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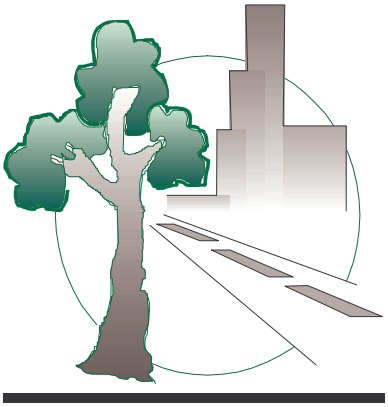
The importance of wastelands as urban wildlife areas – with particular reference to the cities Leipzig and Birmingham

(Die Bedeutung von Brachflächen als “urban wildlife areas” im urbanen Raum – unter besondere Berücksichtigung der Städte Leipzig und Birmingham)

Harriet Herbst



UFZ-Umweltforschungszentrum Leipzig-Halle GmbH

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LIST OF ABBREVIATIONS

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ABM.....Arbeitsbeschaffungsmaßnahmen: work programme for the long-term unemployed
AfU .....Amt für Umweltschutz: Environmental Department
AG .....Arbeitsgruppe: working group
ASW .....Amt für Stadterneuerung und Wohnungsbauförderung: Department for Urban Regeneration and Housing
BauGB.....Baugesetzbuch: Building code
BauROG.....Bau- und Raumordnungsgesetz: Building and planning law
BbodSchG .Bundesbodenschutzgesetz: Soil protection law
BCC.....Birmingham City Council
BfLR .....Bundesforschungsanstalt für Landeskunde und Außenentwicklung: National research establishment for geography and development
BJAS e.V. ...Bund der Jugendfarmen und Aktivspielplätze e.V: Group of young farmers and active playgrounds
BnatSchG...Bundesnaturschutzgesetz: nature conservation law
BR.....Biosphärenreservat: biosphere reserve
BTCV .....British Trust for Conservation Volunteers (nature conservation NGO)
BWT.....Birmingham Wildlife Trust
CD.....Compact disc
DETR .....Department of Environment, Transport and the Regions (now DTLR)
DoE .....Department of the environment
DSS .....Decision support system
DTLR .....Department of Transport, Local Government and the Regions (formerly DETR)
EC.....European Commission
EN.....English Nature
EP.....English Partnerships
EU.....European Union
FNP.....Flächennutzungsplan: Land use plan
FoE.....Friends of the Earth
FR Regio ....Förderrichtlinie Regio: grant programme
GDR .....German Democratic Republic
GIS.....Geographic Information System
GLC .....Greater London Council
GPS .....Global Positioning System
HM Government ... Her Majesty's Government
HMSO .....Her Majesty's Stationery Office
IBA.....Internationale Bauausstellung: International building exhibition
ICMA.....International City/County Management Association
KVR .....Kommunalverband Ruhrgebiet
LA21.....Local Agenda 21
LANU.....Landesstiftung für Natur und Umwelt: Grant from the Land for Nature and the Environment
LEG .....Landesentwicklungsgesellschaft: Development Organisation for the Land (state)
LEU .....London Ecology Unit
LNR .....Local nature reserve
LSG .....Landschaftsschutzgebiet: Landscape protection area
LSP.....Landschaftsplan: Landscape plan

MAGSNRW.Ministerium für Arbeit, Gesundheit und Soziales des Landes Nordrhein Westfalen: Ministry for Employment, Health and Social Affairs NRW
MCA.....Multi-criteria analysis
MCE.....Multi-criteria evaluation
MUFRP .....Ministerium für Umwelt und Forsten Rheinland Pfalz: Ministry for the environment and forestry, Rheinland Pfalz
MUNR .....Ministerium für Umwelt, Natur und Forsten: Ministry for the Environment, Nature and Forestry
NCC.....Nature Conservancy Council
ND.....Naturdenkmäler: Nature conservation objects
GLB .....geschütze Landschaftsbestandteil: Protected landscape elements
ND.....No date
NER .....Naturerfahrungsraum: Nature experience area
NGO.....Non-governmental organisation
NNR.....National nature reserve
NRW .....Nordrhein Westfalen
NSG.....Naturschutzgebiet: Nature conservation area
NUFU.....National Urban Forestry Unit
OS .....Ordnance Survey
PC .....Personal computer
PLC.....Public Limited Company
ERDF.....European Regional Development Fund
PPG.....Planning Policy Guidance
RDA .....Regional Development Agency
RICS .....Royal Institute of Chartered Surveyors
RordG .....Raumordnungsgesetz: Spatial planning law
RPG .....Regional Planning Guidance
SDSS .....Spatial decision support system
SENSUT ....Senatsverwaltung für Stadtentwicklung Berlin: City administration for urban development
SINC.....Site of importance for nature conservation
SLINC.....Site of local importance for nature conservation
SMI .....Sächsiches Staatsministerium des Innern: Ministry of Internal Affairs of Saxony
SMUL.....Sächsiches Staatsministerium für Umwelt und Landesentwicklung: Ministry for Environment and Development of Saxony
SRB .....Single Regeneration Budget
SSSI.....Site of special scientific interest
STEP .....Stadtentwicklungsplan: urban development plan
SUSTRANS Sustainable Transport (NGO)
TRUE.....Trust for Urban Ecology (London)
UDP.....Unitary Development Plan
UFZ.....Umweltforschungszentrum: Environmental Research Centre
UK.....United Kingdom
USA.....United States of America
UWT.....Urban Wildlife Trust
VHS.....Volkshochschule: Institute of further education
VwV.....Verwaltungsvorschrift: Administrative regulation
WTBBC.....Wildlife Trust of Birmingham and the Black Country

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1 Introduction

1.1 Background

This project is based on two issues currently occupying those involved in urban planning and nature conservation: the problems posed by urban wastelands and the lack of accessible nature and wildlife areas in towns and cities.

Wasteland is a phenomenon of many cities and occurs for a variety of reasons such as industrial decline, military decommissioning, changes in requirements of developers or simply due to neglect (see MOSS 1981, CIVIC TRUST 1988). Wasteland or vacant land is not necessarily a problem since a pool of vacant land is needed, and is inevitable, in order to accommodate changes in land use in urban areas (see BULLINGER 1984, CIVIC TRUST 1988). However, when wasteland becomes a long-term phenomenon it is often seen to detract from an area both socially and economically, since: *"Empty shops/houses/derelict sites attract vandalism and rubbish."* (from CIVIC TRUST 1988:9).

Although the above quotation is often shown to be true there are many wasteland sites that are of value to the local population, particularly to children. This has been demonstrated in many studies which have revealed the use of wasteland sites as natural playgrounds for children or for recreational activities such as walking dogs, or even for grazing horses (CIVIC TRUST 1988, NOLDA 1990a, KLEINHANS 1995). The ecological and wildlife value of these sites was recognised in the 1970s by Teagle in the West Midlands of England and has also been researched by various ecologists both in England and Germany (e.g. TEAGLE 1978, GÖDDE 1987, GILBERT 1989).

In many cases wasteland sites are used informally as common land for recreation and in some cases the sites become officially recognised as urban greenspaces. Sometimes initiatives occur to create wildlife areas on urban wastelands - for instance the William Curtis Ecological Park in London, created in 1977 on a derelict site opposite the Tower of London (NICHOLSON-LORD 1987). Such wasteland sites provide an alternative to the traditional urban park, many of which suffer from what Hough describes as the 'green lollipop' syndrome (HOUGH 1995) where mature trees rise out of well-trimmed open grass swards. There is no continuation or natural succession in such landscapes and although they provide opportunities for recreation, they tend to be of relatively low ecological value. In contrast there are also various natural areas to be found in towns and cities, ranging from isolated pockets of encapsulated countryside to school nature gardens or wasteland sites. Despite the presence of these different greenspaces there are many parts of towns and cities that are deficient in open space and, more specifically, in areas of wildlife or ecological value (JOHNSTON 1990). There is evidence to show that people need contact with nature on an everyday basis and with nature or wildlife areas within 5 or 10 minutes walk of home, but this ideal is a long way from the present situation (JOHNSTON 1990). The use of wasteland sites as urban wildlife areas could help to reduce this deficiency, since many wasteland sites are already of considerable value to wildlife or possess the potential to be converted into wildlife areas.

1.2 Aims of the research

The main aim of this research is to investigate the value that wasteland sites have, or could have, as urban wildlife areas. The research also aims to reveal how the use of wastelands as

urban wildlife areas can serve to reduce the deficiency in nature or wildlife areas, as well as identifying the often forgotten positive aspects of wasteland sites. The majority of the research was carried out in Germany and England, focusing on the cities of Leipzig and Birmingham, where the issue of wasteland is particularly pertinent (see section 3.1).

The research was based on the three main hypotheses formulated below:

Are wastelands important as urban wildlife areas?
The importance of wasteland sites as urban wildlife areas is determined theoretically through a review of the ecological value of wasteland sites as well as their social value regarding the use of such sites for enjoying and experiencing nature.

Can the importance of wastelands as urban wildlife areas be evaluated?
The development of an evaluation method to determine the value of wasteland sites as urban wildlife areas. This takes into account various aspects of the sites - not only in relation to the characteristics of the sites themselves, but also the location of the sites. The method is automised through the use of a geographic information system and is implemented in study areas both in Leipzig and Birmingham.

Which strategies are available and can be or are implemented to use wastelands as urban wildlife areas?
The research regarding this hypothesis concentrates on existing strategies that are or could be used to create or use wastelands as urban wildlife areas. Case studies of wasteland sites provide evidence of the use of instruments or policies and their effectiveness in the creation of urban wildlife areas.

1.3 Definition of urban wasteland

There are a plethora of terms and definitions for wasteland both in practice and in the literature on land use and land management. The problems of the lack of a universal definition lead to confusion and problems with surveying and estimating amounts of derelict or brownfield land, as well as difficulties regarding the implementation of policies of land use management and planning (see DENNINGTON & CHADWICK 1982, ALKER et al. 2000, BILTON 2000). The negative public perception of sites termed “wasteland” or “derelict land” (see CIVIC TRUST 1988) have led to the development of neutral terms such as “urban commons”; the latter term was first coined by Mabey in 1973 to describe wastelands that are used by people for recreation (see NICHOLSON-LORD 1987).

There is a great deal of discussion on the correct or most appropriate definition of brownfield/ derelict land/wasteland and the plethora of other terms which are in use (see HANDLEY 1996, STARKE 1999, ALKER et al. 2000). Some of the most common terms used in various countries are summarised below:

- In Germany the term “Brachflächen” is widely used, which originates from the three field agricultural system in which one field was left fallow (or “brach”) each year (REBELE & DETTMAR 1996). The term became adopted for agricultural land that was no longer cultivated and then entered into use for industrial or other forms of dereliction. It has a very wide interpretation (in both planning and ecological fields) and can be used to describe a variety of derelict or wasteland sites. There are however other terms which are less commonly used such as Niemandsland (no-man’s land),

Ödland (wasteland), Baulücke (derelict housing plot), Reservefläche (reserve land) (NOLDA 1990a).

- In the USA the term brownfield is used meaning an "*abandoned, idle or underused industrial and commercial facility where expansion or redevelopment is complicated by real or perceived environmental contamination*" (EPA 2001). The emphasis here is on contaminated sites and their former industrial or commercial use, thus excluding a range of sites which may also fall under the definition of brownfield/wasteland in other countries. In comparison, in both England and Germany contaminated sites are given a category of their own (contaminated sites or "Altlasten" respectively) as such sites are not necessarily derelict or wasteland sites but may be sites that are currently in industrial or commercial use.
- In the UK various terms are used to define wasteland including derelict land, vacant land, neglected land (see HANDLEY 1996). The official definition for derelict land used by the British government is "*land that is so damaged by industrial or other development that it is incapable of beneficial use without treatment*" (DoE 1995). However this definition omits "*that land which may be described as 'wasteland', i.e. neglected land, lying abandoned and idle…*" (DENNINGTON & CHADWICK, 1982: 230) and concentrates mainly on industrial land.
- The term brownfield is also used in the UK and a definition is given in the government's planning guidance for housing: "*brownfield land is defined as previously developed land which is or was occupied by a permanent (non-agricultural) structure and associated fixed surface infrastructure, including the land within the curtilage of that structure.*" (DETR 2000a). It is thus only relevant for sites that have been built on in the past.
- In ecological terms a different definition is frequently used for the type of habitat that develops on abandoned land – "urban wasteland". The Black Country Biodiversity Action Plan uses the term urban wasteland to mean a habitat type that develops on former industrial or mining land that has been abandoned and left to nature, and the term "urban commons" to mean urban wastelands which are used and enjoyed by the local community (BBCBAP 2000). In London's nature conservation strategy wasteland sites are defined as a type of habitat alongside woodland, wetlands etc. (GLC, N.D.). Wasteland has also been used to define different types of land such as neglected land with rough vegetation (CIVIC TRUST 1977) or to describe a wide range of unused, despoiled and neglected land types (BURT & BRADSHAW 1986).

The number of different definitions in use and the varied interpretations of these terms makes it difficult to decide which of these should be used. For this study possibly the most appropriate word would be "Brachflächen" since this includes a wide range of derelict, waste and brownfield land, or particularly the term "Stadtbrachen" (urban wastelands). This is difficult to translate directly into English since it encompasses brownfields, derelict land and wasteland. The term brownfield is not particularly suitable here as neither the UK nor American definitions are applicable as they are all concerned more with contaminated land or land that has been built on (mainly for industrial uses). Derelict land is also unsuitable as this is rather restrictive in its application and there are chances of misapplication of the term. Thus the most appropriate term for use in this thesis is "urban wasteland". Since there is no precise definition of this term in the UK literature, a definition is used, which is based on that developed by Zucchi and Flisse to describe "städtische Brachen" (urban wastelands): "*urban wastelands are sites of different sizes and in different locations that were formerly used in various ways and are now (in the short or long term) no longer, or only extensively, used and*

are colonised by natural succession." (translated and altered slightly, from ZUCCHI & FLISSE 1993:45).

This is a very general definition and includes a wide range of wasteland sites in urban areas as well as what are commonly termed derelict or brownfield sites. One important and essential difference between the term wasteland and other terms is that the former refers to areas of land (not buildings) and thus excludes sites dominated by buildings (e.g. derelict houses). In some cases a building may be present on a wasteland site, but, by definition, it is the land and not the built up area which is referred to in the definition. The terms wasteland, urban wasteland and wasteland sites are used interchangeably in this thesis. Although urban wasteland is the main term used in this thesis, in some cases it may be necessary to use the terms derelict land or brownfield, depending on the source of information and the appropriateness of the terms.

Although there is no size limit on urban wastelands, very large industrial wastelands, (such as those remaining from open cast mining or large scale excavation works) are not considered to fall into this category, these sites being seldom found directly within urban areas. They are usually located in rural areas or on the urban fringe and different planning and regeneration strategies are required to cope with the regeneration of such sites.

1.4 Definition of urban wildlife area

There is no specific definition of the term urban wildlife areas in the literature, but it is used together with terms such as natural areas, semi-natural green space ("naturnahe Grünflächen") or nature areas with reference to places where people have the opportunity to experience nature.

All of these places are perceived as being "natural" and thus provide an alternative to planned open space (ELKIN & MCLAREN 1991). There are difficulties and possible misunderstandings with the use of the term "natural", especially in urban areas where the landscape and environment is almost completely artificial (RHODE & KENDLE 1994). Often natural vegetation is taken to mean that which colonises spontaneously (i.e. is not planted) or that which is native. The futility of the emphasis on "native" vegetation in urban areas, particularly regarding wasteland sites is recognised by many ecologists since plants suited to the conditions in urban areas are often those that are native to different regions (e.g. thermophilic species) (see GILBERT 1992, RHODE & KENDLE 1994, REIDL 1998).

What is essentially meant by the term "natural" whether with respect to natural open space, semi-natural greenspace or urban wildlife areas is the description of places where what is thought of as typical countryside landscape (wildflowers, streams, ponds) can be found. These landscapes are typically absent from the planned and managed city (although often from the countryside too!) The qualities of peace and quiet, the feeling of being close to nature, the informal nature of sites and visual diversity of the landscape form the backbone of many definitions of natural areas (see AG STADTBIOTOPKARTIERUNG 1984, MILLWARD & MOSTYN 1988, JOHNSTON 1990, RHODE & KENDLE 1996, BCC & LAND CARE ASSOCIATES 1997).

Another important feature of natural greenspaces, wildlife areas etc. is that they should be accessible to the local population so that people can have contact with nature on a daily basis, a statement which is frequently found in both the English and German literature on urban nature conservation (for example JOHNSTON 1990, BREUSTE 1994, HARRISON et al. 1995, SCHEMEL 1998).

Figure 1 *Stave Hill Nature Park – an urban wildlife area created on a wasteland in the docklands of London*

The term wildlife area is used rather than "natural" or "semi-natural" area to avoid the possibly misleading use of these terms since such areas may or may not be colonised spontaneously and even if they are, the vegetation is unlikely to be limited to "native" vegetation. There are many examples of urban wildlife areas that have been artificially created on wastelands but provide a wonderful opportunity for city dwellers to experience and appreciate their local wildlife.

The term "urban wildlife area" used in this thesis is taken to mean *"those areas where people can experience and be close to nature and wildlife in a peaceful setting in their daily life."*

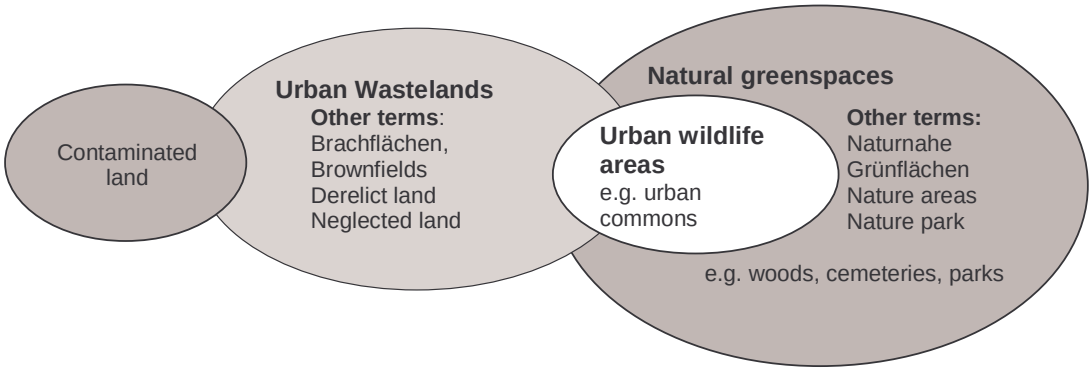
Experiencing and being close to nature and wildlife ("Naturerleben") means not only seeing but also having the chance to smell, taste, touch and use the natural elements found (see here AG STADTBIOTOPKARTIERUNG 1984, SCHEMEL 1998). Thus urban wildlife areas should not present completely finished and planned sites, but instead places that people can use in a sensitive manner to gain an understanding and sense of value of the natural world. These are places where one can pick flowers, build huts or tree houses, hunt for worms or insects and be at one with nature, and in many cases actively partake in the management and care of the site. The other stipulation for sites to be suitable as urban wildlife areas is that they should provide people with the chance to experience wildlife on a daily basis and thus should be situated in areas where people are likely and able to use the sites.

In this thesis urban wildlife areas include those wastelands that have been colonised spontaneously by vegetation, provide a variety of habitats for wildlife and may be used by people for quiet recreation (thus excluding disturbing activities such as motorcycling). GILBERT (1992) refers to these sites as urban commons in order to dissipate the negative image conjured up by the term "wasteland" or derelict land. Urban wildlife areas can also be

created artificially on barren wasteland sites through the completely new landscaping of the site or through a degree of management and planting to enhance the quality of the site.

Figure 2 provides a depiction of the different terms used in this thesis and endeavours to show the relationships between the various definitions that are found in the literature on wasteland and wildlife areas.

Figure 2 *Relationship between different definitions used in thesis*



2 State of the art

2.1 Urban wasteland

2.1.1 Characterisation and classification of urban wastelands

Urban wastelands (as defined in section 1.3) are characterised by their temporary nature as they can be lost to development at any time. They tend to be relatively recently created as older sites are no longer thought of as wasteland, but become accepted as the habitat into which they have evolved (GLC N.D.). They are also characterised by their use by the urban population for a range of activities, which are often only possible on such an unregulated area (KOWARIK 1993).

The vegetation that colonises and develops is an important characteristic of wasteland sites and can be considered to characterise the particular flora of urban areas (see GILBERT 1992). The colonisation of a site occurs within a short time of the land becoming derelict - either after demolition work, or due to neglect or disuse of the site. This successional process is described by various botanists and is typified by the transition from pioneer vegetation to tall perennial herbs with leafy stems, succeeded by a grassland stage and then bush and tree stages, with bryophytes being present at various different stages (GILBERT 1992, REBELE & DETTMAR 1996, GLC N.D.). Gilbert notes the interesting fact that "*many of the early colonisers belong to genera that were widespread during the late-glacial period, for example Artemisia, Betula, Polygonum, Potentilla and Rumex.*" He suggests that the conditions may be similar to those occurring just after the end of the ice age - such as intermittent disturbance, low grazing pressure, low competition and raw base-rich soils (GILBERT 1992).

The time at which different plants colonise depends heavily on chance, the available seed sources and seed banks, soil substrates and degree of disturbance on the site (WITTIG 1991, GILBERT 1992). There may also be variation regarding the times at which different parts of the site fell derelict (particularly on larger sites) (KOWARIK 1993). During the earlier stages of succession plant diversity remains high due to the "palimpest effect" - local disturbances allowing earlier successional stages to persist in some areas of the site (GILBERT 1992). The climax vegetation found on urban wastelands is deciduous woodland, but often of an interesting composition with unlikely mixtures of ash, hawthorn, willows, elder, birch etc. growing alongside orchard apple, garden privet and other garden species (GILBERT 1992).

Actions such as the dumping of garden waste as well as local climatic conditions, have an effect on the vegetation present on urban wastelands with different cities and regions having a typical wasteland flora of their own. For instance GILBERT (1983) noted the abundance of goldenrod and scarcity of buddleia in Birmingham compared with the huge amount of Japanese Knotweed and abundance of wetland species (reed grass and rushes) in Manchester.

In addition to the vegetation characteristics of urban wastelands, sites also varies in size and type, from vast areas resulting from derelict docklands or coal or steel works (as in London or the Ruhr area respectively) to tiny areas on street corners or derelict gardens. They vary with respect to the substrate of the site, which can be differentiated into artificial (such as rubble, brick, stones etc.) or semi-natural substrates (such as clay, sand or topsoil) (GLC N.D.). The former results from demolition work or dereliction of the previous use of the site, whereas the latter more often results from processes such as excavation, construction work or tipping

(GLC N.D.). The type of substrates and previous use of the site also affect the pH, moisture retention capabilities, fertility of a site, soil compaction and surface sealing, as well as contamination of the site (KOWARIK 1993).

Wasteland sites include industrial and commercial sites, empty building plots, derelict gardens or allotments, derelict horticultural or agricultural land (within the urban area) and other forms of urban land use. They can be classified in various ways such as by age, size, previous use, vegetation, location, current use (see REBELE & DETTMAR 1996). One of the most common classification schemes used is that of previous use of the site, as described in Table 1.

Table 1 Description of the classification categories for wasteland sites [1]

Wasteland category	Description and Characteristics
Building plot	This refers to sites that have been prepared for building but not yet developed. Often occur in new industrial estates or developing housing estates and show no trace of previous use. *Characteristics*: flat land, often quadratic plot, infrastructure and utilities often present, even aged vegetation structure, often located in industrial estate or on edge of urban area.
Industrial	This includes all types of industry - light or heavy industrial uses or commercial uses - e.g. petrol stations, factories, trading estates etc. *Characteristics:* sealed surface, possible contamination (depending on previous use), buildings often present, varied vegetation structure.
Empty plot-housing (Baulücke)	Can be old bomb site or where houses have been demolished. Usually occurs within existing building structures. *Characteristics:* no building present, usually level site, often less than 0.5ha, bordered by other houses/buildings, surface usually not sealed - may consist of rubble or be compacted.
Railway	Includes single tracks between buildings, railway stations, or old disused lines. *Characteristics:* tracks and sleepers often still present, stony ground, linear shape, previous use of herbicides influences vegetation.
Military	Includes various types of military installations - barracks, training sites, transport (such as airport). Characteristics: contamination possible, varied sites.
Agriculture – Sub-categories: i) Fields ii) Buildings	Includes both agriculture and horticulture. Subcategories of fields and buildings refer to open land or agricultural buildings (such as sheds, greenhouses etc.) respectively. *i) Fields' characteristics:* large open expanse of land, uniform age of vegetation, arable weeds, found in rural areas or edge of urban areas *ii) Buildings' characteristics:* may be within or outside urban areas, varied vegetation structure, buildings present, surface sealing, e.g. greenhouses, animal stalls.
Garden	Either garden of house or allotment garden. *Characteristics:* no surface sealing, old trees present, varied vegetation with garden flora (usually less than 1ha).
House	Derelict house - may include garden. *Characteristics:* building present, garden or yard often present.
Other	Variety of sites such as educational establishments, recreation, uncertain previous use etc. *Characteristics:* too varied to note.

[1] Based on the definitions of STARKE (1999), ZUCCHI & FLISSE (1993).

2.1.2 Reasons for the occurrence of urban wastelands

The occurrence of urban wastelands is not a new phenomenon but essentially part of the development process and is seen by some as the "result of failure in the land market to recycle land." (TEST 1995:26). Bullinger explains it in terms of a process of development in which all economic products, companies and economically used sites have a life cycle with an initial phase, growth phase, consolidation phase and a closing phase; finally resulting in the closure of the company and the sale of the site or its fall into dereliction (BULLINGER 1984, BULLINGER 1985). In many cases this is not problematic and many sites are snapped up quickly for development but for various reasons this does not always happen.

