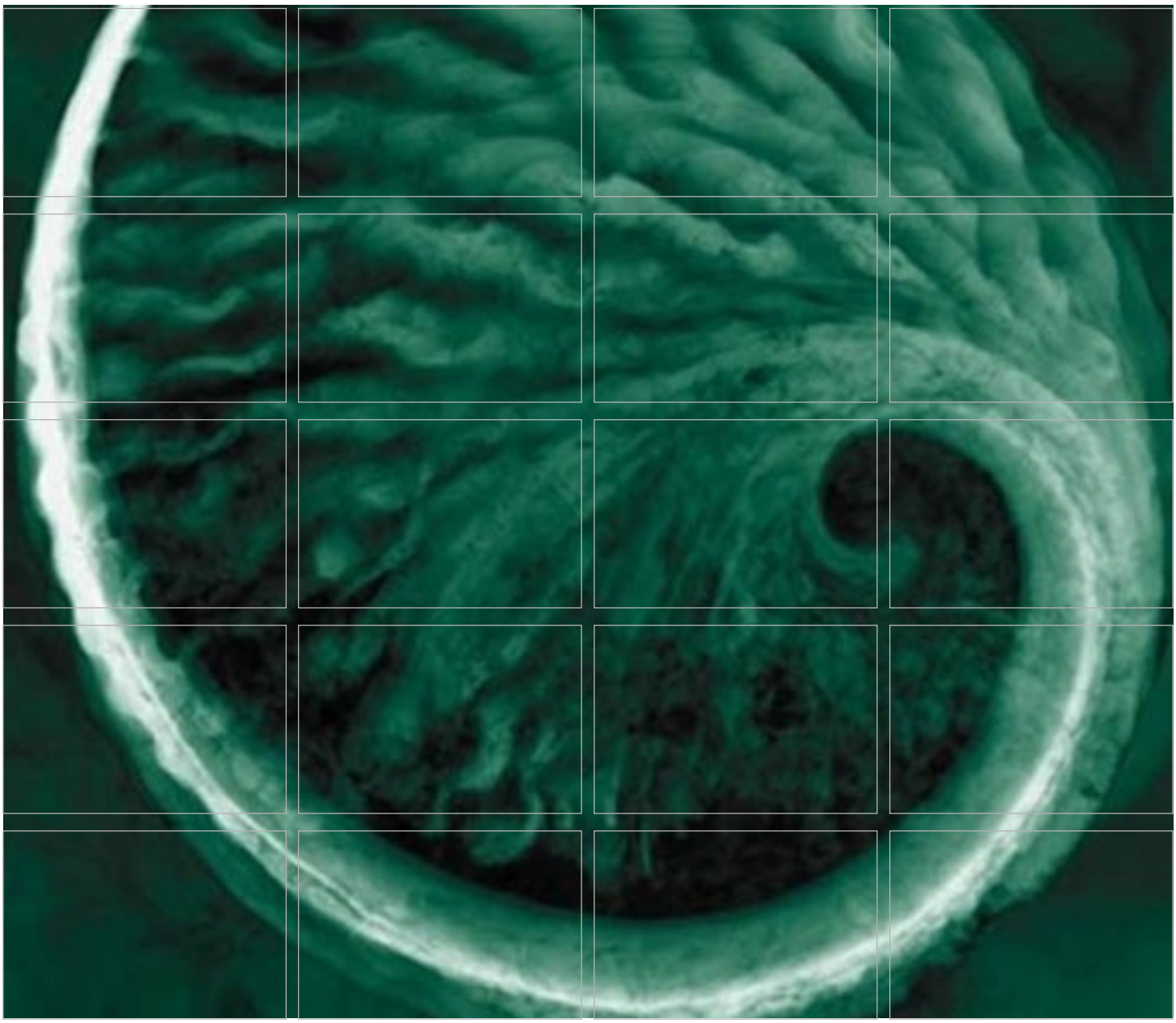

Weightings Assessment for Recycling & Composting and Residual Waste Options

Annex 6

Report

March 2006

Kent Waste Partnership

Weighting Assessment for Recycling & Composting and Residual Waste Options

March 2006

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1 INTRODUCTION

1.1 THE NEED TO WEIGHT CRITERIA

A matrix that presents the performance of each option against each criterion is valuable, but is also complex, at least in part because each criterion is measured in different units. In addition, each option is likely to have different advantages and disadvantages, and it is not possible simply to use the performance data of the options to identify a preferred option.

