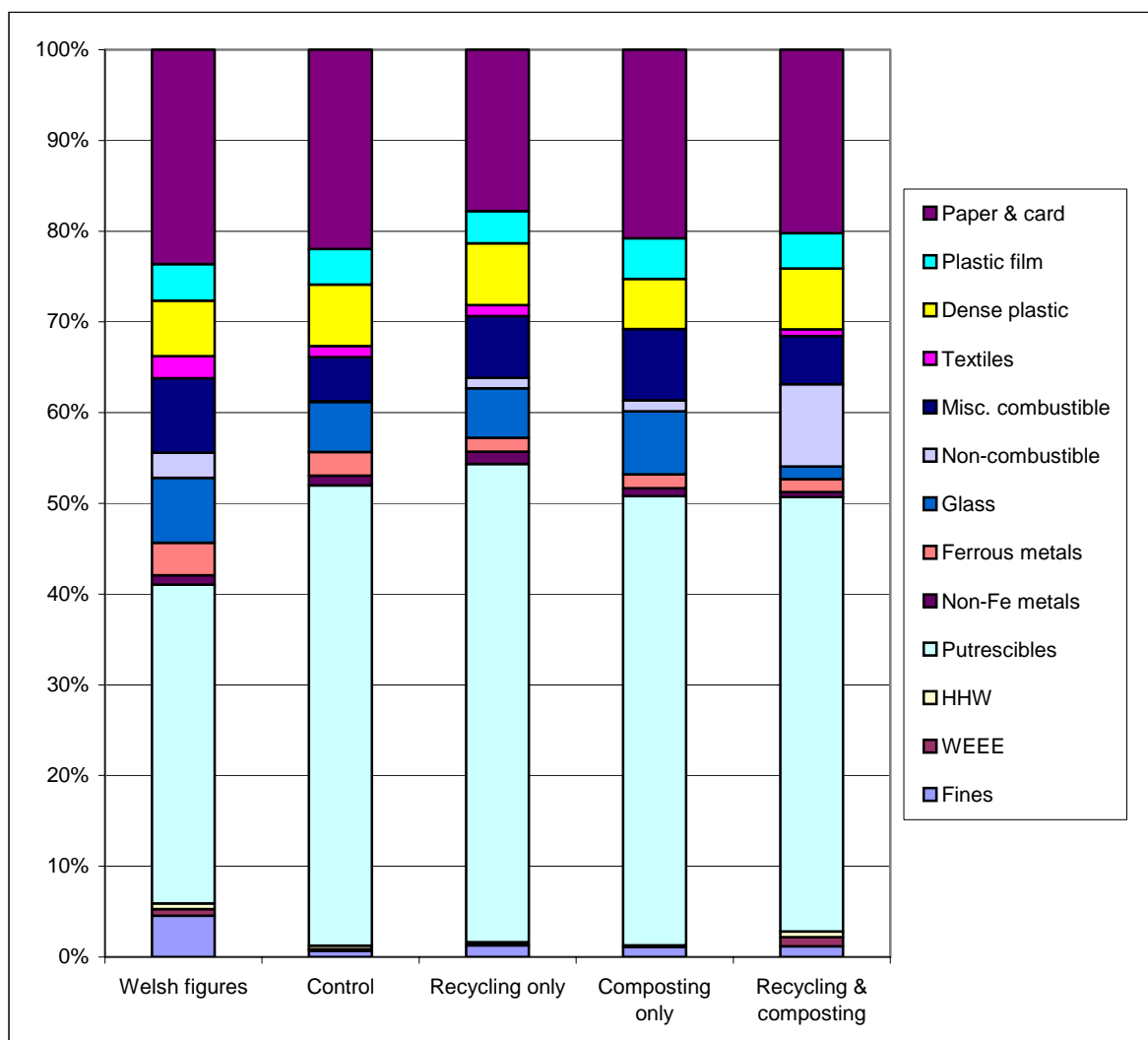


Table A3 Material arisings - putrescibles, kg/hhld/wk

	Control	Recycling only	Composting only	Recycling & composting
Kitchen compostables	1.59	2.20	1.28	1.07
Kitchen non-compostables	1.56	1.99	1.33	1.10
Liquids	0.21	0.17	0.01	0.46
Garden waste	2.38	3.66	4.59	3.72
Other putrescibles	0.57	0.81	0.05	0.35
kg/hhld/wk	6.31	8.81	7.26	6.70