One of the main reasons for the emergence of a large number of wasteland sites during the late 20th century was the widespread phenomenon of de-industrialisation. Many of the traditional industries (at least in western Europe) closed due to the effects of economic changes, a reduction in size and importance of the secondary sector (and increasing importance of the tertiary sector) and the globalisation of production (SPEER 1985, KAHNERT 1988). Examples of this de-industrialisation include the decline in the textile industry in the 1950s in England and the closure of the coal mines and steel works in Germany in the 1970s, particularly in the Ruhr area of Germany and in the north of England (HENCKEL & NOPPER 1985). De-industrialisation in East Germany occurred later with the fall of the Berlin Wall in 1989 and the ensuing reunification of Germany, which led to closure of the majority of the un-competitive industries almost overnight (USBECK 1994). Wastelands also result from the activities of mineral extraction or processing industries' activities such as gravel workings, spoil heaps from mining etc. (DENNINGTON & CHADWICK 1982). They also occur as a result of changes in requirements of industry: industries must no longer be sited near a port or railway station, since road transport is often used as an alternative and thus they can move away from inner-city sites to green field sites close to motorways (MOSS 1981). New forms of production and the need for much larger areas of land make the re-use of old industrial areas difficult and often impractical for modern industries and commercial units.

Urban wastelands do not only result from industrial dereliction. The changes in land use, or dereliction or neglect of land and buildings also result in the creation of wasteland sites, for instance from derelict housing and gardens, derelict railway land, neglected allotments or public spaces, disused schools etc. (DENNINGTON & CHADWICK 1982). Military decommissioning has also resulted in the creation of a large amount of wasteland sites, especially in East Germany where the old Russian military establishments form a substantial proportion of derelict land in many areas. Another form of wasteland is found on what HANDLEY (1996) terms "interim land" or land awaiting development (termed building land in this thesis – see Table 1). It is debatable whether or not this should be categorised as wasteland since it may be seen as an in-between stage of development, but in many cases development does not take place for some time and a lack of management means that such sites may become wasteland.

Land may also become derelict due to the effects of planning, which sometimes leave areas of land unusable due to lack of access or sandwiching of land between roads or between industrial works (CIVIC TRUST 1988). Fire or bomb damage still accounts for some derelict sites, as does blight from development schemes or simply neglect of land or buildings (CIVIC TRUST 1988).

2.1.3 Reasons for continuing dereliction

The reasons for wastelands remaining unused or undeveloped are variable and are discussed by a number of authors (SPEER 1985, CIVIC TRUST 1988, ADAIR et al. 2000, HUBER 2000) and a useful review is given by Arup Economic Consultants (WHITBREAD, MAYNE & WICKENS 1991). The reasons can be summarised as follows:

- *Physical or other constraints*: Site may be the wrong size or shape or may be contaminated. The presence of buildings on the site, too many underground cables or poor ground conditions make the site unsuitable for development (see WIESE VON OFEN1984, CIVIC TRUST 1987, WHITBREAD, MAYNE & WICKENS 1991, MEYER 1993). There are often high costs associated with preparing wasteland sites due to decontamination costs or the need to demolish buildings (ADAIR et al. 2000, DE SOUSA 2000, HUBER 2000, ZABOJNIK 2000). Such sites are often seen as high risk, low return sites since in many cases the costs of clean up may be more per square metre than the land itself! (SPEER 1985).
- *Lack of demand for sites*: Wasteland sites are often situated in areas with a poor quality local environment and are thus unattractive for investors (MOSS 1981). The regional structure has an important influence on investors, as they will not put money in where there is no market (see HENCKEL 1982). In addition to the economic problems there is also the problem of perceived contamination, as the poor image of wasteland sites means that people think that sites are unsuitable for development (HUBER 2000).
- *Ownership difficulties*: Disputed or uncertain ownership means that sites cannot be sold or developed (CIVIC TRUST 1987, DOEHLER & USBECK 1996). This is especially a problem in the new Länder (states) of Germany where the difficulties of land restitution still provide a barrier to the development of wasteland sites (HUBER 2000). Often wastelands have multiple ownership (due to sites being inherited) and the owners often cannot agree on the future use of the site (HUBER 2000). There is also the problem of speculative holding of land by landowners who hang onto land in the hope of obtaining a higher price for sale of the land or planning permission for the site (CIVIC TRUST 1977, MOSS 1981, SPEER 1985, ADAIR et al. 2000, ZABOJNIK 2000). Local authorities often do not have the money to purchase such sites to then use them to improve the local area (e.g. as open space) (SPEER 1985).
- *Institutional restrictions or difficulties:* Over-ambitious planning or changes in planning by authorities (in the case of road building or development schemes or the planning of industrial or trading estates) may lead to sites remaining un-used and falling derelict (CIVIC TRUST 1977, MOSS 1981, HUBER 2000). Some sites may have been cleared for development which then never took place (CIVIC TRUST 1987). Another problem is the lack of planning or development concepts for an area, which may cause uncertainty for investors and thus reduce their likelihood of investing in an area (HUBER 2000).
- *Delays in the development process:* Bankruptcy or a lack of financial resources to continue or start development means that many sites remain un-used or sometimes with half finished buildings until either the investor obtains more money, or someone purchases the site (ZABOJNIK 2000). Continued dereliction may also be a cause of delays to planned projects that cannot be carried out due to a lack of public money (CIVIC TRUST 1987).
- *Alternative locations:* The low cost of land on the outskirts of towns or cities, compared to inner city locations is important as changes in technology and working

methods mean that companies have high land requirements for typically large, single storey buildings (SINZ 1984, SPEER 1985). Not only are large vacant lots difficult to find in the inner city, but they are also very expensive and there is a natural tendency for developers to develop on, and further reduce the quantity of clean, relatively problem-free, peripheral rural land (TEST 1995). The situation is magnified by the competition between authorities, as municipalities outside the main town or city often encourage investors as they then provide the municipalities with a higher tax income (HUBER 2000). This occurred rapidly and on a large scale in the new German Länder, as there was no real alternative to siting new industrial and commercial estates on greenfield sites at that time (USBECK 1999).

One or more of the above reasons may be the cause of the continued neglect or dereliction of wasteland sites in the urban area and the complexity of many of the causes of dereliction make it a difficult problem to solve.

2.1.4 Problems related to urban wastelands

In most cases investors snap up wasteland sites that are suitable for development relatively quickly. However, there remains a hard core of derelict or wasteland sites that cause social, environmental and economic problems, which are viewed as being an inefficient use of resources (WHITBREAD, MAYNE & WICKENS 1991). Handley calculated that at the current rate of redevelopment and re-use of derelict land, it would take 200 years to clear the backlog of sites in England (HANDLEY 1996).

For the majority of people, brownfield, derelict or wasteland sites are associated with litter, disrepair, emptiness and a lack of control (JAKLE & WILSON 1992, DETTMAR 1997). A survey in the UK in 1995 discovered that 71% of those questioned considered that derelict land reduces the quality of people's lives due to its environmental, social and economic impacts (MORI 1995 in HANDLEY 1996). The main concerns were the blighting effect of such sites, rubbish dumping, dangers for children and health concerns (HANDLEY 1996). This substantiates earlier work by the Civic Trust who questioned local amenity societies about wasteland sites. The main concerns were found to be the unsightly nature of such sites, rubbish, debris, and rampant vegetation, with 52% of those questioned regarding wasteland sites as detracting from the local surroundings (CIVIC TRUST 1977). Other concerns are the worries that such sites encourage crime, in particular drug abuse and illegal dealing (HANDLEY 1996, ZABOJNIK 2000).

These problems of wasteland sites may also have far more wide-reaching consequences as dereliction is often accompanied by social problems, such as high unemployment and out-migration of the younger members of the population (TEST 1995). When people move away from blighted areas this results in a decrease in rate income for the local authorities, a decline in essential services, reduction in attractiveness to investors and so the spiral continues downwards (MOSS 1981, CIVIC TRUST 1987). These events reflect the concerns of local authorities who regard wastelands as having a negative influence on investment and depressing land values (as well as the adverse effects on amenity, dangers to the public, dirt and pollution of such sites) (DOE 1996).

2.2 The value of urban wastelands

Urban wastelands are of value for many reasons, in many cases this will depend on the characteristics of the site. A brief indication of the value of wastelands with respect to climate, flora, fauna, the economy and sustainable development is given below.

2.2.1 Climatic importance of urban wastelands

Those urban wastelands that are not highly sealed can have a similar positive climatic effect on the air quality and local climate as urban greenspaces. These effects are strongly correlated with the size of the site and its vegetation. KOWARIK (1993) cites the work of STÜLPNAGEL (1987) in his description of the contribution that urban wastelands may make to cold air production in the urban area and their positive effect on the surrounding built up area. However the degree to which this occurs is correlated with the size of the site and the structure of buildings in the immediate vicinity (see KOWARIK 1993, KUTTLER 1993). The presence of bushes and trees lowers the temperature of a site in comparison with its surroundings (KUTTLER 1993). Wooded sites are especially beneficial as the trees can help to clean the air by filtering out dust and aerosol particles (KOWARIK 1993, DRECKER, SUDHOFF & VEDDER.1995). *Betula pendula* (birch) has been found to be especially effective in this respect and is frequently found on wasteland sites (see JONAS et al. 1985 in KOWARIK 1993). The open, frequently penetrable structure of trees on wasteland sites also plays a positive role in the filtration of air as densely wooded sites (as in planted woodlands) act as a wall to the penetration of wind and thus have a reduced filtration function (see REIDL 1998). Wooded sites can also help to slow down winds, which often reach very high speeds in urban areas (DRECKER, SUDHOFF & VEDDER 1995). On sites with low surface sealing the vegetated ground also facilitates the penetration of rain water, which may then increase the ground water level; however, on contaminated sites this may be detrimental as it may lead to pollution of the ground water (KOWARIK 1993).

2.2.2 Ecological importance of urban wastelands for flora and fauna

Flora

The ecological value of wasteland sites is partly due to the high diversity of species that are present on such sites in comparison with similar sized greenspaces in urban areas. This high diversity is thought to be due to the heterogenous conditions - e.g. types of substrates and soil conditions, different levels of disturbance, varying micro-climate on sites, varied intensities of use, variety of structures on sites, site histories - and sometimes the extreme conditions found on the sites (KLAFFKE 1985, VEDDER & DRECKER 1994, REIDL 1998, CHIPCHASE 1999). It also depends on site size and the type of site: for sites over 5ha those with the most diverse flora have been found to be industrial wastelands, followed by commercial wastelands (or light industry), railway wastelands and then derelict greenspaces, with wasteland sites under 5ha all having a lower floral diversity (REIDL 1998). The diversity of sites also alters with the age and different successional stages of sites. 6-9 year old sites are found to hold the highest number of species and after about 10 years of age the diversity then decreases (REBELE 1988); although this is rather a generalisation, as it will also depend on the rate of succession on the sites. One has to be slightly careful in the interpretation of some of the results on the flora of wasteland sites and floral diversity, as studies do not always concentrate on wasteland sites, but also include railway sites or industrial areas. They are also often carried out for very large

sites (more than 50ha), which are not typical of the type of urban wastelands as defined in this study (see section 2.1.1). However there are certainly some generalisations that can be made about the flora of urban wastelands and the importance of certain floral characteristics of such sites.

The flora of wasteland sites often contains various interesting species, amongst which are a high proportion of neophytes. One source of neophytes in many industrial areas is from the transport of materials from foreign places - for instance the transport of seeds with raw materials such as cotton – demonstrated by the affinity which plants on railway land frequently have with maritime plants (see REBELE & DETTMAR 1986, GILBERT 1992, REIDL 1998). Another interesting feature of wastelands is the high number of red data book species (rare species) found on these sites. Many of these species have had their natural habitat destroyed or disturbed and thus the species colonise wastelands as a secondary habitat. Caution is required before placing an emphasis on the importance of the existence of these species as their presence on secondary habitats is not taken into consideration in the assessment of the degree of rarity of such species (thus they may be rare in their primary habitat but commonly found on secondary habitats) (KOWARIK 1993). There is also controversy about emphasising the importance of red data book species as other species (such as many neophytes) may also be rare and interesting from an ecological point of view, but are not included in the list of rare species (KOWARIK 1993, REIDL 1998). Although the presence of rare species on wastelands is exciting, they actually play a minor role in the whole vegetation picture of wasteland sites; more common (and possibly more important) are the ruderal, grassland and generalist species (see REIDL 1998, CHIPCHASE 1999). Wastelands are one of the few places in urban areas where one can see the many common species, whose cultural importance is reflected in their familiarly known names - such as cow parsley, herb robert, buttercup etc. They also provide sanctuary for many archaeophytes such as cornflowers and poppies (*Centaurea cyanus* and *Papaver rhoeas)* (REBELE & DETTMAR 1996, EVANS 2001). The value of such species is reflected in this quotation: "*The rude but beautiful weeds that colonise the forgotten or unofficial places provide a commonwealth of their own*." (EVANS 2001:20).

A further important factor relating to the flora of urban wastelands is the adaptation and suitability of the flora to urban conditions. For instance *Ailanthus altissima* (tree of heaven) - a typically thermophilous city plant - is very successful on wastelands due to its suckering vegetative reproduction method (HENKE & SUKOPP 1986). Another plant, typical of wasteland sites in many cities, is *Buddleja daviddii*, which typically grows on rubble habitats in the sub-atlantic region of central Europe but has been growing wild in Berlin and other cities for the last 40 years (HENKE & SUKOPP 1971). Other species found are those that have adapted to difficult conditions that frequently occur on wasteland sites (such as extreme pH, or low fertility etc.) and may even be new species that are suited to such conditions (REIDL 1998). Wasteland (or spontaneous) flora is also often adaptable to the use of the site, for instance for children's play, as work by HARD and PIRNER (1988) has shown. For instance in areas of high use low, spreading plants are found, whereas in the less highly used areas herbaceous flora and bushes are able to develop. This provides valuable information for the possible use of such species in landscaping urban greenspaces and reducing the vegetation maintenance required.

The ecological importance of the flora of wasteland sites is summarised as follows: [1]:

- High diversity of species in the urban landscape
- Refugial habitat for rare species
- Creation of new ecotypes and thus new genetic material through adaptation to location
- Vegetation adapted to location and thus requiring little or no management
- Indicator species to indicate state of the environment - passive environmental monitoring
- Diverse and interesting flora, including common plants.

Fauna

Wasteland sites have been found to provide habitats for a wide range of animal species. There are various reasons for this including the provision of rich nutritional sources of food such as seeds, nectar and biomass (KLAUSNITZER & KLAUSNITZER 1993). This is especially important in winter when wasteland plants, such as dock, thistle, mullein etc., provide a vital food source for seed eating birds. Some animal species spend much of their time in other urban habitats but still depend on wasteland areas to provide them with sufficient food (ZUCCHI & FLISSE 1993). Another factor favourable to many animal species is the low intra-specific competition and low number of predators on wasteland sites due to the difficulty of migration to such sites from the surrounding countryside (see here HAMANN 1988 in VEDDER & DRECKER 1994, ABS 1992). The lack of disturbance on many such sites may also favour particular mammal and bird species (VEDDER & DRECKER 1994). However, other species may benefit from local disturbances - for instance mountain biking on sites in the East Thames Corridor ensures that a loose, friable substrate is maintained for ground nesting aculeate Hymenoptera and thermophilic invertebrates (HARVEY 2000). The typical flora of wasteland sites is also conducive to a high number of animal species, especially insects. For instance KLAUSNITZER (1968) found 134 insect species on *Artemisia vulgaris* and 145 on Rainfarn (*Tanacetum vulgare*) whilst SOUTHWOOD (1961) discovered 200 different species of insects on birch trees (*Betula* sps.) - all of these being species commonly found on wasteland sites (see SOUTHWOOD 1961). However this is balanced to a certain extent by the presence of non-native species (neophytes), which often provide a poor food source for native animals: for instance SOUTHWOOD (1961) found only 2 insect species on Robinia, a tree commonly planted in industrial areas (VEDDER & DRECKER 1994). A counter argument is provided by Rohde and Kendle who state that Southwood's research "*is perhaps the most over-quoted piece of ecological research in the whole conservation literature*" and thus should not be taken too much to heart as "*the majority of garden birds are known to live quite happily in exotic trees and shrubs*" (ROHDE & KENDLE 1994:7).

There have been many isolated studies of different animal groups on wasteland sites - mainly insects such as butterflies, wild bees and hoverflies, as well as birds. Gilbert reported the presence of 23 species of butterfly found on one small site in Leicester (GILBERT 1992). The importance of wasteland sites for butterflies is emphasised by KLAUSNITZER & KLAUSNITZER (1993) who report that the loss of such sites could have a serious impact on butterfly populations in urban areas. This is reinforced by studies which show that there are a high number of butterfly species that are dependant on many plants of the typical wasteland flora -

[1] (Collated from GÖDDE 1987, DETTMAR 1991, DETTMAR 1993, WITTIG 1993, VEDDER & DRECKER 1994, WITTIG 1996, REIDL 1998, EVANS 2001).

for instance 25 to 30 species of butterflies use *Urtica dioica* as a food source (REBELE & DETTMAR 1996).

There are also very many other users of wasteland sites but the presence of many species depends on various factors such as the size and position of the site, disturbance, available food sources, presence of different vegetation and other structures such as stones and wood (see GOODE & SMART 1986, KLAUSNITZER & KLAUSNITZER 1993, ZUCCHI & FLISSE 1993). In the Ruhr area of Germany the highest concentration of Kreuzkröte (*Bufo calamita*) in the Land is found on wasteland sites where temporary water features are available, although its numbers have been dropping since the 1980s due to the progress of succession on these sites and thus loss or change of habitat.

Wasteland sites are also home to a large number of rare species, most of which are those found on sites with extreme conditions - for instance the presence of the Waldspitzmaus (*Sorex araneus*) and Schabrackenspitzmaus (*Sorex coronatus*) on coal spoil heaps (ABS 1992). These species tend to use wasteland sites as sub-optimal secondary habitat as their natural habitat has been destroyed or disturbed (for instance by intensive agriculture).

The benefits of urban wastelands for fauna can be summarised as follows: [1]

- Provision of rich nutritional source of food throughout the year (due to presence of dead stems etc.)
- Varied substrates, vegetation and structures provide habitats for wide range of animals
- Provision of secondary habitats for endangered species (refugial sites)
- Ruderal flora important for many butterfly and other insect species.

Despite the evidence for the value of urban wastelands for fauna the research carried out is patchy and concentrates on certain groups - such as butterflies, beetles and birds. There is also little known about population sizes and viable populations and the effects of disturbance (especially by humans) on different species.

2.2.3 Social importance of urban wastelands-

Many urban wastelands have a high social importance in urban areas. They provide unofficial greenspaces for people as well as often being of cultural or historic importance due to their role in the development or history of the area. These sites often provide the only source of "natural greenspace" or "wild" areas in which people can experience nature and escape from urban life, since such sites are rarely found in the intensively planned and managed urban landscape.

The importance of nature and natural areas in towns and cities is recognised by those living and working in urban areas and is reflected in the growing number of urban wildlife and conservation groups, the concern over loss of open space voiced in planning enquiries and the importance given to open space and wildlife areas in urban landscape and land use plans (JOHNSTON 1990). During the period of industrialisation in the 19th century, the importance of greenspaces for the urban population was recognised and parks were provided for the local population. Landscape architects such as Olmsted viewed nature as being important for

[1] (compiled from REBELE & DETTMAR 1986, GÖDDE 1987, DETTMAR 1991, KLAUSNITZER & KLAUSNITZER 1993).

mental health, especially for the working classes, who perhaps had no opportunity to escape the city. This view has been passed on and it is generally accepted that people benefit from direct contact with nature (see GILBERT 1989, GOODE & SMART 1986, BARKER & GRAF 1989) and urban wastelands are identified as an important urban habitat for providing such "natural greenspace" (see BARKER & GRAF 1989, BOCHNIG & SELLE 1992, KOWARIK 1993, ROHDE & KENDLE 1994, HANDLEY 1996, REIDL 1998, CHIPCHASE 1999, KLEEBERG 1999).

However these conclusions are frequently drawn without a proper foundation in the human sciences and are often based on the romantic notions or childhood memories of the authors (see here BRÜHL 1992 for example). There are, however, various empirical studies, which provide a sound foundation to support the theoretical arguments for the importance of nature for people and the role of urban wastelands; these provide the basis for the argument for the social importance of urban wastelands.

An interesting study by COBB (1959) revealed that the influence of nature on children between the ages of 5-12 years might have a positive effect on the development of creative processes in their development. This is supported by other studies, which also indicate the importance, not only of the influence of nature during this period of development, but also the freedom to explore and discover their surroundings (see here OTTERSTADT 1962, BLINKERT 1998). There is evidence that children place a high value on natural elements, even when these are not overly present in their surroundings (MOORE & YOUNG 1978 in GEBHART 1993). Natural landscapes in kindergartens have also been found to provide a wide range of learning opportunities and conditions for different types of functional, construction and symbolic play, due to the diversity of vegetation and topography in such playgrounds (BLINKERT 1998, FJORTOFT & SAGEIE 2000). This is supported in work by Seeger and Seeger who found that children in kindergartens with natural play areas were more balanced and could concentrate better than those in kindergartens with traditional play areas (corroborated by work by GRAHN et al. 1997 in FJORTOFT & SAGEIE 2000). Seeger and Seeger also found that nature calms the nervous system and can be a source of both energy and knowledge (SEEGER & SEEGER 1996).

Other evidence that nature is a calming and healing force comes from the well-known study by Ulrich on the recovery rate of groups of patients whose windows looked out at either a group of trees or a brick wall. The faster recovery rate of those looking out at a natural scene lends support to the importance of nature for mental well being (ULRICH 1984).

MILCHERT (1983) attempts to explain this intangible importance of nature by describing the human need for "wild nature" or "wilderness". Although the process of civilisation has largely sublimed such needs they are thought to be inherent in human beings and the repression of this sensuous relationship to nature may be the cause of many psychiatric disorders (LOWEN 1979 in MILCHERT 1983). This concept is reflected in a study of the benefit people obtain from urban wildlife projects which revealed the emotional, intellectual, social and physical benefits people obtain from contact with nature and the desire or even psychological need people have to contact nature (MILLWARD & MOSTYN 1988). In a study on people's views of nature in London BATTIGE (1997) found that nature was very important to people living in London, even more so for those living in central rather than outer London, with first hand experience of nature being very influential on people's views of nature. Although this research was only carried out in two districts of London and on a total of 140 people, its findings produce interesting information about the importance people place on nature, particularly when their surroundings are dominated by urban structures. Rohde and Kendle emphasise the need for more research on the relationships between contact with nature and

cognitive psychological benefits, although they accept that the evidence so far is encouraging (ROHDE & KENDLE 1994).

Although the role of wastelands, with respect to providing people with contact with nature and wildlife, is important, they are also valuable to people (particularly to children) due to other characteristics such as their informal nature, the diversity of natural and man-made structures and elements and as a place to escape and explore (JOHANNSMEIER 1985, HOLCOMB 1977 in GEBHARD 1993, KEIL 1998). *"A beautiful landscape does not give aesthetic pleasure to children. For them a landscape is an invitation to activity"* (MARGADANT-VAN ARCKEN 1989:17).

JOHANNSMEIER (1985) carried out a survey of kindergarten children over several years and determined that older children prefer to play on wastelands rather than on formal playgrounds. Other studies have also revealed that children spend relatively little time in official playgrounds and they use natural playgrounds, such as wastelands and countryside, far more than the ready made ones (see HART 1982, HARD & PIRNER 1988). A study by WOODWARD (1988) in Stoke-on-Trent revealed that 50% of derelict sites sampled were used by children as playgrounds. The diversity of opportunities and elements such as water, sand and earth are far more interesting for children than the kind of formal landscaping typically used in urban areas (HART 1982, JOHANNSMEIER 1985). This is corroborated by a child's statement in a study by FJORTOFT & SAGEIE (2000: 81): "*Climbing rocks is more fun than climbing trees - but climbing trees is more fun than the boring playground equipment."*

The popularity and usage of urban wastelands (both by adults and children) has been corroborated in various studies of such sites (HANDLEY 1996, WOODWARD 1988, NOLDA 1999a, FREY 1993, KLEINHANS 1995, KEIL 1998). The sites studied varied in size from 0.4 to 50ha and reflect the importance of various features of wasteland sites. The uses of sites varied from walking, biking and sunbathing to children's activities such as tree climbing, building huts, picking flowers, making campfires etc. Both natural and man-made structures or features were found to play a role in the games and activities carried out, for instance the use of an old barrow for "barrow races" or sliding down and climbing steep slopes (KEIL 1998). Urban wastelands are, of course, used for other activities, which have little relationship to nature or natural areas but reflect the ability to hide or escape on such sites, for example illicit smoking or drinking, or use as sleeping quarters for homeless people (KEIL 1998).

On the more emotional level wastelands may fulfil the spiritual enjoyment of nature and may provide the "*piece of wilderness ..outside one's own front door*" (MILCHERT 1983:774). They offer "*the possibility of serendipitous discovery and even that mental freedom normally associated with real wilderness*" (COCKER 2000:21). They also provide children with the chance to learn about nature and natural processes through smelling, touching, seeing and hearing (ULLMANN & BURCKHARDT 1981, BJAS e.V. 1997, REIDL 1998); they allow room for creative play and phantasy outside parental control, thus helping children along the road to independence (GEBHARD 1994).

In many cases people show strong feelings for urban wastelands and a type of bonding to sites they frequently use. These strong feelings may be due to the importance the site has played in the history of culture of the town or city (see KLEINHANS 1995). These feelings are reflected in the often vociferous opposition to destruction of wasteland sites for development, as demonstrated in planning enquiries for various wasteland sites and the views of several local inhabitants about one particular site: *"..it's all right as it is. It's the only place the kids can play."*
"If you make it a park it won't be ours anymore."(SPRAY 1984:14)

The social importance of wastelands as urban wildlife areas is increased by the deficit of nature in urban areas and thus the continuing alienation of people from nature (WINKEL 1992, BJAS e.V. 1997, BRÄMER 1998b). There is a deficit of wild places in urban areas and those that exist are often protected by nature conservationists and use of the sites is highly regulated. Even many wild areas such as wastelands exclude children due to safety regulations and worries about liability (HOPPE 1998). The decreasing range of children (due to worries about safety) and their decreasing freedom (life being ever more organised and controlled) are known trends in children's situations (HARRISON et al. 1995, BLINKERT 1998). Thus the opportunity to explore and be alone is becoming rare, and play therapies, adventure playgrounds, and playgroups are used as compensation, which (according to a study in Freiburg) may lead to an undeveloped semantic and a lack of independence and self-confidence in young people (BLINKERT 1998). There is also the worry that if people (especially at a young age) do not form a relationship with nature, they will not recognise its destruction and be concerned about its survival and the future of nature conservation could be threatened (BREUSTE 1994, GEBHARTH 1994, PREUSS 1998). Although this is a commonly held view there is little direct evidence for it, although in Mostyn's study participation in work at urban natural sites appeared to foster community involvement and political awareness (MILLWARD & MOSTYN 1988).