'Valuing' the performance of each option against the assessment criteria simplifies the performance data, and reports each criterion in terms of the common index of 'value'. Value could be measured on any scale, but is often reported on a scale of from 0, where the option that scores lowest offers the worst performance, or zero value against that particular objective or criterion, to 1, where the option offers the best performance, or the maximum value against that objective or criterion.

Valuing the data results in a matrix where all performance scores are reported as a number between 0 and 1, and where the best and worst performers against the criteria, both separately and on aggregate, stand out more clearly. However, identifying the option or options that perform best overall requires that the relative significance of the assessment criteria is taken into account. An option that performs poorly against many criteria may still be preferred if it is the best performer against a single criterion that is recognised as being of special importance.

Establishing the relative significance of the criteria allows the valued performance data (1) to be weighted and the option or options that offer most value overall to be identified.

1.2 DERIVING WEIGHT SETS

There is not a wide literature on generic weight sets, and, in any case, these may not be appropriate to apply in the circumstances pertaining in Kent. It is more important to incorporate the opinions of local stakeholders in deriving a weight set suitable for Kent. The relative significance accorded any criterion is likely to vary from area to area according to local priorities and objectives. For example, an authority with very low employment may feel that a waste management option that provides a significant increase in potential jobs delivers against an important objective, and that this should be recognised in the weighting applied to the assessment criteria. Other authorities may feel that employment is a relatively insignificant objective compared with their key priorities, and would allocate a lower weight.

(1) First Report of the Royal Commission on Environmental Pollution, 1971

To derive a weight set specific for Kent, the opinions of key stakeholders were sought. In March 2006, an interactive workshop was held with members of the Kent Waste Open Forum (KWOF). Members of the KWOF include officers and elected Members from Kent County Council (KCC) and the constituent District and Borough Councils, and wider stakeholder representatives including:

- local community groups;
- the waste management industry; and,
- members of the general public.

2 WEIGHTING THE RESULTS FOR THE RESIDUAL OPTIONS

2.1 WEIGHT SETS FOR RESIDUAL OPTION PERFORMANCE EVALUATION

Then weight set derived from the KWOF for the residual waste options is provided in *Table 2.1* below. For information, the table also shows the breakdown of the specific preferences for officers, elected Members and the wider stakeholder network.

Table 2.1 Weight Sets for Residual Options

Criterion	Kent Waste Open Forum (KWOF) Weight Set	Members Weight Set	Officers Weight Set	Wider Stakeholders Weight Set
Depletion of Resources	**0.09**	0.08	0.09	0.09
Air Acidification	**0.08**	0.10	0.08	0.07
Greenhouse Gas Emissions	**0.10**	0.10	0.09	0.09
Health Impacts	**0.06**	0.07	0.06	0.06
Energy Consumption	**0.09**	0.09	0.08	0.09
Total Road Kilometres	**0.08**	0.07	0.08	0.08
Employment Opportunities	**0.04**	0.04	0.04	0.04
Compliance with Waste Policy	**0.09**	0.08	0.10	0.09
Liability of End Product	**0.07**	0.07	0.08	0.07
Deliverability and Risk	**0.08**	0.08	0.09	0.08
Financial Cost	**0.06**	0.06	0.06	0.06
Land Use Impacts	**0.08**	0.09	0.07	0.08
Water Pollution	**0.08**	0.09	0.07	0.08

The options developed for residual waste are shown in *Table 2.2* below.

