Ricardo
Energy & Environment

Appendix 2 – Technology Evaluation Methodology

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1 Methodology

The overall aim of evaluating recycling and recovery technologies is to enable Birmingham City Council to be an informed customer in the future procurement of a waste management contract/s, and to provide the council with the technical information and necessary evidence base to aid future decision making.

This document presents a high level overview of the technologies identified in the foresighting exercise. Each technology which has been reviewed in the technology foresighting exercise has been considered against:

- cost,
- risks,
- community benefits,
- impact on operations, and
- carbon reduction potential

This appraisal, has been used to complete the evaluation matrix (Appendix 2).

The information outlined for each technology reviewed enables the identification of high level environmental, economic, social and operational/technical impacts of each of the technologies. Under each of these key areas, a set of indicators was developed and refined with stakeholders and the BCC project team. These indicators have been used to evaluate each technology by evaluating each indicator using a Red/Amber/Green (RAG) scoring system. Where possible, evaluation of each technology has been made as a comparison to the current way in which a particular waste is managed. The aim of the scoring exercise is to be able to compare the overall impacts of each technology and not to discriminate against options that are innovative, low cost or small scale (or are different in other ways from more standard options).

As at this stage we do not know the importance, or weighting, of each criteria therefore it is not intended that the scores are used to conclude the best or preferred technologies against each criteria. This will be dependent on the importance and weighting assigned given to individual impacts when they are eventually evaluated as a solution for a specified waste contract. However, the RAG review will present a powerful and visual overview of the likely environmental, economic, social and technical/operational impacts of each technology option.

The scoring has also been informed by the level of information captured on each criteria in our technology review. For example, where limited information is available on certain technologies, there are more unknowns and more assumptions have needed to be made.

Indicator:	
Not as good	
Similar	
Better	

If a technology is deemed to be better than the baseline for a specific criteria, a Green score has been applied. If the technology will be similar, an Amber score was applied. If a particular impact of a technology is worse than the baseline, a Red score was applied.

Where baseline data is not available, or is not applicable, an Amber rating has been applied.

The evaluation is assessed against the assumption that the technology will be procured or developed by BCC. For example, whilst cartons may be collected by BCC for treatment elsewhere, the evaluation considers the development of carton recycling technology within BCC.

2 Baseline assumptions

BCC Fleet and Waste department have provided information on the current waste management arrangements. These are not presented in detail here, but the management of key waste streams is summarised in the table below.

	Current management or end destination
Household residual	Combusted at Tyseley EfW
Trade waste	Combusted at Tyseley EfW
Clinical waste	Dedicated incinerator at Tyseley
Construction & Demolition waste	Aggregate crushed and recycled at T&T aggregates (via Veolia)
Dry recyclables collected at kerbside	Paper (source separated in Paper Pod) – recycled at a paper mill Mixed recycling (plastics, glass, cans) – processed at Veolia Four Ashes MRF.
Recyclables collected at recycling banks and at 5 Household Recycling Centres	Via transfer stations to Four Ashes MRF, or to reprocessors.
Food waste	Not currently separately collected.
Green waste	Open windrow composting
Mattresses	Not separately collected
Litter/Street Cleansing waste	Combusted at Tyseley EfW
Cartons	Collected only at Recycling Centres
Used Cooking Oil	Freedom Recycling (Ipswich)
Wood	A&A Recycling (Coventry), wood is processed for use in panelboard industry or for biomass
Tyres	Credential Environmental (Reprocessing of tyres for engineering schemes, or use a fuel) /Nottinghamshire Recycling