In addition to the use of urban wastelands for relaxation or play, they can provide an important educational resource. Former wasteland sites that are now managed as nature areas (such as Camley Street and Gillespie Park in London) provide vital educational resources and may be booked up for visits for more than a year in advance (JOHNSTON 1990). It should be noted that such sites are managed and often have facilities such as classrooms and bathrooms, as well as site based staff, which make them attractive to schoolgroups. The potential for urban wastelands to provide nature areas near schools is recognised by many authors (see JOHNSTON 1990, GILBERT 1992).

Despite the number of studies supporting the thesis that nature is important for people and that wasteland sites can contribute to the need for natural areas there is very little work on the feelings and needs of people themselves, especially with regard to wasteland sites. An investigation by HARRISON et al. (1987) into people's views of nature discovered that people value nature because "wildlife is fun" and it is the commonplace occurrences and presence of creatures such as butterflies and birds that interest people; this is supported by work carried out by MILLWARD and MOSTYN (1988). SHOARD (1979) also identifies the strong relationship children form with the natural world but since her study was carried out in the 1970s in a rural area, the relevance of its findings in today's urban landscape is perhaps limited. Some studies have also investigated people's attitudes to wasteland; for instance a study by JOB (1988) showed that young people value wasteland sites more than older people and females more than males. However, in user studies by KEIL (1998) and KLEINHANS (1995) results showed that males use such sites more than females, revealing that the relationship between feelings and actions involves a complexity of factors (such as safety issues, distance from home etc.). It is not clear why people use wasteland sites, whether it is because of the lack of other greenspaces, the wildlife of such sites, or the informal and unofficial status of such sites.

Nevertheless the above discussion reveals a wide ranging body of evidence for the social value of natural areas and wasteland sites, which is summarised as follows: [1]

- Cultural or historic importance of wasteland sites
- Provision of natural green space for mental and physical well being
- Importance for children's development, freedom to explore and be alone
- Provision of wildlife areas on one's doorstep and thus potential to diminish the deficit in such areas
- Educational resource for school-children
- Contact with nature may increase awareness about the value of nature, especially in urban areas.

2.2.4 The economic importance of urban wastelands

Wasteland, derelict or brownfield sites are seen as potential land for development by planners and are thus classified as reserve or interim sites for future development rather than wasteland or derelict land (LEITL 1995). Their potential development value is important for the development capability of the town or city to attract investors into the urban area and thus support economic activity (BOCHNIG & SELLE 1992, HUBER 2000). There are financial advantages not only to the landowner but also to the new owner and users of the site, the local authority (through land taxes) and the government (through value added taxes). Another group of people benefiting are those involved in the actual development of the site - architects, builders etc. (STARKE 1999).

Economically it may make sense to re-use sites for industry or other commercial developments as this produces employment for local people, reducing the need for commuting and saving money by using existing infrastructure (both technical and social) - the so-called '*compact city*' or '*Stadt der kurzen Wege*' (ELKIN et al. 1991, HUBER 2000). Through offering wasteland sites to existing businesses for extension or storage purposes, continuation of such businesses may be ensured, providing a positive contribution to the local economy (HUBER 2000). The re-development of wasteland sites may also make the surrounding area more attractive through the increased economic activity, which may draw in services such as shops, cafes etc.) (DRECKER & SHARPEN 1996). However De Sousa notes that redevelopment of wasteland sites for residential use tends to be more cost effective than for industrial uses due to the higher returns for housing, which can compensate for the high land values in inner city areas compared with those on the outskirts (DE SOUSA 2000).

The dilemma for planners arises not only with respect to which type of future use a site should have but also with respect to reconciling the need to create a pleasant living and working environment with sufficient greenspaces and good air quality with the need for housing and employment (WIESE VON OFEN 1984). However many wasteland sites are unsuitable for development for various reasons (see 2.1.3 and 2.1.4) and thus may be better suited for use as greenspace. This can also provide a positive economic contribution to an area (or even to a city) since open space is acknowledged to make a neighbourhood more attractive and thus will entice both investors and residents to the area (BOCHNIG & SELLE 1992).

[1] (Compiled from OTTERSTADT 1962, HART 1982, SPRAY 1984, JOHANNSMEIER 1985, HARD & PIRNER 1988, JOHNSTON 1990, NOLDA 1990b, FREY 1993, GEBHARTH 1994, KLEINHANS 1995, BLINKERT 1998, KEIL 1998 and others.)

2.2.5 The importance of urban wastelands in terms of sustainable development

Sustainable development is a widely used and accepted term in the planning vocabulary, stemming from the conference on sustainability in Rio de Janeiro in 1992. The importance of urban wastelands with regard to sustainable development has been identified by several authors since the 1980s with regard to the re-use or "recycling" of such sites (KLAUSCH 1984, FOE N.D.) as well as by national governments in both the UK and Germany (DETR 2000b, SCHRÖTER 1998 cited in HÜBER 2000). The essential argument is that if such sites are re-used for development purposes, this will reduce the galloping consumption of greenfield land on the outskirts of urban areas and thus play a part in slowing down the ever-growing suburbanisation of towns and cities. This would in theory reduce land consumption and the negative effects associated with it, such as traffic congestion and pollution, fragmentation of landscapes and habitats, loss of countryside, negative local climatic effects (HENCKLE & NOPPER 1985, FOE 1998). In the UK there is public support for the protection of green belt areas and the development of surplus vacant land (see FREEMAN 1996) as well as government policy to build 60% of all housing on brownfield sites (DETR 2000a). There are arguments that this could even be increased, especially in areas with a high number of brownfield sites (which already achieve the 60% target) and Friends of the Earth recommend that the target should be raised to 75% (FOE 1998, BILTON 2000). Similarly in Germany there is support for the re-use of wastelands to reduce the consumption of resources "Innenentwicklung statt Außenentwicklung" (inner instead of outer development). A survey by the Bundesforschungsanstalt für Landeskunde und Raumordnung (BfLR) in 1995 revealed that 28% of the existing need for land for housing and 125% of the land required for industrial estates could be provided by the re-use of wasteland sites (SCHRÖTER 1998).

However, although this sounds very appealing in theory there are many practical problems associated with the re-use of brownfield or wasteland sites, as discussed in 2.1.4. The majority of wasteland sites tend to be in economically marginalised areas with a low potential for investment and re-use of sites for redevelopment. Another problem is that it may not always be sustainable to re-use urban wastelands for development as many such sites are valuable open spaces or wildlife sites in their own right and are thus important in the context of the sustainable development of urban areas and biodiversity (FREEMAN 1997, BILTON 2000, HUBER 2000).

A different form of argument concerning the importance of wasteland in the role of sustainability is the theory of constant natural assets (as suggested by PEARCE & TURNER 1990 in TEST:13). Non-critical natural assets (i.e. those that can be replaced or substituted) include resources such as recreational land, which, if disturbed or developed, could be created elsewhere. In a report by TEST a suggestion is made that such non-critical natural assets could be re-created by rehabilitating derelict land (TEST 1995). This is essentially what is already done (in theory) through the requirement for compensation measures for developments occurring in Germany (Eingriffs und Ausgleichsregelung). A different interpretation of the constant natural asset theory is found in the Nature Conservation Strategy of Birmingham (BCC & LAND CARE ASSOCIATES 1997). Here non-recreatable habitats or sites of quality are termed "Critical Natural Capital" - meaning a resource, which should not be eroded - and less critical parts "Constant Natural Assets". The amount of the latter should be maintained at a certain level, but may be subject to local changes and includes categories such as urban commons as well as parks, arable land, hedgerows etc. (BCC & LAND CARE ASSOCIATES 1997).

Thus wastelands are seen to be important for sustainability, both in their own right as urban greenspaces and with respect to the re-use of land, which itself is a precious resource and not one that can be wasted (HECKEL & NOPPER 1985).

2.3 Urban nature conservation

There is a general movement in urban nature conservation away from the traditional approach to nature conservation in which people are tolerated only as bystanders and are perceived to pose a threat to nature towards the aesthetic and recreational value of nature for people in urban areas. An insight into the traditional approach or thinking is given here in the Greater London Plan of 1944: *"There are few nature reserves in the London region; they might well be increased in number. The difficulty in a populous region is to fence them off or to enclose them inconspicuously."* (CASTELL 1963).

In contrast the statutory nature conservation agency in England - English Nature - reflects this change of tune and "*welcomes action to improve access on foot to the countryside and greenspace in towns and cities for quiet enjoyment and to enable people to experience and benefit from contact with nature*."(EN 2000).

This change of attitude is far reaching, extending even to the management of National Nature Reserves (NNRs) in England to which access is being improved. This reflects the acceptance that areas of importance for nature conservation need to be understood and appreciated by people and that this is only possible through improved access and interpretation (ENGLISH NATURE 2001). In cities such as Birmingham there is a well-developed system of nature conservation areas ranging from SSSIs (Sites of Special Scientific Interest) to SLINCs (Sites of Local Importance for Nature Conservation). The former comprise sites of very high nature conservation value and are protected by law; access to such sites may be limited or managed to prevent damage/disturbance to vulnerable habitats or species. Other designations in urban areas, such as Local Nature Reserves (LNRs), Sites of Importance for Nature Conservation (SINCs) and SLINCs provide sites which, although of importance for nature conservation, have an emphasis on access for people and the promotion of the quiet use and appreciation of nature. The degree of protection afforded to such sites varies, ranging from the high protection status of SSSIs to almost none for SLINCs (the latter being a non-statutory designation made by the local authority). In Birmingham SLINCs comprise the constant natural assets of the city, which form the less critical parts of the city's nature conservation resource, and it is accepted that losses to such sites may occur and can then be compensated by the creation of new resources of equal or greater value (BCC & LAND CARE ASSOCIATES 1997), see Table 2.

A similar change of attitude can be seen in Germany, although perhaps more at the research level than in practice. The importance of nature conservation for people is reflected in the new nature conservation law of Germany, which states that: *"Depending on quality and location, suitable sites for the type of recreation that is tolerated by nature and landscape should be protected, and where necessary managed, layed out and made accessible. Of particular importance is the provision of sufficient sites for quiet recreation in or near to urban areas."* (translated from §2, Abs 12. BNATSCHG 2001).

However most statutory nature conservation areas in Germany are managed primarily for nature conservation with minimal or sometimes no access for people (for instance Naturschutzgebiete). The other main nature conservation designation is that of a landscape conservation area (LSG). LSGs are areas of importance, not only for nature conservation but also for recreation in nature and the landscape and often extend over a relatively large area.

Other designations include Naturdenkmal and protected landscape objects, which protect relatively small areas of land or particular elements in the landscape (JEDICKE 1994). See also Table 2.

Within the academic field in Germany there is a feeling that the attitude to urban nature conservation has to change as it should be primarily for contact between people and nature, not for the protection of rare species (SUKOPP & WEILER 1986). BREUSTE (1994) describes this as the urbanisation of nature conservation thinking and emphasises that contact with and experience of nature should become a daily occurrence for urban inhabitants. An extension of this train of thought is the proposal for a new site category, the aim of which would be to provide sites where people can experience nature. SCHEMEL (1998) describes these as "Naturerfahrungsräume" (NERs or nature experience areas). There is currently much discussion about how and where these should be implemented and what legal protection they could obtain (see WEDEKIN 1997). There is also an argument that this is an over-bureaucratic solution and one cannot instruct people where they should experience and enjoy nature (PANEK 1997). However, what clearly comes out of this argument is the need for more "natural greenspaces" in urban areas where people can enjoy and experience nature.

Another method by which the importance of nature conservation for people is being considered and incorporated into local plans, is through the inclusion of social aspects in habitat mapping and the identification of sites of importance for nature conservation in England and Germany. Several habitat mapping methods in Germany now include social criteria in the assessment of the importance of different habitats (see AG STADTBIOTOPKARTIERUNG 1984). For instance an extensive mapping process in Mainz incorporated social aspects of habitats such as nature-related recreational activities and their traces, as well as natural phenomena: "*since human contact with nature is mainly achieved by perception and/or recognition of natural phenomena*" (see FREY 1999a:47). Similarly, in England a move has been made away from the traditional criteria used to assess the importance of sites for nature conservation to include social aspects such as access, aesthetic quality, sense of ownership, educational value, location in area of deficiency etc. (see GLC 1985, HOGARTH 1997).

The changing attitude to urban nature conservation, both in research, planning and the practical management fields, emphasises the importance of places where people can experience wildlife or nature on a daily basis. Most towns or cities lay down minimum values or amounts of greenspace or natural greenspace required. Some are specific with respect to wildlife areas, whereas others just give recommendations for open space or greenspace. For instance the recommended amounts of open space in Leipzig and Birmingham are:

- Leipzig: at least 0.5ha of greenspace within 500m of home (STADT LEIPZIG 1994)
- Birmingham: one 2ha site of natural open space within 400m of home (BCC & LAND CARE ASSOCIATES 1997:3.7.12)

Linked to the recommended amount and siting of greenspace is the identification of areas of deficiency, i.e. areas that do not have the recommended amount of greenspace - for instance wildlife action areas in Birmingham.

Wasteland sites can play a role in providing urban wildlife areas (or natural greenspaces) and are integrated in many nature conservation strategies as valuable sites for local (or even national) nature conservation. Urban commons are identified as one of the habitat types in many cities, e.g. Birmingham, London and the Ruhr area of Germany (although the terms used vary) and Brachflächen (or wastelands) are identified by SCHEMEL (1998) as one of the

types of sites suitable as NER (areas to experience nature). Some former wasteland sites or urban commons are even designated as sites for nature conservation (BCC & LAND CARE ASSOCIATES 1997, WTBBC 2000 , GLC N.D).

Table 2 Nature conservation designations in urban areas in England and Germany [1]

Designation	Full name	Description
England		
NNR	National Nature Reserve	Site of national importance for nature conservation
SSSI	Site of Special Scientific Interest	Habitat and species protection - nationally important site
LNR	Local Nature Reserve	Site of regional or local importance for nature conservation
SINC or equivalent	Site of Importance for Nature Conservation	Sites of local value for wildlife and people
SLINC or equivalent	Site of Local Importance for Nature Conservation	Local authority designation - sites of quality for nature conservation
Germany		
BR	Biosphärenreservat	Protection of historical or sustainably used cultural landscapes with core area of high ecological value (NSG)
NSG	Naturschutzgebiet	Comparable to SSSI - habitat and species protection and development of habitats
LSG	Landschaftschutzgebiet	Habitat, species and landscape protection as well as importance for nature-related recreation
ND	Naturdenkmäler	Objects of importance for scientific or natural history reasons
GLB	geschützte Landschaftsbestandteile	Protected landscape components - important for functioning of the natural environment, local landscape, or as buffer areas
NER	Naturerlebnisraum	Designated site in Schleswig Holstein - site where people can experience nature

[1] Sources: BNATSCHG 2001, DOE 1994, JEDICKE 1994, BCC & LAND CARE ASSOCIATES 1997, MUNR-SCHLESWIG-HOLSTEIN (2000)

2.4 The evaluation of wasteland sites as urban wildlife areas

2.4.1 Ecological and nature conservation evaluation methods in urban areas

Very few evaluation methods have been developed specifically for urban wastelands but they may be evaluated through existing evaluation processes: for instance through the evaluation of open space or urban greenspaces for nature conservation.

The traditional criteria used to evaluate the importance of open spaces for urban nature conservation frequently incorporate criteria which are unsuitable when dealing with urban wastelands; a fact recognised by several authors (see FREEMAN 1997, TARA & ZIMMERMANN 1997). Traditional criteria used include size, diversity, naturalness, rarity, fragility, typicalness, recorded history, potential value, intrinsic appeal (see RATCLIFFE 1994, USHER 1994). Many of these traditional criteria are, however, unsuitable for use in urban areas since they were produced for use in rural areas and do not reflect the importance of interaction between people and nature, which is of particular value in urban areas (see GOODE & SMART 1986, SUKOPP & WEILER 1986, BREUSTE 1994, MAURER et al. 2000).

A more suitable approach for urban areas is found in the more recent methods of urban habitat mapping which often identify the importance of various types of habitat or urban greenspaces for nature conservation. These approaches reflect the growing awareness of the need to include people and their requirements as elements in the evaluation of sites in urban areas and the change in approach to urban nature conservation – *"nature conservation should not be restricted to preservation of wildlife but should go hand in hand with the enjoyment of it by all types of people."* (GLC 1985:13).

In the approaches used by the London Ecology Unit and the Urban Wildlife Trust in Birmingham sites of importance for nature conservation are identified by using social criteria, including public access, aesthetic appeal, location in areas of deficiency or near urban areas, as well as the more traditional ecological criteria (see GLC 1985, HOGARTH 1997). The more innovative habitat mapping methods in Germany also use social criteria to assess the importance of certain habitat types for nature conservation. An example of this is the inclusion of criteria such as "usability" of sites and "Erlebnisqualität" (or quality of experiencing nature) in the habitat mapping of Hannover (AG STADTBIOTOPKARTIERUNG 1984). Similarly a comprehensive habitat mapping developed in Mainz linked together ecological, spatial, functional/structural and social information to characterise and evaluate urban spatial units (FREY 1999b).

Some of the criteria used in such evaluation methods are of use for the evaluation of wasteland sites as urban wildlife areas - such as distance from urban areas or accessibility - but many are irrelevant or unsuitable. For instance "period of development of vegetation" is a criterion used by WITTIG and SCHREIBER (1983) in the evaluation of open spaces for nature conservation. This is almost impossible to assess in the case of wastelands as their development depends on a multitude of external factors that are unlikely to recur again in exactly the same manner (GILBERT 1992, GLC (N.D.), AUHAGEN 1995). Similarly the use of 'naturalness' as used by EcoRecord in Birmingham (HOGARTH 1997) is also difficult to apply to wastelands, which do not fall into any particular category of 'natural' or semi-natural habitat. Another controversial criterion is the high value placed on the presence of rare species in most nature conservation evaluation methods. Reidl argues that this is perhaps irrelevant for urban wastelands (Brachflächen) where priority should be given to the development of

structurally varied urban vegetation with a high importance for contact between the urban inhabitants and nature (REIDL 1998:11).

Various authors have, however, recognised this problem and have attempted to develop evaluation methods specifically for wastelands or sites with naturally regenerating habitat (e.g. PEINTINGER 1988, FREEMAN 1997, TARA & ZIMMERMANN 1997, STARKE 1999). The methods of Tara and Zimmermann and Peintinger concentrate solely on the ecological importance of sites whereas Freeman and Starke go further to evaluate social and planning aspects of the sites. That of Starke, however, is limited to the evaluation of the importance of sites as children's natural playgrounds, using constraints and quality targets/standards to assess whether wasteland sites are suitable for such a use. The method developed by FREEMAN (1997) is of more widespread use, including criteria to evaluate the amenity, ecological and planning value of sites. This method is not specific to urban wastelands but aims to evaluate all types of naturally regenerating sites, assuming that many sites undergo some form of management. There is sometimes criticism of such methods by ecologists as they use simple ecological characteristics to evaluate the ecological value of sites (JARVIS 1996). However both the methods of Freeman and Wittig and Schreiber (the latter being also a somewhat simplified ecological evaluation method) revealed that those sites obtaining a high ecological value in the evaluation methods were also identified as being important by the nature conservation bodies in the respective cities (see WITTIG & SCHREIBER 1983, FREEMAN 1997).

An interesting point is that although several of the methods mentioned above use spatial criteria to evaluate the sites, the use of GIS in these methods is limited to presentation of results and storage of data. A logical next step would be to integrate evaluation methods with spatial analysis in a geographic information system (see FREEMAN 1997:123).

2.4.2 Evaluation methods and GIS (automised evaluation methods)

Geographic Information Systems

Geographic Information Systems are described by Burrough as a powerful tool for collection, recording, looking up, transforming and portraying spatial data of the real world (BURROUGH 1986:6). They were first developed in the 1960s following the increasing use of digital graphical data which led to the interest in digital processes in automised cartography, remote sensing, surveying and spatial analyses (LUTHY 1998). Tomlinson is recognised as the developer of GIS with his efforts to combine different computer supported techniques for the analysis of spatial data in forestry. The increased use of digital graphic work started up an interest in the research and development of new digital processes in the USA, Canada and Europe, with Britain and Sweden being some of the first European countries to take up and develop this technology (see COPPOCK & RHIND 1991).

Luthy identifies 2 main areas of research and application of GIS:

- The use of GIS as a tool for the economic use of resources and elaborating specific operations (the question of when and where).
- The use of GIS as a medium for learning and the analysis of problems (question of why or how).

There is a huge amount of literature on the application and research in GIS due to the number of different fields in which it is used. A brief overview of the use of GIS in urban planning and evaluation methods is given here.

GIS in urban planning

Since the 1990s GIS has become widely used in planning applications - for instance for land use zoning, impact assessment, transport planning, facilities management, automated mapping and environmental planning (AYENI 1997, CARVER & PECKHAM 1999).

KILCHENMANN and SCHWARZ VON RAUMER (1999) identify four main areas of use of GIS in urban development planning, which also apply to other applications of GIS in urban planning:

1. Presentation of spatially referenced information – i.e. a mapping system
2. Linkage and analysis of data through production of buffers, overlays and distance related, statistical and geo-statistical evaluation of primary data to produce information for planning
3. Data storage and user-interface - mainly used for the preparation of plans but the GIS also serves as a centralised system for storing and retrieving data
4. Planning support - this is the main goal of the GIS but the first three areas serve to help prepare data for actually solving planning problems.

The advantages of using GIS in urban planning - for instance for landscape or land use plans - is that large amounts of data can be administered and changes and updates are made easier and less time consuming than if the plans are drawn by hand (TENBERGEN & SENDT 2000). MASSER and OTTENS (1999) suggest that GIS is likely to become an essential part of the software for every researcher and planner in the near future and will be integrated into a network based information and communication environment. However the uptake of GIS within the planning field has been slow due to problems such as lack of political support, lack of trained staff, the long lead times involved, problems of sharing data and systems between departments and the sheer complexity of the application (BUDIC 1995 in CARVER & PECKHAM 1999, BOCK 2001).

An area where GIS is commonly used in urban planning is greenspace, ecological or environmental information systems (see BOTT 1999, ECORECORD 2001, SENSUT 2001). GIS can enhance the value of environmental or ecological information and make it more widely available (WALKER 1994). For instance the ecological database in Birmingham provides a centralised pool of ecological data, which is then available to those requiring the information - such as the local councils (ECORECORD 2001). A further development is the presentation of data on the Internet, which can not only make planning decisions more transparent to those interested or affected by the decisions, but may in the future lead to an increase in public participation in urban planning (see MASSER & OTTENS 1999).

GIS and evaluation techniques

GIS provides the possibility to integrate different forms and sources of spatially referenced information and to manipulate and analyse this information. However such abilities are of limited use when information is required to solve complex problems with multiple and often conflicting criteria (CARVER 1991, FREEMAN 1997, PECKHAM 1997). Up until the 1990s GIS and decision support mechanisms were treated as isolated techniques but due to the

limitations of both of these instruments on their own there has been an increasing interest in research and development of the combined use of decision support systems (DSS) and GIS (CARVER 1991, PECKHAM 1997).

A decision support system is described very generally as "*any device or devices used by humans to better understand the information necessary to make a decision*" (HONEA et al. 1991:39) and is composed of a database management system, model base management system and the user interface (SPRAGUE 1980 in CZERANKA 1996). A DSS provides support to the decision maker through provision of methods (including multi-criteria analysis and optimising methods) to help in the decision making process.

The term spatial decision support system (SDSS) is often used to describe systems integrating DSS and GIS; these are described as decision support systems that have been developed for a problem with a spatial dimension (WRIGHT & BUEHLER 1993). Ayeni provides a useful definition of the characteristics of a SDSS: *"a SDSS will provide database management, model base management and graphical and tabular reporting capabilities under a unified and possibly intelligent user interface."* (AYENI 1997:5).

There is, however, some controversy and lack of clarity of the exact definition of a SDSS and use of the term for systems that combine the use of DSS and GIS. Czeranka notes the danger of using the term without a proper explanation of what it actually means and even supposes that a complete SDSS only exists in theory and not in practice (CZERANKA 1996, CZERANKA 1997b). Carver is also careful with the use of the term SDSS and describes the use of MCE (multi-criteria evaluation) or MCA techniques together with GIS as "*an approach in the development of spatial decision support systems*". (CARVER 1991:321). Similarly Peckham avoids the term SDSS and instead describes such applications as GIS as a component of decision support systems (PECKHAM 1993).

In practice various studies have used SDSS or a combination of GIS and MCE or DSS to undertake evaluation methods (e.g. CARVER 1991, SPANG 1995, CZERANKA 1997a, CZERANKA 1997c). The use of GIS and MCE is described in detail by CARVER (1991) together with an example of its application for the selection of suitable sites for nuclear waste disposal. Feasible areas are identified using constraints and then the best sites are located through the weighting of the criteria. The advantages of a GIS are apparent here as it enables a large number of sites to be included in the process and allows the method to be made flexible through the inclusion of different criteria or different weightings according to the views of different interest groups (see KINGSTON et al. 2001). The combination of GIS and MCE or DSS are also of great value when it comes to dealing with problems with multiple and conflicting criteria and the different preferences of the actors involved in the decision making process (PECKHAM 1993).