Table 2.2 Residual Waste Options

Option	Description
1	New Energy from Waste facility in East Kent
2	Expand current contracted capacity at Allington EfW
3	MBT plant in East Kent providing RDF to Allington EfW
4	MBT plant in East Kent stabilising material to landfill
5	Autoclave in East Kent with 'fluff' to Allington EfW
6	Gasification plant in East Kent
7	Anaerobic Digestion (AD) facility in East Kent
8	In vessel composting facilities across Kent for Garden and Kitchen Waste

Table 2.3 - *Table 2.6* below show the impact of applying the KWOF weight set to the valued results. The total weighted scores are the result of multiplying the value each option offers against each criterion by the weight accorded that criterion, and totalling for all criteria. The options are then ranked, with the best performing option given a rank 1. The final row of the table 'values' the total weighted scores, showing how close the options are to one another, preserving the cardinal nature of the data, as opposed to the ordinal ranks.

Table 2.3 Total Weighted Value Performance Using the Kent Waste Open Forum Weight Set

	Option							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Total Weighted Scores	0.48	0.54	0.43	0.36	0.49	0.47	0.76	0.42
Rank	4	2	6	8	3	5	1	7
Value	0.30	0.46	0.18	0.00	0.33	0.28	1.00	0.15

The table above shows the total weighted value performance of the residual options using the weight set derived at the KWOF. Option7 performs well. This is due to the considerable environmental benefit given to the plastic recycling at the pre-treatment stage of the AD process and the subsequent large proportion of weight given to the environmental criteria. Option 2 also performs well. Options 3, 4 and 8 perform poorly in the majority of the environmental criteria and so although may perform well in some of the social and risk criteria, do not perform well over all.

2.2 SENSITIVITY OF DIFFERENT WEIGHT SETS

To test the sensitivity of the results reported in *Table 2.3*, the individual weight sets from each stakeholder group have been applied and are given in the tables below. The tables show that, whichever weight set is applied, options 2 & 7 still perform strongly. When the officer weight set is applied, option 1 moves into 3rd position. This is because of the increased weight the officers give to deliverability and liability of end product.

Table 2.4 Total Weighted Value Performance for Kent Using the Members' Weight Set

	Option							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Total Weighted Scores	0.47	0.54	0.43	0.36	0.50	0.47	0.76	0.41
Rank	5	2	6	8	3	4	1	7
Value	0.27	0.45	0.19	0.00	0.36	0.28	1.00	0.13

Table 2.5 ***Total Weighted Value Performance for Kent Using the Officers' Weight Set***

	Option							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Total Weighted Scores	0.49	0.55	0.42	0.37	0.49	0.47	0.77	0.42
Rank	3	2	6	8	4	5	1	7
Value	0.30	0.45	0.14	0.00	0.30	0.27	1.00	0.13

Table 2.6 ***Total Weighted Value Performance for Kent Using the Wider Stakeholder Weight Set***

	Option							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Total Weighted Scores	0.48	0.54	0.43	0.36	0.49	0.47	0.75	0.42
Rank	4	2	6	8	3	5	1	7
Value	0.31	0.48	0.20	0.00	0.35	0.28	1.00	0.17

2.3 SENSITIVITY ANALYSIS OF ANAEROBIC DIGESTION FACILITY

2.3.1 The Need for Sensitivity Analysis

The results of the options appraisal showed that option 7, the commissioning of an anaerobic digestion (AD) plant to serve East Kent, performed favourably against a number of criteria, specifically those dealing with environmental performance. In the subsequent weighting step, significant weight was allocated to these environmental criteria and, as such, option 7 was found to out-perform other residual treatment options overall.

2.3.2 Weighting the Sensitivity Results

In an identical way to the original assessment, valued performance results were weighted to identify the option or options that offer most value overall.

Table 2.3 - *Table 2.6* show the impact of applying the Kent Waste Open Forum weight set and alternative weight sets to the valued results.

Table 2.7 ***Total Weighted Value Performance Using the Kent Waste Open Forum Weight Set***

	Option							
	1	**2**	**3**	**4**	**5**	**6**	**7a**	**8**
Total Weighted Scores	0.58	0.60	0.48	0.37	0.53	0.62	0.56	0.45
Rank	3	2	6	8	5	1	4	7

	Option							
Value	0.84	0.92	0.45	0.00	0.65	1.00	0.76	0.32

Table 2.8 Total Weighted Value Performance for Kent Using the Members' Weight Set

