Introduction

Heavy industry has been in decline in the UK since the 1970's, leaving behind a legacy of derelict buildings and waste ground (Rivett et al., 2002). Such 'brownfields' (i.e. "any land that has previously been used or developed and is not currently fully in use and may be vacant, derelict or contaminated" (Alker et al., 2000, p. ...)) are frequently associated with deprived or declining neighbourhoods, high unemployment, environmental degradation and neglect (Grimski and Ferber, 2001). Recognition of the loss of green fields to urban sprawl, a need to promote sustainable land use and fears over human and environmental health risks at brownfield sites has prompted many European governments to drive land regeneration through incentives and taxation. The regeneration of brownfield land is regarded as a major tool in achieving sustainable development (Grimski and Ferber, 2001)

The UK government has placed strong emphasis on integrated land use policies including brownfield land regeneration in support of urban renaissance and quality of urban living (Anon., 2005a). According to the Urban White Paper (DETR, 2000) new urban developments should have greenspaces that are accessible to their communities, preferably by forms of transport other than the car. This objective is expanded in the UK by Natural England's 'Access to Natural Greenspace Standards (ANGst)' that recommend that people living in towns and cities should have accessible natural greenspace less than 300 metres from home (English Nature, 2006). Just as important as access, however, are planning, design and management. There is an ever growing body of evidence to demonstrate that greenspaces offer lasting economic, social, cultural and environmental benefits - if quality is maintained (NAO, 2006). Shabby, badly maintained public spaces lend a sense of physical and social decline (CABE Space, undated).

The multi-functional role of urban greenspaces consolidates the case for their re-establishment (van Leeuwan et al., 2002). The environmental and recreational functions of greenspaces include the sequestration of atmospheric pollutants, energy conservation through cooling and shading, storm water attenuation, habitat provision, and a place to relax, exercise and socialise (Moffat and Hutchings, 2007). The economic benefits of greenspaces, though hard to quantify, include improved surrounding land values leading to recognition of brownfield greening as a pump-primer to regional economic revitalisation (Grimski and Ferber, 2001).

Good practice published in support of successful regeneration (e.g., DoE, 1996) is underused, resulting in examples of greenspace establishment projects with questionable success, with respect to sustainable regeneration and the functions the greenspaces were designed to fulfil (Sellers et al., 2006). For example, successfully improving accessibility for local communities at the expense of important species that have colonised the site equates to environmental degradation and contravention of sustainability principles (Anon., 2005b). Consequently, the terms 'success' and 'sustainability' in the context of brownfield greening projects are not automatically interchangeable.

Following decades of declining investment in public open green spaces, calls have emerged for increased investment, quality standards and regional strategies for urban greenspace (NAO, 2006), to raise the profile and quality of greenspaces. Understanding what makes a successful greenspace is important to securing revenue funding and ensuring that the space can deliver the anticipated social, environmental and economic benefits (CABE Space, 2005).

The aims of this paper are to: A) review the literature to consider the definition of success in the context of brownfield greening and elucidate principles important in success evaluation, B) propose the 'logic' model for the evaluation of success, and C) use a case study approach to demonstrate the utility of the logic model within the context of a selection of social and environmental criteria.

A Review

Definitions of success

In brownfield regeneration, success has been described generically as economic benefit (De Sousa, 2003), or as civil infrastructure renewal, tax-based development, economic development and neighbourhood revitalisation (Amekudzi and Fomunung, 2004). In specific terms, success has been described as local community involvement, job creation, or relative to environmental remediation (Amekudzi and Fomunung, 2004). Reviewing the literature, Silverthorne (2006) noted that definitions of success varied between countries, academic disciplines and regeneration projects, recognising that different concepts of success emerged from the attachment of different values. The lack of definitive criteria against which success may be measured can result in a lack of motivation to improve standards (Silverthorne, 2006).

Traditional approaches to success measurement

Dictionary definitions of success emphasize it as a product, gain of a desired state, achievement or conclusion. Thus, success can be thought of as attaining something sought after. In the context of brownfield greening, success is often demonstrated against aims/objectives. This definition is reflected in traditional developer-, funding body- and site owner/manager-centric notions of success where the focus of evaluation is exclusively economic (Wedding and Crawford-Brown, 2007). Three reasons explain the persistence of this definition:

i) economic factors of success justify project expense;
ii) success can be described in project management terms, which are relatively simple to measure (e.g. project deliverables) and data may be collected as part of the delivery programme at little or no extra cost;
iii) project inputs and outputs tend to be easy to describe quantitatively.

However, such measures can imply that once success is achieved, continued investment in management, maintenance and development is not required; irrespective that the measures may bear little relevance to local community needs or site sustainability and that an on-going revenue stream is paramount to prevent disrepair and neglect (CABE Space, 2005; Sellers et al., 2006).

Across the UK, brownfield greening is almost exclusively undertaken by government departments (such as the Forestry Commission), regional bodies (such as the Regional Development Agencies) and Local Authorities, often in partnership with private companies. Exceptions include mineral extraction and landfill site restorations and aftercare strategies. This is primarily because regeneration costs force a financially rewarding hard-end use. However, whilst the costs are relatively easy to identify and calculate, the economic benefits of greenspaces are harder to quantify (Morancho, 2003; Moffat and Hutchings, 2007). Benefit versus cost presents a problematic measure of success because each must be identified, described and compared in order to evaluate the level of success attained.

Sustainability appraisal of success

Sustainability has been defined as the integration of social, economic and environmental considerations. However, when it comes to its application, the central concept of sustainability remains somewhat elusive and its relevance and application are tainted by the complexity of the real world (Moffat and Hutchings, 2007). In the context of urban greenspace, sustainability has been taken to include effectiveness of pollution control measures, longevity of planted vegetation or public utilisation of the greenspace (Moffat and Hutchings, 2007). From an environmental perspective, success may be considered with respect to the conservation of ecological interests (Harrison and Davies, 2002). Relating to economic sustainability, success evaluation may consider the benefits of regeneration as opposed to the cost of doing nothing; and from a socio-environmental perspective, how people visit the greenspace (e.g., car, foot or bike), impacts on the site's environmental sustainability.

Each aim and objective of a regeneration project can be ascribed to one or more stakeholder groups (for a list of brownfield greening stakeholders see Alker et al. (2000) and Doick et al. (2009)). A flaw of traditional funder- or developer-centric approaches to defining success is the restricted representation of the stakeholders. Undoubtedly, greenspace establishment is about community development. The justification may be economic regeneration and the medium of change may be the environment but the vector of change is society. As Selman (1997, ...) states: "sustainability, biodiversity, appearance, accessibility and environmental impact of greenspaces are clearly matters of public concern". Developer-centric notions of success fail to correlate (or inversely correlate) with the social and economic well-being of the surrounding communities and stakeholders such as environmental bodies (Silverthorne, 2006). Although including stakeholders in success evaluation may create conflicts of interest (Kitchen et al., 2002), it may also encourage an integrated appraisal, with long-term perspective on regeneration.

Logic: a model for measuring success

Learning from traditional approaches, evaluation should be practical and appropriate. Sustainability evaluation demands economic, environmental and social criteria and integration of different stakeholders' values. Furthermore, short-, medium- and long-term monitoring perspectives are required to evaluate continuing success and to respond to changes in demand. A model is required that integrates traditional and sustainability principles in the evaluation of brownfield greening projects.