Such methods are commonly used for the identification of sites for particular developments or management strategies (such as waste management) (CARVER 1991, PECKHAM 1993) but there is also potential for their use with respect to nature conservation or ecological research and urban and regional planning. Czeranka identifies various fields in which SDSS could be used, including identification and evaluation of sites for nature conservation and for landscape planning (CZERANKA 1996). Czeranka also provides an insight into their possible application in the selection of suitable sites for implementing compensation measures ("Ausgleich" or "Ersatzmaßnahmen") that are required by law in Germany for damage occurring to habitats or landscape through developments. Some of the advantages of using GIS in conjunction with MCE (or the use of a SDSS) for this application are that the results are obtained through scientifically based data aggregation methods, further criteria can be added to the equation

(for instance availability of sites), and the final results can be entered directly into a digital cadastre of sites for compensation measures (CZERANKA 1997a).

The advantages of combined GIS and evaluation methods are that the evaluation can be carried out for a large number of sites or over a large area and different approaches can be used to find the optimal solution (CARVER 1991). Other qualities required of evaluation methods are also made possible such as:

- objectiveness of the method through programming the method into the system,
- transparency (and also comprehensiveness) of the method through the production of interim and final reports of data, and
- flexibility through the ability to use different weightings or different approaches to the problem (CZERANKA 1997b).

Qualities, such as scientific validity, use of appropriate and complete data and acceptance of the method depend on the expertise of the researcher and must be clarified before the method is developed (CZERANKA 1997b). The knowledge and expertise of the operator and the decision maker are of utmost importance since without the appropriate and correct data, the tools become useless (CARVER 1991, FREEMAN 1997).

The use of evaluation methods and DSS is still a developing field and although the spatial analyses methods available in GIS software packages have improved there is still no ready-made package for DSS and MCE (multi-criteria evaluation) techniques (see CARVER 1991, PECKHAM 1993). Thus the use of these methods involves programming and the production of user-interfaces to customise the GIS for the specific application.

3 Methodology

3.1 Selection of cities/research areas

The research for this project mainly concentrates on England and Germany, although some examples are taken from other countries. These two countries were selected since both have suffered (or are still suffering from) the results of the closure of many traditional industries and the problems of dereliction. Different strategies have been developed in England and Germany to cope with derelict or wasteland areas and regeneration of both sites and regions to improve the local environment (socially, ecologically and economically). Another reason for the specific choice of these two countries was the fluency of the researcher in both English and German, a prerequisite for undertaking comprehensive research in both countries.

There are several regions in both England and Germany which suffer from extensive dereliction. In England the main areas affected by dereliction are the south-west, the Midlands (Birmingham and the Black Country) and the north of England. In Germany the areas most affected are the Ruhr area and the former eastern Germany, especially the old industrial cities (TEST 1995). Since urban wastelands were being investigated, cities in both countries were selected rather than regions and due to considerations of time and manpower one city was selected in each country for in depth research, as well as general research in other areas and cities of each country.

In Germany the city of Leipzig was selected as a focus for research, this being one of the old-industrial cities of the former East Germany (GDR). In comparison to the west of Germany, the problem of dereliction is comparatively new in east Germany, since the dissolution of the GDR and the reunification of Germany in 1990 led to widespread closure of industries with accompanying social and economic problems. Since very little research has been carried out on the regeneration of wastelands in east Germany, especially urban wastelands, a need was seen to research the problems in an east German city. Leipzig proved to be a suitable city for research due to the large numbers of wasteland sites and the recent development of various initiatives to deal with these sites.

The city of Birmingham was selected as the subject of research in England since the problems of dereliction and work on regeneration have been going on here since the 1980s and the city is thus a stage further than Leipzig. Not only does the city have well developed strategies for dealing with wasteland but it also possesses a progressive nature conservation strategy, which is particularly interesting with regard to the use of wastelands as urban wildlife areas. An English city was selected rather than another city in Germany, since it is interesting to look not only at differences in regional approaches to the problem of wastelands, but also the national differences in approaches both to wasteland regeneration and nature conservation.

A further reason for the selection of both Leipzig and Birmingham is that the close link between the two cities, both between research institutions and in the public sector, eased the problem of data gathering and establishment of contacts for undertaking research.

3.1.1 The city of Birmingham

The city is situated in a densely populated conurbation in the West Midlands alongside the city of Coventry and the neighbouring Black Country. The city itself has a population of

961,000 (BCC 1994) and is thus the UK's second largest city, housing the largest concentration of people and economic activity outside London. Birmingham was traditionally an industrial city, the development of which was accelerated by the construction of the canals and railroads during the 19th century (BCC 1993). The city prospered until the 1960s but its concentration on manufacturing industries (mainly the production of cars, bicycles and electrical equipment) meant that the city suffered greatly during the decline in the manufacturing sector in the 1970s and 1980s, leaving a legacy of dereliction (BRYSON et al. 1996). The region lost 300,000 jobs between 1979 and 1992 (EU 1994) and between 1971 and 1983 the level of employment declined by 29%. The current unemployment rate lies at 14.6%. The city has also experienced a decline in its population since the 1950s, partly due to people moving out to 'greener' suburbs (BCC 1993).

Birmingham was tarnished with an image of being "*a concrete jungle dedicated to the service of the motor car"* during the 1980s (BCC 1993:18). Despite new developments and regeneration initiatives the legacy of the economic recession is still present, with the existence of vacant and derelict sites and a lack of high quality open space in some parts of the city (BCC 1993). Nevertheless the city's image is being improved and the regeneration of many of the once derelict canals and their linkage to the greenspace network of the city has helped to improve the natural and social environment in the city (BCC & BRITISH WATERWAYS 1998). The city now has a good greenspace network, but this is limited mainly to narrow corridors due to the high building density in the city.

Birmingham has now climbed back from its position as one of the most depressed peripheral regions in the mid 1980s (see BRYSON et al. 1996) and the large number of regeneration projects and initiatives during the 1990s have meant that most wasteland sites in favourable locations have been developed and the amount of derelict land has fallen from 380ha in 1990 to 174 ha in 2001 (TRINGHAM 2001). Although the future looks brighter than before, there are still many problems to be overcome as the city's environment and image cause it to remain unattractive to modern investors and employers (BCC 1993: 4.3).

3.1.2 The city of Leipzig

Leipzig is a somewhat smaller city than Birmingham with a population of 492,325 and a land area of 29,754ha (STADT LEIPZIG 2001a). Until 1990 the city was very compact with a high population density compared to similar sized cities in west Germany (BREUSTE 1994). Leipzig is also characterised by various types of building structures including the traditional Gründerzeit buildings (4 or 5 storey residential terraced housing from the turn of the 20th century) and mixed residential and industrial areas.

Leipzig was traditionally a trading city with the growth of industry being assisted by the connection to the railway system in 1839 (HUBER 2000). Its most successful era was in the 1920s, just after the construction of the trade-fairground, when Leipzig was the second most important city in Germany (BREUSTE 1994). However the importance of the city declined after the second world war, accompanied by a continuous loss of inhabitants (SCHOLZ 1996). Leipzig remained an important industrial city for the GDR but lost its high position in the rankings of importance of cities in Germany. The investment in industry concentrated on the large industries such as machinery and textile manufacturing as well as the traditional book-binding and publishing industries but neglected the small industries and crafts (SCHOLZ 1996, FRIEDRICHS & KÜPPERS 1997). The problems of competition from modern "western" companies and years of under-investment in the industrial sector led to the closure of almost all factories in Leipzig and the consequent loss of jobs after the fall of the Berlin Wall in 1989

and the ensuing reunification of Germany. In Leipzig 80% of the industrial workplaces were lost within the first 3 years of reunification, a total of 80,000 jobs (BREUSTE 1996). The official unemployment level is currently 18.5% (STADT LEIPZIG 2001a).

After the "changes" in 1989/90 an almost uncontrolled building spree took place on the outskirts of the city (see BREUSTE 1996, USBECK 1999). Cheap land, undisputed land ownership, absence of contamination problems etc. made this much easier and faster than trying to build in the city (see SCHMIDT 1997). This trend exacerbated the problems of the inner-city wastelands, as well as creating new wasteland sites on the outskirts of the city (much of this land becoming part of Leipzig through the incorporation of outlying villages since 1990). Despite this expansion, the population of Leipzig continues to decline, partly due to people moving out to "greener" locations but efforts are being made to encourage people back into the city.

The history and development of the two cities show both similarities as well as differences. The radically different histories of the two makes it difficult to compare the development processes, but both have undergone a period of decline of their industrial base and a switch to an emphasis on the tertiary sectors. The city councils of both Leipzig and Birmingham are trying to make the cities more pleasant places in which to live and draw people back into the city to prevent any further loss of inhabitants and the problems of increased social division (through the movement of more wealthy inhabitants into the suburbs).

The longer period of restructuring and regeneration in Birmingham, compared with Leipzig, means that many regeneration initiatives have already been completed in Birmingham and the strategies and their results can be investigated and compared to those being implemented in Leipzig.

The cultural and strategic differences of the two cities, along with their differing histories, provide an interesting basis on which to carry out research. The cities' location is shown in the introduction on the accompanying CD-ROM.

3.2 Evaluation method

3.2.1 Evaluation method - Background

Evaluation is described as the assignment/classification of characteristics of an object to a defined category (JESSEL 1994, in CZERANKA 1997b). "*Evaluation and decision making methods can support rational thinking and action*" (EISENFÜHR & WEBER 1994 in JACOBY & KISTENMACHER 1998:147) and also help "*to reveal and select alternative decisions and to justify any decisions made*" (KILCHENMANN & SCHWARZ VON RAUMER 1999:36).

Important requirements of an evaluation method are that the method is as objective as possible, as well as being reliable, transparent and comprehensible (see BECHMANN 1981). However, as many authors have noted, complete objectivity of an evaluation method is impossible as there are always subjective decisions that have to be taken by the evaluator/decision maker (see WEILAND 1994, CZERANKA 1997b, KILCHENMANN & SCHWARZ VON RAUMER 1999). What can be done is to make the justification of the method, criteria etc. as objective as possible through using generally accepted relationships and judgements (KILCHENMANN & SCHWARZ VON RAUMER 1999:39).

Other considerations are that the method should not be too complex and should also be flexible with respect to its ability to include other factors or alternative goals. It should also include all the important information required to make a decision and be adapted or adaptable to the information available (FISCHER 1983 cited in KILCHENMANN & SCHWARZ VON RAUMER 1999).

There are various different types of evaluation methods but all are made up of key components including the subject that is to be evaluated, the object or person carrying out the evaluation or from whose point of view the subject is to be evaluated, evaluation criteria and indicators. The criteria represent the characteristics of the subject and determine its value and indicators then serve to characterise the subject. Scales must also be decided upon, through which the criteria can be valued and the evaluation method itself provides a regulated process through which the evaluation is carried out. [1]

As stated above, evaluation methods provide a basis for, or an aid to, decision-making, not a final conclusive decision. Such methods are often criticised but it is often the use of the results or use of the method that should be criticised, rather than the method itself (see KILCHENMANN & SCHWARZ VON RAUMER, 1999:41). The limits of evaluation methods should be recognised as well as their strengths and benefits in decision-making processes.

3.2.2 Aim and limitations of the evaluation method

The aim of the evaluation method is: to evaluate the suitability of wasteland sites as urban wildlife areas. As stated in section 1.4 an urban wildlife area is: *"an area where people can experience and be close to nature and wildlife in a peaceful setting as part of their daily lives."*

The method evaluates both site specific as well as spatial characteristics to develop an overall indication as to the suitability of wasteland sites as urban wildlife areas.

The method was developed to fill what was seen as a gap in the current knowledge and research on wastelands. Up to now most research work on wastelands has concentrated on the ecological or social characteristics and although some work has been carried out to determine the relationship between ecology and use of sites (e.g. NOLDA 1990a, KLEINHANS 1995, STARKE 1999) little has been carried out to actually try to evaluate wasteland sites as places where people can enjoy and experience nature (see section 2.4.1).

This methodology builds on that developed by STARKE (1999), which aimed to evaluate the importance of wasteland sites as natural playgrounds for children, but goes further by using multiple-criteria evaluation methods (MCE) and a geographic information system (GIS) to automise the evaluation process. Such a system (which may loosely be termed a SDSS - spatial decision support system) provides a flexible and comprehensible method for assessing different types of wasteland sites.

The evaluation method provides a relatively quick assessment of the importance of wasteland sites as urban wildlife areas. The information obtained from the evaluation method not only shows which sites are suitable as urban wildlife areas but also provides information which can be used in decision making processes regarding the future use of the sites. The method can be useful in urban areas with high concentrations of wasteland and can indicate where limited

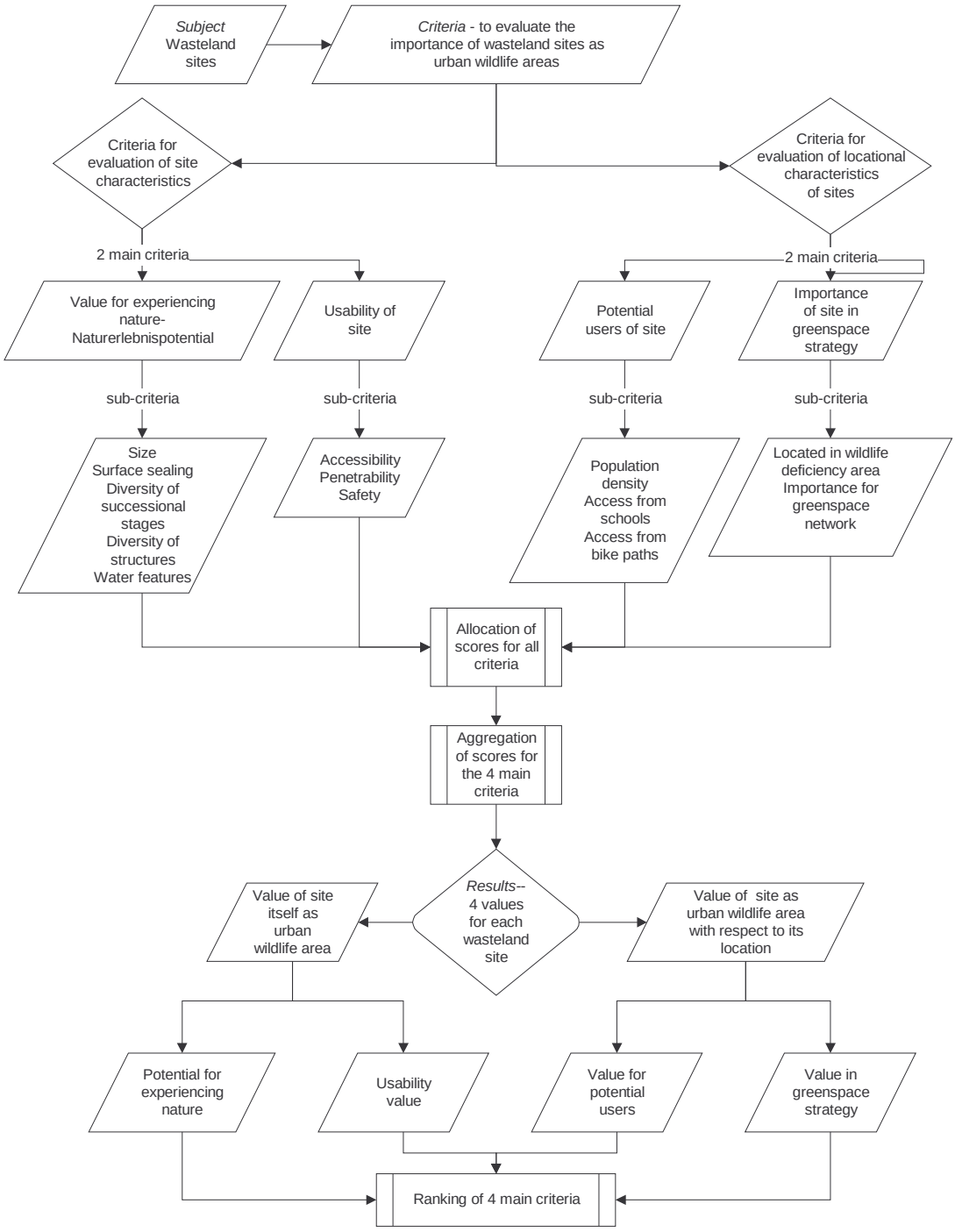
[1] (based on CZERANKA 1997, see also WEILAND 1994)

resources should be concentrated and where urban wildlife areas could be created with relatively minor changes to existing wasteland sites.

It should be noted that the methodology has its limitations and is designed only to provide an indication of the suitability of sites as urban wildlife areas. It does not aim to assess the nature conservation value of wasteland sites. Some of these sites may be of particular value for nature conservation and it is important that an ecological survey is carried out on such sites to determine their future use and management.

Additional information may also be required before a decision can be made as to the future use of a site. The advantage of the integration of the evaluation method in GIS is that extra data can be added to the GIS to aid the decision making process.

Figure 3 Explanation of the evaluation method



3.2.3 Description of the evaluation method

The subject - In this methodology the subject of the evaluation is the wasteland site. This may be composed of one or more land parcels. Usually in the built up area the boundaries of a site are fairly clear, due to the demarcation of the site by neighbouring buildings, walls, fences or boundaries of some sort. However, land parcel boundaries are often difficult to identify in the field since there is not always a boundary around a site and many sites are made up of several land parcels of differing sizes and shapes.

Peintinger used land parcels as the subject of his evaluation of empty housing plots, arguing that if one evaluated two neighbouring parcels together, the value would be higher than if one carried out the evaluation singly for each parcel (see PEINTIGER 1988). This is true; however, he only dealt with a specific type of wasteland in his survey where land parcel boundaries can be estimated fairly easily. With larger, irregularly shaped sites it is not possible to locate land parcel boundaries without suitable surveying techniques. Since the sites are being evaluated for their importance as urban wildlife areas, on which neither vegetation nor people using a site are likely to take notice of invisible land parcel boundaries, the latter are not considered to be applicable for use in this method. Instead the site is taken to be the extent of the area lying derelict, i.e. the boundaries of the wasteland site. The sites' limits are usually defined by features such as buildings, roads or other such urban structures, or in some cases by land use boundaries.

The object – The object of the evaluation is the planner or decision maker from whose point of view the evaluation method is undertaken.

The criteria - The criteria for evaluation of wastelands as urban wildlife areas reflect the characteristics of wastelands and the requirements of a site for it to be considered suitable as an urban wildlife area. Some wasteland sites may be ideally suited as urban wildlife areas, whilst others have the potential to be turned into such areas (or with time may develop into wildlife areas through natural succession). The criteria selected aim to evaluate the current suitability of wasteland sites as urban wildlife areas.

The subject of the evaluation is modelled by the use of two sets of criteria: one set to model the characteristics of the wasteland site and the other set to model the characteristics of the site's location which determine its suitability as an urban wildlife area. Each set of criteria includes two main criteria, which are further sub-divided into so-called sub-criteria (see Figure 3).

The criteria for the characteristics of the site include:

- **"Naturerlebnispotential" –** this reflects the value of the site for experiencing wildlife and refers to whether the characteristics of the site are such that they enable people to come into contact with, and experience wildlife on the site. This includes the sub-criteria: size, diversity of successional stages, diversity of structures, water features and surface sealing.
- **"Usability" -** this refers to whether the site is currently suitable for use - i.e. whether people can easily access the site, whether once on the site they are able to penetrate the vegetation and actually make use of the site, and whether or not the site can be used in safety. This includes the sub-criteria: accessibility, penetrability and safety.

The criteria used to assess the locational value of the site include:

- **The "proximity of potential users" to the site** - this refers to the relative number of people who could use the site due to the suitability of its location, i.e. the population density within easy walking distance of the site, the possible use of the site by schoolchildren and potential use by people passing by (for instance on bike paths). This includes the sub-criteria: population density, access from schools and access from paths.
- **"Importance of site in greenspace strategy" –** this reflects the value of the site in the city or town's greenspace strategy. A site is presumed to be of high value as an urban wildlife area if it can contribute to the greenspace strategy of the urban area, i.e. through reducing the deficiency in wildlife areas or enriching the network of green spaces. This includes the sub-criteria: improvement of provision of wildlife areas and importance for greenspace network.

Indicators are then produced for all the criteria and the relevant information obtained to be able to evaluate the criteria. A combination of methods is used to obtain the relevant data: some data is obtained through site surveys and other information from existing or created spatial data.

The evaluation of the data takes place automatically in a geographic information system, into which all the relevant information is entered and processed. Four end values are produced which can be aggregated to obtain an overall indication of the value of the sites as urban wildlife areas through ranking the importance of these criteria.

The selection of the criteria entailed consideration of two fields of research - ecology and sociology. The pure ecological research validates the choice of criteria for providing the sites with wildlife interest whilst the social research forges the link between the ecology of the site and the use or experience of nature by people. The reasons for selection of the criteria are discussed below.

3.2.4 Criteria for the evaluation of site characteristics

Criteria to determine the value for experiencing wildlife/ "Naturerlebnispotential"

i) Size of site

Hypothesis: larger sites are more beneficial as urban wildlife areas than smaller sites.

Ecological evidence for the importance of site size: Various general statements can be made about the link between site size and diversity of species and habitats found on the site.

- *Species number increases with site size:* Numerous ecological studies have demonstrated that species number increases with site size (e.g. WILLIAMS 1964, DAVIS & GLICK 1978, CROWE 1979, LUNIAK 1983, REBELE 1988, REIDL 1989 in KOWARIK 1993, HOGARTH 1997). There is evidence from the island biogeography theory that increasing the area by an order of magnitude very approximately doubles the number of species of any particular group found within that site (BBCBAP 2000). This increase in the number of species found on large sites may be related to the fact that there is also a greater likelihood that the habitat diversity will be greater on a large site than on a smaller site (NCC 1989). This diversity of habitats can have a positive effect

on the numbers and types of species present on the site, as a variety of niches will be provided, which may fulfil the requirements of various organisms or the different requirements of specific species (e.g. the different feeding and nesting requirements of birds). The Birmingham Urban Wildlife Trust argues that larger sites are important reservoirs for species and thus play an important part in enhancing biodiversity in the urban environment (BBCBAP 2000). This is true both for large and small sites, for instance the number of ruderal species was positively correlated with size for plots of 0.001 to 0.519ha (HARRISON et al. 1995:6) as well as for larger ones (see REIDL 1993). Harrison argues that "*although there seems to be some correlation between species number and site size the underlying reasons for this may have more to do with habitat diversity, management and use, site history, vegetation structure, topography, location than with size per se*", this is especially true for smaller sites (HARRISON et al. 1995). This is supported by Zucchi and Flisse who note that similar sized sites do not hold the same numbers of bird species since an important factor is found to be the location as well as size of site (ZUCCHI & FLISSE 1993).

- *Larger sites are more capable of coping with disturbance than smaller sites:* - A single large area of greenspace is more valuable ecologically than an equivalent area of separate greenspaces because the peripheral effects of disturbance are less frequent and less severe on a large site than on small areas (AUHAGEN & SUKOPP 1983, SCHULTE & MARKS 1985, NCC 1989). If disturbance occurs it is usually concentrated in one area and recolonisation of local extinctions can take place from within the site (HOGARTH 1997). Thus large sites can retain their wildlife value even if disturbed in some places by user pressure.

Social evidence for the importance of site size: A relationship has been found between site size and enjoyment of the site by people. This relates partly to the diversity of habitats often found on larger sites (as noted above). NOHL, and SCHARPF (1976) argued that the chances of experiencing nature are greater when sufficient space is available, a view reinforced by MILCHERT (1983) who views the size factor as vital for obtaining "spiritual benefit" from nature. The importance of size does not only relate to habitat diversity but also to the overall feeling and atmosphere of the site, the ability to escape from the pressures of urban life and into another world. A study by Coles and Bussey revealed that woods need to be about 2 to 2.5ha before adults look upon them *as "a wood worth visiting*". *"We hardly ever go for a walk in the wood at the back - it is too small. It doesn't feel like a wood because you can always see the houses and hear the traffic noise."* (COLES & BUSSEY 2000)

Gebhard also emphasises the importance of site size for experiencing nature as larger sites provide more space for uncontrolled, self-defined play and minimise negative influences from outside the site (such as noise, pollution etc.) (GEBHARD et al. 1989:74) and Nolda noted that on the whole larger sites were visited more frequently than smaller sites (NOLDA 1990b). The issue of site size is somewhat controversial as, although many authors argue for a minimum size of sites for experiencing nature (e.g. BOCHNIG & SELLE 1992, SCHEMEL 1997), others feel that, with regard to planning and social requirements, there is no strong biological or social evidence to suggest a class size below which sites should be excluded (HART 1982, HARRISON et al. 1995, DOE 1996). For instance a study carried out in Redditch shows that small, natural sites within 5 minutes of the home are particularly attractive to children (BUSSEY 1996). Gilbert also notes that people can feel safer in smaller sites as large areas can be seem overwhelming and threatening (GILBERT 1989). The problem with relating some of these findings to urban wastelands is that such small sites are often intensively managed to retain their wildlife character and other factors

such as accessibility, site history, management etc. will also play an important role (as substantiated by NOLDA 1990b, HARRISON et al. 1995, KLEINHANS 1995).

Site size is however used in many evaluation methodologies to determine the importance of sites as naturerlebnis areas - for instance SCHEMEL (1998:342) or STARKE (1999) - as well as in traditional nature conservation evaluation methods (see RATCLIFFE 1994).

On the whole larger wasteland sites will tend to be more suitable as urban wildlife areas for the following reasons:

- Ability to withstand disturbance and visitor pressure
- Correlation between species number and site size
- Greater chance of a variety of habitats being present on site
- Greater potential to experience nature i.e. greater habitat diversity and structure and thus higher probability of seeing plants, animals and obtaining a feeling of being with nature
- Feeling of escaping from the pressures of urban life.

Indicator: size of site

ii) Structural diversity of site

The structural diversity of a site is a criterion that is frequently used in various evaluation methods to evaluate the ecological importance of sites (such as in those of WITTIG & SCHREIBER 1983, AG STADTBIOTOPKARTIERUNG 1984, FREEMAN 1997, STARKE 1999) but the indicators used for this criterion in these methods vary considerably.