	Option							
	1	**2**	**3**	**4**	**5**	**6**	**7a**	**8**
Total Weighted Scores	0.57	0.59	0.48	0.37	0.54	0.62	0.57	0.44
Rank	3	2	6	8	5	1	4	7
Value	0.78	0.88	0.45	0.00	0.68	1.00	0.78	0.28

Table 2.9 Total Weighted Value Performance for Kent Using the Officers' Weight Set

	Option							
	1	**2**	**3**	**4**	**5**	**6**	**7a**	**8**
Total Weighted Scores	0.59	0.60	0.48	0.37	0.52	0.62	0.57	0.44
Rank	3	2	6	8	5	1	4	7
Value	0.87	0.93	0.41	0.00	0.59	1.00	0.79	0.28

Table 2.10 Total Weighted Value Performance for Kent Using the Wider Stakeholder Weight Set

	Option							
	1	**2**	**3**	**4**	**5**	**6**	**7a**	**8**
Total Weighted Scores	0.58	0.60	0.48	0.36	0.53	0.61	0.55	0.45
Rank	3	2	6	8	5	1	4	7
Value	0.85	0.93	0.46	0.00	0.67	1.00	0.74	0.36

The results of weighting also show that overall options appraisal results are sensitive to the inclusion of a pre-sorting process for plastics during anaerobic digestion. Option 7a performs considerably less well than the original option 7. If plastics separated from the anaerobic digestion process are unsuitable for recycling, alternative treatment options, such as gasification (option 6) and EfW (options 1 and 2) perform more favourably against the weighted assessment criteria.

3 RECYCLING AND COMPOSTING WEIGHT SETS

3.1 WEIGHT SETS FOR RECYCLING AND COMPOSTING OPTIONS

Then weight set derived from the KWOF, for the recycling and composting options is provided in *Table 3.1* below. For information, the table also shows the breakdown of the specific preferences for officers, elected Members and the wider stakeholder network.

Table 3.1 Weight Sets for Recycling and Composting Options

Criterion	Kent Waste Open Forum (KWOF) Weight Set	Members Weight Set	Officers Weight Set	Wider Stakeholders Weight Set
Depletion of Resources	**0.10**	0.09	0.10	0.10
Air Acidification	**0.09**	0.11	0.08	0.08
Greenhouse Gas Emissions	**0.11**	0.11	0.10	0.10
Health Impacts	**0.06**	0.07	0.06	0.06
Energy Consumption	**0.10**	0.10	0.09	0.10
Total Road Kilometres	**0.08**	0.07	0.07	0.08
Employment Opportunities	**0.04**	0.04	0.04	0.04
Compliance with Waste Policy	**0.10**	0.09	0.11	0.10
Liability of End Product	**0.08**	0.08	0.09	0.07
Deliverability and Risk	**0.09**	0.09	0.10	0.09
Financial Cost	**0.07**	0.07	0.07	0.07
Accessibility of Services	**0.09**	0.09	0.10	0.09

The options developed for recycling and composting are shown in *Table 3.2* below.

Table 3.2 Recycling and Composting Options

Option	Description
Option A	Raise participation and capture rates of current recycling collections to 80%.
Option B	Increase coverage of recycling and composting collections to 100% and increase participation and capture to 80%.
Option C	Expand glass collections to all households.
Option D	Introduce compostable kitchen waste collections to all households.
Option E	Expand garden waste collections to all relevant households.
Option F	Expand the current cardboard collections to all households.
Option G	Collect dense and film plastics from 100% of households.
Option H	Collect tins and cans from 100% of households.

Option	Description
Option I	Add kitchen and cardboard to current garden waste collections.
Option J	Collect commingled plastics and tins and cans from 100% of households.
Option K	Increase recycling at bring sites by 15%.
Option L	Increase recycling at bring sites by 20%.
Option M	Expand the range of bring sites to include dense and film plastics.
Option N	Increase recycling at the HWRCs to 60%.
Option O	Increase recycling at the HWRCs to 75%.

As noted in the recycling and composting appraisal report, it is envisaged that a combination of a number of these options be put forward, rather than just the 'best performer'.

To assess the financial costs of each of the options, it was necessary to identify four generic 'groups' of authorities. Certain options were not relevant for some of the groups as they were already undertaking that particular aspect of the scheme.