The 'logic model' was developed in the 1970s by Joseph Wholey as a general framework for describing work in organizations; it categorises work as inputs, processes, outputs and outcomes to represent the logical flow from one step to the next (Millar et al., 2001). Logic modelling has been applied to program and strategic planning, childhood development and project performance evaluate in relation to different stakeholders (Millar et al., 2001). An input is a resource, investment or commitment into a project; a process is a programme or activity by which an output is delivered; an output is a product or service delivered directly by or through a project; and, an outcome is a consequence of a project (an indirect output). Figure 1 presents a logic root model diagram for brownfield greening projects and a variety of greenspace aims and objectives as inputs, processes, outputs and outcomes for a number of example stakeholders. Logic models highlight the synergy between difference stakeholders' project aspirations.

Insert Fig. 1 about here

Outputs, directly attributable to a project partnership or influence and are typically straightforward to measure. On the contrary, project outcomes are susceptible to influences external to a project. Thus, it can be hard to apportion with certainty the influence of a project on an outcome. Outcome measurement may also be problematic as resource demand is greater than for output monitoring. Moreover, there is often a lag between the project's delivery and outcome realisation.

Regeneration project evaluations have tended to focus on inputs and outputs, not outcomes (DETR, 1999; Wedding and Crawford-Brown, 2007). However, brownfield regeneration and greenspace establishment project aims are frequently outcome-based (e.g., improve health and well-being in local communities). Inputs and outputs evaluate the project's contribution to achieving the outcome but do not demonstrate that the desired outcome has been attained. Thus, outcome evaluation becomes unavoidable in any meaningful evaluation of site success and sustainability. A summary of documented impacts of greenspace establishment that may be employed in the identification of 'outcomes' and, thus, success assessment criteria is presented in Table 1.

Insert Table 1: Impacts of greenspace establishment from regenerated brownfield land used in the identification of evaluation criteria of a successful greenspace.

The input-process-output-outcome categorisation within the logic model can also be used to direct and facilitate monitoring (i.e. what to monitor, when and how). 'Monitoring' is defined herein as observation and recording of a variable, either qualitatively or quantitatively, to assess performance or progression to a target. 'Evaluation' goes further by assessing impact against a scheme's objectives and testing that those objectives remain valid.

Application of the logic model to brownfield greening success evaluation: a case study approach

The following sections provide an example of how the logic model was applied within the context of six brownfield regeneration case studies to assess success with respect to outcomes and quality attained.

Methodology

Six UK case study sites were examined in order to investigate a number of brownfield greening project success criteria. The sites studied were: Bow Creek Ecology Park, East London (BC); Eastbrookend Country Park, London (EBE); Ibstocks, St Helens (IBS); Ingrebourne Hill community woodland, Essex (IH); Russia Dock Park, London (RD) and Thames Barrier Park, London (TBP). The case studies, introduced in Table 2, bear similarities in their land-use histories but varied in the extent and methodology of regeneration employed. For each project, relevant background information was compiled including land use and reclamation history, site management plans and project aims. The sites were investigated in 2005 and included walkovers, environmental media analysis and visitor surveys. Analytical data were collected using standard field and laboratory protocols (Table 3).

Insert Table 2: The six case study sites

Insert Table 3: Methods of data collection and laboratory analysis

Each study site was divided into zones based on spatial and historical land-use differences. For vegetation and soil sampling, 5 sub-sites were randomly selected within each zone and the media bulked to provide a single, representative sample (unless otherwise stated, Table 3). The number of zones ranged from 14 at Russia Dock to 22 at Eastbrookend.

Formal project documentation and reclamation specifications were not available for all sites because of time lapse since restoration. Therefore, a comprehensive list of site aims and objectives for each case could not be compiled. However, interviews with site managers and perusal of historical documentation and management plans elucidated many of the original and contemporary site aims. Aims and objectives common to all sites were:

- regenerate land to a soft-end use for public use,
- provide access to attractive setting,
- increase use of the site for sport, amenity or recreational activities,
- involve community in design and management of site,
- create new habitats,
- maintain and enhance biodiversity.

Each site also had context-specific aims and objectives and some examples include: providing an educational resource (BC, EBE, TBP), and promoting surrounding land and house prices (TBP, IBS). Applying the logic model to the case study sites presents a summary of inputs, processes, outputs and outcomes related to the common objectives (Figure 1). The outcomes considered by this research were establishment of trees/woodland and provision of quality greenspace with social and amenity value. Analysis drew on comparisons between the case-studies to evaluate to what extent outcomes and success had been achieved.

Results

Substrate for the establishment of healthy trees/woodland

Brownfield sites are exemplified by site variability and instability, soil infertility and site hazards (Moffat and McNeill, 1994). Consequently, risk assessment, remediation and landscape design are priority regeneration tasks. However, tasks that promote healthy vegetation establishment are often de-prioritised due to cost implications. For example, recognising that vegetation has both a preference and a tolerance range to growth, a variety of soil-forming materials at the outer bounds of the tolerance limit are used in brownfield greening without amelioration or amendment. Tolerance ranges can be used both pre-reclamation in species selection and post reclamation to see how conditions are changing.

Soil pH at the six case study sites was typically in the range 6.8-7.8, but extremes were observed (pH<3 at Ingrebourne Hill; pH>8 at Russia Dock and Bow Creek). The optimum range for most tree species is pH 5.0-7.5 (Bending et al., 1999). Thus, species selection must be appropriate to ensure establishment and health. In this context, species selection at each site was appropriate. Species tolerant of brownfield land conditions including rowan (*Sorbus aucuparia* (L.)), field maple (*Acer campestre* (L.)) and hawthorn (*Crataegus monogyna* (Jacq.)) and pioneer species such as silver birch (*Betula pendula* (Roth.)) and common alder (*Alnus glutinosa* (L.) Gaertn.) were used at the majority of the case study sites. Extremes in pH have the potential to influence various woodland establishment success measures such as localised tree loss (as seen at IH) and poor growth rate. Regarding success for woodland establishment according to species suitability to soil pH, all case studies were successful.

Soil chemical quality was assessed using total and calcium chloride extractable concentrations ($CaCl_2$-extractions representing the mildly extractable or 'bioavailable' fraction (Landrum, 1989)) for various metals, metalloids and nutrient concentrations. Tolerance levels of metal/metalloid total soil concentration vary between plant species and individuals, growing medium and condition, so conservative literature values were used (Table 4). Two case study sites displayed localised exceedences relative to published background concentrations for total arsenic and zinc concentrations (Table 4); however, these values did not exceed the tolerance values reported by Dickinson (2000) as suitable for tree planting. Total copper, nickel, cadmium, chromium and cobalt soil concentrations were within background ranges (Table 4). Boron, lead and barium tolerance values were exceeded at 3, 1, and 1 sites, respectively. However, these exceedences were localised and mean values per site zone were less than the published tolerance values and, although tolerance values are conservative to take account of species and site variability, the broadly acceptable metal/metalloid total soil concentrations across the case studies nevertheless represent success in terms of contamination abatement. Observed values for available concentrations and uptake (recorded as leaf concentration) enable a site specific prognosis of vegetation establishment success. In the following sections, available metal/metalloid is discussed with respect to observed leaf concentrations and field notes to elucidate causes of poor tree health and growth.