In the habitat mapping of Hannover the indicators used to determine the structural diversity were the vegetation layers present (vertical diversity) and the richness of form, colour and edible fruits (AG STADTBIOTOPKARTIERUNG 1984). Other methods use different indicators - for instance STARKE (1999) used only the number of vegetation layers to represent the diversity of a site, dividing layers into tree, shrub, herb and bryophyte following the method used by DIERSSEN (1990). Starke supposed that the quality of natural play areas increases with increasing number of vegetation layers (STARKE 1999). In contrast the methodology developed by WITTIG & SCHREIBER (1983) uses different vegetation structures to assess the habitat function of an area - these structures included phenomena such as rows of trees, wall communities, grass communities etc.

None of the above was thought to be suitable for this methodology for various reasons. The use of layers is considered too simplistic and ignores other types of structures that might be present on the site and add to the overall structural variety (e.g. man-made structures, different substrates etc.). The indicators used in Wittig and Schreiber's method are perhaps the most usable, but the vegetation structures that they used are not suitable for urban wastelands. For these reasons two different criteria were chosen to capture the qualities of structural diversity of wasteland sites - successional stages and diversity of structural phenomena. These are treated as 2 separate criteria and evaluated accordingly.

ii a) Diversity of successional stages

Hypothesis: the higher the number of successional stages, the more suitable the site is as an urban wildlife area.

Ecological evidence for the importance of successional stages: The presence of a variety of successional stages is a typical feature of wasteland sites. Ecological studies of wastelands/brownfields identify various stages of succession (see GILBERT 1989, REBELE & DETTMAR 1996) with a different flora being associated with each stage. The identification of the successional stages present on a site provides a guide to the number of vertical layers present, as well as a rough indication of the diversity of habitats present on the site - for instance wood stage denotes woodland habitat, grass stage grassland habitat etc. (as shown in Figure 4).

Successional stages and vegetation layers are sometimes used interchangeably in the literature thus research on both features are considered in the discussion of this criterion. Different habitat types are also included in the discussion but care should be taken when using this information, as the successional stage is not necessarily comparable with habitat type.

There has been much ecological research carried out to investigate the correlation between diversity of habitats, vegetation structure or successional stages and the diversity or number of species present on a site. For instance LUNIAK (1983) noted that the provision of refuge areas (shrubs and inaccessible recesses - i.e. bush or tree stage) increased the number of breeding birds on a site and that the number of layers of vegetation and their density also had a positive effect on species numbers. ZUCCHI and FLISSE (1993) also emphasised the importance of a variety of successional stages being present on wasteland sites for animal populations since this provides different habitat niches and fulfils the various requirements of different animal groups.

In a project to produce an atlas of wintering birds in the city of Valencia the habitats offering the most complex structure, and thus the widest range of resources, achieved the highest values of species richness (MURGUI 1999). Flocks of birds were found in places where a super-abundant resource was present (e.g. of grasses), as on urban commons. Seed eaters, insectivorous birds and ground or foliage foragers were found on urban commons due to the presence of all of these different food sources in these areas (MURGUI 1999). This can be correlated to the different successional stages present - e.g. grass or herbaceous layer and/or bush or tree layer. Similarly BEZZEL (1982) notes the importance of vegetation structures for birds - for instance if several different sucessional stages are present, then three different types of nesting birds will be able to colonise the site (ground, bush and tree nesters). Many species require a variety of structures for their activities - e.g. Goldammer (*Emberiza citrinella*) needs open spaces for feeding but bushes in which to nest, sleep and sing, thus if all structures are present on one site, the species is more likely not only to visit but also to nest on the site.

Social evidence for the importance of successional stages: The existence of a variety of successional stages is beneficial for an urban wildlife area as it provides a varied basic structure to the site. The presence of natural elements and the possibilities to move, change and use structures are factors mentioned frequently by authors with respect to their importance to people for creativity, phantasy and the forming of relationships with the natural world (see ZULLIGER 1990, SEEGER & SEEGER 1996, BJAS e. V 1997, WAGNER 1998). Bushes and hidden corners take on another meaning when looked at from a child's viewpoint as these become places to hide in or create a secret world. Even the

phenomenon of high grass can provide new and important experiences such as hiding, walking through or lying in long grass (MAGS-NRW 1989).

"*..where there's long grass we just dive in it and then jump over and dive in it again.*" (Christopher age 11 in SHOARD 1979).

The natural succession of vegetation from grass to bushes, shrubs and trees and the presence of open ground for digging and playing in all provide an interesting landscape and opportunities for different types of play (HART 1982, WAGNER 1998, FJORTOFT & SAGEIE 2000). However it is not only children who enjoy the variety of successional stages but also adults are found to appreciate such diversity since bushes or trees can be used for play or camping, more open areas for sitting, relaxing or picking flowers etc. (see KLEINHANS 1995). However there are of course also negative effects of some successional stages: for instance the fear people have of being in enclosed spaces, such as dense woodlands or bushes (see JOHNSTON 1990, KLEINHANS 1995). These are factors that should be considered in the management of sites and may be overcome through interpretation or improved landscaping of sites.

The presence of different stages of succession also indicates the dynamic nature of wasteland sites and their temporal as well as spatial diversity. They provide continued interest for people as they can follow the changes in vegetation on sites, not only during the course of a year but also over a longer period of time. This temporal diversity is one of the important characteristics that differentiates wastelands from other urban greenspaces (most of which are managed to restrain natural succession).

A variety of successsional stages has been shown to be important both from ecological and social viewpoints. One problem is the possible importance of the layout or amount of the various successional stages. There is no research on the importance of the relative amounts or distribution of various stages and since this is a difficult aspect to assess (even with the use of aerial photographs since these may be out of date) it will not be considered here. However another aspect is the establishment of a cut-off value, below which a successional stage will not be included; this will prevent the over-estimation of the diversity of stages (as in the evaluation methods of STARKE (1999) and the habitat mapping in Hannover (AG STADTBIOTOPKARTIERUNG 1984). In this method the cut off value will be taken to be a total amount of one successional stage comprising less than 5% of the total area of the site as used in the habitat mapping of Leipzig (ÖKOKONZEPT 1994).

Indicator: number of successional stages present with the stages being classified as: [1]

1) Bare ground - i.e. recently cleared, no vegetation colonised
2) Bryophyte layer - this is not necessarily a stage in the vegetation succession but can either be present within another layer or on its own - for instance on sealed ground
3) Pioneer species - normally the first species to colonise: short grasses, annuals, short lived perennials (wind transported), rosette species (dandelions)
4) High herbaceous flora - lupin, golden rod, thistle, *Malve*, mint
5) Grass stage - blooming grasses and tall herbaceous species, single bushes
6) Bush stage - pioneer trees, *Betula*, *Salix*, ruderal high herbaceous flora, semi-dry grassland and bushes

[1] (Taken and amended from GILBERT 1989, KOWARIK 1993, REBELE & DETTMAR 1996).

7) Pre-wood stage - *Betula*, robinia (*Robinia pseudo-acacia*), maple - up to 3m in height
8) Wood stage - mature or semi-mature woodland- over 3m in height.

Figure 4 Photos of different successional stages

Photo 1 Herbaceous and bush stage (from Gilbert 1992)

Photo 2 Grass stage (photo H.Herbst)

Photo 3 Bush and tree stage (from Gilbert 1992)

ii b) Diversity of structural phenomena-

Hypothesis: the higher the number of structures on a site, the more suitable it is as an urban wildlife area

Ecological evidence for the importance of structural phenomena: In addition to the value of the diversity of successional stages, as stated above, the structural phenomena of a site also play an important role in the overall ecological diversity of a site (REIDL 1997). These structures may include both natural and man-made features such as chimneys, dead trees, hedges etc.

The value of these "Kleinstrukturen" or small structures has been widely accepted and they are often included in habitat mapping studies to determine the ecological value of sites as in Hannover, Mainz and Leipzig (as recommended by SCHULTE 1988). The London Ecology Unit includes the criterion "urban character" in its evaluation of the importance of urban sites for nature conservation. Railway sidings, old walls, bridges etc. have been found to provide additional habitat niches on sites (LEU 1994). This is supported by work by ZUCCHI and FLISSE (1993) who found that walls, old buildings etc. increase the number of cliff breeding birds on wasteland sites. An example of the use of such a niche is the discovery of a Turmfalcon (*Falco tinnunculus*) spotted nesting in a disused chimney on an industrial wasteland in Leipzig. Luniak also found that an increase in the number of structures such as dead trees was correlated with the number of bird species found on a site (LUNIAK 1983). Various structures such as dead or hollow trees or dry wood can form important niches for beetles, birds, insects or even bats (PLACHTER 1980).

Another important structural phenomenon is varying relief/topography on a site. From an ecological point of view changes in relief provide different micro-climatic effects on a site - for instance, south facing slopes are warm and thus favoured by certain thermophilic species (WAGNER 1998, FREY 1999b). Changes in relief are also correlated with changes in moisture conditions as undulations or hollows will provide sites for moisture collection and thus temporary (or permanent) water features (ponds or marshy areas). These in turn provide different niches and conditions for plants and animals and may increase the ecological diversity of a site.

Social evidence for the importance of structural phenomena: In addition to the wealth of support for the importance of structural diversity for increasing the variety of plants and animals, other studies reveal its value for enjoyment of a site by people. Most of these studies are based on the experience of nature by children, in particular from an educational viewpoint, but there are some references to the use of, or relationship to, nature by adults.

The diversity of vegetation, morphology and man-made structures is one of the advantages of wasteland sites since this diversity provides a variable and exciting environment that stimulates the invention of games and inspires recreational activities by both adults and children (NOLDA 1990a, KEIL 1998).

A study by NOLDA (1990a) to investigate the use of wastelands by people showed that structures of particular importance include:

- Ditches - for children's play, e.g. hiding
- Fruit trees - for picking fruit or for children's games
- Trees or bushes - for playing hide and seek or for collection of sticks to make fires

- Hills, embankments - for children's play or riding bicycles
- Species rich meadow - for walking, picking flowers, or for children's play
- Blackberry bushes - for picking berries.

Kleinhans' investigation into the use of four wasteland sites reinforced the above conclusions with almost half the activities noted being directly related to structures typical of wasteland sites.

An example of one popular activity is fruit or blackberry picking which is demonstrated by the paths made to blackberry bushes all over the city in later summer; this is also verified in studies of people's use of wasteland sites (see FREY 1993, KLEINHANS 1995). Fruit or berry picking also helps people to understand natural processes (such as formation of fruits from flowers) and the use of nature and can thus play an important role in children's development (SEEGER & SEEGER 1996, WAGNER 1998).

Various other structures can provide added interest to a site and the potential to use materials on site for activities - for instance fallen branches for playing with or fallen trees for sitting on. The presence of different substrates such as sand, gravel or mud also provide added interest and opportunities for play (HART 1982). For instance a study of the use of wastelands in Mainz revealed the popularity of an area of sand as a natural sandpit for children to play in (KLEINHANS 1995:42).

As mentioned above changes in relief also provide extra interest to a site. This is a factor frequently referred to with respect to the creation of semi-natural playgrounds for children. It is also found to be an important element in studies on the use of wasteland sites due to the use of relief features by children for bike-riding, playing, hiding in ditches etc. (see NOLDA 1990a, KLEINHANS 1995). Variations in relief are often formed on wastelands by the tipping of earth or rubble and these provide an exciting place for playing in (HART 1982, SCHEMEL 1998:273). Ditches and holes are prioritised by children for digging, playing, hiding or social games and hills provide the motivation to run or slide up and down, ride bikes, toboggan in winter etc. (WAGNER 1998, FJORTOFT & SAGEIE 2000). *"I make a slope and I go speeding up and straight off the edge… it feels like I'm flying."* (A comment by a 7-year-old child in SHOARD 1979).

Topographical undulations also provide added interest to a site, particularly larger changes in relief as they provide the opportunity to obtain a view over the site and surrounding area. Changes in relief are frequently treated as important features in methods to evaluate sites for "Naturerlebnis" (SCHEMEL 1998, STARKE 1999).

Other features that are sometimes used to evaluate the importance of sites for experiencing nature are the presence of flowering plants, colour, smell etc. (AG STADTBIOTOPKARTIERUNG 1984, FREY 1999b) but these are very subjective phenomena and difficult to identify as they often depend on non-static aspects such as time of year, weather etc. and thus are excluded here.

The popularity of natural features has been revealed in Freiburg where the replacement of the usual playground equipment by natural elements (such as water, mud, wood and stones) led to such a high degree of use that a citizen's group was formed by surrounding inhabitants to revert the playgrounds to their former states so the use and thus noise level would decrease! (BLINKERT 1998).

Indicators: The indicators used to assess the variety of structural phenomena present are taken from studies of wasteland sites and habitat mapping studies that have identified

various structural phenomena of importance to the overall structural diversity of a site. These include:

Natural structures: single old trees, dead wood (on ground), dead trees, hedges, climbing plants, fruit/nut trees or bushes.

Man made structures: single walls, rubble, sand or gravel, chimney, buildings, relief N.B. Relief is further differentiated into 3 classes: [1]

- Small changes in relief (less than one metre in height or depth)
- Large changes in relief (1 to 5 metres in height or depth)
- Significant changes in relief (over 5 metres in height or cliff face, ravine etc.)

iii) Importance of water features

Hypothesis: the presence of water features on a wasteland site increases its value as an urban wildlife area

Water is treated as a separate criterion here as it is thought to be of particular importance in the urban landscape where few natural wetland areas occur. This is mainly due to the anthropogenic use of the land and technical engineering of many streams and rivers. Streams are frequently diverted or channelled underground in pipes or canals and there is little opportunity for direct contact with naturally occurring water features. From the ecological point of view ponds, streams or wetland areas provide a range of different habitats and niches for plants and animals and provide people with the opportunity to investigate and understand such habitats (TEAGLE 1978). Some wasteland sites provide interesting wetland habitats due to a combination of water impoundment and natural succession and thus provide precious natural reserves (HOUGH 1995:154).

Water is one of the most interesting natural phenomena for children and can add greatly to the diversity and interest of a site (see SCHEMEL 1998:343, WAGNER 1998). There is an irresistible attraction of streams, rivers, waterfalls and ponds and the thrill of splashing through puddles after a rainstorm forms an integral part of most people's childhood (BRÄMER 1998a).

The presence of natural water features is extremely important as it is vital for children to experience and understand water - how it changes with temperature, the dangers of water etc. There is abundant support for the fact that water features form a central element and medium for the personal development of children through play and experiencing water related phenomena (see HART 1982, HARRISON et al.1987, BJAS e.V. 1997, WAGNER 1998). Additionally the presence of water features provides a new range of plants and animals with their associated sounds, smells, differences in touch etc. For instance frogs croaking, the feel of frog spawn or water weed in ponds, the noise a stone makes when it is thrown into water - to mention only a few.

There are various water features that may be present on wasteland sites, some of which will depend on the weather and time of year. Temporary water features such as puddles or low lying areas in which temporary pools form can provide important features for experiencing water, especially for children, for paddling in summer, skating in winter etc. (MUFRP 1997). Semi-permanent water features are valuable due to the presence of wetland vegetation (such as reeds), which provide important habitats in urban areas (see

[1] (Taken from SCHULTE 1988, NOLDA 1990b, LEU 1994, ÖKOPLAN 1994, KLEINHANS 1995).

WITTIG & SCHREIBER 1983). Saturated or muddy earth provides an interesting medium for exploration through different senses (MUFRP 1997). Permanent standing or running water features (e.g. ponds, streams) provide not only an especially high value for the experience of nature and for play, but are also ecologically valuable. This is especially true of such features with aquatic and semi-terrestrial vegetation, such as water plants, reeds etc. since these provide extra habitats frequently used by animals living in water (JEDICKE 1993).

Figure 5 *Example of running water with semi-terrestrial habitat – Acocks Green, Birmingham (photo: H.Herbst)*

Indicators:

- No water features
- Temporary water features - puddles or hollows where water can collect
- Semi-permanent water features - evidence of water features through presence of wetland vegetation such as reeds, or saturated (muddy) ground
- Standing or running water - with little or no vegetation
- Standing or running water with aquatic and/or semi-terrestrial habitat (streams, ponds, wetlands).

N.B. Water features such as concrete basins or streams channelled in concrete are not included as features of importance for nature experience as these have little or no wildlife value or ecological value (see SCHUMACHER 1993) and may be extremely dangerous since their steep sides make it difficult to climb out if one falls in.

iv) Surface sealing

Hypothesis: the lower the degree of surface sealing, the more valuable a site is as an urban wildlife area

This is a particularly important criterion with respect to urban wasteland sites as many are still partly or completely sealed from the previous use.

Ecological evidence: Surface sealing is ecologically disadvantageous for various reasons such as the negative climatic and water retention capabilities of the site, reduced ground

water production, increased surface run-off, increased temperature and reduced moisture - the latter resulting in unfavourable micro-climatic conditions (especially in hot weather) (REBELE & DETTMAR 1996:28, SCHULTE et al. 1997, MÜNCHOW 1999). Surface sealing is also unfavourable with respect to wildlife, as it may destroy habitats which were present on the site and once sealed, such surfaces prevent most vegetation from colonising the sealed area and thus lead to an overall reduction in nature in cities (see MÜNCHOW 1999, BREUSTE 2000). There are, of course, exceptions as some plants always manage to find a crack in the concrete or others (such as mosses) can grow directly on the concrete or paving substrate. In general, the more surface sealing present on a site, the less chance there will be for vegetation to colonise and develop; this in turn will lead to an unfavourable micro-climate with a lack of trees and bushes for shading and moisture production. Both of these factors will limit the relevance of the site as an urban wildlife area.

Social evidence: Most highly sealed sites are unattractive as urban wildlife areas, - due to the lack of vegetation that is able to colonise and the monotony of the site. Highly sealed sites tend to be flat and deficient in vegetation structures. According to Schemel a minimum of 90% unsealed surface is required to make a site usable as a 'Naturerlebnisraum' (SCHEMEL 1998). Further support for unsealed sites comes from Hohenauer who reflects that sites sealed with asphalt, paving, or other surface sealing deny the opportunity for experiencing nature (HOHENAUER 1995:44).

A small amount of surface sealing may not necessarily be detrimental as it may provide a "sunbathing" spot for some animals (due to its capacity to heat up quickly in the sunshine) or a place to carry out certain activities, e.g. ball games.

Indicator: degree of surface sealing

Criteria to assess the usability of the site: Access/Zugänglichkeit, penetrability, safety

i) Access / "Zugänglichkeit"

Hypothesis: the more freely accessible a site is, the more it will be used by people (if its overall wildlife value is high).

Access to sites is seen as being very important, especially in urban areas, for the quality of life of the inhabitants (EN 2001). It is essential to enable people to enjoy and experience nature: *"Nature conservation is not restricted to the preservation of wildlife, but goes hand in hand with the enjoyment of it by all people" (*LEU 1994:8*).* Care must be taken here with the terms 'access' and 'accessibility' (Zugänglichkeit and Erreichbarkeit respectively in German) as the former refers to the rights of approach, entry or use that are legally or conventionally defined, whereas accessibility refers to how these rights are exercised (see HARRISON et al. 1995). It is not always clear how authors use these terms so some of the literature must be interpreted with caution.

Access to sites has been found to be an important factor influencing the use of wastelands sites (FREY 1995, KLEINHANS 1995). A study by COLES and BUSSEY (2000) also emphasises the importance users give to the accessibility of a site; however it is not clear here whether this refers to the accessibility from home, or the actual access to a site.

Several evaluation methods include access as a criterion in their methodology. For instance Starke considers wasteland sites to be unsuitable as natural playgrounds when

access is only possible by climbing over a fence or wall, or traversing private residential areas or industrial or commercial sites as these impede access and use of the site (STARKE 1999). FREEMAN (1997) also defined access as an important criterion when considering the usability of open spaces citing similar categories to those mentioned by Starke.

There does not necessarily have to be free access around the whole perimeter of the site but the siting of entrances and ease of access will affect the degree of use of a site as obviously certain groups of people are excluded from a site if walls or fences impede access. However a site should not have completely unrestricted entry as it will then tend to be accessed by motor vehicles and used as a parking place, which destroys both vegetation and the peace and quiet of a site (see VHS MAINZ 1980 in FREY 1993, WITTIG 1993).

Indicator: Type of access to site.

ii) Penetrability

Hypothesis: a certain degree of penetrability is required to enable a site to be used as an urban wildlife area

Penetrability is an important factor with respect to wasteland sites as many sites are overgrown with stinging nettles, brambles or thistles and become impenetrable and therefore unusable by people, without some form of management.

The definition of penetrability given by Starke is used here: *"complete cover of dense, bushy, thorny vegetation or stinging or thorny herbaceous species or large expanse of permanent water."* (Translated from STARKE 1999:217).

There is not much discussion of penetrability in the evaluation methods for urban greenspaces since it is not a relevant issue on sites managed for public access. It is, however, used in several studies to evaluate the usability of a site (see AG STADTBIOTOPKARTIERUNG 1984, STARKE 1999). Although there is a certain amount of adventure and fun making tunnels through vegetation this is impossible or unpleasant when the vegetation is truly impenetrable. Thus the degree of penetrability of vegetation will have an important influence on whether or not the site is used by people.

Indicator: % penetrability of vegetation on site.

iii) Safety

Hypothesis: The more widespread and serious dangers are on a site, the less suitable it is as an urban wildlife area

This is an extremely important issue and one that can have a great influence on the degree and type of use of a wasteland site, or the suitability of the site as an urban wildlife area. Safety is particularly relevant with respect to wasteland sites, where dangers from the previous use of the site, or from interim uses, are often present.

There are no specific guidelines with respect to safety issues on informal open spaces such as wastelands since these are not official open spaces so do not fall under the official safety guidelines for public greenspaces or playgrounds (e.g. German DIN norms). Other open space guidelines are not applicable in the case of wastelands since on the latter an element of danger, which might not be acceptable elsewhere, provides some of the excitement and interest to the site.

An important issue that must be considered here is where one draws the line between adventure and danger. A certain level of danger is thought by some to be acceptable as it provides a learning experience (BRÜHL 1992, HOHENAUER 1995): "*Basically the jurisdiction accepts that, up to a certain point, children are able to recognise risks and protect themselves appropriately depending on the age and the psychological development of the child.*" "*Children should be protected from serious dangers and not from dangers which are a part of life.*" (translated from HOHENAUER 1995:125, 126).

According to the working group 'Spielen in der Stadt' (playing in urban areas) of the Gartenamtsleiter Conference "*risks are knowingly accepted, increasingly with the agreement of those legally responsible, who were formerly inclined to be over-cautious*" (translated from SCHEMEL 1998:329).

SCHEMEL and STRASDAS (1998) also emphasise the importance of the risk element but state the need to minimise "hidden dangers". What these dangers are is left up to the local authorities but recommendations are given by AGDE (1996). Some of these are considered reasonable such as the creation of a boundary to flowing traffic (as in DIN 18034). However others are seen to be too over-protective such as not allowing sharp edged stones, height of fall being in accordance with DIN 7926 (thus there would be a height limit on climbing trees), logs not rolling if stood on, water not more than 40cm deep etc. (AGDE 1996).

Despite the importance of not making a site too immaculate, there are several issues, which pose unacceptable or hidden risks on a site and must thus be taken into consideration. As Barker and Graf state "*no-one would advocate leaving obviously dangerous features, such as open, unguarded mine-shafts, in open space used heavily by the public*." (BARKER & GRAF 1989:43). Several of these issues are discussed below:

1) The issue of land contamination is taken seriously with respect to derelict sites (see ZABOJNIK 2000). The degree of danger is related to the location and type of contamination (e.g. surface or underground contamination). It may not always be necessary to de-contaminate the site (if contaminated), or perhaps only in particular places (through the cleaning of hot-spots), thus an analysis of the site is imperative to determine if and where measures should be taken (see REBELE & DETTMAR 1996). Since children are encouraged to play on urban wildlife sites and be in direct contact with natural elements (water, earth etc.) contamination is a real danger and such sites may be considered unsuitable as urban wildlife areas (see here FREY 1993).
2) Another danger is that of fly-tipping as dangerous substances such as oil, paints and chemicals may be dumped which can endanger users of the site and diminish a site's value for people and nature (BBCBAP 2000, ZABOJNIK 2000). Fly-tipping (in addition to graffiti, litter, discarded syringes etc.) also has a negative social influence as these signs are interpreted by users as a lack of social control and care of the site and thus make people feel unsafe on the site (HARRISON et al. 1995). This is collaborated by the results of a survey of the opinion of 2000 children in Berlin by the Kinder and Jugendbüro Kaktus as to the phenomena that they find disturbing on playgrounds - rubbish, glass splinters and dog mess being some of the things mentioned (in BJAS e.V 1997:164).
3) Unstable buildings also provide unacceptable risks and should either be made safe, demolished or securely fenced off as they present an unacceptable danger to the public (BJAS e.V. 1997, SCHEMEL & STRASDAS 1998).

4) There are other dangers (which are rarely mentioned in studies) including those of the presence of broken glass (BJAS e.v. 1997). This is often found on wasteland sites where windows may have been smashed or glass dumped. Another danger is the presence of uncovered holes or cellars, which are frequently found on wastelands, as well as rods or elements protruding from the ground or from spoil heaps. These latter are often part of concrete building elements that may have been buried or left on the site.

Safety is a difficult issue to deal with being "*a legally treacherous and emotionally fraught topic*" but a balance has to be made between creating a bland, safe open space and somewhere with interest for wildlife and adventure and interest for children and adults (BARKER & GRAF 1989:44).

Indicators: The dangers constituting real safety threats can be placed into two groups, those that could cause pose serious dangers and/or are difficult to deal with, and those that can be dealt with quickly and are of a less serious nature.

Serious dangers include:

- Contamination of site
- Unstable structures - walls, buildings
- Deep or large holes or cellars into which one could fall
- Sharp elements protruding from, or lying on the ground or sticking out of heaps

Minor dangers include:

- Broken glass
- Fly tipping - may contain dangerous substances (e.g.paint, chemicals)

This categorisation is somewhat subjective as there is very little to literature on this subject, especially regarding specific dangers, but since wasteland sites may pose serious dangers some form of identification and categorisation of dangers is seen to be necessary when regarding the value of sites as urban wildlife areas.

