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A conceptual framework for negotiating public involvement in municipal waste management decision-making in the UK

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ABSTRACT

The technical expertise that politicians relied on in the past to produce cost-effective and environmentally sound solutions no longer provides sufficient justification to approve waste facilities. Local authorities need to find more effective ways to involve stakeholders and communities in decision-making since public acceptance of municipal waste facilities is integral to delivering effective waste strategies. This paper presents findings from a research project that explored attitudes towards greater levels of public involvement in UK waste management decision-making. The study addressed questions of perception, interests, the decision context, the means of engagement and the necessary resources and capacity for adopting a participatory decision process. Adopting a mixed methods approach, the research produced an empirical framework for negotiating the mode and level of public involvement in waste management decision-making. The framework captures and builds on theories of public involvement and the experiences of practitioners, and offers guidance for integrating analysis and deliberation with public groups in different waste management decision contexts. Principles in the framework operate on the premise that the decision about 'more' and 'better' forms of public involvement can be negotiated, based on the nature of the waste problem and wider social context of decision-making. The collection of opinions from the wide range of stakeholders involved in the study has produced new insights for the design of public engagement processes that are context-dependent and 'fit-for-purpose'; these suggest a need for greater inclusivity in the case of contentious technologies and high levels of uncertainty regarding decision outcomes.
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1. Introduction

Historically, decisions affecting the public, particularly environmental risk decisions have been made with input from selected stakeholders, including public officials with responsibility for decisions and technical expertise in the appropriate area (Laird, 1993; Stern and Fineberg, 1996; Jasanoff and Wynne, 1998). Often this has meant that the public has either been excluded from decision-making or involved too late (Rydin and Pennington, 2000; Petts, 2004). International guidelines such as the Aärhus Convention proposed increasing levels of public involvement in environmental decision-making (UNECE, 1998), but there are different perspectives on the benefits of involving the public in policy decisions. For instance, public involvement is often argued as necessary because "public support is needed to implement policy" (Renn et al., 1995; p. 6). However, this has not gone unchallenged: "public participation and consensus-building is over-rated as a policy tool" (Nichols in Minard et al., 1993; p. 31). More recent research suggests the rationale for seeking greater public involvement needs to be better articulated (O'Faircheallaigh, 2010) with greater clarity around the definition of who participates in decision-making, the rules of participation, and the expected influences and learning outcomes that improve the quality of engagement (Benneworth, 2009). In this paper, "public involvement or engagement" is used as an umbrella term and encompasses: (1) "public participation" that implies a popular democratic notion of ordinary citizens' involvement in policy decisions, and (2) "stakeholder and community involvement or engagement" that implies a more pluralist notion of interest group involvement in policy-related issues, usually specific planning decisions (Creighton, 2005).

In Britain, the Localism Act 2011 and the National Planning Policy Framework (DCLG, 2012) gives communities a greater role in decision-making, promoting early public involvement through effective deliberative and participative systems of governance. In

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Table 1
Policy drivers for early public engagement.

Waste policy/planning documents	Relevant guidance on public involvement
National Planning Policy Framework (DCLG, 2012)	"Early and meaningful engagement and collaboration with neighbourhoods, local organisations and businesses is essential..." (p. 37) "...local planning authorities should aim to involve all sections of the community in the development of Local Plans and in planning decisions..." (p. 17)
Waste Management Plan for England (Defra, 2013a)	"In line with the Government's approach to localism...local communities should benefit from hosting waste infrastructure and be involved from an early stage in planning for such infrastructure" (p. 29)
National Planning Policy for Waste (DCLG, 2014)	"...undertake early and meaningful engagement with local communities...recognising that proposals for waste management facilities such as incinerators can be controversial" (p. 4)

a waste policy context, local authorities are required to develop robust public engagement strategies that clearly demonstrate how stakeholder views, including those of local communities, will shape the development of waste strategies and facility plans (Table 1) (House of Commons, 2010; SITA, 2010).

The growing momentum for public involvement in waste strategy and facility planning presents an opportunity to refashion traditional consultation techniques to incorporate deliberative and participatory activities that involve stakeholders (including communities) at an early stage of decision-making, where there is still a chance to talk about alternatives, potential sites and community benefits (Cotton, 2013).

In studies related to environmental planning, Farina et al. (2012) suggest there is a need for purposeful and continuous efforts to balance "more" and "better" public involvement according to how it is "valued" in a particular policy context. Areizaga et al. (2012) suggest the need for flexible and adaptive participatory approaches with specific structures for different situations. We argue that certain decision situations may call for greater inclusivity while others may not; hence there is a need to understand how public engagement events are 'valued' in a particular context and best positioned within existing regulatory and institutional regimes. In the waste context, the problem of heightened contention around specific site applications (Environment Council, 2007a, 2007b) and regulatory fragmentation (i.e. separation of responsibilities for strategy development and facility planning) (Petts, 2004) poses questions about the degree to which engagement methods are 'fit-for-purpose' and culturally appropriate.

The major challenges faced in designing public involvement strategies are how to conceptualise unknowns, the limits of available scientific knowledge, the cognitive biases inherent in technical analysis and thus, the terms for wider public involvement in such judgements. In response to these challenges, questions such as 'who to involve', 'at what level', 'what methods to use', and 'how to ensure engagement is suited to the decision context' have been pursued in environmental planning (Rowe and Frewer, 2005; Chilvers, 2007; Krutli et al., 2010; Bull et al., 2010). In a study of engagement in the waste sector, we provide insights into the design of appropriate engagement processes by clarifying the context for deliberation and the conditions upon which public values may be successfully integrated with technical analysis (Garnett and Cooper, 2014). In this paper, we extend and expand on these findings by proposing a conceptual framework for negotiating the level and mode of public involvement. The conceptual framework is built on the premise that public involvement is context-specific, depending on the type of technology or waste facility under consideration, the local culture and history of public engagement in the community, and the potential for controversy.

The following section of the paper establishes the rationale and structure for public involvement in decision-making, and explores the appeal for early public involvement through examination of its origin within the political theory, governance and public involvement literature. It is followed by a brief description of the problem-structuring technique that underlies the study, and the research methods. Finally, the findings from the study are presented, structured around our key arguments, and synthesised in final recommendations and conclusions.