Insert Table 4. Ranges of total soil concentrations recorded at the case study sites and the literature values used for comparison.

All sites displayed widespread deficiency of available potassium, phosphorus and magnesium. For example, at Thames Barrier Park (TBP) all but one of the samples were deficient in available potassium and phosphorus and over half were deficient in available magnesium, in comparison to literature guidelines. At Russia Dock (RD) all samples were deficient in available phosphorus, contained adequate magnesium, but were deficient in potassium at approximately one third of the sampling locations. The least fertile site with respect to tree growth was Eastbrookend (EBE) where all samples suggested a deficiency of available potassium, magnesium and phosphorus. At these sites, the prognosis for healthy tree growth was poor – this suggests that TBP, RD and EBE did not succeed in providing a suitable medium for sustainable tree growth.

The successful establishment of a diverse wildflower grassland favours soil of poor fertility (Agate, 2002). In contrast to nutrient availability for tree growth, soil fertility exceeded wildflower's preference range with respect to available potassium and phosphorus (Table 4) at all sites except TBP and Ibstocks (IBS). High fertility constrains wildflower meadows because more competitive species (particularly grasses) tend to thrive in areas of bare earth required for perennial seed setting (Agate, 2002). The results suggested that only TBP and IBS had a soil resource appropriate to wildflower establishment; Bow Creek (BC), Ingrebourne Hill (IH), RD and EBE were unlikely to be successful in the establishment of naturalistic wildflower meadows without intensive management input.

Woodland establishment: vegetation establishment and quality of trees and wildflowers

A number of parameters of vegetation health and quality are useful in determining the success of vegetation establishment, including survival rate, vigour, growth rate (height or biomass) and visual appearance. In this study, tree vigour - expressed as crown density, appearance and elemental leaf concentrations (Table 5) - was investigated. Low crown densities (15-30%) occurred in areas of low nutrient availability, and leaf discoloration (browning) occurred in trees growing in areas of elevated concentrations of available boron, zinc, cadmium or lead. For example, at Bow Creek (BC) low crown density was observed in field maples growing in soils deficient in K, Mg, and P. Low crown density and leaf discoloration could also be related to poor rooting conditions (e.g., soil compaction and water availability) and tree vigour may have been hindered by excessive weed growth.

Insert Table 5. Leaf tissue concentration ranges recorded at case studies sites and literature values used for comparison.

Foliar concentrations of lead, zinc and cadmium were elevated in comparison to published tolerance ranges at each of the case study sites, particularly in certain species. For example, samples of silver birch displayed elevated concentrations of zinc in two third of samples at Eastbrookend (EBE) and in all samples from BC. Similarly, eared willow (*Salix aurita* (L.)) displayed elevated zinc concentrations in seven out of eleven samples and elevated cadmium concentrations in all samples from Ibstocks (IBS). Five of six grey willow (*Salix cinerea* (L.)) samples taken at Russia Dock (RD) contained elevated zinc concentrations. Elevated lead concentrations were recorded in eared willow, silver birch and alder (*Alnus* spp) at IBS. For each species investigated, concentrations were not correlated with soil pH. Other factors may have contributed to the elevated foliar concentrations (e.g. the propensity of some species/varieties to bioaccumulate, Gussarsson, 1994; Punshon and Dickinson, 1997). Furthermore, the $CaCl_2$-extractable assessment demonstrated local elevation in the putative bioavailable fraction; e.g., $CaCl_2$-extractable zinc ranged 0.2-0.5 mg/l across all case study sites, with 'hotspots' of >2 mg/l at each. Local elevations in the $CaCl_2$-extractable fraction were also noted for lead, boron, copper, barium and cadmium at more than one site.

Based upon trees growing on green and brownfield sites, Dickinson (2000) and Sopper (1989) suggested a boron foliar concentration tolerance level of 100 mg/kg, above which decreases in growth may be expected. All sites, except IBS, had boron foliar concentrations in excess of this tolerance level including eared willow and silver birch at Bow Creek (BC); eared willow (all samples) and dogrose (*Rosa canina* (L.), 4/5 samples) at EBE; Eared willow (all samples) and oak (*Quercus* spp, 3/5 samples) at IH; in all grey willow, maple, oak, London plane (*Platanus acerifolia* (Aiton) willd.), false acacia (*Robinia pseudoacacia* (L.) and grey poplar (*Populus x canescens* (Aiton) Sm.) at RD; and, finally, in more than half of the oak, Norway maple (*Acer platanoides* (L.)) and hornbeam (*Carpinus betulus* (L.)) at Thames Barrier Park (TBP). At each of these sites, a high percentage (10-50%) of the total soil boron was $CaCl_2$-extractable and, therefore, may be considered available for plant uptake. However, elevated boron foliar concentrations did not correlate with visual signs of poor tree health.

Foliar concentration measurements do not demonstrate site success or failure alone. For example, many species are capable of tolerating concentrations significantly elevated in comparison to background levels without adverse toxicological effect. These results support other studies demonstrating accumulation of various metals/metalloids in birches (Gussarsson, 1994) and willows (Punshon and Dickinson, 1997). However, long-term monitoring of tree health may be necessary as accumulating species may constitute pollutant pathways to sensitive receptors (e.g., food-chain transfer and leaf litter recycling).

The diversity of wildflower species recorded at the case study sites ranged from zero to nine per quadrat and was typically 3-5 species. Some of these areas were dedicated by design to wildflowers (i.e. were seeded for wildflowers, although may not have received the appropriate ground preparation or on-going maintenance). Others were subject to natural regeneration by grasses and wildflowers. At Bow Creek (BC), two wildflower and grassland areas recorded species diversity of 9 and 6 per quadrat. At Ibstock (IBS), species desirable because of their aesthetic appeal, rarity or importance to biodiversity such as yellow rattle (*Rhinanthus minor* (L.)), rough hawkbit (*Leontodon hispidus* (L.)) and devilsbit scabious (*Succisa pratensis* (Moench.)) competed with smothering and/or aggressive species such as common ragwort

(*Senecio jacobea* (L.)) and 'mares-tail' (*Equisetum* spp (L.)). Furthermore, a natural regeneration area was predominated by bramble (*Rubus fruticosus* (agg) (L.)), creeping thistle (*Cirsium arvense* (L.) Scop.), broadleaf dock (*Rumex obtusifolius* (L.)) and silverweed (*Argentina anserine* (L.) Rydb.). At Russia Dock (RD), a wildflower area, whilst containing cow parsley (*Anthriscus sylvestris* (L.) Hoffm.) and field rose (*Rosa arvensis* Hudson), also contained the binding cleavers (*Galium aparine* (L.)), poisonous deadly nightshade (*Atropa belladonna* (L.)) and bramble – plants commonly associated with compacted low nutrient soils. Predominance was also observed locally for species favoured because of their ecological function – such as willowherb (*Epilobium hirsutum* (L.)), a good provider of pollen and nectar. The diversity of species identified demonstrated that wildflower meadows had not been successfully established and changes to soil preparation or management regimes were required if this objective was to be met.