Table 3.3 - *Table 3.6* below show the impact of applying the KWOF weight set to the results obtained for the four groups. For Group A authorities, options O & M (increasing the emphasis of recycling at CA sites & bring facilities) perform strongly. Option D performs less well because it does not perform so well in the environmental criteria.

Table 3.3 Total Weighted Value Performance with Financial Cost Group A

	Option														
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**
Total Weighted Scores	0.52	-	0.32	0.23	-	-	-	-	0.33	-	0.25	0.27	0.56	0.41	0.57
Rank	3	-	6	9	-	-	-	-	5	-	8	7	2	4	1
Value	0.85	-	0.24	0.00	-	-	-	-	0.29	-	0.06	0.09	0.95	0.52	1.00

For Group B1, B2 and D, option B performs strongly. This is because more recycling is achieved through this option and brings with it the subsequent environmental benefits. Options D and E perform less well, this is because less environmental benefit is given to the recycling of biodegradable waste.

Table 3.4 Total Weighted Value Performance with Financial Cost Group B1

	Option														
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**
Total Weighted Scores	0.42	0.63	0.33	0.26	0.27	0.32	0.44	0.44	0.34	0.53	0.26	0.27	0.46	0.35	0.44
Rank	7	1	10	15	13	11	6	5	9	2	14	12	3	8	4
Value	0.44	1.00	0.19	0.00	0.03	0.16	0.48	0.49	0.22	0.72	0.02	0.03	0.54	0.25	0.50

Table 3.5 Total Weighted Value Performance with Financial Cost Group B2

	Option														
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**
Total Weighted Scores	0.43	0.63	0.29	0.27	0.27	0.32	0.44	0.44	0.34	0.53	0.27	0.27	0.46	0.35	0.44
Rank	7	1	11	13	14	10	6	5	9	2	15	12	3	8	4
Value	0.44	1.00	0.06	0.01	0.00	0.15	0.47	0.48	0.21	0.73	0.00	0.01	0.54	0.24	0.49

Table 3.6 Total Weighted Value Performance with Financial Cost Group D

	Option														
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**
Total Weighted Scores	0.46	0.55	-	0.35	0.36	0.41	-	0.51	0.39	0.53	0.35	0.36	0.39	0.42	0.50
Rank	5	1	-	13	11	7	-	3	9	2	12	10	8	6	4
Value	0.53	1.00	-	0.00	0.02	0.30	-	0.78	0.16	0.87	0.01	0.03	0.18	0.36	0.70

3.2 SENSITIVITY OF DIFFERENT WEIGHT SETS

To test the sensitivity of the results reported in the tables above the individual weight sets from each stakeholder group were applied.

Table 3.7 Sensitivity on Different Weight Sets - Group A

		Option														
		A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**
Member	Total Weighted Scores	0.53	-	0.30	0.22	-	-	-	-	0.32	-	0.23	0.25	0.56	0.40	0.57
	Rank	3	-	6	**9**	-	-	-	-	5	-	8	7	2	4	**1**
	Value	0.88	-	0.22	0.00	-	-	-	-	0.27	-	0.04	0.08	0.96	0.50	1.00
Officer	Total Weighted Scores	0.52	-	0.33	0.24	-	-	-	-	0.34	-	0.27	0.28	0.55	0.41	0.56
	Rank	3	-	6	**9**	-	-	-	-	5	-	8	7	2	4	**1**
	Value	0.87	-	0.27	0.00	-	-	-	-	0.31	-	0.08	0.11	0.95	0.53	1.00
Wider Stakeholder	Total Weighted Scores	0.51	-	0.31	0.24	-	-	-	-	0.33	-	0.25	0.26	0.55	0.41	0.57
	Rank	3	-	6	**9**	-	-	-	-	5	-	8	7	2	4	**1**
	Value	0.83	-	0.23	0.00	-	-	-	-	0.28	-	0.05	0.08	0.95	0.51	1.00