Figure A3 Material arisings - putrescibles, kg/hhld/wk

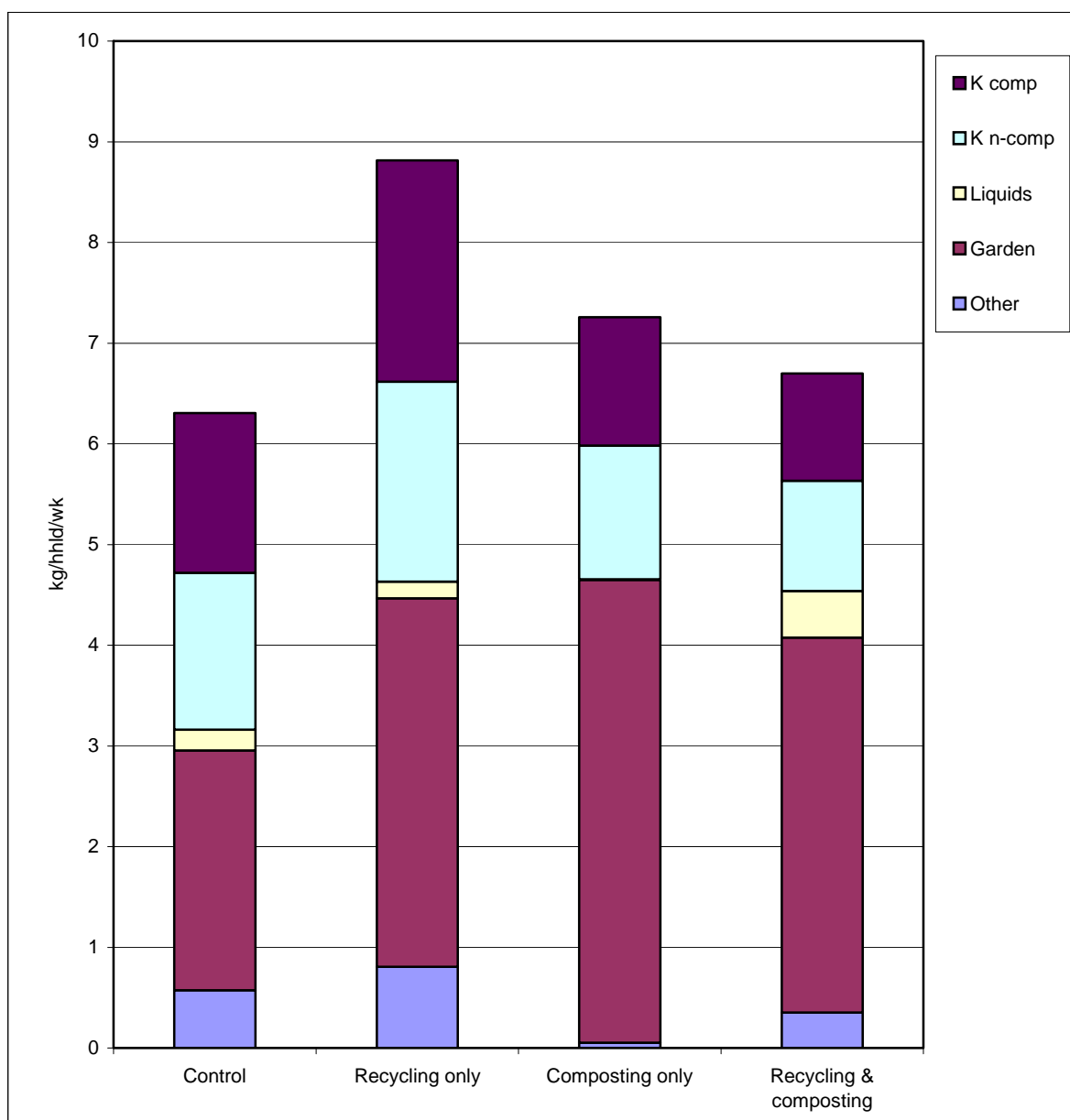


Table A4 Material distribution - putrescibles, wt % of arisings

	Control	Recycling only	Composting only	Recycling & composting
Kitchen compostables	12.77	13.15	8.70	7.61
Kitchen non-compostables	12.52	11.87	9.05	7.84
Liquids	1.66	0.99	0.06	3.30
Garden waste	19.14	21.88	31.34	26.61
Other putrescibles	4.62	4.83	0.36	2.52
kg/hhd/wk	50.72	52.72	49.51	47.88

Figure A4 Material distribution - putrescibles, wt % of arisings

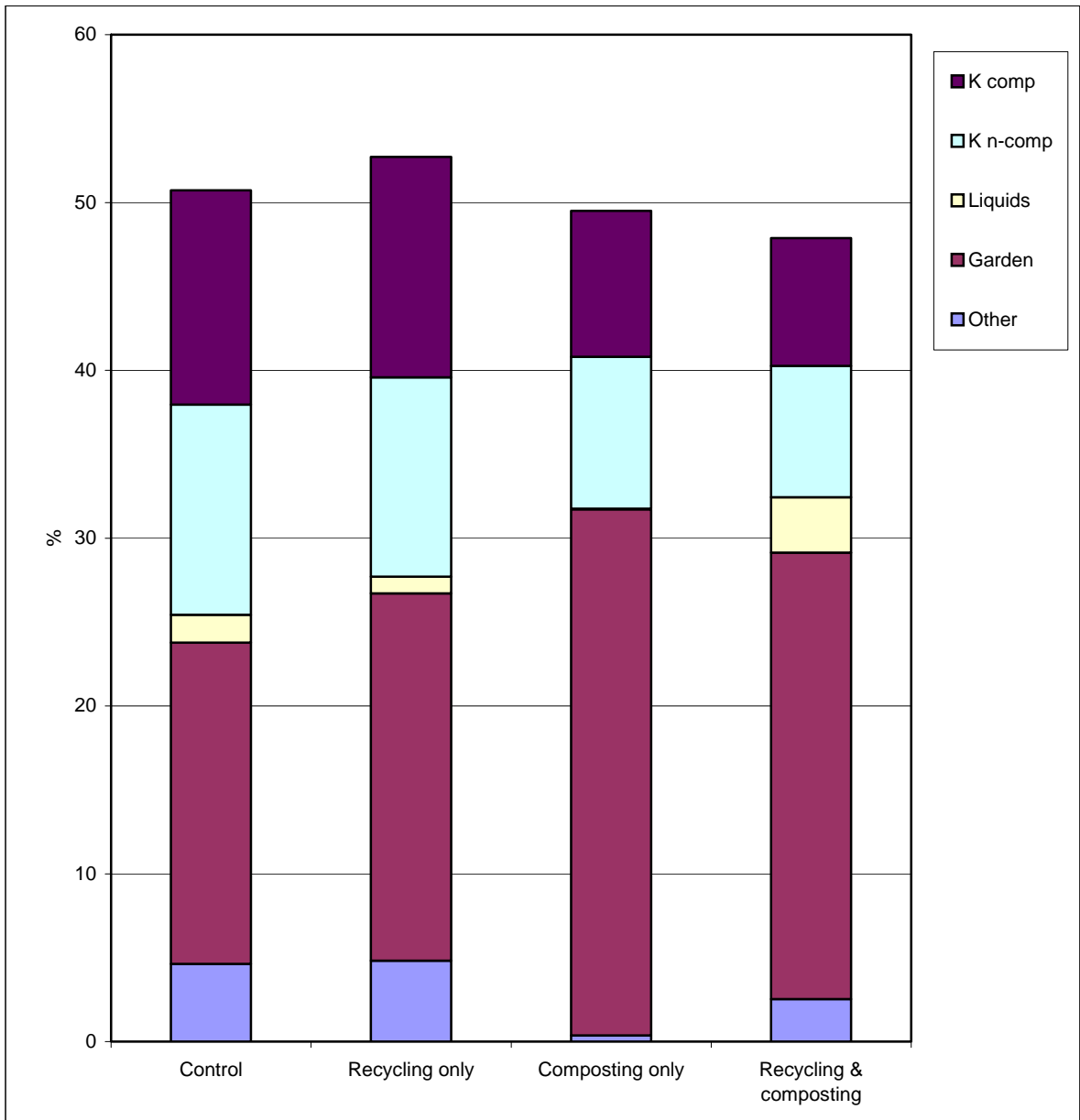


Table A5 Material arisings - recyclables in the residual waste, kg/hhld/wk

	Control	Recycling only	Composting only	Recycling & composting
Paper & card	2.37	2.57	2.61	2.29
Dense plastic	0.56	0.67	0.51	0.56
Glass	0.58	0.70	0.98	0.16
Fe metals	0.22	0.16	0.17	0.11
non-Fe metals	0.08	0.06	0.06	0.01
kg/hhld/wk	3.81	4.15	4.34	3.12