2. Rationale and structure for public involvement in decision-making

2.1. Waste management context

This research focuses on the key challenge facing UK local authorities of determining the optimal method of managing municipal solid waste, specifically post-recycling residual waste. Providing an integrated service that links communities and their potential to participate in minimising and recycling wastes needs to be matched with implementing waste treatment technologies that are socially acceptable to the majority of the community. Management options to treat municipal solid waste including biodegradation or energy recovery differ in technological complexity, scale and potential locations. These are the key aspects of debate over such facilities (Tunesi, 2010). Resource recovery is generally accepted as a positive outcome from waste disposal. However, incineration as a basis for recovering energy from waste (EfW) is regarded as controversial from the perceptions of localised health and environmental risks. Emerging advanced thermal treatment (ATT) technologies are being considered by some local authorities as they appear less controversial. However, there is scepticism about the efficiencies of these technologies (e.g. gasification and pyrolysis), despite recent public investments made to support their design, installation and operation (Defra, 2013b; Evangelisti et al., 2015). Operating requirements for some ATTs include pre-treatment such as mechanical biological treatment (MBT), thus increasing the complexity while offering the potential for energy recovery and integration into wider municipal waste management strategies (Defra, 2007; Tunesi, 2010). Overall, reliance on technologies that are not well established increases development times as well as capital and operational costs for operators required to meet landfill diversion targets.

Non-thermal treatment such as anaerobic digestion (AD) and composting are emerging as more acceptable options (Frick et al., 1999; WRAP, 2009). AD is a mature technology with many commercial plants in existence. These are being increasingly sited in England, although this increase, in response to favourable energy tariffs, has resulted in a need for collections of source-segregated food and garden wastes within a market of limited supply and difficulty in determining the right mix of waste input (AEA, 2009; Defra, 2010, 2007; RTPI, 2010). Similarly, composting has expanded in response to increased landfill diversion targets, with a growth of centralised facilities, increased collections of source segregated food and garden waste and surplus markets for compost. Quality of the final product remains a concern, with standards

such as PAS100 and PAS110 established to promote product quality (Frick et al., 1999; WRAP, 2009).

The heterogeneous nature of municipal waste poses a planning challenge for local authorities. Defining long-term infrastructure in the changing context of population demographics, housing stock, consumer products, environmental knowledge and attitudes, as well as seasonal variations all have significant influence. At the same time predicting changes in regulatory and market conditions makes long term planning challenging. Past governments have set requirements for the consideration of waste management options in a systematic way, where effective public involvement has been put forward as an important and integral part of the decision-making process (Defra, 2005; ODPM, 2005). Government guidance on public involvement is based on communicative partnerships between different interest groups who have (or may have) a stake in the issue with specific commitment given to the redress of environmental and social inequalities (Morphet, 2008; Pratchett, 2000).

2.2. Theories and practice of public involvement

Public involvement practitioners have suggested the fundamental question of how much participation is required for a decision to be valid remains unanswered (e.g. Burgess et al., 2004; Creighton, 2005; Chilvers, 2007; Petts, 2008). Attempts to develop more inclusive decision processes have raised questions regarding the level of public involvement, the degree of power sharing between authorities, experts and citizens, the relationship between traditional representative institutions and new participatory deliberative processes, and the importance of 'context' in designing appropriate engagement strategies (Petts, 2004, 2008; Burgess et al., 2004; Benneworth, 2009; Chilvers, 2009, 2007; Bull et al., 2010, 2008). Ostrom et al. (1993) put forward institutional rules for negotiating what level of public involvement is necessary for a decision to have legitimacy. They suggest a more inclusive decision process can be designed on the basis of explicit (statutory) or implicit (informal) rules about 'who to involve' in each stage of the process and on 'what basis they should be involved':

- authority to put forward proposals in relation to the nature and context of the decision (authority),
- degree to which citizens have free access to information and are assisted in obtaining and processing that information (information and interaction),
- level to which ordinary citizens are allowed to participate in decision-making (boundary), and
- mechanism used to assess the validity of decision reached (aggregation).

Fiorino (1990) established three compelling rationales for broader public involvement that shows divergent models of the role of ordinary citizens in environmental or risk decision-making. These allow for defining who to engage, the rules for participation, and the expected influences and learning outcomes from public engagement processes. The first is the 'normative' rationale based on citizens' democratic right to participate meaningfully in decision-making and to be informed about the basis for government decisions (Fiorino, 1990; Perhac, 1998; UNECE, 1998). Rydin and Pennington (2000) suggest the normative rationale sees the policy process *"as a locus for the articulation of values and preferences on policy options, and participation is a means of bringing the pattern of values and preferences represented within the policy process closer to that existing within society as a whole"* (p. 153). In this context, Perhac (1998) suggests that the question of how the public is defined for purposes of public involvement becomes the question of whose acceptance is necessary for political viability. In cases where decisions concern localised environmental issues (e.g. siting waste facilities), political viability may define the public in terms of special interest groups with political 'clout' (e.g. a local action group). For decisions that involve wider environmental concerns around the development of local waste policy, political viability may define the public as individuals regardless of their affiliation with special interest or lobby groups.

The second is the 'substantive' rationale that reflects the epistemic argument on the relevance of different types of knowledge in the decision process. Perhac (1998) suggests the epistemic rationale, in its most radical form, challenges the scientific understanding (and characterisation) of risks. The risk perception literature suggests there is a tendency for technical experts "to view objective characterisation of risk, illuminated by experts' calculations, as somehow more real or more valid that the perceptions of the rest of the public" (Kasperson, 1980; p. 77). The motivation for public involvement in this case is it allows for an explicit examination of social, ethical and political values that cannot be addressed solely by analytical techniques, but also requires deliberation with a wide group of interested and affected parties. This generates a greater breadth and depth of information by integrating the knowledge and views of both scientific experts and the public (Leksmono et al., 2010).

The third is the 'instrumental' rationale based on the premise that public involvement builds trust and avoids controversy over decisions. In situations where risks are attributed and distributed among communities, the lack of trust in responsible authorities is a problem in most instances (Slovic et al., 1991). Some authors suggest that improving risk analysis and risk characterisation may have little practical effect on reducing opposition to decisions without efforts to rebuild trust through public involvement (Leroy and Nadler, 1993; Slovic, 1993). Other authors are more sceptical and question whether the trust and credibility of a government, if lost, could ever be regained (Covello, 1992). However, the argument from a policy delivery perspective is that involving parties early in the decision process may avoid possible conflict later on and contribute to improving the overall legitimacy of decisions taken (Stern and Fineberg, 1996). The motivation for public involvement in this context is related to a desire to achieve a decision process that will be perceived as equitable and fair (Smith and McDonough, 2001).

Implicit in each rationale and the supporting literature is an understanding that an appropriate mix of direct, consultative, deliberative and representative mechanisms is needed to ensure citizens are not alienated from the institutions of local democracy. However, the terms for wider public involvement, in practice, require investigation to gain a deeper understanding of factors influencing effective implementation of engagement processes.