Figure 6 Example of potentially dangerous fly-tipping (photo: Umweltamt, Leipzig)

3.2.5 Criteria to evaluate the locational value of a wasteland site

Proximity of potential users

i) Population density

Hypothesis: the value of a site as an urban wildlife area will be affected by the density and structure of the surrounding population

This is an important criterion when evaluating the importance of a wasteland site as an urban wildlife area since people visit open spaces that are close to their homes most frequently (BCC & LAND CARE ASSOCIATES 1997). A preliminary study of wasteland sites in Leipzig for this research showed that out of 12 sites showing traces of more than one recreational use, 11 of these were situated in or within 50m of a residential area. A study in Mainz showed similar findings, since the most frequented of the study sites were those located directly in or next to residential areas. This argument is also supported by nature conservation guidelines, which recognise that sites in urban areas are more accessible for the local inhabitants than more isolated ones (GLC 1985). Such sites will then provide the benefits available from a rich and varied wildlife to all people living or working nearby (BARKER & GRAF 1989).

The other side of the argument is that from the point of view of nature conservation, sites that are inaccessible or away from residential areas may be of great value as nature can develop undisturbed. Sites located within an industrial area or on trading estates, through which people rarely walk or cycle, may provide undisturbed havens for wildlife. There are examples of wasteland areas, or even existing industrial sites, that have been converted into nature reserves specifically for wildlife with limited entrance for educational purposes

(see HOUGH 1995). However, since the aim of urban wildlife areas is that they should be accessible to the public their distance from residential areas is of great importance.

The problem here is how to assess the number of people who constitute potential users of the site. A radius of 300m is taken as the catchment area of the site or the distance which people can easily walk to a site; this is commonly termed "accessibility" (see BARKER & GRAF 1989). This distance is seen as being more realistic than the old 500m British standard, due to increasing traffic volumes and infrastructure obstacles and tighter controls on children's freedom than in 1964 when the standards were set[1]. This is also verified in a study by COLES and BUSSEY (2000) in which the "home range" of woodland sites in terms of walking distance was found to be 100-400m, with an ideal walking time of 6-8 minutes. 400m was also the distance found to be the permitted range of children under 14 in studies by Hillman and Matthews (cited in BUSSEY & COLES 2000).

Thus the people living within a 300m radius of a site should be considered to be the most frequent potential users of the site. However, this is complicated by the fact that different types of residential areas will have differing amounts of private or communal greenspace and thus the residents will have differing requirements for public greenspaces. It is possible to classify structures into those with high or low requirements for greenspaces. For instance structures with a high amount of private greenspaces (whose inhabitants thus may have a lower requirement for public greenspace) are villas, detached or semi-detached or terraced houses (SENSUT 2001). The problem with using such data is that there is little information available on the differing requirements of people in the different structures and "needs" can only be guessed at. Another factor to be considered is the population structure, since a high proportion of children within a 300m radius may make a site even more important as an urban wildlife area since children between the ages of 5 and 15 have been found to be the most common users of wasteland sites (see here NOLDA 1990a, KLEINHANS 1995).

Indicators: There are several possibilities regarding the selection of an indicator to use for the criterion:

- Density of population (per/km^2) within the 300m radius of site
- Number of people/population structure within the 300m radius of the site
- Type of residential structures within the 300m radius of the site (e.g. high rise blocks, detached houses etc.) and their average population density.

The indicator used will depend on the data available. If population density or actual population numbers for districts or census areas are available then the number of people within 300m of the site can be estimated. However, if such data is not available, or is not suitable due to the large size of districts with uneven population distribution, it may be better to use an ordinal scale of relative population density in different residential structures (e.g. detached housing versus terraced housing). An estimate can then be made of the average density within 300m of the site. The most exact method would be to calculate the population living within the 300m radius from precise residential data (number of people living in each house). However this is very time consuming and costly and is only considered suitable for a survey of industrial sites.

[1] The 500m standard was set by the National Playing Fields Association based on evidence found in 1964. Source LPAC 1992

ii) Access from bike paths

Hypothesis: a site will be more valuable as an urban wildlife area if it is located along a bicycle route.

The use of bicycles is something that is supported in most city development plans since it not only reduces the amount of traffic on the roads but is also important for the health of the population. Organisations such as Sustrans (Sustainable Transport, UK) and Rails to Trails (USA) support the development of safe cycle paths, where possible away from heavy traffic (RAILS TO TRAILS 2001, SUSTRANS 2001). In addition to providing safe and attractive routes for people on foot or on bicycles, these pathways can also provide a means of linking together greenspaces (such as wasteland sites). This can improve access to greenspaces and thus make it easier for people to enjoy natural open spaces (BCC & LAND CARE ASSOCIATES 1997:3.7.18). This is also supported by a questionnaire in Leipzig about people's expectations of greenspaces - 50% of those questioned placing a high value on the connection of greenspaces in the cycle network (KABISCH 1996). Wasteland sites that are used or converted to urban wildlife areas can provide valuable greenspaces that can be accessed by cycle paths.

In many cases wasteland sites also serve as bike paths in their own right, either in the form of linear pathways or through the creation of pathways through the site. For instance disused railway lines, canal paths and other wasteland sites are commonly used areas on or along which cycle paths are created. Such cycle routes provide habitats where wildlife can thrive as well as safe corridors for species to move along. Many of these corridors provide excellent habitat for hunting raptors, and roosting places for bats are frequently found in old stone-arched bridges, a frequent feature of cycle paths on old railway lines (SUSTRANS 2001). Of course these paths are not only used by cyclists but also provide valuable footpaths in urban areas and are thus used by a wide range of people for commuting or leisure purposes.

Indicator: Location of site next to bike path (or other pathway)

iii) Access from schools

Hypothesis: a site is more valuable as an urban wildlife area if it is located within walking distance (300m) of a school or another establishment for young people

Wasteland sites that are accessible from schools can provide an excellent outdoor education resource for children (and adults) without involving the cost and time of travelling to a distant ecology park or nature centre (see GLC (N.D.), KLAFFKE 1985). The location of an urban wildlife area on the route to or from school (or another establishment for young people) can also provide children with the opportunity to experience and spend time with nature on a daily basis (see BJAS e.V. 1997). In this way it is possible to "*relate school studies to the place where they actually live and to experiences they have in their daily life*" (BARKER & GRAF 1989:47). The London Ecology Unit and the Nature Conservancy Council (now English Nature) also note the need for field study areas in close proximity to local schools (GLC 1985, BARKER & GRAF 1989) and such areas can be of great benefit in ecological studies to explain plant and animal relationships (BELL 1995). Such local sites can also demonstrate that nature occurs in the local surroundings and not only on formal nature conservation sites. In practice the value of wasteland sites for school children has been revealed in a study by Kleinhans, who discovered that a wasteland site was highly used by children from a school directly adjacent to the site (KLEINHANS 1999). Many former wasteland sites in London provide an excellent

education resource for local schoolchildren (although it should be noted that most of these are managed in some way). Over 10,000 school-children visit Camley Street Natural Park (an urban wildlife area developed on a wasteland site in London) each year and visitors have had to be limited due to excess demand (JOHNSTON 1990). Although this site is managed and cannot be compared directly to wasteland sites, its conversion from dereliction shows the potential of such sites.

Indicator: Site situated within 300m of a school

Importance of site in greenspace strategy:

i) Improvement of provision of wildlife areas

Hypothesis: a site is more valuable as an urban wildlife area if it reduces the deficiency of wildlife sites in the area

One of the factors affecting the importance of a wasteland site as an urban wildlife area is the potential of the site to provide local inhabitants with an urban wildlife area (see HARRISON et al. 1987, JOHNSTON 1990, BUSSEY 1996, FREEMAN 1997, STARKE 1999). Most towns or cities have guidelines for the recommended amount of open space, although the definitions of open space and wildlife areas and amounts recommended vary. Areas deficient in greenspace or wildlife are then defined according to these guidelines. For instance the city of Birmingham defines "wildlife action areas" as any areas with no sites of importance for wildlife within 300m. The distance of 300m is used here since this is the acknowledged distance that most people are willing to walk to a local greenspace (BARKER 1997).

Wastelands that are suitable as urban wildlife areas can help to reduce such deficiencies and form part of the greenspace strategy of a town or city. The importance of wasteland sites in this context is recognised by some authorities - for instance the recognition of urban commons as a type of greenspace in Birmingham and the value of "Brachen" (wasteland) in Berlin (SENSUT 2001).

The difficulty here is that not all cities identify informal greenspaces or wildlife areas and the categorisation varies from place to place. Thus the calculation of deficiency areas will vary depending on the data and nature conservation strategies that exist. Since this method aims to identify sites of importance as urban wildlife areas it is necessary to know whether the site falls in an area lacking such sites. Thus when possible, wildlife deficiency areas will be calculated, but where information is lacking on wildlife areas then greenspace information can be substituted.

Indicator: Location of site in deficiency area

ii) Importance of site in greenspace network

Hypothesis: a site is more valuable as an urban wildlife area if it can contribute to the quality or size of the existing greenspace network

The aim of this criterion is to demonstrate the role that wasteland sites could have in the greenspace network of the urban area. This has both ecological and social advantages, which are discussed below.

Ecological evidence: Attempts have been made to connect the theory of island biogeography (MACARTHUR & WILSON 1967) to urban areas, as urban wildlife habitats are often isolated from one another in the "urban desert". In theory the more isolated islands are from the "mainland" or species pool, the fewer species they will contain. Thus in theory the number of species present should increase if areas are linked to one another by corridors or the distance for movement reduced by the use of stepping stones. Wastelands are particularly important as links in the green network as they possess an enormous variety of species - particularly in the early stages of succession (MESSER 1999:60). This is supported by work in Duisberg where 7 of the 28 stepping-stones in the habitat network are provided by wasteland sites (MESSER 1999). Gibson also lends support to the importance of connectivity as isolated sites become impoverished in invertebrate species (GIBSON 1998). Connectivity is also thought to be important for small mammals; however, both roads and paved areas can form barriers for such species (see ZUCCHI & FLISSE 1993). There is some debate as to whether the corridor theory is really applicable in urban areas and preliminary results of the URGENT project in the West Midlands reveal that "on corridor" sites do not seem to be more diverse than those away from the corridors (URGENT 2000).

Arguments against the theory state that to be of use a corridor must be continuous (seldom the case in urban areas) and it should form an ecological continuum, as a different habitat may be as much of a barrier to some species as a man-made feature such as a road. However, Auhagen notes that many species require different habitats during their life-cycles, thus a range of habitats in a corridor may be advantageous to certain species (AUHAGEN 1995). Dawson also supports the corridor theory for the provision of conduits for plants and animals in urban areas (DAWSON 1991). The potential importance of urban wastelands is also recognised in various nature conservation or biodiversity action plans and they are seen as potential contributors to the spatial network of greenspaces (BCC & LAND CARE ASSOCIATES 1997:§ 7, SCHULTE et al. 1997, BBCBAP 2000).

Social evidence: Wildlife corridors have the advantage of providing trails for human use (for commuters, cyclists or pedestrians) and for the enjoyment of the natural environment (TAYLOR et al. 1995). Not only corridors, but also the networking of greenspaces is seen to be valuable in improving the accessibility of open space (BOCHNIG & SELLE 1992). Even in the early open space plans, such as the "General Freiflächenplan" of Berlin in 1929, concepts were developed to create ring and radial systems of greenspaces for the urban inhabitants. Most greenspace or landscape plans aim to create a network of greenspaces throughout the urban area. For example the nature conservation strategy of Birmingham identifies a strategic network of open space corridors of value to wildlife and people (BCC & LAND CARE ASSOCIATES 1997:3.4.14). This is reinforced by people's views obtained through a survey in Leipzig in which 60% of those questioned regarded connectivity of greenspaces to be important (KABISCH 1996). The importance of a greenspace network is also becoming more apparent in the health care profession where daily walks are becoming an accepted prescription for some medical problems (GRAYSON 2001).

Recent wisdom justifies corridors on the basis of multiple use, not only for ecology (for which the evidence is controversial) but also for visual, recreational, hydrological, climatic and social purposes (SEARNS 1995, TAYLOR et al. 1995, BARKER 1997). If situated on these key corridors or within the network wasteland sites can provide an important contribution to the overall greenspace network of a town or city.

N.B. The data available for this criterion may be variable as not all authorities identify greenspace networks or wildlife corridors, although they may be indicated in local plans. The evaluation method is thus flexible to enable different data to be used to assess whether sites are of importance to the greenspace network. In this method a distance of 50m is used to assess whether sites are located near existing greenspaces as there may be a gap between sites due to a road or path dividing the sites. Although this forms a barrier to the continuity of the green network it is also accepted as a phenomenon of a built up area since transport networks divide the whole urban area. A distance of 50m also allows for a degree of error in the digital data.

Indicator: Site located within 50m of a greenspace

Table 3 *Summary of the criteria and indicators used to evaluate the suitability of wasteland sites as urban wildlife areas.*

Site criteria	Indicators
Criteria for the suitability of the site	
Naturerlebnispotential/value for experiencing nature	
i) Size	Size of site
ii a) Diversity of successional stages	Number of different successional stages present
ii b) Diversity of structural phenomena	Number of different structural phenomena present
iii) Importance of water features	Presence of different water features
iv) Surface sealing	% of surface sealing
Usability of site	
i) Accessibility/Zugänglichkeit	Type of access to site
ii) Penetrability	% Penetrability of vegetation on site
iii) Safety of site	Type and degree of dangers on site
Criteria for the evaluation of locational value of site	
Proxmity of potential users	
i) Number of people able to reach site easily	Density/ structure of population within 300m of site
ii) Accessibility from bike paths	Site situated next to bike path
iii) Access to site from schools/ bike paths	Site situated within 300m of school
Importance in greenspace strategy	
i) Improvement of provision of wildlife areas	Location of site in deficiency area
ii) Importance of site in greenspace network	Site located within 50m of greenspace

3.2.6 Allocation of scores for criteria

It is necessary to allocate values or scores to the criteria used in the evaluation so that the different criteria are normalised and thus can be compared or aggregated with one another (KILCHENMANN & SCHWARZ VON RAUMER 1999). An odd numbered scale is seen to be useful as it enables a middle value (i.e. 3) to be given (see KÖPPEL et al. 1998:96). 1- 7 is usually thought to be the maximum scoring range with 1 to 3 or 1 to 5 being other commonly used ranges (CZERANKA 1997b, OSGOOD et al. 1957 IN CZERANKA 1997b). Freeman considers five classes enough to provide a broad enough spectrum of possible outcomes (FREEMAN 1997).

In this method different scales are used for different groups of criteria. In most cases a scale of 1 to 5 is considered suitable to indicate the values of the specific criteria but in some cases the scores are limited to 1 or 0 as the criteria required only a yes or no answer (for instance location in wildlife deficiency area- yes=1, no=0).

Throughout the evaluation method a higher number indicates a more positive score, for instance with a scoring system of 1 to 5, 1 is considered to be the lowest and 5 the highest score. For some criteria the scores can be attributed directly to the indicators but for others the raw data first has to be classified before scores can be attributed, for instance for site size.

Allocation of scores for site characteristics

The allocation of scores for the site characteristics is summarised in Tables 4 and 5 and explained briefly in the accompanying texts.

Table 4 Allocation of scores for Naturerlebnispotential/ value for experiencing wildlife

Score	Size (ha)	Succ. stages	Struc. Phen.	Surface Sealing %	Water features
1	x≤0.5	0	0 or 1	>75	No water features
2	0.5>x≤1	1 or 2	2 or 3	50%-75	Temporary water features - puddles or hollows where water can collect
3	1<x≤3	3 or 4	4 or 5	25-50	Semi-permanent water features - evidence of water features e.g. reeds
4	3<x≤6	5 or 6	6 or 7	<25	Standing or running water - with little or no vegetation
5	x>6	7 or 8	≥8	0	Standing or running water with aquatic and/or semi-terrestrial habitat

Explanation of scores in Table 4

Size - The size classes are quite narrow since most wasteland sites in urban areas tend to be small, with very few being over 6 ha. It might be necessary to alter the classification in other cities if the size range of the sites were much larger. For instance in the Ruhr area sites of over 30ha are common due to the proliferation of heavy industry within the cities in the region. In contrast, Harrison found that the majority of urban wastelands in Birmingham, London and Liverpool are less than 0.02ha (HARRISON et al.1995).

Diversity of successional stages - In the evaluation of successional stages, the more successional stages present, the better the site is, as this will provide greater diversity of both vegetation layers and potential habitats on the site. The maximum number of successional stages possible is eight.

Diversity of structural phenomena - One point is given for each type of structure present, the only exception are relief features, which are given different scores according to their contribution to the overall structural diversity of the site (larger or more prominent changes in relief receiving greater values).

1 point = small changes in relief (less than one metre in height or depth)
2 points = large changes in relief (1 to 3 metres in height or depth)
3 points = significant changes in relief (over 3 metres in height or cliff face, ravine etc.)

It was considered unnecessary to count the number or relative amount of each structure. This is substantiated by other studies, which also counted types and not absolute numbers of structures: for instance FREEMAN (1997) and WITTIG & SCHREIBER (1983) used such methods to assess the importance of sites for nature conservation or as urban open space and found that their results agreed with the those of more detailed ecological investigations.

Surface sealing - the degree of sealing is self-explanatory. The higher the degree of sealing, the lower the score. Some surface sealing is not necessarily detrimental, as some vegetation may colonise here (such as mosses) or come up through cracks in the paving and it may also allow for activities (such as ball games) that require a hard surface.

Importance of water features - A temporary water feature, or evidence of such, is given a low score since this only provides experience of water for a limited period of time. Semi-permanent water features, with wetland vegetation such as reed communities, obtain a moderately high score. However the lack of open water limits the experience value of this type of habitat as a water feature. Open water features obtain higher scores, those with well developed wetland vegetation obtaining the highest score since such vegetation provides a valuable habitat for nesting birds or as a refuge for many species in urban areas. Open water features are also regarded as being of high value for nature experience in urban areas as they provide the possibility for direct contact with, and experience of, water (SCHEMEL 1998).

It is possible that more than one of the water features are present on a site, but the final score will be taken to be that of the highest scoring feature (e.g. if marshy area and open water with well developed vegetation are present, the score will be 5, reflecting the score of the latter).

Table 5 Allocation of scores for usability of site

Score	Access	Penetrability	Safety
1	Inaccessible	0%	Widespread major danger or several major danger(s)
2	Accessible with difficulty (climbing fences etc.)	<20%	Isolated case of major danger on less than 10% of site
3	Accessible via private land	20-50%	Widespread minor danger(s)
4	Accessible via limited entrances	50-75%	Isolated case (s) of minor danger on less than 10% of site
5	Easily accessible via visible entrances	>75%	No danger on site

Explanation of scores in Table 5

Accessibility - The accessibility score increases with ease of access to site. It is not necessary for the site to be freely accessible from all sides (as this may lead to use of the site as a car park or for vehicle dumping etc.) but visible, accessible entrances will enable a variety of different users to access the site. The scoring system is based on that of FREEMAN (1997) but differs slightly as her method was developed for public open spaces so included clear signing and accessibility features, which are obviously irrelevant for urban wastelands.

Penetrability -The distribution of the scores for penetrability is similar to that of accessibility, the more penetrable the site, the higher the score. A site is considered to be unsuitable as an urban wildlife area if the vegetation is so dense or the ground surface so wet, that people cannot penetrate it, as they will then have no chance to experience and use the site. A degree of impenetrability is considered acceptable as this may add to the interest of a site and provide a valuable refuge for animals.

Safety of site - The danger, or potential danger, posed by the conditions of a site depends not only on the type of danger present but also its size or influence with respect to the whole site. Those elements or structures that are relatively easily and quickly dealt with or removed are less problematic and pose less of a danger than those which require extensive or difficult methods to deal with them (such as contamination).

Thus scores are allocated according to the type of danger (serious or minor) and the degree to which it influences or is distributed on the site. If a danger is only present as an isolated case, which does not have a large negative influence on the site (for instance fly tipping at the edge of a site) a higher score will be allocated than if the same danger is found on a large area of the site. It is somewhat difficult to define isolated and widespread dangers precisely but a value of 10% is given as a rough guidance as to what is meant by isolated case; it is often very difficult to assess the precise percentage cover of a danger (such as fly tipping) so the assessment has to be left up to the surveyor to a certain extent.

Allocation of scores for locational characteristics of sites

Explanation of allocation of scores for locational characteristics (Table 6)

Population density around site - The data obtained for this criterion may be in the form of numerical or ordinal scales depending on the raw data available (see section 3.2.5). The result of the calculation is standardised using the interval scale properties method (see CARVER 1991) to obtain values from 0 to 1 (see section 3.2.8). These are then divided equally into three equally spaced classes (high, medium and low population density) to reflect the number of people/population density living within 300m of the site.

Accessibility to site from bike paths - A wasteland site is considered to be easily accessible from a bike path if it is located within 40m of the site (this value is rather large to compensate for possible errors with respect to digitising features, especially bike paths which may be located on either or both sides of a wide road but may be digitised in the middle of the road). The scoring then depends on whether the site falls within this distance of a bike path - a score of 1 being given for sites within the distance boundaries and 0 for sites outside the distance boundaries.

Accessibility to site from schools - A site is considered accessible from schools if the site falls within 300m of a school. The scoring then depends on whether the site falls within this distance - a score of 1 being given for sites within the distance boundaries and 0 for sites outside the distance boundaries.

Improvement of provision of wildlife areas - The scoring here is relatively straightforward. If a site is situated in an area of wildlife deficiency it obtains a score of 1 and a score of 0 if it is not located within a deficiency area (i.e. within 300m of a wildlife area).

Importance of site in greenspace network- The scoring here is also straightforward with sites obtaining a score of 1 if they are situated in or directly adjacent to the greenspace network and 0 if situated outside the network. A distance of 50m is used to assess whether a site is situated near to the greenspace network to allow for the presence of a boundary such as road or path between sites as well as a degree of digitising error.

Table 6 Indicators and scores allocated to criteria for locational value of wasteland site

Criterion	Indicator	score
Proximity to potential users		
Number of people able to reach site easily (population density in vicinity of wasteland site)	Population within 300m radius of site	1- low population density 2- medium population density 3- high population density
Accessibility via bike paths	Sites within 50m of bike path	0 not within 50m 1 within 50m
Access to site from schools	Sites fall within 300m of school features	0 not within 300m 1 within 300m
Importance of site in greenspace strategy of town/ city		
Improvement of provision of wildlife areas	Location of site in wildlife deficiency area	0 not within deficiency area 1 within wildlife deficiency area
Importance of site in greenspace network	Site adjoins or is within greenspace network	0 outside greenspace network 1 site directly adjoins or is in greenspace network

3.2.7 Weighting

The use of weights in evaluation methods is controversial. They are seen to be necessary in order to take into account the differences in importance of the various criteria (Carver 1991). However it is difficult to ensure that the relationship between characteristics is the same as the coefficient used for weighting (see FREEMAN 1997, KILCHENMANN & SCHWARZ VON RAUMER 1999). A lack of scientific evidence or consensus on the distribution of weights can also mean that the weightings have a bias on the results of the evaluation (CZERANKA 1997b, FREEMAN 1997, PECKHAM 1997). This can only be lessened by testing different combinations of weights (pair-wise comparisons) or through techniques such as round table talks to obtain a consensus (see CZERANKA 1997a).

Since insufficient evidence was considered to be available to support the allocation of weightings in this methodology, weightings were not used for individual criteria. Instead the scoring and aggregation methods developed endeavoured to take into account the differences in importance of the various criteria. Only in the final compilation of score is a user-defined weighting carried out using the hierarchical optimisation method described in section 3.1.7.

3.2.8 Data Aggregation

Three types of aggregation method are used in the evaluation process to evaluate the importance of wasteland sites as urban wildlife areas.

i) Summation of scores

This is a commonly used and simple method based on the addition of scores. However the problem is that it ignores the fact that the distribution of some of the scores may be uneven and thus the final outcome may be misleading. This can be overcome by the use of constraints and/or minimum required values so that low value sites are excluded from the evaluation process. There is also the problem that it may not make sense to add some scores together if they relate to completely different features or aspects of the subject being evaluated (see CZERANKA 1997b). Also such methods cannot be applied to non-compensatory factors (i.e. factors that are dependent on each other) or to criteria with scores of different length (DIAMOND & WRIGHT 1988). However the advantage of this method is that it is easy to use, can be replicated easily and means that it is simple to add or remove criteria from the evaluation process.

ii) Parallel consideration of scores

This is a method used by WITTIG & SCHREIBER (1983) in their evaluation of open spaces. The advantage of the method is that it can be used when scales are of different length and minimises loss of information about the individual scores. It is also useful when dealing with a small number of criteria (as in "usability") as addition of such scores can lead to misleading results.

The problem, however, with using this method is that it becomes quite complex to use when dealing with a large number of criteria (i.e. more than 3). It is only possible to use with large amounts of data if it can be calculated automatically as it would be too time consuming to work out the score for each site by hand. It is also more difficult to add extra criteria when using this method, as the algorithm must be edited to include each new criterion.

iii) Hierarchical optimisation

This is a useful aggregation method for non-compensatory criteria as it does not require transformations of scales or standardisation of values, as the criteria are not compared with one another. The criteria are ranked and the scores for each entry (e.g. for each site) are then compared and as soon as an alternative is found with a higher value for the next most important criterion, this is put in the next highest place in the rankings of the alternatives. The problem with this method is that some of the criteria may not necessarily be considered and thus a relatively high value alternative may be overlooked (see CARVER 1991, CZERANKA 1997b). The use of the hierarchical optimisation process relies very much on the expertise of the decision maker, and there is also a degree of subjectivity as to the ranking order used and the variety of ranking processes undertaken (CARVER 1991).

Another problem occurs with only a small number of criteria (i.e. less than 5) as the ranking often becomes meaningless, since sites with equal scores can be allocated different ranks. This is because the sites are dealt with sequentially so the ranking depends not only on the criteria's scores but also on the position of the site in the database table.