With the exception of Thames Barrier Park (TBP), each case study site displayed localised patches of poor growth in grassland areas (i.e. less than 50 % surface coverage). Physicochemical parameters analysed at each of these locations demonstrated that in most cases the problems related to soil pH, low nutrient availability or compaction. For example, a sampling location at IBS dominated by coltsfoot (*Tussilago farfara* (L.)), ragwort, creeping thistle, willowherb and broadleaf dock may be explained by the low soil pH. At Eastbrookend (EBE), areas of grass surface coverage of < 35 % may have been the consequence of an inappropriate grass seed mix for soil pH 6.0. At IH, soil pH of 3.4 limited the presence of grasses and wildflowers, although oaks, eared Willow, Corsican pine and silver birch grew in the locality. At RD, an area of cow parsley, bramble and red deadnettle (*Lamium purpureum* (L.)) growth, providing on average 25 % surface coverage, suffered from very compacted soil (> 5 MPa) below 15 cm depth. Poor quality tree growth (crown densities of 25-40 %) were also recorded for birch, willow, ash, maples and poplars growing in areas with soil compaction (> 4 MPa) at depths as shallow as 15-30 cm at Russia Dock (RD), Ingrebourne Hill (IH), Bow Creek (BC) and EBE. A soil strength value of 2-3 MPa has been found to significantly limit root development (Greacen and Sands, 1980). Non-compacted soil with soil density < 1.5 g cm^{-3} to 50 cm depth has been proposed as best practice in brownfield land reclamation for tree establishment (Bending et al., 1999).

Amenity greenspace and social value: visitor survey perspectives

A major social sustainability criterion for new greenspace is that it should be wanted by its intended users (Moffat and Hutchings, 2007). Therefore, success criteria included the creation of spaces for diverse activities, local use and the promotion of social diversity. These criteria were reflected in visitor surveys for Thames Barrier Park (TBP) and Eastbrookend (EBE).

A comparison of questionnaires conducted at TBP and EBE showed different patterns of use depending on the destination type. The formal design of TBP was intended to create a tourist destination, as well as a place for locals to relax, yet the predominance of occasional and first-time and early afternoon visitors suggests that TBP is a tourist destination rather than a local amenity (Table 6). In comparison, use of EBE is widespread and most visitors arrive by foot or bicycle, which suggests local usage. Previous visitor surveys at TBP suggested that whilst the site was highly regarded by site users, it was relatively poorly used by neighbouring communities and user groups did not reflect the local ethnic diversity of UK census data (Villella et al., 2006). Thus, TBP did not fully meet the stated aim of promoting social diversity.

Insert Table 6. Summary of visitor survey questionnaire results performed at Eastbrookend Country Park (EBE) and Thames Barrier Park (TBP)

Visitor surveys showed that the reasons stated for visiting EBE and TBP were very similar, including walking, relaxing and exercise, as well as site specific attributes such as fishing at EBE and visiting the café at TBP (Table 6). Respondents pointed out potential improvements for both sites, including signage, information boards and other infrastructure. Addressing these site specific failures may encourage target audiences to visit but would not, in themselves, constitute a measure of success.

The importance of wildlife as part of a visit scored very highly at both sites, with 86 and 71% of respondents stating it to be 'very important' or 'important' at EBE and TBP, respectively. EBE respondents also stated that more trees and wildflowers and other animals would be valued improvements, suggesting that existing vegetation was inadequate. The woodland establishment data (soil chemical, vegetation establishment and quality) presented in previous sections raise a number of questions concerning the viability and sustainability of the established habitats (e.g., because of soil fertility) and demonstrate that reclamation works must be appropriate given the importance of wildlife to visitor experience. In summary, the social surveys highlighted three factors (quality, design and biodiversity) as important site attributes. Quality in design, site delivery and on-going management and maintenance therefore lend themselves as important input and output success criteria, and biodiversity as an important outcome success criterion.

Surveys of visitors to urban greenspace typically quote aesthetics alongside safety as key factors that would lead them to feel excluded from a site. Survey data demonstrated an array of problems affecting the aesthetic appeal of the case studies including litter; water-logged paths (because of ground compaction); arson damage; patchy grass growth; unauthorised construction of cycle jumps; and Japanese knotweed (*Fallopia japonica* (Houtt.)) a highly invasive non-native species indicative of inadequate site management. Lack of appeal and low frequency of use may promote anti-social behaviour, neglect and decline, and are indicators of potential problems for the future success of the greenspace.

Discussion

Delivering a brownfield greening project on time, on budget, with the ascribed habitats and infrastructure is not enough to guarantee the success of a new greenspace, either in the context of its aims or in the long-term (Sellers et al., 2006). Many project aims and objectives are by definition outcomes and therefore cannot be measured immediately upon delivery of a greenspace, nor can they always be measured directly. This research indicates that there is a gap between measuring outputs as indicators of success and achieving the 'outcome' project aims and objectives envisaged. Whilst this research focussed on greenspace projects, the findings are supportive of calls in the literature to promote brownfield development sustainability in the wider sense (Pediaditi, et al., 2006; De Sousa, 2008). This research also, therefore, focussed on socio-environmental outcomes of brownfield regeneration, but not socio-economic.

The aim 'to establish habitats' had been only partially successful at the case studies, with poor quality tree health (leaf discoloration) and growth (low crown density) recorded. Woodland establishment was compromised in the long term by poor soil nutrient quality and foliar accumulation of metals/metalloids. Applying the logic model demonstrates the need for continuity in design, development, management and evaluation; e.g., the development phase establishes the planting medium - the foundation for the successful establishment of vegetation, however, site developers are typically not the site owner/manager and are unlikely to be formally associated with a greenspace as it matures. Therefore, evaluation of development phase inputs (e.g. monitored by the developer) and project outputs (monitored by the developer and/or site owner/manager) provide a prognosis of success that can only be affirmed by monitoring and medium- to long-term outcome evaluation. Ensuring continuity in evaluation through the project phase and post-regeneration will help ensure successful long-term project delivery.

With respect to the provision of quality greenspaces with social and amenity value, the success of the case study sites is also questionable. The use of the sites by age and ethnically diverse groups was an outcome aim for Eastbrookend and Thames Barrier Park; yet visitor surveys indicate that this aim has not yet been achieved. Managers should determine whether this can be achieved by further work or if the original project aims were unrealistic (see Villella et al., 2006).

Improved access to 'quality' greenspace is a common aim in greenspace establishment projects (whether green- or brown-field land regenerations). Successful delivery of this aim requires an understanding of greenspace 'quality'. Yet, greenspace 'quality' is an emergent property, complex to understand and deliver. Greenspace quality needs to consider all users of the greenspace (NAO, 2006). Harshaw et al. (2007) stated that visitor satisfaction is a multidimensional concept dependent upon not only resource, social and management settings but also socio-economic and cultural characteristics, experience, attitudes, preferences and norms. This research support claims that large capital expenditures do not guarantee visitor satisfaction, quality or success, but that design and on-going management and maintenance are influential.