Figure A5 Material arisings - recyclables in the residual waste, kg/hhld/wk

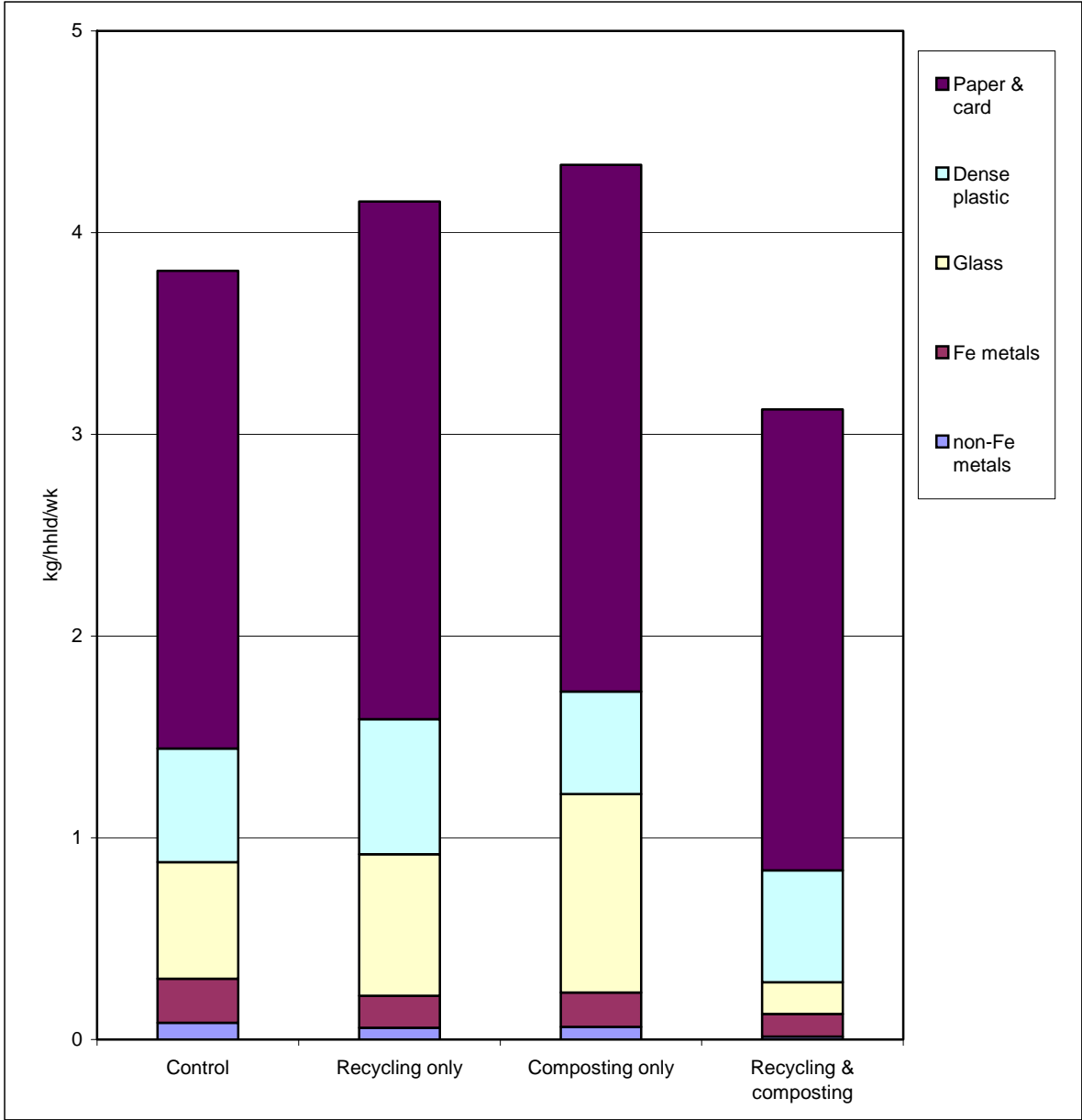
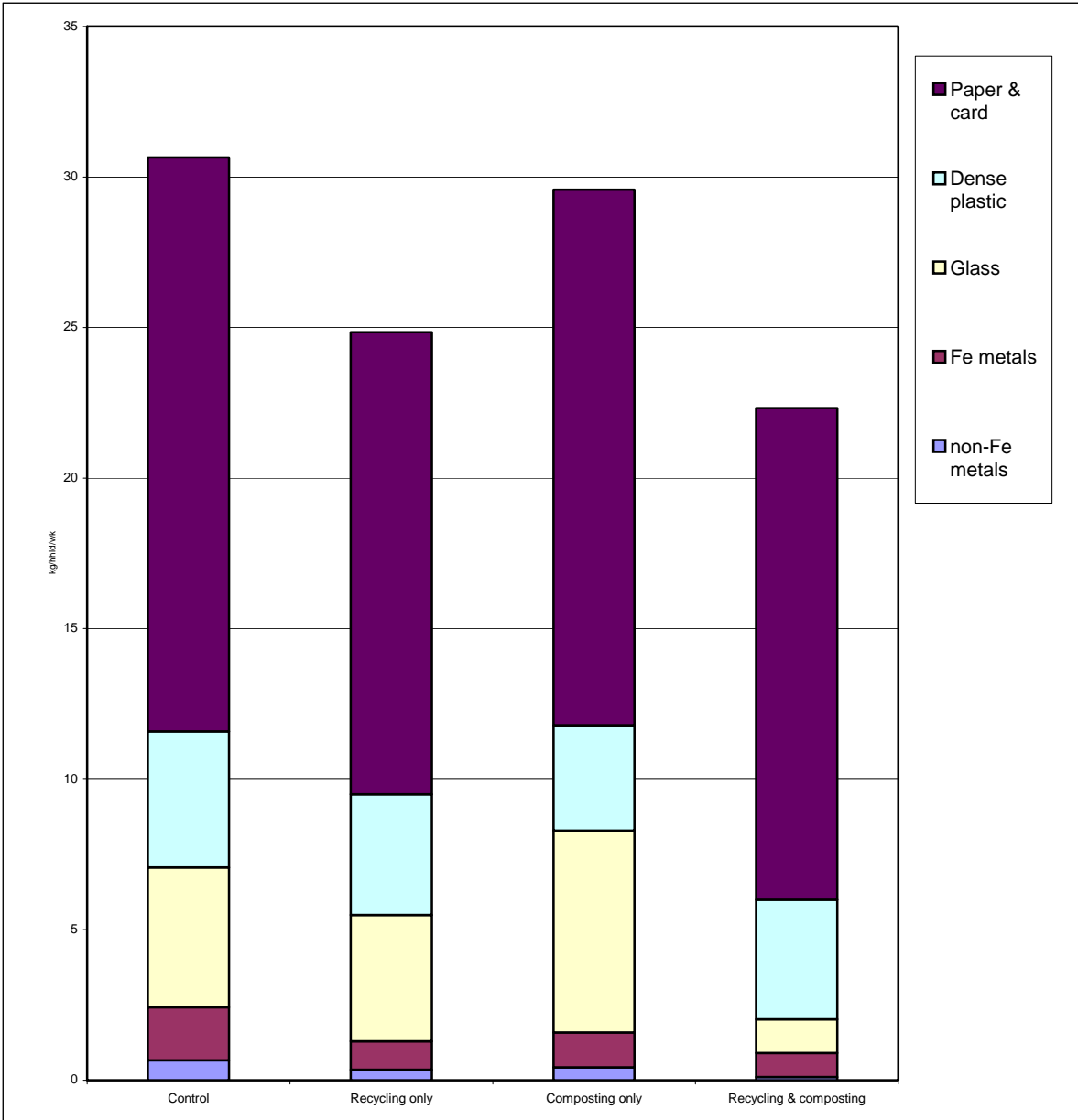