3. Methodology

The study sought to propose a conceptual framework for negotiating the level and mode of public involvement in different waste management decision contexts. This required the exploration of diverse and competing interests around waste management issues (i.e. from industry experts, policy makers, and interested and affected citizen groups) and involved different perspectives on early public involvement (i.e. the extent and structure of expert-citizen deliberations, where consideration was given to the level of public representation, means of engagement, and perceived benefits of optimising public involvement). Utilising multiple methods of inquiry, there were three main steps in the research: (1) design of the study and development of an analytical framework upon which to base subsequent assessment of data, (2) selection of interview and survey participants, applying a qualitative sampling

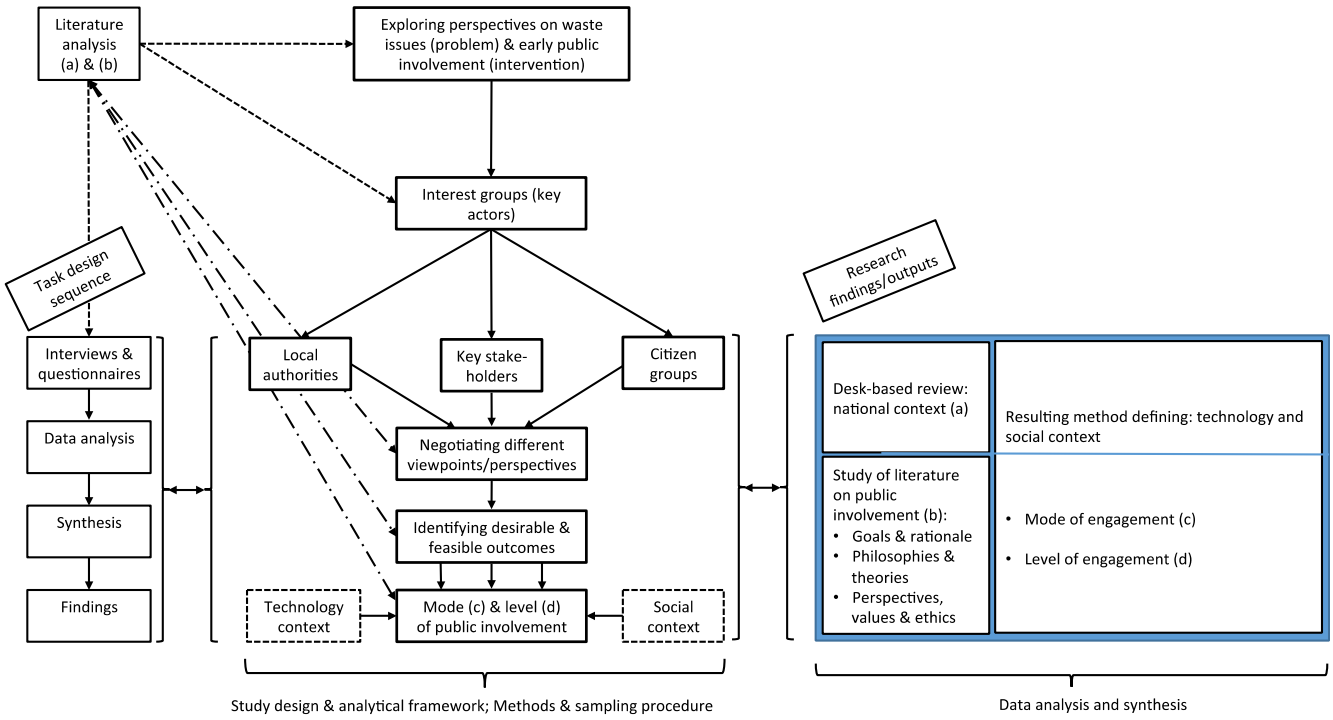


Fig. 1. Methodological approach.

technique, and (3) data analysis and synthesis to draw insights upon which to base a conceptual framework for negotiating the mode and level of public involvement (Fig. 1).

3.1. Study design and analytical framework

As the basis for the research, a problem-structuring technique based on soft systems methodology (Checkland, 1999, 1981) was used to understand and explain differences in perceptions and judgements that guide the actions of different groups, and the traditions and culture that affect the potential for social and institutional change (Checkland and Poulter, 2006; Checkland and Scholes, 1999). Applying this technique allowed for reflecting on, and identifying responses to, the problem of waste management and public involvement, and thereby to capture different perspectives on what is recognised to be a sound waste planning and communication approach. Soft systems methodology (SSM) is used to analyse complex situations where views diverge about how problems are to be defined and addressed, usually within a social context. The approach to SSM was 'problem-oriented'; emphasis was placed on fully exploring the problem to capture different views, before identifying desirable and feasible outcomes of the proposed intervention. Based on SSM's mode of analysis, a framework was developed for analysing and interpreting the research data (Table 2).

The SSM approach is an empirical form of enquiry, appropriate for qualitative studies (Checkland, 1999). In applying the approach, the focus was on exploring participants' interests and vision for change (the intervention), the socio-technical context (the issues), the prevailing culture, and political variables that convey the feasibility and desirability of the intervention (Checkland, 1999; Checkland and Scholes, 1999).

3.2. Methods and sampling procedure

The study involved the collection and analysis of qualitative information, which provided preliminary findings that facilitated the collection of quantitative data. Qualitative information was gathered from a series of 33 in-depth semi-structured interviews to generate a typology of variations in perceptions of the waste problem and establish attitudes to early public involvement. Aggens' (1983) orbit of participation was used as a classification tool to identify key groups for the research. Broad categories of interest groups common to environmental decision-making were deemed relevant to the research, including internal and external stakeholders, local communities and activist groups. Participants selected from these categories were not necessarily individual experts, but represented organisations with an interest in waste policy or local waste management practices. Following consultation with a sample of representatives from each category, further classification was made, resulting in three defining interest groups: 'local authorities', 'key stakeholders' and 'citizen groups' (Table 3).

A purposive sample (Palys, 2008) was employed to select interview participants. To achieve maximum variation across the three groups, several factors were employed to sub-divide categories and ensure that different types of organisations and individuals were included in the sample: (1) the type of organisation (e.g. main business or service, sector), (2) its responsibility or interest in waste management (e.g. waste action group, regulator or policy maker), and (3) the geographical region (e.g. London, West of England). To find participating organisations, those often consulted on waste planning or policy development were identified from local authorities' consultation lists, and those typically excluded from decision-making were identified through nomination by participants. Participants were systematically selected; those within the citizen groups' category were selected from the same local authority areas in order to compare information gathered and assess issues related to misrepresentation, bias and reliability of evidence.