Aggregation of scores for criteria for the characteristics of the site

There are two main criteria used to evaluate the characteristics of sites as explained in section 3.2.3: “Naturerlebnispotential” and “Usability”.

Aggregation of scores for “Naturerlebnispotential” (potential for experiencing wildlife)

The summation of scores was considered to be the most suitable aggregation method here since the parallel consideration method is both difficult to use and to understand with a large number of criteria. Hierarchical classification was also considered to be inappropriate as it requires a weighting of the importance of the different criteria, which must first be justified.

Using the summation of scores method the scores of all the criteria were added together to produce a total score with a maximum possible score of 25. The aggregated scores were then standardised using the following formula (taken from CARVER 1991):

$$\text{Standardised score} = \frac{\text{raw score - minimum raw score}}{\text{maximum raw score - minimum raw score}}$$

The standardisation technique provides an objective method of classifying the scores, and takes into account the range of values that exist. The resulting values (ranging from 0 to 1) are then divided into 5 equal classes to produce an index of suitability for Naturerlebnispotential; 1 indicating a very low and 5 a very high Naturerlebnispotential (see Table 7).

Table 7 Aggregation of scores to show the “Naturerlebnispotential”

Index	Standardised score
1 - very low	0≥x<0.2
2 - low	0.2≥x<0.4
3 - medium	0.4≥x<0.6
4 - high	0.6≥x>0.8
5 - very high	0.8≥x>1.0

Aggregation of scores for usability criteria

The scores were attributed using the parallel consideration of scores method (see Table 8). This was considered the most appropriate aggregation method since hierarchical classification cannot be used on only 3 criteria with integer scores (due to the problem of the different ranking of equal scores). Summation was also not considered to be suitable as a site can score very low in one criteria but obtain a relatively high score overall, thus obscuring the low score. This is particularly important for this group of criteria where a low score in one of the three criteria can make the site unsuitable for use as an urban wildlife area. Thus in the parallel consideration of scores, any site with one or more low values (i.e. 1 or 2) obtained a low overall score. The best possible score is 5 if all the criteria obtain the maximum score of 5.

Table 8 Aggregation of scores to show the usability value of the site

Index	Consideration of scores	Alternative scores
1- very low	1 score = 1 or 2, other scores < 3	2 scores = 1 or 2, other score >2
2- low	1 score = 1 or 2, others ≥ 3	
3- medium	One or more scores = 3, other scores ≥3	
4- high	2 scores = 4 and one score = 5	2 scores=5, one score=4
5- very high	All scores = 5	

Aggregation of scores for locational criteria

There are two main criteria used to evaluate the locational criteria as described in section 3.2.5: "Proximity to potential users" and "importance in greenspace strategy".

i) Site's proximity to potential users

The criteria were aggregated using the parallel consideration of scores method since the scores could not be added due to the different lengths of the scales (see Table 9). Hierarchical classification was also not considered suitable with a low number of criteria with integer values due to the problem of the different ranking of equal scores.

The site is considered to be of high value for potential users if it is situated in an area of high population density and can also be accessed by children coming to or from school (or possibly for educational purposes) or can be accessed from an existing bike path (or other similar feature). Less valuable are those sites in an area of medium or low population density, or where the population density is medium or high but no other features (such as schools or bike paths) are located nearby. The sites with the least value are those with a low population density and no schools or bike paths located nearby.

Table 9 Aggregation of scores to show the value of the site for potential users

Value	Consideration of scores
1- low	School = 0 and (bike path = 0 or 1), population = medium/low
2- medium	Schools = 1, population = medium/ low, bike path = 1 or Population =high, (school = 0 or bike path = 0)
3 - high	Schools = 1, population = high, Bike path = 1

ii) Importance of site in greenspace strategy of town/city

The scores are aggregated using a simple summation of scores (see Table 10). No standardisation was necessary as the scores automatically fell into 3 classes. This is considered to be the simplest and most appropriate aggregation method to use with only two criteria with equal lengths of scales.

Sites are considered to be of high value for the greenspace strategy if they are located in a wildlife deficiency area and thus may provide a much needed urban wildlife area, as well as being located within the network of greenspaces and thus able to improve the quality or dimension of the existing network. Those sites of medium importance are those that are located either in a deficiency area or within the greenspace network and those of low value are neither in a deficiency area nor within the network.

It is possible for a site to be located both in a wildlife deficiency area and in the greenspace network as the network may run through an area of deficiency as it just shows where greenspaces should be present, not where they actually are present.

Table 10 Aggregation of scores to show the value of the site in the greenspace strategy

Value	Consideration of scores
1	Sum of scores= 0
2	Sum of scores= 1
3	Sum of scores= 2

3.2.9 Compilation of final scores

The evaluation method produces four separate scores for the four main criteria:

1) Naturerlebnispotential (potential to experience nature)
2) Usability of the site
3) Proximity of potential users
4) Importance of site in greenspace strategy of town/city

The first two criteria reflect the characteristics of the site itself and the latter two the spatial characteristics of the site. The results of all of the four main criteria are important when deciding which wasteland sites are valuable as urban wildlife areas and thus should be looked at together in the decision making process.

It is difficult to aggregate these four final scores since information would be lost and the value laid on the four main criteria may be different according to the circumstances surrounding the decision making process.

Nevertheless some form of aggregation is considered to be useful to provide an overall indication of the importance of wasteland sites as urban wildlife areas. The four final scores are compiled together into one table in the last stage of the evaluation and a hierarchical optimisation method is used to aggregate the data. This enables the user to weight the importance of the four main criteria (through the ranking of these four criteria) and a sensitivity analysis can be carried out by altering the rankings and determining which sites remain of high value as urban wildlife areas, regardless of the different rankings used (see CARVER 1991).

Care must be taken on interpretation of the final end ranking, as this may obscure some of the characteristics of the site itself. The values for the four main criteria, as well as the characteristics of the site itself (such as safety etc.) should also be examined before making a final decision as to the suitability of sites as urban wildlife areas. It should not be forgotten

that the successful application of the evaluation method relies, amongst other things, on the correct interpretation of results.

There may also be other factors to be taken into account when making a decision as to the future use of a wasteland site as an urban wildlife area - for instance land ownership or planned developments on the site. Although these factors have not been included in the evaluation method they may be used as constraints or provide additional information in the decision making process.

3.3 Tools and instruments used in the execution of the evaluation method

3.3.1 Field survey

A field survey provides a method of obtaining accurate, up to date information about sites. The drawback to this method is that it is time consuming and it is difficult to cover the whole of a large site on foot. Although some characteristics can be identified using aerial photographs others are hidden by vegetation or are too small to be identified (for instance rubbish or logs on the ground) and thus a field survey is required (see KLEINHANS 1995). In the case of wastelands it is essential to undertake a field survey as changes occur very rapidly in land use and vegetation cover and aerial photographs cannot provide up to date information about the existence of sites and many of their characteristics (see STARKE 1999:242).

3.3.2 Aerial photograph interpretation

Aerial photographs provide a useful source of information on land use and land cover. They are widely available but the length of time between coverages varies considerably from place to place. There are various types of film available but colour infra-red film material is useful for urban open space and for habitat mapping (BIERHALS 1988, SCHNEIDER 1995, STARKE 1999). It has also been found to be useful for identifying and surveying wastelands (see STARKE 1999) but it may not always be available in all areas.

The resolution of photographs is also important; a useful scale for identifying wasteland sites is 1:5,000 although for more detailed surveys a higher resolution may be necessary.

The use of aerial photograph interpretation is discussed for two areas of work:

- identification of wasteland sites
- surveying of indicators for the evaluation of wasteland sites as urban wildlife areas.

i) Use of aerial photographs for identification of wasteland sites

Aerial photographs have been found to provide a useful information base, particularly for comprehensive wasteland identification and/or survey, and can ease the burden of field work (BIERHALS 1988, KIRSCH-STRACKE 1990:290, REBELE 1990:13). Research in this project into the possible use of aerial photos to identify wasteland sites revealed that the sites can be identified by interpretation of certain characteristics such as varied colours and textures (cloudy appearance), the large amount of white colour present (i.e. little vegetation), confused structures, various levels of vegetation and the presence of informal pathways through the site. This is substantiated by work carried out by Starke and Bierhals (see BIERHALS 1988, STARKE 1999).

Although aerial photographs can be used to identify wastelands there are some problems with interpretation due to factors such as:

- Age of photos - the regularity of aerial photo coverage varies considerably. In some areas the land is regularly photographed (Leipzig being photographed roughly every five years) whereas Starke's survey of wasteland sites in the Ruhr area used aerial photos varying from one to seven years of age (STARKE 1999). Thus sites which are derelict in the photographs may since have been developed and new wasteland sites appeared.
- Confusion of wastelands with other land uses - for instance confusion between extensively managed greenspaces or old industrial areas and wastelands (the latter often appear derelict but may still be in use).

Despite these drawbacks API is a useful instrument to locate wasteland sites but verification of the sites is necessary through comparison with other data or with a ground survey.

ii) Use of aerial photographs to survey indicators for the evaluation of wasteland sites

Aerial photographs are frequently used in habitat mapping surveys since they can provide information about the type of vegetation and habitats present. (DEUTSCHER RAT FÜR LANDESPFLEGE 1992, AG BIOTOPKARTIERUNG 1993). They have also been used in various surveys of wasteland sites to identify features present and activities carried out on the sites (see NOLDA 1990a, STARKE 1999).

Many of the indicators for the criteria discussed in section 3.2 can be identified through the interpretation of aerial photographs. Stereoscopic pairs of photographs are useful for identification of some features, such as height of vegetation, type of built structure or changes in relief. The investigation into the possible use of aerial photographs for this project revealed that vegetation features such as successional stages and vegetation structures could be identified from aerial photographs as could water features, bare ground and sealed ground (although the latter two could be confused). NOLDA (1990b) and STARKE (1999) found that other phenomena could also be identified - such as footpaths or intensity of use of site. However Starke noted that a complete site evaluation was not possible through the use of aerial photographs alone due to the difficulty of identifying all features present on the site (STARKE 1999).

The problems with using aerial photographs is that the identification of many features is dependant on the time of year the photos were taken. For instance for vegetation features photographs must be taken in the vegetation period but this makes identification of other features on the ground difficult or impossible (particularly under tree crowns). The age of the photos also affects the validity of the identification as the characteristics of the site may change with time, particularly with regard to vegetation features. Although aerial photographs cannot be used to identify all the indicators of the criteria, they can provide a certain amount of information and may be of use if a ground survey is not possible. They can also provide an overview of the site or identify areas or features of interest, which is particularly useful for larger sites where it may not be possible to cover the entire site on foot. A great advantage of the use of aerial photographs for site surveys is that they enable a large area to be covered in a short space of time (compared with ground surveys).

3.3.3 Geographic Information Systems (GIS)

Introduction to GIS

A geographic information system (or GIS) is best described by its characteristics or components. There are various definitions of a GIS but perhaps one of the best is that of MAGUIRE (1991) who describes it as a computer based information system for the recording, saving, administration, analysis and portrayal of spatially referenced data (see also BURROUGH 1986). This is made possible by the facilities of a GIS - the geographical database, graphical display and spatial analysis functions (PECKHAM 1993).

The spatial data and the information present in a GIS can be represented in various data structures, the most common of which are raster and vector data models. Vector models are considered more appropriate for spatial objects with sharp boundaries (for example in urban planning) (see CZERANKA 1997b), whereas the use of GIS with continuous values or unsharp boundaries (as with remote sensing or photographic data) is better suited to raster data formats (CZERANKA 1997b). In raster formats every cell or "pixel" (or group of pixels) is considered as a spatial unit and will have one or more values associated with it describing the coverage of the space enclosed by that cell (like a patchwork quilt of cells). In vector formats data features are represented by lines, points, or polygons, each of which is considered to be a spatial unit with its own attribute information (GILFOYLE 1991). In this way layers of information about a study area (such as a town) can be produced in the GIS including information on various features such as roads, population, land use etc. Query and data processing applications enable the manipulation and analysis of the available data (LUTHY 1998).

GIS software

The GIS software selected for use in the project is ArcView, a vector based GIS programme. The advantage of this system is that it can be used on a normal PC and so does not require expensive hardware. According to Batty it is "*amongst the most popular and flexible GIS software*" (BATTY 1999:53) and its common usage and compatibility with other Microsoft applications makes the import and export of data relatively simple (i.e. through the many compatible data forms and sources). ArcView enables one to "*add tabular data, and display, query, summarize and organise data geographically*" (BUHMANN et al. 1996:2). It can also be used to analyse data and thus assist in decision making processes.

In ArcView features and their attributes are stored in shapefiles (.shp), which can be in either point, line or polygon form. These shapefiles are then used to produce data feature themes (units of features and their attributes e.g. greenspaces, wasteland sites etc.) (ESRI 1997). The use of spatial analysis functions in ArcView make it possible to create new data themes through processing original shapefiles. Application programming (using Avenue scripts) can also be used to customise the application and automise certain parts of the data input and spatial analysis processes.

Use of GIS to automise the evaluation method

The high number of different criteria used and the large number of sites to be evaluated make the automisation of the evaluation process almost essential to avoid lengthy and tedious calculations by hand. Recent research in the field of integrated evaluation techniques and GIS is discussed in section 2.4.2.

The integration of the evaluation method in GIS as used here might be thought of as a spatial decision support system (SDSS) (see section 2.4.2) as it possesses all the attributes of a SDSS as described by DENSHAM (1994). This includes the capture of data, representation of complex spatial relationships, spatial and geographical methods of analysis, generation of a variety of outputs, an adaptable user interface and a flexible architecture that can be adapted to the needs of the user. The production of a properly functioning SDSS requires a huge amount of work and there is a danger of the over-use of this term to describe all systems relating to the solution of spatially related problems (CZERANKA 1996). Possibly a more precise way of describing the system is as a combination of a multiple-criteria evaluation method and GIS, using the more tentative approach taken by Carver and Peckham (see CARVER 1991, PECKHAM 1993).

The debate over the exact definition of an SDSS is not thought to be productive here, what is more important is how the evaluation method and GIS are integrated together to provide a user-friendly interface that enables the evaluation method to be carried out in a flexible and adaptable manner. The method used here integrates the evaluation method described in section 3.2 with GIS to enable automisation of many of the processes, as well as providing a user-interface which allows a certain degree of flexibility with respect to the application of the evaluation method.

Functions of GIS in the evaluation process

i) Use of GIS for data input

The GIS is used for entering various types of information which can then be used in the evaluation process.

Input of digital data: existing spatial digital data can be imported into GIS as data feature themes (for instance data on wasteland sites). Tabular data can also be imported into ArcView and either linked to existing spatial data or (if spatially referenced) can be converted to a shapefile or feature theme.

Input of raw data: data from surveys can be entered directly into tables in a GIS or database data can be linked to existing spatial data. Images (such as maps) can be scanned and used as background information (image data source) or information can be digitised from the maps to create a feature source (feature data theme).

ii) Use of GIS for data processing

The GIS is used for various aspects of data processing in the evaluation method:

- Calculation of size of wasteland sites
- Calculation of scores from the raw survey data
- Complex spatial analysis - using reclassification operations and distance and connectivity measurements (for example to determine which sites are located near to schools)
- Use of data aggregation methods to produce results for the main criteria at various stages of the evaluation process.

iii) Use of GIS for data presentation

Results are presented in GIS in the form of tables, graphs, layouts (maps) etc..

iv) Provision of user interface for execution of evaluation method

ArcView (like most other GIS) enables the user to create menu-driven interfaces between the user, the GIS and the evaluation method (see CARVER 1991). This provides a degree of flexibility in the execution of the method and enables the user to retain an overview of the steps and different stages of results involved in the evaluation process. A user interface can be used to enter data or automise various actions (such as complex spatial analysis) or to provide a tool which integrates various different actions - such as data input and analysis.

3.4 GIS programming - the “wasteland tools”

3.4.1 Introduction

A special set of tools were produced for the automisation of the evaluation method using GIS. The aim of these tools is to provide a user-friendly interface for the data input and evaluation processes and to provide a degree of flexibility regarding the use of the evaluation method.

N.B. Although the structure, contents and calculations included in the tools were developed as part of the methodology, the computer programming was carried out externally as it was beyond the scope of this thesis.

The wasteland tools consist of three main sections as well as a comprehensive help file:

1) Data input and evaluation of site characteristics of wasteland sites
2) Input and evaluation of locational characteristics of wasteland sites
3) Compilation of final scores

Each of these sections consists of a sequence of dialogues (a mode or modeless window which contains controls) in which the user is required to enter the appropriate data or information. The data feature themes to be used in the various stages of the evaluation process must be selected by the user, as must the output files (since a new output file is created for each stage of the evaluation process). The tools also give the user some flexibility as to the choice of data used in the evaluation process and the buffer distances, which are required for the purposes of calculations (for instance to calculate which wasteland sites fall within or adjoin the network of greenspaces). The structure of the wasteland tools is shown in Figure 7.

The accompanying CD-ROM provides a visual demonstration of the wasteland tools through which the evaluation method can be tested using the available data (use command “application of the evaluation method” on the CD-ROM). The help file also provides a step by step guide to use of the wasteland tools.

Figure 7 Data flow diagram for wasteland evaluation tools

3.4.2 Data input and evaluation of site characteristics – Tool 1

Data input

Data can be entered into a data input form in the wasteland tools, either from site survey forms (see appendix 2) or directly in the field. Once the data has been entered for all the sites surveyed a table is produced containing the input data. The only data which are not available from the site survey are contamination of the site and site size. Information about site contamination must be obtained from existing digital or analogue data and entered into the table or entry form manually. Site size is calculated automatically for each site when the data input table is created. It is possible to edit data entries either in the table or in the data entry forms, the latter being preferable to prevent errors from occurring.

Evaluation of data for site characteristics

The data entered for the site characteristics can then be evaluated automatically on activation of the “calculate scores for site characteristics” command in the wasteland tools menu. The evaluation then occurs automatically in the following manner:

1) Those scores that are based on a simple numbering system of the various indicators (for instance accessibility) are allocated at the stage of data input but the more complex scoring algorithms occur automatically at this stage (such as safety). The scores are allocated using the scoring system explained in section 3.2.6.
2) The scores for each of the main criteria (“Naturerlebnispotential” and “Usability”) are aggregated automatically using the method outlined in 3.2.8.
3) The new user-defined theme and its associated table is then created. This contains the scores for each of the criteria as well as the two fields for the aggregated scores (see Table 11).

Table 11 Explanation of output table for the evaluation of site data

Fields	Data type	Explanation
Shape	Polygon	Feature type
ID	Numerical	Identification of site
area	Numerical	Area of site (ha)
Size	1-5	Score for size
Surf_sealing	1-5	Score for surface sealing
Succ- Stage	1-5	Score for diversity of successional stages
Diversity	1-5	Score for structural diversity
Water	1-5	Score for water features
Accessibility	1-5	Score for accessibility
Penetrability	1-5	Score for penetrability
Safety	1-5	Score for safety
Nature	Numerical	Raw value for the aggregated scores for "Naturerlebnispotential"
Nature index	1-5	Standardised score for the value of the site for "Naturerlebnispotential"
Usability	1-5	Score for the value of the site's "usability"

3.4.3 Input and evaluation of locational characteristics – Tool 2

This stage involves the spatial analysis of the locational characteristics of the wasteland sites. It is possible to either carry out the whole process, or to select one of the main criteria (i.e."potential users" or "greenspace strategy") if only interim results are required. This option provides a degree of flexibility with regard to the use of the wasteland tools.

Data input

The data input uses a sequence of dialogues in which data is entered for each sub-criterion.

The user is required to select the appropriate data themes for each of the sub-criteria (e.g. schools, greenspace network etc.) It is possible to select more than one theme for the criteria "wildlife areas" and "greenspace network" and the result is calculated using the themes selected. A buffer distance must be given for all selected themes – for instance the distance of 300m could be given to calculate which sites fall within this distance of schools.

The one sub-criterion that is slightly more problematic is "population density" since the type of data available will affect the type of calculation to be carried out. The three possible types of data are:

- Population density - persons/km^2
- Population number - number of inhabitants living in specific area

- Ordinal classification of population data - e.g. population may be high, medium or low in particular residential or land use structures.

Once the type of data available has been identified the appropriate option is selected. If ordinal classification is selected a further dialogue appears in which values must be given for the different classes occurring in the selected field of the population data theme. An explanation of the calculations used in the evaluation process is given in appendix 1.

Evaluation of data for locational characteristics

The scores produced at the data input stage are used to calculate the aggregated scores for both of the main criteria using the method described in section 3.2.8. The output table contains both the scores for each sub-criterion and the aggregated scores (see Table 12).

Table 12 Explanation of output table for the evaluation of the locational site data

Fields	Data type	Explanation
Shape	Polygon	Description of feature
ID	Numerical	Site identification number
Bike paths	Binary	Score for bike paths criterion
Schools	Binary	Score for schools criterion
Population	Number	Raw data from population calculation
Popn-std	Number	Standardised score for population data
wda	Binary	Score for wildlife deficiency area
Network	Binary	Score for greenspace network criterion
Use	Numerical	Final score for value of site for "potential users"
Gspace	Numerical	Final score for importance of wastelands in "greenspace strategy"

The calculations and methods used in the spatial analysis are explained in detail in appendix 1.

3.4.4 Compilation of final scores – Tool 3

The final command in the wasteland tools menu is the compilation of final scores. This takes the final scores for the four main criteria and produces another data theme whose attribute table contains only these scores. The four scores can also be compiled together using the hierarchical classification method to determine which sites are the most suitable as urban wildlife areas. The following steps are involved in this stage:

- The user is required to select the appropriate data feature themes which contain the results of the evaluation for both site and locational characteristics. A list of the fields contained in the database files for the selected themes is drawn up automatically and the user must select the appropriate data field for each criterion.

- The user is then requested to rank the four main criteria according to their importance with respect to the use of the wasteland sites as urban wildlife areas. Either three or four criteria may be selected, but not less, since hierarchical classification does not work properly for only two values (see section 3.2.8).
- The output table then contains the final scores for each of the four main criteria, the ranks of each wasteland site and an even grouping of the ranks into 5 classes to summarise the ranked scores (see Table 13).

Table 13 Explanation of output table for the compilation of results

Fields	Data type	Explanation
shape	polygon	Description of feature
ID	numerical	Site identification number
Nature	1-5	Score for “Naturerlebnispotential”
Usability	1-5	Score for “usability”
Pot-users	1-3	Score for “potential users”
Gspace_strat	1-3	Score for “greenspace strategy”
Rank	1 to x	Rank of importance of each wasteland site
Rank_indx	1-5	Index of ranks

3.5 Implementation of evaluation method

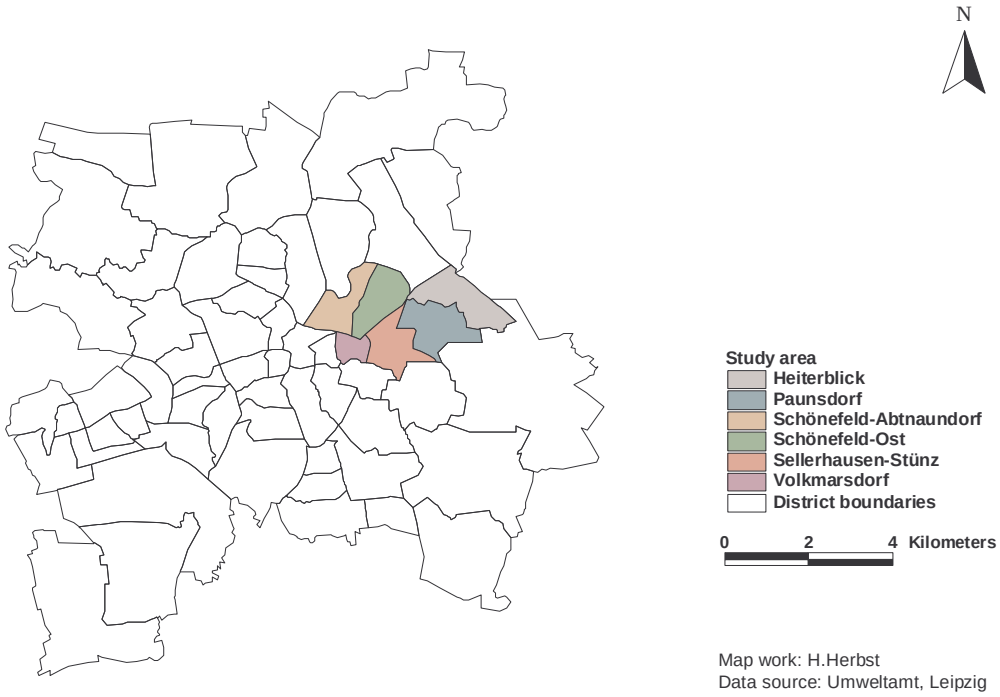
The evaluation method was developed through use of data obtained in a study area in Leipzig. In addition to assisting with the development of the method, this enabled the practicability of the method to be verified and the identification of any problems or areas where the method could be improved. The implementation is broken down into four phases:

1) Selection of study area in Leipzig
2) Identification of wastelands in study area
3) Development of field survey method
4) Use of wasteland evaluation tools for data input and processing

3.5.1 Selection of study area in Leipzig

The study area in Leipzig was selected to incorporate the main types of building structures in the city and a wide variety of different types of wasteland sites. It was not possible and also not necessary to consider the entire city, as it would not have been feasible to cover all wasteland sites in the city considering the time and manpower available for the project. Thus an area of the city was selected in which a large number of wasteland sites were concentrated (from the information available from the city council) and which incorporated a wide range of typical structural types (Stadtstrukturtypen). The study area (see Figure 8) incorporates sseven districts in the north-east of Leipzig. The mixture of structural types - mixed industrial/ residential, high rise residential area, Gründerzeit housing, inner-city, suburban areas, old and new industrial estates - incorporates a wide variety of wasteland types and thus provides a suitable basis on which the applicability of the method can be tested.

Figure 8 Location of study area in Leipzig



3.5.2 Identification of wasteland sites in study area

Once the study area had been identified it was necessary to locate the existing wasteland sites in this area. Two methods were considered to obtain this data, as defined by BEHR (1998):

1) Use of primary data: creation of new dataset using ground surveys, API etc.
2) Use of secondary data: use of existing data such as databases, maps etc.