3 Evaluation criteria and scores

Costs			
Does the technology provide potential cost savings in terms of avoiding disposal costs, including exposure to taxation?	Costs increase	No potential cost savings	Potential cost savings
Does the technology provide potential cost savings in terms of avoiding natural gas use or electricity?	Costs increase	No potential cost savings	Potential cost savings
Does the technology provide potential cost savings in terms of avoiding transport and haulage where particular waste streams can be treated on-site or closer to the point of generation than current disposal or treatment options?	Costs increase	No potential cost savings	Potential cost savings
Does the technology offer potential revenue from fiscal measures and incentives for heat and/or power?	No potential revenue	Unknown/same as existing scenario	Potential revenue
Does the technology offer potential revenue from sale of outputs?	No potential revenue	Unknown/same as existing scenario	Potential revenue
Are the capital costs (purchase costs of technology and associated infrastructure) less than expanding the present services?	Higher capital costs	Unknown/No difference to capital costs	Capital costs less than expanding present
Are the operational costs likely to be less than the baseline?	Higher operationall costs	Unknown/No difference to operational costs	Operational costs less than expanding present
Does the technology present a funding opportunity through the attraction of inward investment?	No potential funding opportunities	Unknown/not applicable	Potential funding opportunities
Risks			
Does the technology have a demonstrable track record of delivery?	Limited or no track record	Unknown/some track record	Proven track record
Is the feedstock waste required for this technology (composition/ quantity) available?	Limited availability of feedstock		Feedstock widely available

Does the technology offer similar operational risks to the present technology (for example availability, contingency?)	Higher operational risks	No change in operational risks	Fewer operational risks
Does the technology have similar site and planning risks to the present?	Higher site and planning risks	No difference in site and planning risks	Fewer site and planning risks
Is there evidence of examples of problems and risks experienced in similar schemes in the past, or extrapolations drawn from pilot schemes?	Strong evidence of problems and risks	Unknown	No evidence of problems or risks
Are there examples of other local authorities utilising the technology?	No examples of local authorities utilising technology	Some examples of local authorities utilising technology	Several examples of local authorities utilising technology
Is the typical site area (ha) building footprint and building height similar to the present technology?	Large footprint than present technlogy	Unknown/not applicable if technology not currently in use	Smaller footprint than present technology
Is the expected lifetime of facility (years) similar to the present technology?	Shorter lifetime	Similar lifetime to present technology/not applicable	Longer lifetime
Is the technology vulnerable to policy or legislative change?	Highly vulnerable to policy or legislative change	No change in vulnerability to policy or legislative change/not applicable	Unlikely to be vulnerable to policy or legislative change
What has been the technology's track record in public acceptability?	Significant record of poor public acceptability	Unknown/Not applicable	Limited issues with public acceptability
Community impacts			
Are actual impacts associated with traffic similar to the present technology?	Potential increase in traffic impacts	Unknown/Not applicable/Same as baseline	Potential reduction in traffic impacts
Are actual impacts associated with noise similar to the present technology?	Potential increase in noise impacts	Unknown/Not applicable/Same as baseline	Potential reduction in noise impacts

Are actual impacts associated with odour similar to the present technology?	Potential increase in odour impacts	Unknown/Not applicable/Same as baseline	Potential reduction in odour impacts
Are actual impacts associated with dust similar to the present technology?	Potential increase in dust impacts	Unknown/Not applicable/Same as baseline	Potential reduction in dust impacts
Are local and regional air pollution impacts similar to the present technology?	Potential increase in local and regional air pollution impacts	Unknown/Not applicable/Same as baseline	Potential reduction in local and regional air pollution impacts
Is the visual impact similar to the present technology?	Potential increase in visual impacts	Unknown/Not applicable/Same as baseline	Potential reduction in visual impacts
Are the health impacts similar to the present technology?	Potential increase in health impacts	Unknown/Not applicable/Same as baseline	Potential reduction in health impacts
Are the jobs created and skills requirements similar to the present technology?	Reduction in jobs and skills	No change in number of jobs/unknown	Increase number of jobs and upskilling
Will the technology have the potential to provide community incentives, i.e., local services, subsidised energy bills, community heating?	No potential for community incentives	No change in community incentives/unknown	Potential to provide community incentives
Will the technology particularly benefit citizens from deprived areas?	No specific benefits to deprived areas	No changes in deprived areas/unknown/not applicable	Specific benefits to deprived areas
Will the technology support third sector organisations?	No potential for third sector support	No changes /unknown/not applicable	Potential for third sector support
Will the technology contribute to behaviour change, e.g. engage with citizens/schools?	No potential for contribution to behaviour change	No changes /unknown/not applicable	Potential for contribution to behaviour change
Will the technology support/ contribute to the local supply chain?	No potential for contribution to local supply chain	No changes /unknown/not applicable	Potential for contribution to local supply chain