The resulting sample (33 participants) included representatives of key organisations with a wide range of interests or responsibility for waste policy and local waste management practice. Time taken on interviews ranged from 45 min to 1.5 h, and the total amount of tape-recorded material was approximately 36 h. Interview questions were framed around focal points for the research (Table 2),

Table 2
A framework for analysis based on SSM.

Context for analysis		Focal points/themes for analysis
The issues	Problem definition captures a wide range of issues, reflective of the variety of perspectives taken	• Perspectives on waste issues and public involvement • Negotiated viewpoints/perspectives on the potential for 'early' public involvement • Desirable and feasible outcomes of 'early' public involvement • Mode and level of public involvement appropriate to the decision context (i.e. technological and social context)
Prevailing culture	Problem definition carries an implicit judgement of the values underlying stakeholders' actions	
Politics	Problem definition carries an implicit judgement of the ethical position taken and the disposition of power in decision-making	
The intervention	Action that is desirable and culturally acceptable is identified, based on negotiated values of different stakeholders	

Table 3
Affiliation of participants (interviews).

Main groups	Sample size (N = 33)	Type of organisations	No of participants (N = 33)
Citizen group	n = 11	Community action groups	6
		Environmental campaign groups	5
Key stakeholder group	n = 10	Community engagement practitioners	2
		Government agencies	3
		Non-governmental organisations	2
		Waste management companies	3
Local authority group	n = 12	Waste collection authorities	2
		Waste disposal authorities	3
		Unitary authorities	7

Table 4
Affiliation of participants (questionnaire).

Main groups	Sample size (N = 60)	Type of organisations	No of participants (N = 60)
Citizen	n = 17	Community action groups	7
		Environmental campaign groups	10
Key stakeholder	n = 17	Community engagement practitioners	3
		Government agencies	3
		Non-governmental organisations	4
		Waste management companies	7
Local authority	n = 26	Waste collection authorities	5
		Waste disposal authorities	8
		Unitary authorities	13

and the probing technique was used to solicit additional information on emerging themes. This technique provided more focus than the conversational approach, but still allowed for a degree of freedom and adaptability in that participants could shape the discussion (Opdenakker, 2006).

The collection and analysis of quantitative data followed. A questionnaire was used to measure the prevalence and variation in participants' opinions about waste management issues and public involvement. A random stratified sample was used in selecting questionnaire respondents to maintain maximum variation across the three groups (Table 4). The respondents to the questionnaire also represented a range of organisations with different interests or responsibility for waste policy and local waste management practice.

A total of 345 questionnaires were sent out by email, and 60 organisations responded (a response rate of 17.4%). Since the general population of the target groups was unknown, the same number of organisations was used for each group (i.e. 115), although the resultant sample (60 respondents overall) was self-selecting and not proportional across groups. This required due consideration in the presentation and interpretation of questionnaire data. Questions from the previous interviews were included in the questionnaire to assess the importance of, and links between, themes that emerged, which allowed for a better understanding of the underlying reasons behind participants' attitudes. The questionnaire developed from the interview data is reproduced in full in Garnett and Cooper (2014).

Separating the samples across main groups, based on institutional, professional or organisational background was a useful way of ensuring that a wide range of stakeholders across the waste sector was represented in the sample. Certain groups not directly involved in local waste management decision-making were omitted from the study, including mass media, as were politicians and local councillors, who have obvious interests in and responsibilities for waste management. However, there are often difficulties encountered accessing political groups, and concerns that the views of individual politicians are likely to confirm to 'party' opinion, which tends to introduce biases in small samples where group homogeneity of interests can skew the data.

3.3. Data analysis and synthesis

The analysis of data collected was systematic, based on a transformative design in which datasets are combined, i.e. qualitative data converted to quantitative data (Bryman, 2006; Caracelli and Greene, 1993; Onwuegbuzie and Teddlie, 2003). This combination enabled an exploration of differences of views across groups that might have otherwise been missed. Descriptive statistics (applied to questionnaire data) measured prevalence and variation in participants' views, which allowed for the verification and augmentation of the qualitative responses from interviews. The use of a transformative design allowed for stronger inferences to be made by capturing a greater diversity of views and underlying reasons behind differences in opinion.

Developing a framework for public involvement relied on a synthesis of attributes derived from the datasets (Fig. 1c and d) and the literature about the national context (Fig. 1a) and public involvement (Fig. 1b). The perspectives of different participants (groups) were compared, providing a basis for illuminating, extending and revealing contrasting arguments in the literature around the rationale for public involvement and the situations that warrant increasing public representation in waste management decision-making.

4. Research findings

The findings from the research provides a framework for negotiating the level and mode of public involvement, and demonstrate that deliberation with public groups ought to be context-dependent and 'fit-for-purpose'; this will allow for greater inclusivity in the case of contentious technologies and high levels of uncertainty regarding decision outcomes. Important insights garnered from the research allowed for:

- rationalising stakeholders' preference for waste management technologies, and
- assessing stakeholders' preference for early public involvement in decision-making.

4.1. Rationalising stakeholders' preference for waste management technologies

A key challenge in delivering waste management strategies is selecting the appropriate and acceptable technologies that demonstrate an equitable balance between national and local needs. The findings suggest that the diverse perceptions and competing interests around waste management tend to influence how solutions are rationalised, and the priorities and actions recommended for improving the deliverability of waste strategies.

A hierarchical order was established for waste management technologies by asking participants to identify suitable technologies for handling residual waste with regards to its potential to be situated at the local (town or city) and national (region or county) level. Technologies with the most and least potential are established, reflecting general preference at both the local and national level, though opinions tend to differ across groups (Table 5).

In your opinion, which technology has the most potential for handling waste left after recycling? Rate each technology in terms of its potential to be situated in your city/town (local) AND across the region/county (national)?