Table A6 Material distribution - recyclables, wt % of arisings

wt %	Control	Recycling only	Composting only	Recycling & composting
Paper & card	0.66	0.35	0.43	0.10
Dense plastic	1.76	0.95	1.16	0.81
Glass	4.64	4.20	6.71	1.12
Fe metals	4.53	4.01	3.47	3.97
non-Fe metals	19.05	15.35	17.81	16.33
Total wt %	30.65	24.85	29.58	22.32

Figure A6 Material distribution - recyclables, wt % of arisings



B. Autumn Waste Compositional Analysis

1. Samples collected

The majority of the residual waste samples were collected on the morning of Wednesday 10th November 2004 (round 3 and part of round 6), with 17 control samples collected on the morning of Thursday 11th November 2004 (part of round 6). The number of samples that were collected from each of the treatment groups are shown below:

Group	Code	No. of samples
Control	C	44
Recycling only	R	50
Recycling and composting	RC	48

2. Summary of results

2.1 Arisings

Waste arising at each of the sample sites is summarised as kg/hhld/wk are shown in Table A1.

The average amount of refuse arising in the recycling & composting area was low at 10.78 kg/hhld/wk. Other average waste arisings were 15.38 and 15.09 kg/hhld/wk in the control and the recycling only (C, R) groups respectively. Arisings appear to decrease with increased recycling and composting activity. However, the overall composition of the residual waste from each group is similar, see

Figure A2.

2.2 Assay

The summary assays for the household waste arising in each of the groups are illustrated in

Figure A2. These results show a consistency in the composition of residual waste arising in each of the sample groups. The main differences were the lower proportion of non-combustible material and putrescible material arising in the control group.

The proportion of glass present in the residual waste appears to decrease with increased recycling and composting activity. The R sample showed a lower percentage content of glass than the C sample (4% vs. 6%), with the RC sample showed the lowest proportion of glass present, 2.6%.

2.3 Putrescibles

The average arisings for putrescibles in the residual waste are shown in Table A3 and illustrated in

Figure A3.

2.4 Recyclables

The average arisings of recyclables in the residual waste are shown in Table A5 and illustrated in Figure A5.

The composition of the recyclable fraction of the waste is shown in

Table **A6**. These data show that the percentage of recyclable material in the residual waste decreased with increased recycling activity. The Control group with no recycling activity showed the highest proportion (35.35%) of recyclables in the residue. The Recycling only group showed 25.48% recyclables, while the Recycling & composting group showed 21.91% recyclables in the residual waste. The assay of the recyclable content was similar for all three sample groups.

Table B7 Summary of material arisings, kg/hhld/wk

Material	Control	Recycling only	Recycling & composting
Paper and Card	4.07	3.21	2.13
Plastic Film	0.50	0.55	0.43
Dense Plastic	0.96	0.91	0.75
Textiles	0.37	0.18	0.23
Miscellaneous Combustible	1.40	1.30	1.06
Non-Combustible	0.08	0.38	0.24
Glass	0.95	0.61	0.29
Ferrous Metals	0.41	0.33	0.18
Non-Ferrous Metals	0.17	0.16	0.06
Putrescibles	5.82	7.26	5.00
HHW	0.24	0.05	0.06
WEEE	0.24	0.01	0.17
Fines	0.17	0.14	0.17
Total, kg/hhld/wk	15.38	15.09	10.78