Greenspaces are dynamic places: vegetation grows, ecological succession takes place and social attitudes toward the place change. Given this dynamism, a greenspace considered successful relative to establishment aims may become 'unsuccessful' or 'less successful' as the roles it is expected to fulfil change. Thus, in the context of greenspaces, success is more than just 'attaining a desired state': it has to be embedded within a process of review and re-evaluation as a site matures. A site management plan typically contains sub-sections on monitoring but not all sites have such a plan and the monitoring specified may not support assessment of outcomes, especially where the focus is on quantitative measures. Irrespective of the history or primary functionality of the greenspace, evaluation of data collected is required to assess outcomes, to manage the greenspace more effectively, to identify good practice and to allow accurate reporting to key stakeholders (DETR, 1999). Given the social and environmental benefits of a quality greenspace, the presence and appropriate management of greenspaces should be welcomed, even in light of the establishment and maintenance mentioned above.

Monitoring and evaluation affords many opportunities over and above assessment of project delivery including:

i) supporting the site management cycle - management efficiency and effectiveness,

ii) informing funding bodies and other stakeholders,

iii) learning lessons,

iv) formulating best practice,

v) providing opportunities for community engagement.

Characterisation of outcomes is not always dependent on expert assessment; rather, many indicators (such as bird and butterfly counts) can be captured by local residents or volunteer groups, which is in itself an opportunity to deliver against social outcomes such as education, volunteering and encouraging community cohesion. Problems associated with long-term monitoring and evaluation should also be recognised, including cost, time, skills-base and stakeholder capacity (e.g., see De Sousa, 2008). Therefore, capital regeneration funds must be supported by a revenue package to manage and maintain the established greenspaces, and fund monitoring.

This research supports the UK's National Audit Office call for increased investment and quality standards for urban greenspace (NAO, 2006). Different forms of greenspace require a range of appropriate benchmark standards encompassing *inter alia* recreational spaces, habitats, green-infrastructure and formal planting. Such benchmark standards should be refined through multidisciplinary input, peer-review and ongoing research and applied via the site management plan review. The research highlights the need for sustainability objectives to be defined and agreed for each site as a matter of good practice to drive delivery and success (Doick et al., 2009).

Success for brownfield greening projects can be defined as the on-going delivery of site aims and objectives. This requires developers and managers to shift their focus from project completion to project outcomes and to adopt a fluid monitoring and evaluation process of greenspaces. Such a process must integrate a broad range of stakeholder perspectives and be designed with long-term sustainability of the greenspace in mind. This research does not disregard the efforts made towards the successful regeneration of brownfield land, but rather aimed to emphasise the need of a clear understanding of success, adapted to the context of regeneration and evaluated in terms of its outcomes, rather than just its outputs, in order to strive towards sustainable quality greenspaces.

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Tables:

Table 1. Impacts of greenspace establishment from regenerated brownfield land used in the identification of evaluation criteria of a successful greenspace.

Economic	Social		Environmental
	Social – Community	**Social – Civic**	
Cost (reclamation and regeneration)	Access (accessible resource, community aware of site)	Aesthetics – site and locality	Air quality, temperature and pollutants
Economic regeneration	Amenity and facilities and public use of site	Community engagement in local political issues	Biodiversity – populations and biodiversity action plans
Employment (prosperity and affluence)	Community development, cohesion, interaction	Connectivity networks	Resilience to and mitigation of climate change
Energy efficiency (heating/cooling)	Cultural heritage conservation (built environment)	Crime reduction	Flood alleviation and mitigation
Inward investment	Education / life skills	Design (especially at the landscape scale)	Habitat (provision and delivery of BAPs)
Land value (property rental prices; revised tax base)	Health and well-being - healthier environments	Legislative and risk of potent-ially contaminated land	Natural heritage conservation (flora, fauna, landscape)
Regional image: tourism, commerce, industry	Neighbourhood renewal / Renewed sense of place	Planning (delivery of local strategic needs)	Soil quality conservation
Revenue for management and maintenance	Recreational asset	Sustainable communities - waste / energy	Water quality conservation

Table 2. The six case study sites

Site	UK OS Landranger map grid reference	Regeneration year	Regeneration costs £ (£/ha)	Site history
Bow Creek Ecology Park, Limmo Peninsular, East London (BC)	TQ386817	1996 (initially) and 2006	£1.2 million in 1996 (~ £460,000)	Initially marshland, the Victorians converted the site in to a coal wharf and then, in 1912, a rail marshalling yard for 68 years whence forth it lay unused until construction of the Dockland Light Railway extension. Construction exposed hitherto buried soils containing zinc, arsenic, copper and mercury hotspots. Soils were imported (200 mm depth) and grass sown. A complex 2.6 ha ecology park was built and opened in 1996 featuring patches of woodland and wetland areas fed by water sluices. By 1998, the park had severe problems including incorrectly managed wetland systems, collapsed embankments, unsafe boardwalks and was closed on safety grounds. A further £2 million was invested in re-landscaping in 2006 (one year after the data for this study was collected) and, recognising the sites limited vehicular access and vulnerability to vandalism, a new management plan was created, the site re-opened in June 2006.
Eastbrookend Country Park, Rush Green, Romford, London (EBE)	TQ507859	1995	£2.5 million (~ £31,000)	From 1920 to the 1950s this area of farmland (80 ha) was opened for gravel extraction and, subsequently, in-filled with uncontrolled waste. After closure, the area was vacant until the 1980s when it was converted to a country park with a low budget. Natural regeneration was preferred to active restoration although various waste materials, including London Clay, were brought in. The park was split into three areas with distinct management regimes: Fels field, Eastbrookend Grove and a lake, and opened in 1995.
Ibstock (the Daisyfield Landfill Site), Lea Green Road, St Helens (IBS)	SJ514917	1996	(regeneration obligated by planning; budget unknown)	Formerly agricultural land, Ibstocks (45 ha) is a mosaic of former land uses including a colliery railway site, clay pits (for brickworks) and, subsequently, landfill sites, initially for non hazardous industrial waste (from 1966) but later (1969) for general packaging waste. Contaminant risks include leachate contamination of ground and surface waters and methane production. In 1996, planning permission was obtained for further clay extraction, land-filling of the void and limited restoration of closed landfill areas to green open space with community access. Poorly executed, remedial works were subsequently required including deepening the soil resource to > 300mm. Previous surveys recorded nothing of ecological significance on site. Daisyfields - a 4 ha ex-landfill site – was the only part of the Ibstock site surveyed in this study.
Ingrebourne Hill community woodland, Rainham, Hornchurch, Essex	TQ526836	1996 (initially) and 2007	(regeneration obligated by planning; costs unknown)	Originally agricultural land, the 74 ha site was used for sand and gravel extraction between 1932 and 1960, followed by uncontrolled tipping and land-filling. Subsequently, the area was restored with inert soil forming material and soils excavated on site, the new voids being used to created lakes and wetland areas. The site is bounded to the southeast by an SSSI (Ingrebourne marshes). Restoration specifications required soil forming material to a depth of 0.5 m in open areas and to at least 1.5 m depth where trees were to be planted. A shipment of pyritic London clays used to restore some areas led to tree