4.1.1. Non-thermal technologies (e.g. AD and composting)

The data revealed greater preference for non-thermal technologies such as composting (62% of respondents) and anaerobic digestion (55% of respondents) at the local level, though this is more prevalent across citizen groups (92%) where there are assumptions that the size of facilities are smaller (and hence more desirable to local communities), avoiding controversial issues associated with larger facilities such as EfW incineration. Some local authorities expressed concerns about residents' perception of social injustice and disparities in health impacts from EfW incineration propagating to a national scale through the tendency for politicians to 'avoid the hard decisions' and adopt technologies acceptable to local people but not necessarily representing the best solution:

> *...our Liberal Democrat administration has a national policy against [EfW] incineration so we have got a very difficult situation, as it is coming out as the best technical option. The public is against it and the politicians have abstained from even considering it...*
> [*Head, Sustainability Unit, Unitary Authority.*]

Arising from interviews was a clear message regarding the need to target people's consumption, where a coherent and publically acceptable waste strategy ought to set out operationally how the waste hierarchy options will be pursued in the short term. Much of the debate focused on who should take responsibility for educating the public on the need for facilities and raise awareness on the importance of waste prevention and recycling. The issue of inadequate funding to enact waste prevention and recycling schemes was raised by local authorities, which is consistent with literature (e.g. Waste Watch, 2010), suggesting that producers should assume greater responsibility for such schemes:

> *The responsibility [for waste prevention] is handed over to local authorities with very little funds to enact the necessary schemes so it is just not going to happen.*
> [*Waste Strategy Development and Implementation Manager, Unitary Authority.*]

Recycling was seen as a viable option to avoid waste going to landfill though with mixed views on the availability of markets to recover costs inherent in recycling:

> *There are tangible benefits to recycling, not just a percentage benefit...with kerbside schemes you recycle locally and get cleaner feedstock, which generates business, particularly if the use of virgin materials is replaced.*
> [*Founder and Member, Environmental Campaign Group on Waste.*]

Table 5
Preference for waste treatment and disposal technologies.

Waste management targets	[a]Frequency distribution (N = 60)		[a]Local authorities (n = 26)		[a]Key stakeholders (n = 17)		[a]Citizen groups (n = 17)	
	National (%)	Local (%)	National (%)	Local (%)	National (%)	Local (%)	National (%)	Local (%)
Composting	60	62	80	71	59	57	67	92
Anaerobic digestion	55	55	52	48	77	77	78	92
EfW incineration	48	30	75	54	47	23	38	20
Mechanical biological treatment	38	33	38	29	59	62	44	39
Gasification	25	13	29	21	38	25	33	0
Pyrolysis	17	12	21	17	27	18	11	11
Landfill	8	8	13	13	6	0	13	20
Autoclaving	8	7	8	13	21	10	0	0
Plasma arc	7	3	8	4	14	10	0	0

N/n = sample size.
[a] Data shows the 'most potential' response.

Government has focused on the short-term subsidies of material collection in hope that producing larger volumes of material will create markets for them, but actually most of the markets will be demand rather than supply led.

[*Director of Policy and Public Affairs, Trade Association.*]

The research suggests social responsibility factors such as public education on waste reduction and recycling are important to the debate. The difference in priorities for waste management, evident in the level of disparity around stakeholders' judgement regarding the potential of non-thermal options, highlights the need to align different values and preferences.

4.1.2. Emerging technologies (e.g. MBT, gasification and pyrolysis)

The data revealed that emerging technologies had marginally more support at the national level. The data revealed greater preference for mechanical biological treatment (MBT) (38% of respondents), compared to gasification (25%) and pyrolysis (17%). These technologies, particularly MBT at the local level (62% of key stakeholders, 39% of citizen groups and 29% of local authorities) are preferred because as suggested in interviews, they are seen as publicly acceptable, appearing to be 'new', 'cutting edge' and 'cleaner', thus avoiding local environmental issues commonly associated with EfW incineration. Nevertheless, concerns about the efficiencies and reliability of new and emerging technologies in the UK (Defra, 2013b; Evangelisti et al., 2015) means there is little knowledge about their potential risks and social hazards - a problem that dominates discussion at the local and national policy level. Poor uptake of these technologies, particularly MBT, was associated with issues concerning wider environmental and economic impacts, and the regulatory and institutional implications of these technologies (e.g. compliance with the Landfill Allowance Trading Scheme) tended to dominate discussions among local authorities and industry:

MBT has an increasing role to play [in local waste strategies] as long as there is something sensible to do with the outputs because at the moment there is no capacity to recover energy from refuse derived fuel.

[*External Affairs Officer – Waste Management Company.*]

. . .with MBT, we need residual treatment technology to meet [our] targets. . .it is almost inevitable that any major treatment facility will go to public enquiry, creating delays in the planning process.

[*Head, Sustainability Unit, Unitary Authority.*]

There are additional concerns associated with high costs, low potential for energy recovery and other issues that make it difficult to secure funding for new or emerging technologies. The potential for controversy is mostly associated with the high costs and concerns around the reliability of the technologies, and also with the tendency of the public (and politicians) to favour these technologies on the grounds that they potentially increase recycling rates and are a more acceptable option compared to EfW incineration. The different perspectives among stakeholders on emerging technologies highlight the need to gather information and insights about the concerns and issues to better inform decision-making.

4.1.3. Controversial technologies (e.g. EfW incineration)

The data revealed that controversial technologies such as EfW incineration are largely preferred at the national level (48% of respondents) though with comparatively less support across key stakeholders and citizen groups (75% of local authorities, 47% of key stakeholders and 38% of citizen groups). One local authority suggested EfW incineration is the sensible option after an optimum level of recycling is achieved:

. . .We need to make a decision on how to manage the remaining waste [left after recycling]. . .my position is EfW [incineration] will always be better than other available options (e.g. landfill).

[*Planning and Community Engagement Officer, Unitary Authority.*]

The impacts associated with EfW incineration, from a citizen perspective, are related to the risks to human health and local environmental issues (e.g. restrictions on recycling, transport and other amenity impacts). Additional concerns related to a lack of trust in public officials (and their representatives) who attribute and distribute risk among communities, which raises concerns about equity, thus creating a level of controversy around the selection and installation of EfW incineration facilities:

Waste management companies like [X] are owned by equity companies so if you are dictated by shareholders to get the best possible financial deal for them, you are going to implement solutions that may not be the best for that council or its community.

[*Campaigner on Waste and Resources, Environmental Organisation.*]

How is it that the Government and the Environment Agency think [that EfW incineration] is such a fantastic facility? One reason is that the expert view - but not the community view - takes into account avoided emissions from a power station 200 miles away.

[*Principal, Waste Management Consultant.*]

Opinions from a regulatory and institutional perspective relate to public opposition to waste facilities and associated impacts on the planning process:

. . .a planning application was put into build. . . a plant feeding a 330,000 tonnes fluidised bed [EfW] incinerator – a huge scale. As you can imagine that got a lot of ferocious opposition from the public generally, but specifically in the area where it was proposed.

[*Chief Waste Management Engineer, Unitary Authority.*]

The planning situation could be helped by dealing sensitively with the strategy and having some mechanism in place to reduce controversy related to siting the facility.

[*Waste Strategy Development And Implementation Manager, Unitary Authority.*]

The difference in stakeholders' perspectives highlights the level of ambiguity in framing the issues and defining the nature of the waste management problem. The level of ambiguity around the concerns and values of different interest groups highlights the need to ensure that dissent and differences are fully engaged and understood.