Figure B7 Summary of material arisings, kg/hhld/wk

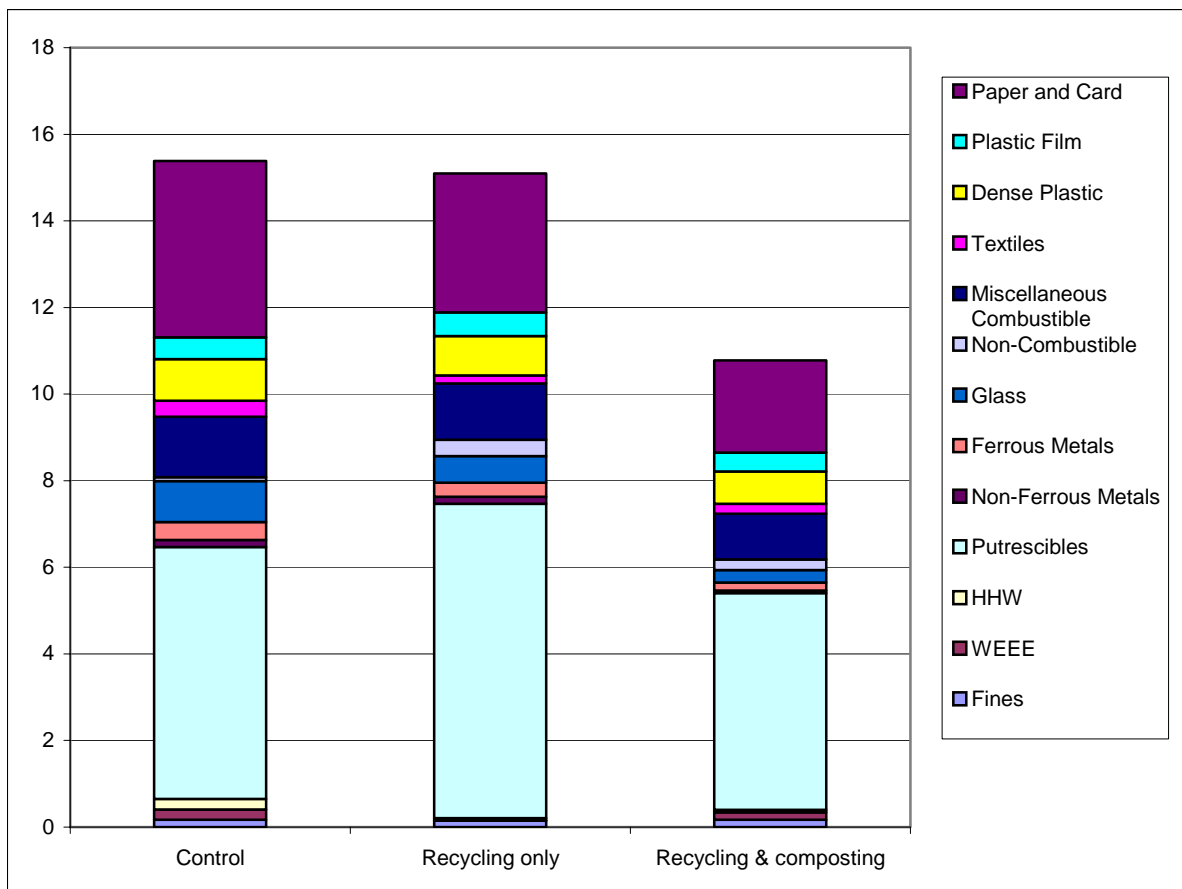


Table B8 Summary of waste assay, weight percent

Material	Control	Recycling only	Recycling & composting
Paper and Card	26.48	21.24	19.74
Plastic Film	3.26	3.62	4.02
Dense Plastic	6.24	6.06	6.96
Textiles	2.43	1.21	2.10
Miscellaneous Combustible	9.08	8.62	9.85
Non-Combustible	0.55	2.51	2.25
Glass	6.18	4.02	2.69
Ferrous Metals	2.66	2.19	1.71
Non-Ferrous Metals	1.09	1.07	0.55
Putrescibles	37.81	48.09	46.45
HHW	1.57	0.32	0.54
WEEE	1.54	0.09	1.59
Fines	1.12	0.96	1.56
Total, wt %	100.00	100.00	100.00