Operations			
Are the implications for waste collection the same as at present?	Significant implications for current waste collection	Unknown/not applicable	No implications for current waste collection
Does the option fit within current and future European, UK, English, regional & local policy?	Contradicts current and future policy	Unknown/not applicable	Complements current and future policy
Does the option move waste up the waste hierarchy compared to the present treatment method?	Waste moves down hierarchy	No change/not applicable	Waste moves up hierarchy
Does the option have a similar number of vehicle movements to the new technology?	Increased vehicle movements	No change/not applicable	Reduced vehicle movements
Is the technology flexible to accept municipal, commercial & industrial and other waste streams?	Inflexibility to accept range of waste streams	No change/not applicable	Flexibility
Is the technology flexible to accept changing waste composition and policies?	Inflexibility to accept changes in composition	No change/not applicable	Flexibility to accept changes in composition
Can the technology be developed using existing sites/ current locations?	New sites will be required	Not applicable	Potential to use existing sites
Does this technology complement current technology (as this is decommissioned/ phased out/ comes to the end of its life?	Does not complement current technology	No change/Not applicable	Complements current technology
Carbon reduction and environmental			
Does it offer a reduction in life cycle carbon impacts in comparison to the present technology?	Increased life cycle carbon impacts	No change/Not applicable	Potential reduction life cycle carbon impacts
Does it offer more opportunities for outputs to be utilised as a resource by current or emerging industries (e.g. bio refining, chemicals manufacturing) than the present technology	Decrease in opportunities to use waste as a resource	No change/Not applicable	Increase opportunities to use waste a resource
Does it offer links to transport technologies (e.g. provision of transport biofuels)?	No links to transport technologies	No change/Not applicable	Potential links to transport technologies
Can the technology provide combined heat and power (CHP), heating or	No potential to provide	No change/Not	Potential to provide

cooling?	CHP, heating or cooling	applicable	CHP, heating, or cooling
Can the technology provide opportunities for community energy schemes?	No potential for community energy	No change/Not applicable	Opportunity for community energy

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Recycling	Multi-material MRF
	Advance Mixed Materials Sorting
	Optibag
	Pneumatic waste collection
	Magpie plastics sorting
	Mixed Plastic sorting
	Water-free plastics recycling
	Enzymatic depolymerisation
	Tyre recycling
	Advanced Glass Recycling
	CRT Recycling
	Street sweepings recycling
	UCO - biodiesel
	AHP Recycling
	Carpet waste recycling
	Mattress recycling
	Gum-tec
	Cigarette waste recycling
	Dog waste digester
	Dog waste wormery
	Carton recycling
Thermal	Moving grate
	Rotary kiln
	Fluidised bed
ATT	Rodecs Pyrolysis
	Pyrolysis
	Flash pyrolysis
	Gasification
	Plasma gasification
	Thermal depolymerisation
	Hydrothermal Carbonisation
	Thermal-Catalytic Reforming
	Waste to biofuels
Energy recovery	Boilers
	Turbine and generator set
	Heat pump
	Flue gas condensation
	Cooling
Distribution	Private Wire Network
	District Heating Network
	High grade heat
	District Cooling Network
Biological	Open windrow
	IVC
	Dry AD
	Wet AD
	Small scale AD
	Advanced AD
	MBT
Energy recovery	Gas to grid
	Gas to vehicle fuel