4.2. Assessing stakeholders' preference for early public involvement in decision-making

The design of effective dialogue and early public engagement strategies necessitate consideration be given to the level of public representation, means of engagement, and perceived benefits of optimising public involvement in different contexts. The study revealed that the aim of public engagement processes is not to achieve consensus across all interested and affected parties, but to negotiate a workable, relatively fair solution that not everybody agrees with but the vast majority can accept. Specific considerations in designing early public engagement activities include: (1) deciding upon the relevant information and expertise to inform the process, and (2) ensuring access to information, its communication and interpretation and assessment of validity claims.

Table 6
Relevance of different knowledge bases and approaches to public involvement.

Stakeholder priorities	[a]Frequency distribution (N = 60)		[a]Local authorities (n = 26)		[a]Key stakeholders (n = 17)		[a]Citizen groups (n = 17)	
	WS (%)	FP (%)	WS (%)	FP (%)	WS (%)	FP (%)	WS (%)	FP (%)
Expert knowledge	88	87	81	81	94	88	100	100
Procedural knowledge	67	68	77	85	71	75	50	47
Local knowledge	82	88	69	85	94	94	94	93

N/n = sample size; WS – waste strategy; FP – facility planning.
[a] Data shows the 'agree' response.

Table 7
Preferences around the extent (level) of public involvement.

Stakeholder priorities	[a]Frequency distribution (N = 60)		[a]Local authorities (n = 26)		[a]Key stakeholders (n = 17)		[a]Citizen groups (n = 17)	
	WS (%)	FP (%)	WS (%)	FP (%)	WS (%)	FP (%)	WS (%)	FP (%)
Part of problem definition	53	43	42	31	50	40	77	75
Part of criteria development	38	38	31	31	38	33	53	63
Consulted on short-listed options	78	63	73	59	75	73	94	93

N/n = sample size; WS – waste strategy; FP – facility planning.
[a] Data shows the 'agree' response.

Table 8
Preferences for approaches to early public involvement.

Stakeholder priorities	[a]Frequency distribution (N = 60) (%)	[a]Local authorities (n = 26) (%)	[a]Key stakeholders (n = 17) (%)	[a]Citizen groups (n = 17) (%)
Educate public then engage in debate	87	81	100	94
Use combination of different methods	73	80	88	59
Use independent facilitators	70	78	81	73
Solicit public ideas on how to consult	67	63	81	71
Use modern methods to engage young people	63	58	67	77
Engage community in setting targets	62	52	75	86
Use different methods at each decision stage	55	56	69	50
Use joint select committee approach	53	50	63	59
Authorities and public to jointly select experts	30	16	44	41

N/n = sample size.
[a] Data shows the 'agree' response.

Participants were asked to identify the relative importance of different types of knowledge bases[1] (Table 6), to indicate preferences around the extent (level) of public involvement in decision-making (Table 7), and also to indicate preferences for different approaches (identified during interviews) to involving the public early in decision-making (Table 8). These questions explored how different groups viewed the relevance and extent of input from local authorities/politicians, experts and citizens to the decision process, and evaluated what factors impact upon the level of interaction, and opportunities for more active dialogue between experts and citizens.

Different types of knowledge are relevant to decision-making. In your opinion, which type of knowledge is most important to municipal waste management decision-making?
Which option do you most support (or agree with) for early public involvement in municipal waste management decision-making?
Which approach do you most support (or agree with) for involving the public early in municipal waste management decision-making?

[1] Expert knowledge involves scientific, technical and socio-economic methods of analysis, while local knowledge tends to be of a particular community or locality and may derive from social impacts associated with waste facilities. Procedural knowledge tends to be of due process, political, legal and institutional frameworks.

4.2.1. Relevant expertise and information to inform the process

The data revealed wide agreement on the importance of both expertise and local knowledge to the debate around strategic issues (88% and 82% of respondents respectively) and local planning issues (87% and 88% of respondents respectively). Recognition of the contribution to be made from different knowledge bases, however, may not transfer to actual engagement practice as there was far less regulatory and institutional support for engaging citizens early on in the decision process – i.e. defining the problem (31%/42% of local authorities and 40%/50% of key stakeholders, compared to 75%/77% of citizen groups) and developing criteria to evaluate technologies (31%/31% of local authorities and 33%/38% of key stakeholders, compared to 53%/63% of citizen groups). Some participants during interviews felt early public involvement delays decision-making:

This is probably a radical thing to say, but in some ways you do need national campaigns to raise the importance of things like recycling, but you don't want people to input into other decisions because it doesn't work; it polarises opinions and is an excuse for inaction.

[*CEO, Private Sector Organisation.*]

I think government and local authorities need to continue to evaluate the options scientifically and put facts into the mix, rather than emotion.

[*Head, Waste Management Unitary Authority.*]

Other views (expressed during interviews) suggest that the range of expertise (or representation of different interest groups) should be balanced, particularly where controversial facilities are proposed, so there is equal consideration of national and local issues, and participants feel there is greater transparency and fairness in the process:

> *It is no good pretending a view can be taken on environmental or health risk without considering the social context because that affects whether the public is willing to accept the assessment of risks or whether they even understand it.*
>
> [*Head, Waste Regulation Policy Unit, Government Agency.*]

> *I noticed in [County X] that they had . . . the waste contractor at the public meeting on their Joint Municipal Waste Strategy. I think this makes the process transparent.*
>
> [*Waste Planning Officer, Waste Disposal Authority.*]

Developing a better understanding of both the local and regional impacts of waste management decisions provides greater credibility of the policy process. The existence of institutional trust issues resulting from a history of conflict or lack of trust between local authorities (or the waste contractor) and the local community may require increased analytical attention to issues such as social equity and fairness of process. Public involvement initiatives may achieve perceptions of fairness and legitimacy if stakeholders and citizens are given equal opportunities to act meaningfully in all aspects of decision-making, including framing the problem and establishing evaluation criteria to assess technologies or sites.