Figure B8 Summary of waste assay, weight percent

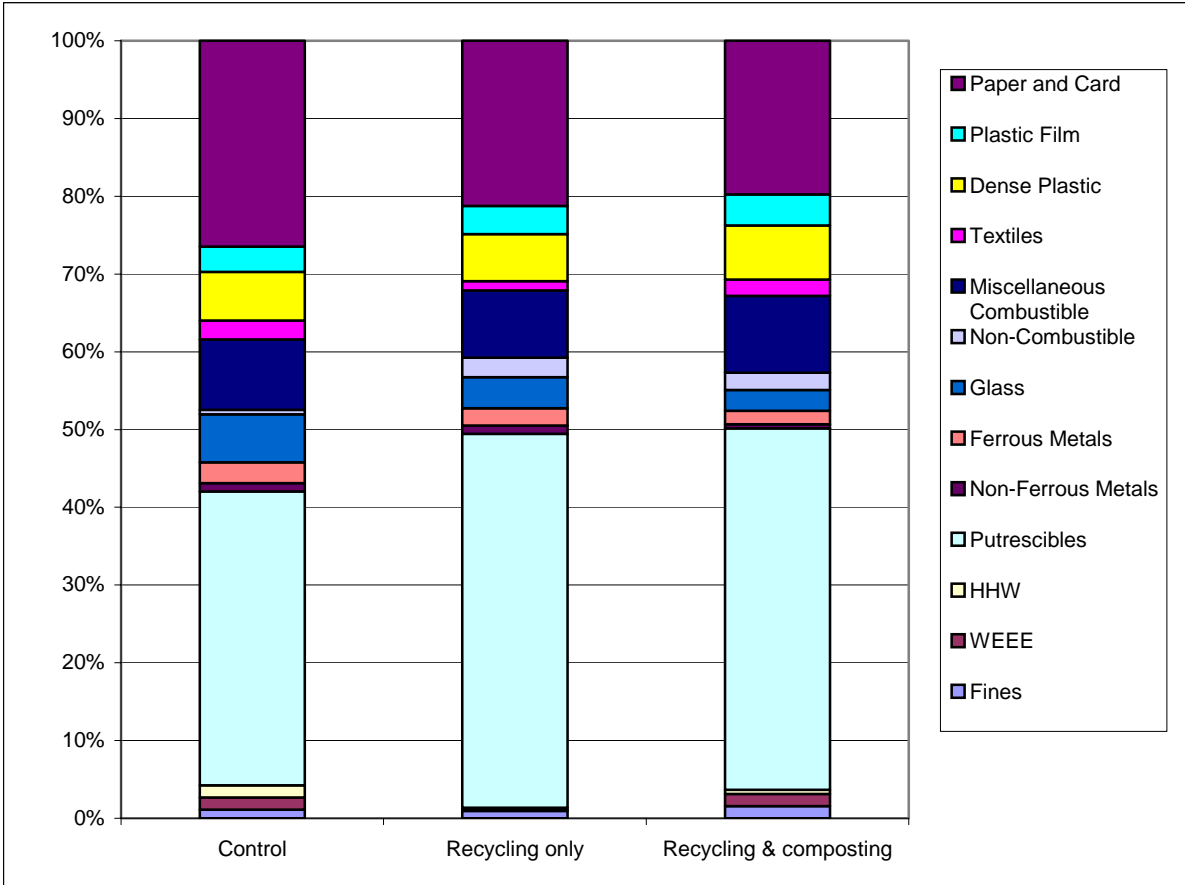


Table B9 Material arisings - putrescibles, kg/hhld/wk

	Control	Recycling only	Recycling & composting
Kitchen compostables	1.77	2.03	1.34
Kitchen non-compostables	2.17	2.22	1.21
Liquids	0.15	0.18	0.01
Garden waste	1.60	2.05	2.31
Other putrescibles	0.12	0.79	0.14
kg/hhld/wk	5.82	7.26	5.00

Figure B9 Material arisings - putrescibles, kg/hhld/wk

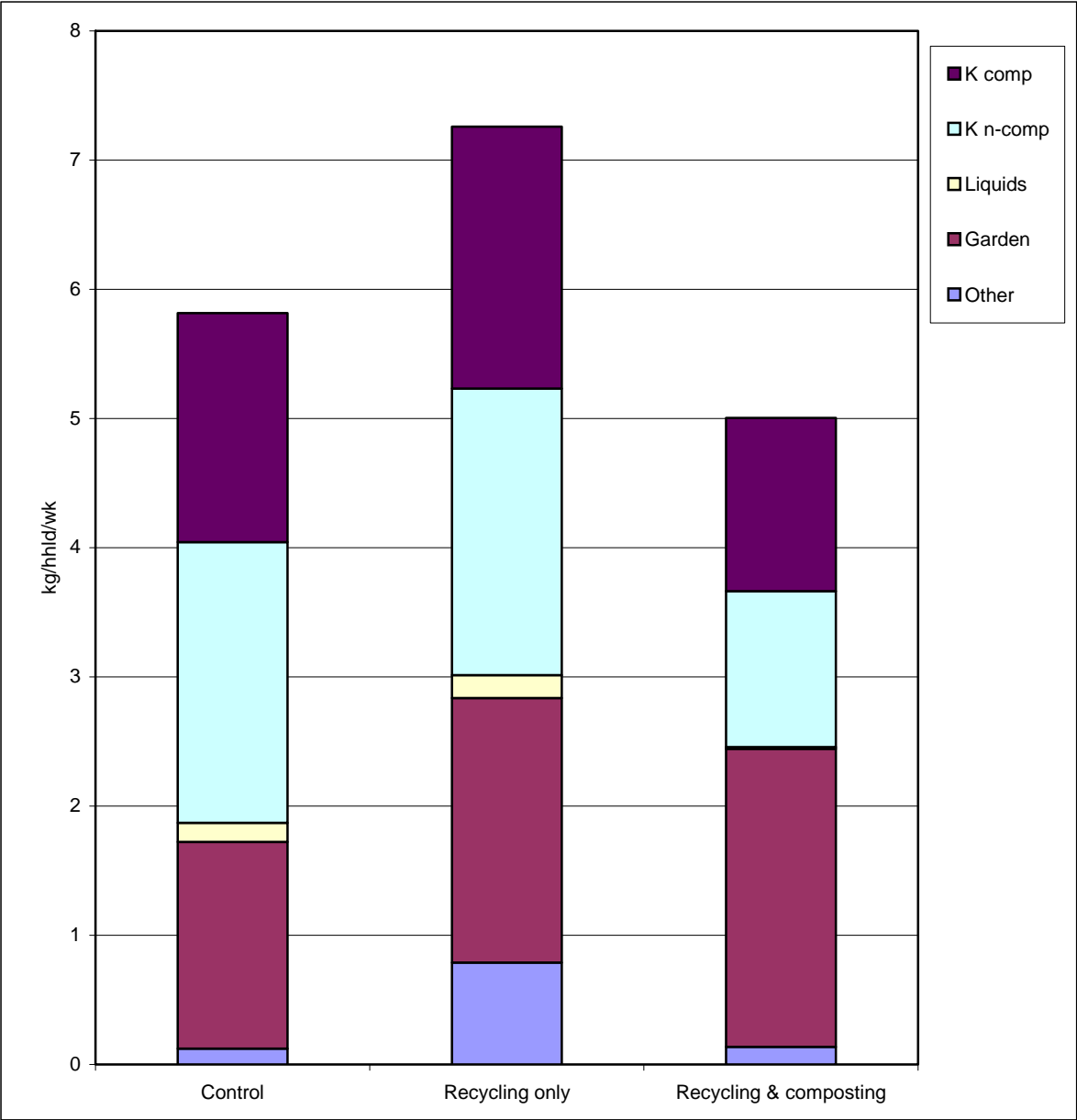


Table B10 Material distribution - putrescibles, wt % of arisings

	Control	Recycling only	Recycling & composting
Kitchen compostables	12.77	13.15	7.61
Kitchen non-compostables	12.52	11.87	7.84
Liquids	1.66	0.99	3.30
Garden waste	19.14	21.88	26.61
Other putrescibles	4.62	4.83	2.52
wt %	50.72	52.72	47.88