Table 3.8 Sensitivity of Different Weight Sets - Group B1

		Option														
		A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**
Member	Total Weighted Scores	0.41	0.65	0.30	0.24	0.24	0.29	0.41	0.43	0.31	0.51	0.24	0.24	0.44	0.33	0.42
	Rank	7	**1**	10	14	12	11	6	4	9	2	**15**	13	3	8	5
	Value	0.41	1.00	0.16	0.00	0.01	0.11	0.42	0.46	0.17	0.68	0.00	0.01	0.49	0.21	0.44
Officer	Total Weighted Scores	0.43	0.61	0.34	0.26	0.28	0.33	0.45	0.45	0.35	0.53	0.28	0.28	0.46	0.36	0.44
	Rank	7	**1**	10	**15**	13	11	5	4	9	2	14	12	3	8	6
	Value	0.47	1.00	0.22	0.00	0.04	0.20	0.52	0.53	0.25	0.76	0.03	0.05	0.56	0.27	0.52
Wider Stakeholder	Total Weighted Scores	0.42	0.63	0.33	0.26	0.27	0.31	0.44	0.44	0.34	0.52	0.26	0.27	0.46	0.35	0.44
	Rank	7	**1**	10	**15**	13	11	5	6	9	2	14	12	3	8	4
	Value	0.43	1.00	0.19	0.00	0.03	0.15	0.48	0.48	0.21	0.71	0.01	0.03	0.54	0.25	0.49

Table 3.9 Sensitivity Analysis of Different Weight Sets - Group B2

		Option														
		A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**
Member	Total Weighted Scores	0.41	0.64	0.28	0.25	0.25	0.29	0.41	0.43	0.31	0.52	0.24	0.25	0.44	0.33	0.42
	Rank	7	**1**	11	12	14	10	6	4	9	2	**15**	13	3	8	5
	Value	0.42	1.00	0.09	0.03	0.01	0.12	0.42	0.46	0.18	0.68	0.00	0.01	0.50	0.21	0.44
Officer	Total Weighted Scores	0.43	0.61	0.30	0.28	0.28	0.34	0.45	0.45	0.36	0.53	0.28	0.29	0.46	0.36	0.44
	Rank	7	**1**	11	13	**15**	10	5	4	9	2	14	12	3	8	6
	Value	0.47	1.00	0.07	0.01	0.00	0.18	0.51	0.52	0.23	0.77	0.00	0.02	0.56	0.25	0.50
Wider Stakeholder	Total Weighted Scores	0.42	0.63	0.29	0.27	0.27	0.32	0.44	0.44	0.34	0.53	0.27	0.27	0.47	0.35	0.44
	Rank	7	**1**	11	12	14	10	6	5	9	2	**15**	13	3	8	4
	Value	0.43	1.00	0.06	0.02	0.01	0.15	0.47	0.47	0.21	0.72	0.00	0.01	0.55	0.24	0.49

Table 3.10 Sensitivity Analysis of Different Weight Sets - Group D

		Option														
		A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**
Member	Total Weighted Scores	0.45	0.56	-	0.34	0.34	0.38	-	0.49	0.37	0.52	0.33	0.33	0.37	0.40	0.47
	Rank	5	**1**	-	10	11	7	-	3	8	2	**13**	12	9	6	4
	Value	0.50	1.00	-	0.03	0.03	0.22	-	0.71	0.17	0.79	0.00	0.01	0.17	0.30	0.60
Officer	Total Weighted Scores	0.46	0.55	-	0.35	0.36	0.42	-	0.51	0.39	0.53	0.36	0.36	0.40	0.43	0.49
	Rank	5	**1**	-	**13**	12	7	-	3	9	2	11	10	8	6	4
	Value	0.58	1.00	-	0.00	0.03	0.36	-	0.82	0.18	0.92	0.04	0.05	0.23	0.38	0.71
Wider Stakeholder	Total Weighted Scores	0.46	0.55	-	0.36	0.36	0.42	-	0.51	0.39	0.53	0.36	0.36	0.39	0.43	0.50
	Rank	5	**1**	-	12	10	7	-	3	8	2	**13**	11	9	6	4
	Value	0.53	1.00	-	0.00	0.02	0.30	-	0.79	0.16	0.87	0.00	0.01	0.15	0.36	0.73