(IH)				death. Subsequently, the inappropriate material was replaced with new material and replanted. In 2007, two years after the data for this study was performed, £1 million was invested to regenerate the site as community woodland with mixed grassland open space and woodland planting.
Russia Dock Park, Salter Road, Rotherhythe, London (RD)	TQ362801	1980s (initially) and 2003	(initial costs unknown) Restoration in 2003 - £350,000 (£17,500)	Initially marshland unsuitable for farming, the land including the neighbouring village of Rotherhythe, was developed in the 1600's for shipbuilding and docks. By the 19th-Century the docks were handling grain, timber, cheese, bacon, and served as a base for whaling fleets. As ships got bigger, the docks became less suitable and closed in 1969. No contamination issues were reported. Approximately 20 ha, the site was developed as an island of woodland, wetland (based upon a complex pumping system) and open grass, with adjacent sports facilities and an ecology park. Completed in the 1980's, the site was handed to Southwark council. Restoration retained historical and cultural significance such as the old wharf edges. The park declined for many years until a simpler 'sustainable' plan was implemented in 2003 by Southwark Borough Council.
Thames Barrier Park, North Woolwich Road, London (TBP)	TQ414798	2000	£12 million (£1.35 million)	This formal garden (8.9 ha) situated adjacent to the River Thames in the London Borough of Newham is a former dock and industrial chemicals factory. It was left contaminated upon closure of the docks in the 1960s. Creation of the London Docklands Development Corporation (LDDC) in 1981 saw this and surrounding areas regenerated, mainly for housing and commercial development, but also for greenspace. The park was created by clearing the derelict land of physical structures and contaminated soils, capping it with a capillary break layer and importing soils (2.5 m - trees, 1 m - wildflower meadow/ grasses). The park remains sacrificial land, in case the Thames barrier fails. Annual running costs are quoted as £700k (Villella et al., 2006).

Table 3. Methods of data collection and laboratory analysis.

Environmental research	**Soil analysis**	Soil cores taken at depths of 30 cm (wildflower areas) or 60 cm (tree areas), containerised, labelled, stored (0-4 ^{o}C). Soil pH was determined in the laboratory using a 0.01 M $CaCl_2$ solution according to the method of Avery and Bascomb (1982). This solution was subsequently filtered through No 42 Whatman Filters and the supernatant retained at 0-4 ^{o}C, until required for elemental analysis. Concentrations were determined for potassium (K), magnesium (Mg), phosphorus (P), boron (B), copper (Cu), zinc (Zn), nickel (Ni), cadmium (Cd), chromium (Cr), lead (Pb), cobalt (Co) and barium (Ba) by Inductively Coupled Plasma – Optical Emission Spectrometry (ICP-OES) (Spectrohm, Germany) following $CaCl_2$ or aqua regia digest, using standard laboratory protocols for measurement, calibration and calculation (Kilbride et al., 2006).
	Soil compaction	Penetration resistance was recorded using a modified Bush recording cone penetrometer (Anderson et al., 1980). The penetrometer recorded soil resistance at 0.03 m depth intervals to total depth of 0.45 m (Sinnett et al., 2006).
	Foliar analysis	Grass and wildflower vegetation sampled using a 0.5 m^2 quadrat. Vegetation was cut, bulked and stored in a paper bag. Conifers were sampled by collecting 5 current year shoots from 5 trees of the same species cut from the first whorl below the leader (the needles were not stripped off), between early October and mid November. Deciduous conifer and broadleaf trees were sampled by collecting a leaf area equivalent to one A4 sheet of paper of fully expanded undamaged leaves between late July and late August. Trees less than two growing seasons old were not included as they reflect nursery nutrient and contaminant conditions. Crown density was determined according to the methods outlined for each species by Innes (1990).
	Tree and wildflower identificatio n	Tree identification was carried out in the field by qualified personal. For grasses and wildflowers, a 0.5 m^2 quadrat was placed at 5 sub-sites per zone and a species count, estimate of percentage cover and species identification performed. Those plants that could not be identified in the field were sampled and returned to the laboratory for subsequent identification using Rose (1991) and Stace (1997) as primary references.
Social research	**Visitor survey**	Visitor surveys were carried out in Eastbrookend Country Park (EBE) and Thames Barrier Park (TBP). Surveys sought to determine who used the park (in terms of gender, age, income and ethnicity), how they travelled to and how they used the park, what they liked about the park and how it could be improved. At TBP, 103 interviews were conducted over the course of 3 days (one weekend in June and one Tuesday in August) in 2005. At EBE, 119 interviews were conducted in the third week of October, 2005.

Table 4. Ranges of total soil concentrations recorded at the case study sites and the literature values used for comparison.

Total soil concentration - literature values

(mg/kg)	**As**	**B**	**Cu**	**Zn**	**Ni**	**Cd**	**Cr**	**Pb**	**Co**	**Ba**
Mean background [a]	<20	1.1	23	97	25	0.8	42	74	11	
Background range [a]	0.1-50	0.4-3.1	2-250	10-300	7-70	0.01-2.4	10-121	2-300	2.3-53	
Tolerance level [a]	80	30	600	3000	250	15	1000	2000	240	
Background [b]	29		36	140	35	0.8	100	85	9	160
Intervention value [b]	55		190	720	210	12	380	530	240	625

	Extractable-Mg	**Extractable-P**	**Extractable- K**
Recommended value for tree establishment	>51 mg/l (Index 1)	>16 mg/l (Index 2)	>121 mg/l (Index 2-)
Recommended value for wildflower meadows		< 10 mg/l (index 0)	<100 mg/l (Adas 0-1)

(Index value given in the parentheses refers to the Adas agricultural Index)

Ranges observed at case study sites

(values in parentheses in the table are mean averages) (mg/kg) [d]

	As	**B**	**Cu**	**Zn**	**Ni**	**Cd**	**Cr**	**Pb**	**Co**	**Ba**	**pH**	**Extractable-Mg** (mg/l)	**Extractable-P** (mg/l)	**Extractable -K** (mg/l)
Bow Creek Ecology Park (BC)	21-71 (38)	16-46 (26)	96-224 (157)	259-514 (404)	27-53 (34)	2-3 (3)	37-56 (43)	407-2320 (1010)	9-17 (11)	221-1809 (734)	7.2 – 7.8	29.3 – 385 (100)	0.0 – 4.1 (1.2)	22.5 – 441 (168)
Eastbrookend Country Park (EBE)	5-17 (11)	5-22 (14)	15-55 (33)	59-247 (105)	14-25 (18)	1-2 (1)	14-45 (33)	35-321 (122)	4-9 (7)	5-22 (14)	5.9 – 7.6	0.0 – 34.9 (10.5)	0.0 – 1.6 (0.3)	0.0 – 26.1 (11.3)
Ibstocks (IBS)	5-19 (13)	32-61 (48)	19-89 (44)	46-88 (71)	45-53 (49)	3-5 (4)	80-144 (92)	39-67 (50)	13-18 (16)	299-591 (402)	3.9 – 7.4	64.4 – 321 (175)	0.0 – 2.6 (0.2)	4.9 – 133 (58.5)
Ingrebourne Hill (IH)	8-18 (13)	12-27 (19)	9-155 (49)	27-234 (125)	17-29 (23)	1-3 (2)	27-54 (41)	12-354 (160)	8-11 (10)	38-227 (130)	2.8 – 8.1	0.0 – 248 (84.9)	0.0 – 14.2 (2.7)	0.0 – 380 (106)
Russia Dock (RD)	12-26 (20)	22-53 (36)	37-212 (98)	186-1400 (462)	23-49 (38)	2-6 (5)	56-106 (85)	141-329 (247)	9-15 (12)	167-285 (214)	6.8 – 7.5	50.4 – 719 (165)	0.2 – 13.3 (5.7)	9.0 – 584 (185)
Thames Barrier Park					(not available)						7.1 – 7.6	0.0 – 161 (52.2)	0.0 – 16.7 (2.5)	0.0 – 581 (96.2)

(TBP)

[a] (Dickinson, 2000)
[b] (Crommentujin et al., 2000)
[c] (Bending et al., 1999)
[d] for metal/metalloid concentrations n = 9; soil pH and nutrient conc. n = 3 per site zone

Table 5. Leaf tissue concentration ranges recorded at case studies sites and literature values used for comparison.