Figure B10 Material distribution - putrescibles, wt % of arisings

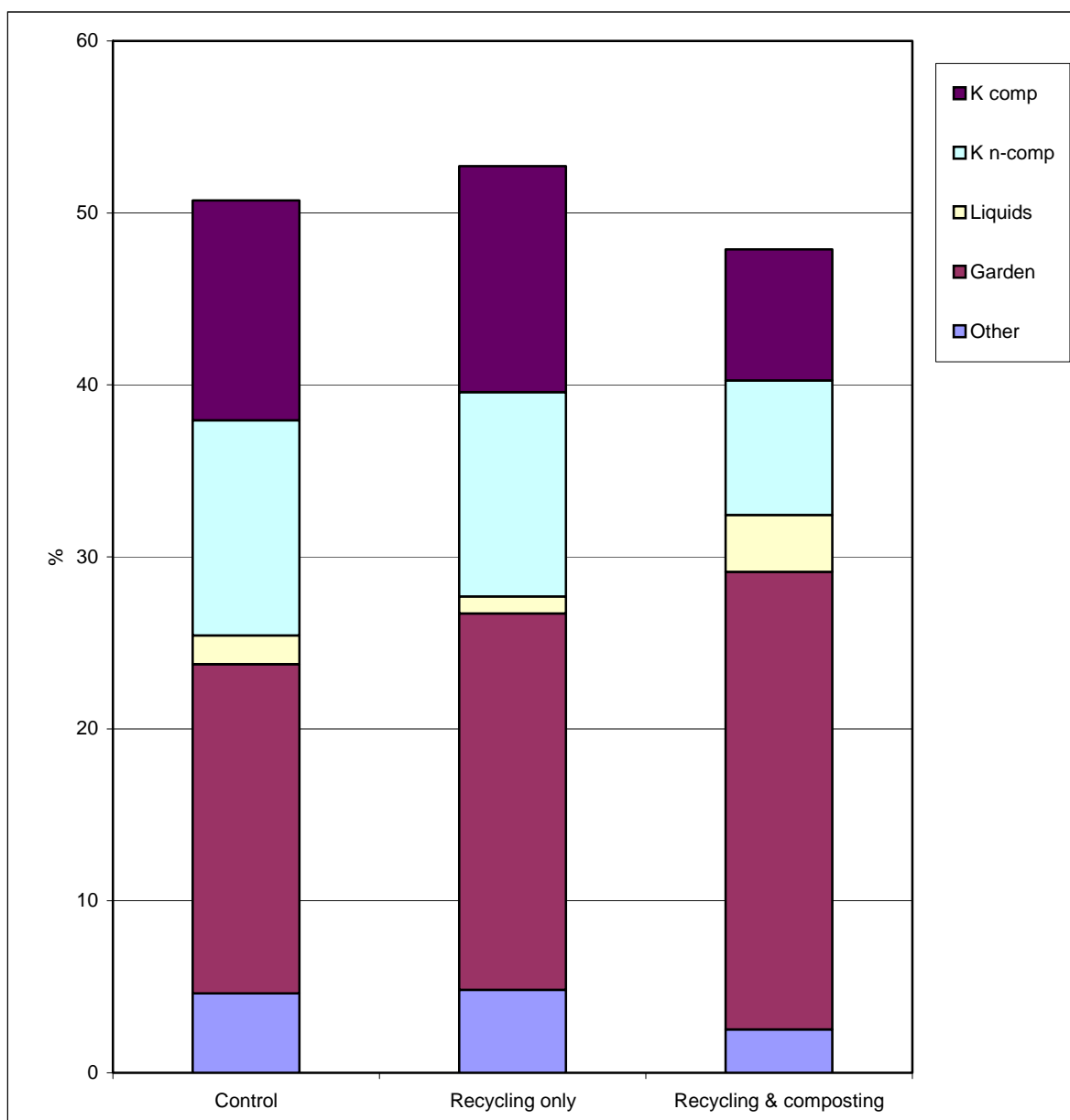


Table B11 Material arisings - recyclables in the residual waste, kg/hhld/wk

	Control	Recycling only	Recycling & composting
Paper & card	3.52	2.56	1.64
Dense plastic	0.64	0.55	0.46
Glass	0.90	0.50	0.20
Fe metals	0.27	0.21	0.06
non-Fe metals	0.10	0.02	0.01
kg/hhld/wk	5.44	3.85	2.36