4.2.2. Access to information, its communication, interpretation and assessment of validity claims

The data revealed all groups recognized the importance of educating the public before engaging them in debate to reduce the level of misrepresentation or misunderstanding of issues (87% of respondents; 100% of key stakeholders, 94% of citizen groups and 81% of local authorities). Interview data revealed a need for more interactive methods of communication, specifically as it relates to delivering technical information. Adopting visual aids in presentations or prototypes (mock-ups) of technologies may allow citizens to better visualise facilities. One participant during interviews suggested this has been particularly effective for consultation on facility proposals:

> *. . .One of the things we did was to take a mobile unit (a prototype of the facility) to the village hall to allow people to visualise the new plant. We did this before and after the planning application phase and our staff spent hours talking to people and responding to questions.*
>
> [*Waste Management Contractor, East of England.*]

Combining different forms of engagement as part of a public involvement strategy had greater support among key stakeholders and local authorities compared to citizen groups (73% of respondents; 88% of key stakeholders and 80% of local authorities, compared to 59% of citizen groups). Interview data suggested that there is a tendency to view formal consultation (and indeed more participatory and deliberative exercises) as a means of *post hoc* rationalisation of pre-determined decisions:

> *I am a bit cynical about how much [the Citizens' Advisory Panel's report] will actually influence [the Council's] decision. Personally I think the Council had already made their decision before the consultation.*
>
> [*Member of Citizen Panel, South East England.*]

Ideas on how best to conduct engagement activities may be solicited from the public to determine the best means for delivering technical information, soliciting feedback and actively engaging citizens (particularly young people) in discussing issues and generating information. This could ensure discussions are inclusive, consider the specific need of participants and stimulate effective public involvement in situations where a controversial facility is proposed or there is knowledge of public dissent relating to experiences of poorly operated facilities.

5. Recommendations: negotiating the mode and level of public involvement in different decision contexts

The findings revealed that the approach to public involvement depends on factors such as the nature of the technology, culture, values and history of the area, urgency of decision-making, availability of expertise and resources for public engagement. A synthesis of the findings is presented in Fig. 2, providing a framework for negotiating the mode and level of public involvement in different waste management decision contexts. The framework does not present 'hard and fast' rules for public involvement. Rather it should be interpreted as a guide for thinking through what balance between deliberative and representative approaches is needed to legitimise decisions in different waste management contexts. The framework is built on the premise that deliberative and participatory approaches should not be considered a treatment applied to representative decision-making. It conveys the need to balance representative and deliberative approaches for the three policy options or facility types (Sections 5.1–5.3), and presents minimum expectations for public involvement based on stakeholder perceptions of what is needed to legitimise decisions.

5.1. Non-thermal technologies (e.g. AD and composting)

The empirical data revealed debate about the adoption of non-thermal technologies tend to be dominated by issues around the wider environmental and economic impacts and the regulatory and institutional implications of the technology (e.g. compliance with LATS). When issues around the waste policy (or type of facility) are largely technical in nature and narrowly defined, there is more appeal to institutional authority (and expertise) to assess the risks and reduce negative impacts on local communities. However, the level of disparity around stakeholders' judgement regarding the potential of non-thermal technologies highlights the need for aligning public values and preferences for waste management options more closely to those represented within the decision process (Section 4.1.1). In such instances, local authorities may want to employ formal consultation methods that restrict participation to a small group (e.g. internal stakeholders and statutory consultees) who are tasked to consider and respond to proposals on well-defined issues and short-listed solutions. Consultation events use cost-effective techniques such as information dissemination exercises and opinion polls to widen public access to the decision process. Decision-makers have more control of the process and are able to impose strict time frames for public engagement activities, while satisfying the public constitutional right to participate in decision-making.

Criticism around how local authorities attribute and distribute risks among communities means trust is often at stake so early decisions to limit participation may later prove detrimental to creating a legitimate process. The risk research literature revealed the evidence for this in the siting of waste facilities (e.g. Snary, 2002; Petts, 2001, 1997), and the empirical data revealed that instances of public opposition to waste facilities emerge from factors related to perceptions of inequality and unfairness (Section 4.2.1). Where local authorities are required to represent public views on potentially controversial issues or non-thermal options they may find that an informal approach to consultation can add value by provid-

Policy options (or type of facility)		Non-thermal technologies (e.g. AD and composting)	Emerging technologies (e.g. MBT, gasification and pyrolysis)	Controversial technologies (e.g. EfW incineration)
Nature of the problem (or type of risks)		Largely technical and narrowly defined	Largely technical and narrowly defined but with greater levels of uncertainty	Ambiguous problem; includes social issues that are more broadly defined
Premise for public involvement		Align values and preferences represented within the process closer to that existing within society (normative)	Provide essential information and insights about the problem to develop a more effective/agreeable strategy or proposal (epistemic)	Expose dissent and disagreement to clear up misunderstandings and negotiate a more effective/acceptable solution (instrumental)
Mode and level of public involvement	Extent of public involvement (boundary)	Restricted public involvement - open to internal stakeholders and partners, and statutory consultation bodies	Intermediate public involvement - open to internal stakeholders, statutory consultation bodies and a representative group of interested and affected parties	Extensive public involvement - open to internal stakeholders, statutory consultation bodies and a wide range of interested and affected parties (including the general public)
	Roles / remit of the public (authority)	Participants have the right to question or object to the strategy/proposal	Participants have the right to frame the issues and set the agenda	Participants have the right to frame the issues, set the agenda, identify options and influence the strategy/proposal
	Information dissemination and deliberation methods	Detailed strategy or proposal (draft) is provided for comments usually at public meetings (or via surveys or focus groups). Little interaction between participants	All relevant and available information is provided. Use of deliberative techniques (CACs or citizen juries) and formal consultation to gather public knowledge. Interaction between participants follows a pre-defined (fixed) remit	Mostly technical information provided. Use of deliberative techniques (CACs, conflict resolution techniques) and formal consultation to explore perspectives, debate and resolve issues. Interaction between participants follows a pre-defined (flexible) remit
	Aggregation of information	There is some reflection on comments from the consultation process	There are detailed comments on how the concerns and values of participants are addressed	The concerns and values of participants have changed or influenced several elements of the strategy/proposal
Benefits of public representation	Process outcomes	Ensures accountability and enables local democracy; allows for a timely and cost-effective process	Builds institutional credibility; meets expectations for epistemic competence; potentially responsive process	Meet expectations for a fair and equitable process; responsive, legitimate (open and transparent) and considered epistemic/ethically competent
	Substantive outcomes	Emphasis on developing effective solutions	Emphasis on developing effective and potentially agreeable solutions	Emphasis on developing effective and potentially acceptable solutions
	Quality outcomes	Improve public understanding and raise public awareness	Establishes dialogue and promotes collaboration to reconstruct ideas around the deficit model of public understanding	Resolve conflicts, promote social interaction, mutual learning and trust building
		ANALYSIS		DELIBERATION

Fig. 2. Framework for negotiating the mode and level of public involvement in different waste management decision contexts.

ing 'upfront' input which allows communities and external stakeholders to participate in shaping the strategy or facility proposal before, rather than after, the draft document is produced. The ability for local authorities to work with the regulatory regime, rather than being constrained by it, is also demonstrated in practice, where there is evidence of formal consultation activities being run successfully alongside more innovative processes such as stakeholder workshops and citizen advisory panels (The West of England Partnership, 2010; PPS, 2008; Petts, 2008).