				Literature Values			
	Ca^{2+} (%)	**Mg^{2+}** (%)	**N** (%)	**P** (%)	**K** (%)	**Fe** (mg/kg)	**Mn** (mg/kg)
Tolerance level [a]							300
Deficiency and Optimum levels [b]		< 0.03 – > 0.05	< 1.2 – > 1.5	< 0.12 – > 0.16	< 0.3 – > 0.5		
Sufficiency range [c]	0.13 - 0.16					20-100	50-600
Indicative average concentration	0.06 – 0.35 (in cereals) [e]	0.09 – 0.15 (in cereals) [e]	1.7-2.8 (in trees) [d]	0.14 -0.22 (in trees) [d]	0.7 - 1.2 (in trees) [d]		
				Ranges observed across all species studied at the case study sites			
	Ca^{2+} (%)	**Mg^{2+}** (%)	**N** (%)	**P** (%)	**K** (%)	**Fe** (mg/kg)	**Mn** (mg/kg)
(values in parentheses in the table are mean averages excluding outlier species (willow, poplar, oak) see text)							
Bow Creek Ecology Park	0.78 – 3.25 (2.07) [j]	0.2 – 1.0 (0.4)	1.3 – 4.3 (2.3)	0.12 – 0.44 (0.22)	0.8 – 3.3 (1.7)	97.3 – 457 (253)	9.6 – 66.6 (26.0)
Eastbrookend Country Park	0.75 - 4.23 (2.12)	0.2 – 0.6 (0.4)	1.0 – 3.5 (1.9)	0.11 – 0.82 (0.38)	0.7 – 4.6 (4.5)	75.1 – 267 (138)	26.5 – 211 (105)
Ibstock	0.31 – 2.99 (1.53)	0.1 – 0.6 (0.4)	1.3 – 3.7 (2.5)	0.15 – 0.40 (0.26)	0.8 – 2.0 (1.2)	79.3 – 838 (194)	44.8 – 3447 (270)
Ingrebourne Hill	0.29 – 3.16 (1.57)	0.1 – 0.6 (0.3)	0.8 – 3.5 (1.9)	0.10 – 0.93 (0.28)	0.6 – 2.7 (1.2)	108 – 742 (236)	22.5 - 6330 (123)
Russia Dock	0.49 – 4.21 (2.35)	0.1 – 0.7 (0.3)	1.1 – 3.7 (2.2)	0.09 – 0.31 (0.18)	0.4 – 4.0 (1.7)	110 – 511 (217)	9.1 – 132 (29.4)
Thames Barrier Park	0.31 – 4.30 (1.58)	0.1 – 0.5 (0.2)	1.1 – 3.1 (1.9)	0.12 – 0.52 (0.23)	0.5 – 1.9 (1.1)	116 – 670 (238)	15.4 – 480 (83.0)
				Literature Values (mg/kg)			
	B	**Cu**	**Zn**	**Ni**	**Cd**	**Cr**	**Pb**
Tolerance level [f] *	100	100	900	220	200	30	300
Tolerance level [a] *	100	150	300	50	3		10
Sufficiency range [c]	3-9	2-6	20-50				
Indicative average plant concentration [g]				0.02-5	0.2-0.8	0.03-15	0.1-10
				Ranges observed across all species studied at the case study sites (mg/kg)			
	B	**Cu**	**Zn**	**Ni**	**Cd**	**Cr**	**Pb**
Bow Creek Ecology Park	31.8 – 555 (150)	4.5 – 16.4 (9.0)	20.9 – 1240 (55.5)	0.4 – 2.2 (1.4)	0.0 – 2.9 (0.4)	0.3 – 1.8 (0.7)	1.0 – 7.2 (3.8)
Eastbrookend Country Park	25.2 – 176 (72.0)	3.2 – 15.5 (6.6)	10.2 – 348 (37.9)	0.4 – 11.4 (1.3)	0.0 – 2.3 (0.2)	0.3 – 1.2 (0.6)	1.0 – 3.5 (1.6)
Ibstock	23.9 – 66.0 (40.5)	3.9 – 27.7 (12.2)	20.0 – 277 (109)	0.8 – 17.8 (3.8)	0.0 – 4.0 (0.4)	0.3 – 2.5 (0.6)	1.9 – 52.7 (5.4)
Ingrebourne Hill	21.2 – 394 (77.6)	3.0 – 18.6 (6.7)	15.4 – 2771 (63.5)	0.4 – 17.0 (3.3)	0.0 – 9.8 (1.1)	0.3 – 1.6 (0.7)	1.2 – 9.0 (2.7)
Russia Dock	22.9 – 303 (93.8)	3.7 – 12.8 (8.1)	19.3 – 748 (77.4)	0.3 – 9.2 (1.4)	0.0 – 3.3 (0.5)	0.4 – 2.5 (0.8)	1.0 – 6.2 (3.0)
Thames Barrier Park	20.1 – 244 (74.9)	4.6 – 13.1 (7.7)	24.1 – 483 (59.6)	0.4 – 3.7 (1.1)	0.0 – 0.3 (0.1)	0.4 – 2.2 (0.7)	1.6 – 6.4 (3.4)

[a] (Sopper, 1989) [b] (Binns et al., 1980)

[c] (Brady and Weil, 1999) (for pine trees)
[d] (Evans, 1984)
[e] (Rowell, 1988)
[f] (Dickinson, 2000)
[g] (Ross, 1994)