Figure B11 Material arisings - recyclables in the residual waste, kg/hhld/wk

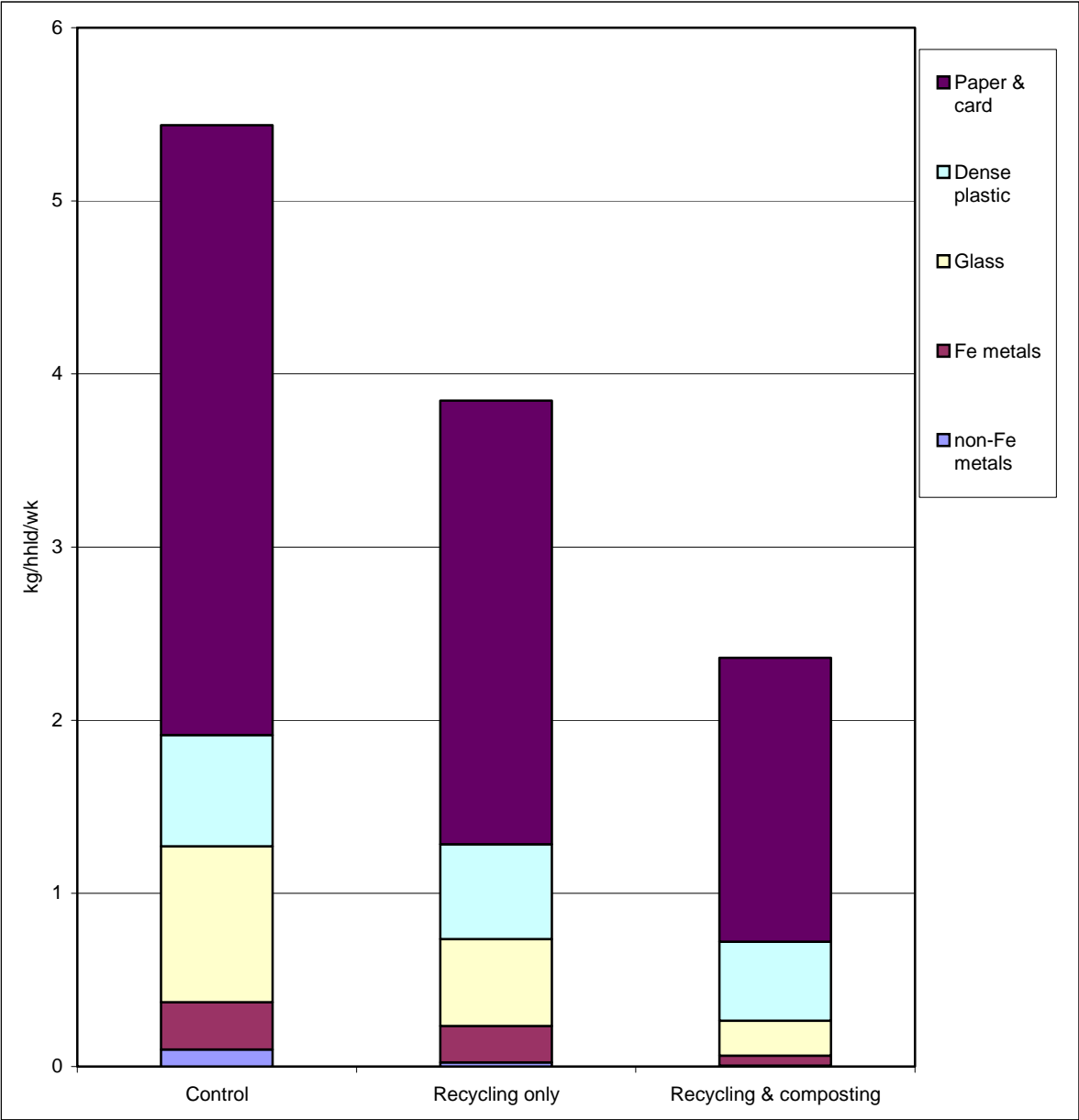
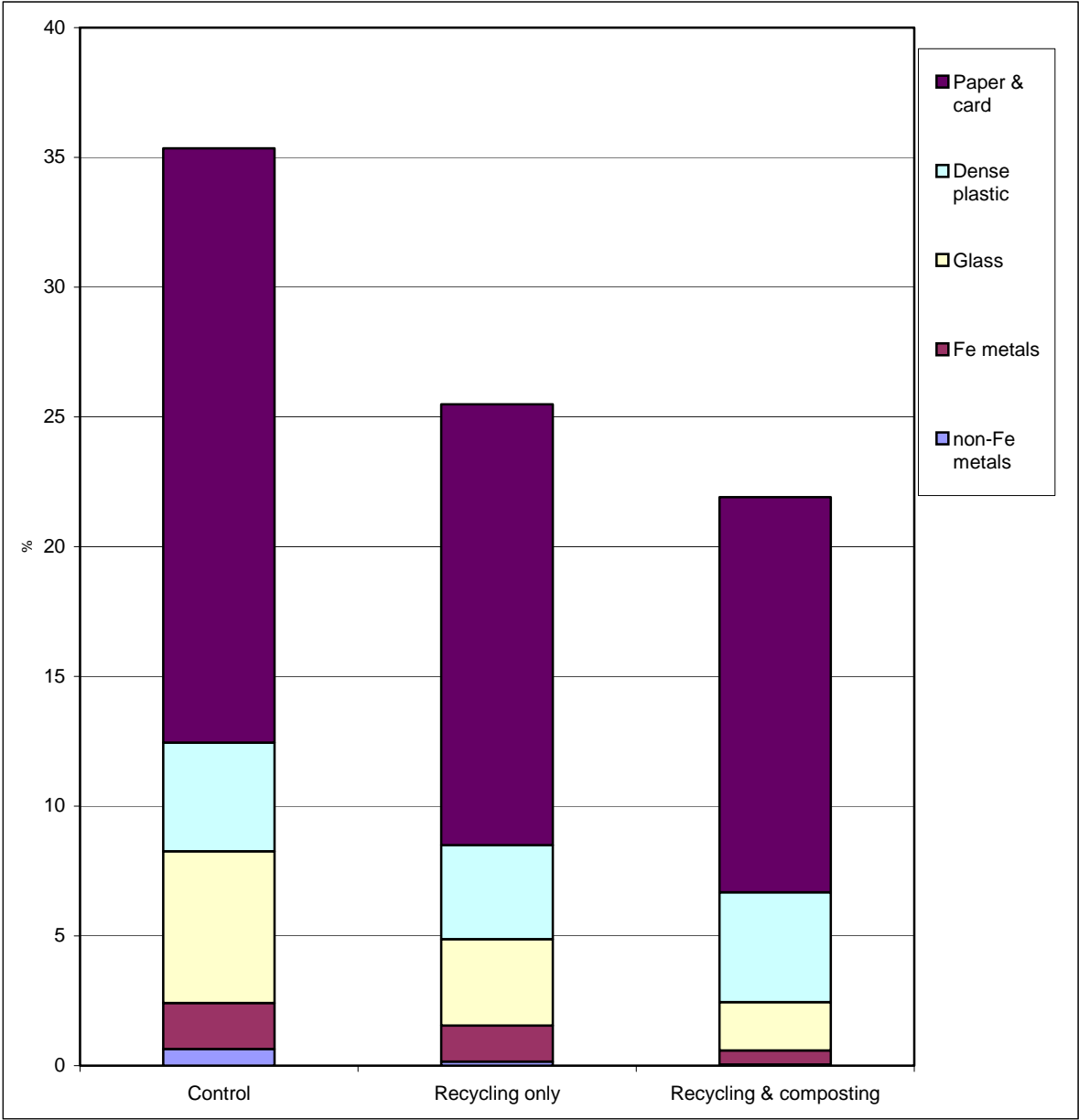


Table B12 Material distribution - recyclables, wt % of arisings

wt %	Control	Recycling only	Recycling & composting
Paper & card	0.64	0.16	0.05
Dense plastic	1.77	1.39	0.54
Glass	5.85	3.33	1.87
Fe metals	4.18	3.63	4.23
non-Fe metals	22.90	16.98	15.23
Total wt %	35.35	25.48	21.91

Figure B12 Material distribution - recyclables, wt % of arisings



References

1. AEA Technology, M.E.L, Waste Research Ltd and WRc, (2003) The composition of municipal solid waste in Wales. AEAT/ENV/R/1626.