5.2. New or emerging treatment technologies (e.g. pyrolysis and gasification)

Public involvement in decisions around new or emerging technologies provide opportunities for gathering essential information about wider environmental and economic issues and insights around social concerns to develop a more effective and agreeable strategy or facility proposal. The empirical data revealed there is limited knowledge about the potential risks and social hazards of these technologies (Section 4.1.2). Where there are high levels of uncertainty regarding decision outcomes from the waste policy (or proposed facility), there is more appeal to involving public groups at an earlier stage in decision-making (i.e. framing the issues, identifying and evaluating options). In these situations, local authorities should extend the boundaries of participation to obtain relevant information about the risks and explore concerns related to social, cultural, political and other relevant interests. The level of public representation largely depends on the extent of uncertainties around the technology and potential for controversy.

Opening up the process (from an early stage) to include a representative group of interested and affected parties may be sufficient for issues that can be framed as a risk or, to a lesser extent, an uncertain problem or one that is narrowly defined. For example, the use of community advisory committees, workshops or citizen juries may enable local authorities to work collaboratively with small groups of stakeholders and community representatives to develop criteria that reflect the interests of the community and informs decision-making. Our earlier published findings revealed that involvement of ordinary citizens is prerequisite to getting a good representation of communities and the range of people interested and willing to participate (Garnett and Cooper, 2014).

Greater levels of uncertainty inherent in concerns expressed about the technology require the engagement of a wider group of stakeholders to frame the issues so that the interests represented are comprehensive and include a wide range of values, principles and concerns. The empirical data revealed the challenge is overcoming the tendency of local authorities to privilege technical input over local knowledge during problem framing and the development of criteria to evaluate technologies (Section 4.2.1). The level of interaction between participants may be tied to local authorities' agenda and time frame but there should be adequate opportunity for the public to put forward information as both expertise and local knowledge is important to the discussion. Establishing a remit for public involvement (in consultation with stakeholders and citizens) may allow local authorities to control the process and impose a relatively fixed time frame for public engagement activities. The benefits involve working directly with stakeholders and citizens to discuss issues constructively and to solicit views with the aim of gathering public knowledge, ensuring their concerns and values are fully understood and addressed. The advantage over the traditional consultation approach (i.e. using methods such as public meetings or surveys) is the opportunity to solicit a more holistic view of waste management issues, particularly where input is required at an early stage in decision-making.

5.3. Controversial technologies (e.g. EfW incineration)

The empirical data suggested controversy around the selection and installation of technologies (e.g. EfW incinerators) is associated with a lack of trust in officials (and expertise), issues around equity and fairness and ambiguity around the concerns and values of different interest groups (Section 4.1.3). Where there are high levels of ambiguity (or disagreement) regarding the goals and priorities for waste management, there is more appeal to involving

public groups at an earlier stage in decision-making (i.e. framing the issues, identifying and evaluating options). In these situations, public involvement is necessary to expose dissent and disagreement and clear up misunderstandings around the nature of the controversy.

Local authorities may extend the boundaries of participation to involve a wider group of stakeholders, specifically in consideration of the risks associated with the policy or proposed facility. The research findings suggested a key objective is to clarify the views of various participants and the level of assessment necessary to achieve an adequate balance between regional (national) and local needs, thus building credibility and trust in the process (Section 4.2.1). Often the latter requires consideration of what could be considered reasonable (or acceptable), recognising the challenges inherent in reconciling divergent perspectives and opinions on issues (Pimbert and Wakeford, 2001; Renn, 1999). Overcoming these challenges requires the resolution of conflicts over the admissibility of evidence, a better understanding of opposing perspectives, and aggregation and interpretation of different forms of knowledge to solve problems and find common ground.

The empirical data suggested that a more inclusive process may prolong problem framing to the extent that it becomes difficult to close discussions in a timely manner, thus delaying decision-making (Section 4.2.1). Additionally there is a danger of incorporating so many perspectives of the problem that it becomes difficult to negotiate a common definition of the problem and agree a set of objectives for taking action. Our earlier published findings revealed that establishing an intensive communications protocol (in consultation with stakeholders and citizens) should clarify the remit for public involvement and allow local authorities to control the process, imposing a flexible time frame for public engagement activities (Garnett and Cooper, 2014). Opening up the process to a wide range of interested and affected parties ensures all relevant perspectives on the issues are captured early to inform analysis and deliberation. The research suggested that involving a wide range of expertise (and independent facilitation) can help build trust and encourage positive input from communities in situations where trust (and the credibility of the institution) is at stake (Section 4.2.2).

The literature on public involvement has demonstrated that highly interactive deliberative groups (e.g. community advisory committees) are suitable to provide a forum for stakeholders and citizens, working in collaboration with experts to combine technical facts with public values into a set of conclusions and recommendations (e.g. Abelson et al., 2003). Our earlier published findings revealed that the integration of quantitative and qualitative information will require a trusted and accomplished facilitator to design an appropriate mechanism for converting and conveying information between parties and ensuring impartial assessment of options against a comprehensive list of criteria (Garnett and Cooper, 2014). The benefits include the opportunity to establish genuine partnerships with communities to resolve conflict, promote social interaction, shared learning and improve public confidence in local authorities (and their representatives). The advantage over the traditional consultation approach is the potential to match desires for more direct forms of democracy, openness and transparency and also the possibility of saving money and time at a later stage of the decision-making process.

6. Conclusion

In a climate of localism in which the focus is on community input, conflict over issues such as the selection of technology, the need for pre-treatment or off-site energy recovery, and the scale of plant for thermal treatment of wastes (Defra, 2007; Tunesi, 2010) may be exacerbated. Consequently, greater effort is necessary to support decision-makers' needs, either in framing waste policy or in taking site-specific decisions. Optimising the level of public involvement provides opportunities to open up the decision process and admit a wider range of perceptions of complex issues to gain a richer understanding of the risk situation and a more holistic assessment of options and potential outcomes, thus creating a stronger foundation for decisions. The challenge is finding the best means of combining analysis and deliberation to enhance conditions for successful participation: social interaction, shared learning and trust building. This research has demonstrated that the decision on the level and extent of deliberation can be negotiated, based on the nature of the waste problem and the social context of decision-making. This necessitates an assessment of the risks or level of uncertainty and ambiguity inherent in concerns expressed about the technology, the range of interests and values defining the priorities for waste management, and the local culture and potential for controversy. Careful consideration of these factors establishes the premise for public involvement and the benefits of optimising public representation in different decision contexts.

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