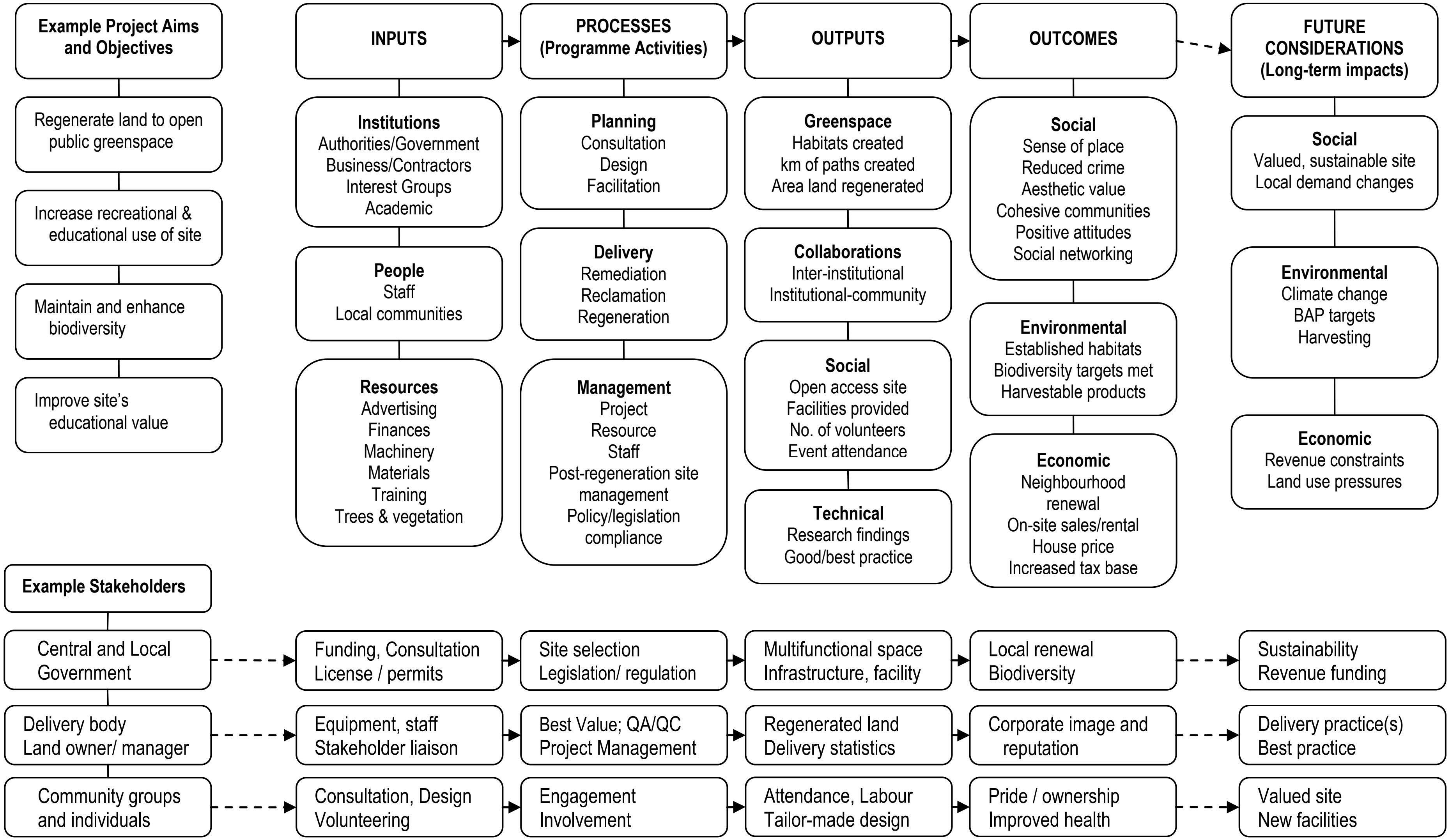
*Tolerance levels are the total concentration in plant foliage that should be considered suitable for tree planting

Table 6. Summary of visitor survey questionnaire results performed at Eastbrookend County Park (EBE; n = 119) and Thames Barrier Park (TBP; n = 103) in Summer 2005. Surveys also sought to determine who used the park (in terms of gender, age, income), what they liked about the park and how the park could be improved.

Greenspace visit frequency		**Daily**	**A few times a week**	**Once a week**	**A few times a month**	**Once a month**	**Not at all**	**First Time**	**Does not say**
	EBE	28	28	18	10	12	4	0	0
	TBP	7	11	12	17	23	0	27	3
Time of day greenspace normally visited			**Morning**	**Early Afternoon**	**Late Afternoon**	**Evening**	**Does not say**		
	EBE		34	30	22	14	0		
	TBP		41	35	9	3	12		
Mode of transport to greenspace			**Car**	**Walk**	**Cycle**	**Bus**	**Train/DLR**	**Other**	**Does not say**
	EBE		61	27	7	4	0	1	0
	TBP		72	17	1	6	3	1	2
Activities greenspace used for			**Taking Children Out**	**Being with nature**	**Walking** (with dog / without)	**Relaxing**	**Exercise**	**Other**	**Does not say**
	EBE		8	19	33	16	14	10	0
	TBP		12	3	33	10	3	4	64
Activities greenspace used for (specified by recipients)	EBE		Sketching	Horse riding	Student education	Bird watching	Cycling	Fishing	
	TBP		Fountain	Riverside Path	Basketball court	'Green Dock'	Children's play area	Café	
Importance of wildlife to greenspace visit			**Very Important**	**Important**	**Somewhat important**	**Not very important**	**Not at all**	**Does not say**	
	EBE		56	30	7	7	0	0	

	TBP	38	33	18	5	4	2
Ethnicity		**White**	**Mixed**	**Asian**	**Black**	**Chinese**	**Does not say**
	EBE	96	0	2	1	1	0
	TBP	83	3	5	5	0	4

Figure 1. Logic root model for brownfield greening projects, including a variety of greenspace aims and objectives and examples for a number of stakeholders.


Example Project Aims and Objectives
Regenerate land to open public greenspace
Increase recreational & educational use of site
Maintain and enhance biodiversity
Improve site's educational value
INPUTS
Institutions
Authorities/Government
Business/Contractors
Interest Groups
Academic
People
Staff
Local communities
Resources
Advertising
Finances
Machinery
Materials
Training
Trees & vegetation
PROCESSES (Programme Activities)
Planning
Consultation
Design
Facilitation
Delivery
Remediation
Reclamation
Regeneration
Management
Project
Resource
Staff
Post-regeneration site management
Policy/legislation compliance
OUTPUTS
Greenspace
Habitats created
km of paths created
Area land regenerated
Collaborations
Inter-institutional
Institutional-community
Social
Open access site
Facilities provided
No. of volunteers
Event attendance
Technical
Research findings
Good/best practice
OUTCOMES
Social
Sense of place
Reduced crime
Aesthetic value
Cohesive communities
Positive attitudes
Social networking
Environmental
Established habitats
Biodiversity targets met
Harvestable products
Economic
Neighbourhood renewal
On-site sales/rental
House price
Increased tax base
FUTURE CONSIDERATIONS (Long-term impacts)
Social
Valued, sustainable site
Local demand changes
Environmental
Climate change
BAP targets
Harvesting
Economic
Revenue constraints
Land use pressures
Example Stakeholders
Central and Local Government
Funding, Consultation License / permits
Site selection Legislation/ regulation
Multifunctional space Infrastructure, facility
Local renewal Biodiversity
Sustainability Revenue funding
Delivery body Land owner/ manager
Equipment, staff Stakeholder liaison
Best Value; QA/QC Project Management
Regenerated land Delivery statistics
Corporate image and reputation
Delivery practice(s) Best practice
Community groups and individuals
Consultation, Design Volunteering
Engagement Involvement
Attendance, Labour Tailor-made design
Pride / ownership Improved health
Valued site New facilities