The advantages and disadvantages of these methods are outlined in Table 14. After reviewing the different methods and the data available on wasteland sites in Leipzig the decision was taken to use both primary and secondary data to identify wasteland sites since the standard and availability of secondary data was insufficient for the use of this alone.

Table 14 Advantages and disadvantages of different methods of identifying wasteland sites

Data source	Advantages	Disadvantages
Primary data sources		
Field survey	Precise Up to date Identification 100% accurate	Time consuming and expensive Difficult to access some sites Difficult to define boundaries accurately
API	Can cover large area in short time	Not always up to date Identification not 100% accurate
Global positioning systems	Precise Up to date Survey and data input in one step	Expensive hardware Requires expertise Difficult to access some sites and may be difficult in built up areas.
Secondary data sources		
Existing digital data	Already digitised Can be updated easily Saves time and money - no need to collect primary data	May be out of date Often incomplete coverage Possible differences in identification/ definition of wastelands Accuracy/scale/boundaries vary - planning/ vegetation etc. Data may not be available free of charge - copyright laws etc.
Existing analogue data	Saves time and effort of collecting data	As for digital data plus Time consuming to use - data transfer required Often bulky and difficult to use

Method to identify wasteland sites

The data sources identified in Table 15 were used to produce a data feature theme of wasteland sites in ArcView. The 1:5000 cadastral map of Leipzig and the aerial photographs were used to help identify the sites' boundaries. Exact verification of the sites' boundaries was not always possible and would require time-consuming research of the sites' land parcel boundaries. Although this degree of accuracy is required for planning purposes it was not regarded to be necessary for the purposes of this study.

Table 15 Data used to identify wasteland sites in Leipzig[1]

Data source	Data form	Scale	Feature type	Date	Updated
Brachflächen (wasteland) cadastre	Digital/GIS	1: 5 000	Point and polygon	1999	Under construction
Industrial database of derelict or contaminated land	Digital	Database	Point	From 1994	Continuously
Cadastre of derelict land in industrial estates	Digital	1:10 000	Polygon	1998	n.a.
Database of empty housing plots	Analogue	n.a	n.a	1998	Continuously
Habitat mapping	Digital/GIS	1:25 000	Polygon	1994/ 1998	1998 latest
Aerial photographs	Analogue[2]	1:5000	n.a	1997	Every 5 years

Discussion of data sources used:

The quality and usefulness of the data sources available varied considerably. The differences and problems are discussed below briefly:

Habitat mapping (source Environmental Department (AfU)): the data proved to be of little use for various reasons:

- Age of data - from 1994 with a re-classification in 1998
- Confusion between extensive parkland and wastelands
- Survey identified vegetation and not land use or administrative boundaries

It can, however, be useful to provide information as to the likely location of wastelands and their vegetation cover.

Brachflächen/Wasteland cadastre (source AfU): although this theoretically provides an extremely useful source of information on wastelands its use here was limited as much of the data was only available in point or tabular form and thus site boundaries had to be digitised using other information. It was also incomplete (as the data is still being compiled) so could not provide an overview of all the wastelands in the study area.

Industrial wasteland (Industriebrachen) database (source AfU): this provides data only in point form so again boundaries have to be digitised using other information (for instance aerial photographs). It also includes sites that are not necessarily derelict but may be environmentally problematic.

Cadastre of derelict land (Gewerbebrachen) in industrial estates (source AfU): this is possibly the most accurate information source being relatively up to date and complete for all

[1] Data was obtained from the Environmental Department and the Department for urban regeneration and housing (Leipzig City Council), and the Umweltforschungszentrum (Centre for Environmental Research) Leipzig

[2] Aerial photographs used were colour infra-red stereoscopic photographs

the industrial estates in Leipzig at the time of production and the data is available in digital form.

Database of empty housing plots (Source Amt für Stadtsanierung und Wohnungsbauförderung - ASW): this provides a useful source of information but is only available in analogue form so all data has to be digitised into GIS. The tracing of the sites' location from a paper map before digitising meant that errors were possible during the data transfer. It was also very time consuming to compile all the data from the analogue data source.

Aerial photographs (Source Umweltforschungszentrum, Leipzig): there were some problems with identification of wasteland sites from the aerial photographs (see section 3.3.2). Also the fact that the photographs were already 3 years old at the time of the survey meant that land use changes had occurred to the land use of some sites since that time and they could no longer be classified as wasteland sites.

3.5.3 Field survey method

A field survey was undertaken to investigate the site characteristics of each wasteland site. Although aerial photographs were used as an aid in the field survey, the majority of the information was obtained through the field survey itself. A survey sheet was prepared using the criteria to evaluate the characteristics of the sites, which are explained in section 3.2.4.

1) Maps of all the wasteland sites were printed out for each district in the study area and the sites labelled with identification numbers according to the district in which they were situated. The 1:5 000 cadastral information (available from the University of Leipzig) was used as a basemap to assist with location of the sites in the field along with copies of aerial photographs.
2) All the wasteland sites were surveyed during the months of May and June 2001. The criteria surveyed include: surface sealing, diversity of successional stages, structural diversity, water features, accessibility, penetrability and safety. Sites were excluded from the survey if they were dominated by buildings (i.e. over 50% of the area built over) as such sites are regarded as being totally unsuitable as urban wildlife areas without a high investment of time and money. A detailed explanation of the survey method, along with the survey sheet is given in appendix 2.
3) General information about each wasteland site was also noted but this was not used in the evaluation process. The information included address/location, current use of site, presence of buildings on site, previous use and neighbouring uses.

3.5.4 Use of wasteland evaluation tools for data input and processing

The wasteland evaluation tools were used to input the site data and to undertake the evaluation method as described in section 3.4. The raw data used was obtained from various sources either in analogue or digital form (see appendix 3).

The evaluation process is described in detail in the demonstration projects available on the accompanying CD-ROM.

Final evaluation

The final evaluation was carried out as described in section 3.2.9. In order to be sure of the suitability of sites as urban wildlife areas a sensitivity analysis was carried out, which entailed the following steps:

- The final evaluation was undertaken a total of eight times using a random selection of different ranking sequences for the groups of criteria (see Table 16).
- Sites scoring 3 or more in all the ranking sequences were identified as suitable sites for urban wildlife areas. Of these sites, those scoring only 4 or 5 in all the ranking sequences were separated as the most suitable sites as urban wildlife areas and data feature themes were produced of both of these groups of sites.

Table 16 Random ranking sequences used in the final evaluation process.

	Ranking sequences of final evaluation processes							
Groups of criteria	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
Usability	1	2	3	4	3	4	2	1
Naturerlebnispotential	2	3	4	1	1	3	4	2
Potential users	3	4	1	2	2	1	3	4
Greenspace strategy	4	1	2	3	4	2	1	3

Ranking: this random ranking is carried out in such a way that each group of criteria are allocated each of the scores twice and thus are equally weighted in the combination of all the ranking sequences. Eight different ranking sequences are considered to be sufficient for the sensitivity analysis, although of course there are more combinations of ranks that are possible, but there is a limit as to how many can be undertaken since the sensitivity analysis has to be carried out manually. The use of too many ranking sequences would lead to confusion and make it difficult to identify the most suitable sites.

3.6 Trial of evaluation method in Birmingham

The evaluation method was also tested in a study area in Birmingham, to verify that the method functioned with digital data from a different source. Only the spatial analysis was undertaken, (i.e. the evaluation of the locational characteristics of wasteland sites) and not the evaluation of the characteristics of the site (i.e. from the field survey data). This was partly due to financial and time constraints but also it was not seen to be necessary, since the evaluation of the site characteristics had already been undertaken on over 100 sites in Leipzig. The verification of the spatial analysis, on the other hand, is very important, since problems may arise with the use of different file names or data types that had not been encountered in the study area in Leipzig.

The spatial data was obtained in digital format from the planning department of Birmingham City Council (see appendix 3). A study area of $1km^2$ was selected in Birmingham in which to check the spatial evaluation method, (as shown in the introduction of the accompanying CD-ROM). The data themes required for the evaluation were created from the available data, either using the data in its original form or by digitising themes from the data (e.g. schools), (see appendix 3).

3.7 Management of wastelands

This section of the thesis aims to investigate and elaborate strategies with respect to the management of wastelands and their use as urban wildlife areas through research and comparisons of the different situations in Birmingham and Leipzig.

3.7.1 Research into strategies relevant to the use of wasteland sites as greenspaces

European, national and local strategies relevant to the development or protection of wasteland sites as urban greenspaces were investigated as part of the research. The research concentrated on the strategies of the cities of Leipzig and Birmingham and either regional, state, national or European policy that affected local policies or work carried out in the cities themselves. With respect to Germany the research thus concentrated on the Land of Saxony, as the de-centralised political structure of Germany means that many of the laws and policies are created by the government of the Land/ state. On the other hand in England more of the research was carried out on a national level as, having a centralised political structure, the majority of planning and regeneration policies are made by central government and centralised bodies in England. The research specifically refers to England and not the United Kingdom, as Scotland and Wales have powers to make their own policies in certain matters (this being true of many planning regulations) (see CULLINGWORTH & NADIN 1997, HMSO 1992).

The strategies investigated were those having either a direct or indirect effect on the creation of greenspaces on wasteland sites or the protection of wasteland sites as urban greenspaces and also of the general strategies related to wasteland regeneration. It was not possible to limit the research to strategies relating only to the creation or protection of urban wildlife areas on wasteland sites as most strategies are not so specific in the end use of the site. However there is usually a clear delineation between policies aimed at the hard end (i.e. economic) uses of sites and soft-end uses (such as recreation or open space), thus where possible research was limited to the policies relating to soft-end uses of wastelands.

The research methods involved literature research, interviews with representatives of various organisations (e.g. local councils, regeneration organisations etc.), review of existing information on wasteland development in the cities of Birmingham and Leipzig and participation in organisations and working groups involved with the problems relating to wastelands (Brachflächen) in Leipzig.

The research was broken down into six sections:

1) *General policies on the regeneration of urban wastelands:* European, German and English laws and policies were investigated; policies refer here to governmental policy or legislation, planning policies and planning documents (e.g. land use plans).
2) *Policies on the creation or protection of open space, particularly as urban wildlife areas:* European, German and English policies relevant to this topic were investigated. As in the research on general policies, government policy or legislation, planning policies and planning documents were investigated. Research concentrated on those policies affecting the creation of urban wildlife areas on wastelands, or the protection of wastelands as urban wildlife areas (i.e. as urban commons).
3) *General regeneration strategies:* An investigation was made into strategies that have been developed in Germany and England with respect to the regeneration of wasteland sites as urban greenspaces. The national and regional strategies were

investigated that directly affect the regeneration of wastelands in Leipzig and Birmingham. In addition the strategies developed by the cities themselves were investigated to demonstrate how the use of wasteland sites as greenspaces fits into the general regeneration strategies.

4) *Organisations dealing with the regeneration of wastelands as urban greenspace:* Research was carried out into organisations in Leipzig and Birmingham which are active in the development or use of wasteland sites as greenspaces. These include local authorities, governmental/statutory bodies and non-governmental organisations. Research was made specifically into factors such as the aim and set-up of the organisation, how it is funded, which strategies are used to implement projects and the type of projects carried out.
5) *Instruments used to develop manage wastelands sites as greenspaces:* Research was carried out into European, German and English instruments that are used to convert wasteland sites to greenspaces, or manage the sites as greenspaces. These instruments provide the tools for implementation of the policies of the respective country or region. The instruments researched included grants, funding programmes, planning instruments, agreements and informal instruments (such as Local Agenda 21).

3.7.2 The creation of urban wildlife areas on wasteland sites

Research was carried out into the practical implementation of strategies and instruments used to convert or manage specific wasteland sites as urban wildlife areas in England and Germany. This section provides an insight into the practical application of the strategies researched in theory as described in section 3.7.1. All the sites investigated were wasteland sites that have been converted to, or protected as greenspaces and serve as urban wildlife areas for the local population. The sites vary in the degree and type of work and maintenance carried out on the site but they all fall under the definition of the term ‘urban wildlife area’ used in this thesis (see section 1.4).

The research was carried out on two levels:

- General investigation into the approaches used on a variety of sites in Germany and England. The aim here was to provide an overview of the different approaches used in different regions, as well as in the cities of Leipzig and Birmingham. The research involved site visits and informal interviews with site wardens as well as a literature review of projects carried out on wasteland sites.
- Detailed investigation into selected sites in Leipzig and Birmingham, which have been converted from wasteland sites to urban wildlife areas. Four case study sites were selected in total - two from each of the cities. In each city a site was selected that was previously wasteland but has been coverted to an urban wildlife area and another site that is currently wasteland but plans are underway to convert it to, or use it as an urban wildlife area. The research was carried out mainly in the form of interviews with various employees from the city councils and organisations involved in the management or planning of the sites as well as site visits.

The sites selected are:

1) Burbury Brickworks - a former wasteland site in Birmingham, now converted to an urban wildlife area.
2) Birmingham Battery - a wasteland site, currently used as an urban common but being considered for development and use as open space.

3) Brandt's Aue - a former wasteland site in Leipzig which has now been converted to an urban wildlife area.
4) Heiterblick - a large area of wasteland that is being planned to become part of a chain of greenspaces in Leipzig.

The selection of these case study sites was based on the interesting characteristics of the sites, the diversity of planning instruments involved in the conversion of the sites and the availability of data on the sites. The size range of the sites is fairly large - ranging from 4 hectares to 32 hectares and although it would have been interesting to include more examples of smaller sites, there was a scarcity of information available for the use of such sites as urban wildlife areas in Leipzig and Birmingham.

4 Results

4.1 Results of evaluation

4.1.1 Types of wasteland sites found in Leipzig and Birmingham

Leipzig

There has not yet been a comprehensive survey of wasteland sites in the city of Leipzig but data on different types of wasteland sites was compiled from various sources.

Table 17 Amount and type of wasteland in Leipzig [1]

Type of wasteland	Data source	Number of sites	Total area
Industrial/commercial	Survey of industrial/trading estates	450	260ha
Industrial	Database of industrial wastelands	367	-
Empty housing plots	Survey of “Baulücken”	600	-

According to these figures there are over 1400 wasteland sites in the city, but some of these may have been counted twice as industrial wastelands may occur in industrial estates. More recent figures estimate that wastelands encompass a total area of roughly 1500ha (ZABOJNIK 2000).

Before 1989 wasteland was limited mainly to bomb sites from the Second World War and although many buildings were in a derelict state housing was at a premium and all industries were functioning. The wave of new dereliction came after the reunification of Germany when most of the industries in Leipzig and other East German cities were forced to close and large areas of land and buildings became derelict (see section 3.1.2).

The main types of wasteland currently found in Leipzig are:

- industrial wastelands found mainly in the inner-city,
- empty housing plots (gap sites) - these are the result either of bomb damage and the resulting demolition of houses, or the demolition of derelict housing,
- new wastelands on “building plots” - these are mainly found on the outskirts of the city in the newly planned and laid out industrial or trading estates. Over-ambitious planning has meant that many plots in such estates remain unused.

There are of course other types of wasteland such as derelict railways or agricultural wasteland but such sites tend to be in the minority.

[1] Sources: Stadtplanungsamt, Umweltamt and Amt für Stadterneuerung und Wohnungsbauförderung, Leipzig City Council- unpublished figures.

The main problems identified in dealing with these wastelands are the lack of financial resources to purchase the sites and ownership problems. Many sites are in receivership with the Treuhandgesellschaft (trust company) holding the sites until an investor is found, making any arrangement a long and difficult process. Other sites may have multiple owners or a group of inheritors, which makes any agreement on the future use of the site very difficult. The Deutsche Bahn (German Rail) presents another problem to the regeneration of wastelands since any arrangements involve negotiation of the complex administrative structure of the organisation (ZABOJNIK 2000).

Birmingham

In Birmingham the majority of wasteland sites that are suitable for development have already disappeared due to the pressure for land for development in the densely built-up region of Birmingham and the surrounding Black Country. The green belt policy also makes it difficult for the city to develop greenfield sites and thus any suitable inner-city sites are snapped up quickly. However there are still a number of wasteland sites present in the city. Information from Birmingham City Council revealed that out of 102 wasteland sites, 62 are less than 1ha in size and all except one site were smaller than 10ha (BCC 1999).

The small sites are extremely problematic and often cause social and environmental problems. They are rarely dealt with since the Council tends to put forward the larger sites for development or improvement. The small sites are either held on to by owners in the hope of selling or developing, or are frequently sold on (sometimes as often as three or four times a year) and thus nobody is willing to take on responsibility for the site. Some sites are simply anomalies that may have been neglected or forgotten - for instance sites owned by the wrong council department, which do not get moved on to the relevant department (GRAYSON 2001).

Ownership difficulties are often cited as the cause of continued dereliction of sites in Birmingham. If the site is in private ownership it is difficult to persuade the landowner to do something with the site. In other cases multiple or unknown ownership makes it difficult to deal with wasteland sites. Another recent problem regarding ownership is that of Railtrack (the company owning and operating all railway infrastructure). Managerial problems within the company have meant that there has been a high rate of staff turnover and it is thus very difficult to enter into agreements regarding wasteland sites (GRAYSON 2001).

4.1.2 Results of field work in Leipzig

The study area selected in Leipzig included six districts covering a total area of 1795 hectares (18km^2) (roughly 6.5% of the total area of the city). Within this study area 136 wasteland sites were identified in 1999. 16 sites were lost to development or change of use from the period of site identification to site survey (see Table18).

Table 18 Changes in land use to wasteland sites from 1999-2001

Land use in 2001	Number of sites	Total area (ha)	% of all sites	% of total area
Developed	11	13.7	8	5.2
Greenspace	3	7.2	2.2	2.6
Road	2	1.3	1.5	0.50
Wasteland (new)	3	8.1	2.2	3.1
No change	117	235.37	86	88.6
Total	136	265.3	100	100

105 wasteland sites were actually surveyed since sites dominated by buildings were excluded from the survey as such sites are not regarded as being suitable as urban wildlife areas (see section 3.5.3). The sites are categorised using the system explained in section 2.1.1(see Figure 9 and Table 19). The categorisation is shown spatially in Figure 1 in "results of the study" on the accompanying CD-ROM.

Figure 9 Graph to show distribution of surveyed sites according to wasteland categories

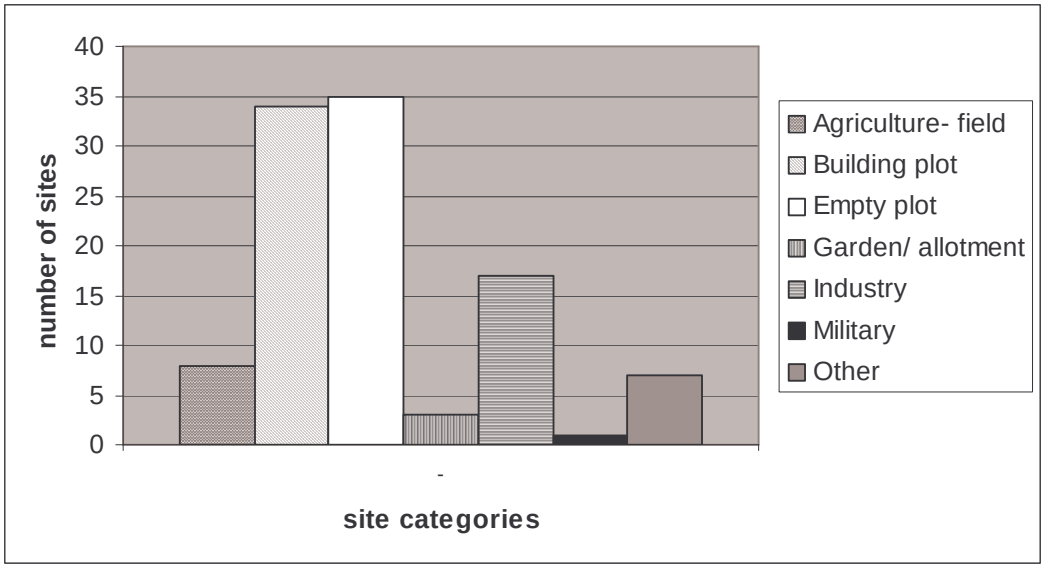


Table 19 Numbers and sizes of wasteland sites according to category [1]

Wasteland category	Number of sites	Total area of sites (ha)	Average size of site (ha)
Agriculture - field	8	58.8	8.4
Building plot	34	58.9	1.7
Empty plot	35	4.8	0.1
Garden/allotment	3	0.8	(0.3)
Industry	17	38.1	2.2
Military	1	55.3	(27.7)
Other	7	14.6	2.0

4.1.3 Results of evaluation of wasteland sites in Leipzig

The 105 sites identified in the study area in Leipzig (as described in 4.2.2) were surveyed and evaluated as described in section 3.2. The full results of the survey are available in appendix 4 and a summary of the results for both the site and locational characteristics of the surveyed wasteland sites are given in appendix 5. The maps showing the final results are found on the accompanying CD-ROM since these are too detailed to be presented effectively in the text. Where this is the case the exact location of the file is given in the text. Tables 20- 23 show the distribution of the scores in each group of criteria according to the categories of wasteland.

Observations on the four main criteria from results of the evaluation

It is not possible to carry out a statistical analysis of the results of the evaluation due to the low numbers of sites in some of the site categories. However some general observations can be made about the distribution of the scores according to the type of wasteland site (as described in section 2.1.1)

[1] Figures in brackets refer to those categories containing a low number of sites, thus the average size is not meaningful

Naturerlebnispotential

An interesting observation is that very few sites have a high score for Naturerlebnispotential and these high scores are distributed evenly throughout the different categories.

Table 20 Scores for Naturerlebnispotential

	score					
Categories	1	2	3	4	5	*sum*
empty plot	4	22	8	1	0	*35*
building plot	0	11	22	1	0	*34*
industry	1	5	10	1	0	*17*
agriculture	0	1	6	0	1	*8*
military	0	0	0	0	1	*1*
other	0	3	2	1	1	*7*
allotment/garden	0	1	2	0	0	*3*
sum	*5*	*43*	*50*	*4*	*3*	*105*

The sites scoring 5 (the highest score) are all large sites located on the outskirts of the city and are influenced by natural features (notably water features), which are rarely found in the anthropogenic inner city. Other sites with relatively high Naturerlebnispotential are the more mature sites in the inner city that have been abandoned for a long time or are inaccessible and thus nature has taken hold. The less valuable sites in terms of Naturerlebnispotential tend to be sites with a high degree of surface sealing (on which little can grow) or recently cleared or disturbed sites (the latter being a common phenomena on empty plots) on which little vegetation has colonised and few structures break up the monotony of the site. This observation is reflected in Table 20 which shows that empty plots tend to have a low Naturerlebnispotential. The results are shown in Figure 2 as a map layout (see “results of the study” on accompanying CD-ROM).

Usability of sites

Many sites with high usability are located in new industrial or trading estates (on building plots) since these sites are seldom fenced off and vegetation is usually penetrable. However some of these have a low safety score which decreases their usability (see Table 21).

Table 21 Scores for usability

	score					
Categories	1	2	3	4	5	*sum*
empty plot	3	16	5	2	9	*35*
building plot	0	11	2	4	17	*34*
industry	3	12	0	1	1	*17*
agriculture	0	2	5	1	0	*8*
military	0	1	0	0	0	*1*
other	1	3	0	2	1	*7*
allotments/garden	0	1	2	0	0	*3*
sum	*7*	*46*	*14*	*10*	*28*	*105*

Interestingly, the distribution of empty plots in the usability score is fairly equally divided between the high and low scores (see Table 21). This can be explained by the fact that many of these sites are fenced off to prevent anti-social use of the sites and some may also have a low safety score, whereas others are freely accessible and thus obtain a higher score. Industrial sites tend to obtain a low score for usability since these sites are frequently inaccessible and there are often safety issues to be considered. The results are shown in Figure 3 as a map layout (see “results of the study” on accompanying CD-ROM).

Potential users

The sites with a high value with respect to the potential users are clearly concentrated in areas of high population density, where schools are also located. Large sites do not necessarily obtain a high score since their surrounding area may not encompass many areas of high population density, especially since large sites are often situated on the outskirts of the city where the population density tends to be lower than in inner-city areas (as can be seen in Figure 4 in the "results of the study" on the accompanying CD-ROM).

Table 22 Scores for potential use

	score			
Categories	1	2	3	*sum*
empty plot	0	15	20	*35*
building plot	34	0	0	*34*
industry	14	2	1	*17*
agriculture	5	3	0	*8*
military	1	0	0	*1*
other	3	2	2	*7*
allotments/garden	2	1	0	*3*
sum	*59*	*23*	*23*	*105*

The value for potential users is related to the location of sites, and also to the type of site since some site categories have a particular distribution in the study area. For instance all the sites in the building plot category obtain a low score for potential users since these sites are frequently found in industrial and trading estates where the population density is extremely low and few schools are located nearby. Most of the sites in the industry category also obtain a low score for the same reason.

In contrast sites in the empty plot category have either medium or high scores for potential users which reflects their location in more built up areas with a higher population density. Agricultural wastelands also tend to have low or medium values for potential users, since these are also located on the outskirts of the city, frequently in areas of relatively low population density, see Table 22.

Greenspace strategy

There is little correlation between site categories and distribution of scores as the location of the different types of wasteland site does not tend to be related to the criteria used to calculate the value of the site in the greenspace network, see Table 23.

Table 23 Scores for greenspace strategy

	score			
Categories	1	2	3	*sum*
empty plot	23	11	1	*35*
building plot	3	27	4	*34*
industry	5	8	4	*17*
agriculture	0	2	6	*8*
military	0	0	1	*1*
other	0	6	1	*7*
allotments/garden	1	2	0	*3*
sum	*26*	*60*	*19*	*105*

Those sites with a high score are those situated both in a deficiency area and close to features in the greenspace network. Interestingly for Leipzig, there are many high scoring sites located in Paunsdorf and Heiterblick where a "Green Crescent" of greenspaces is planned. The results are shown in Figure 5 as a map layout (see "results of the study" on accompanying CD-ROM).

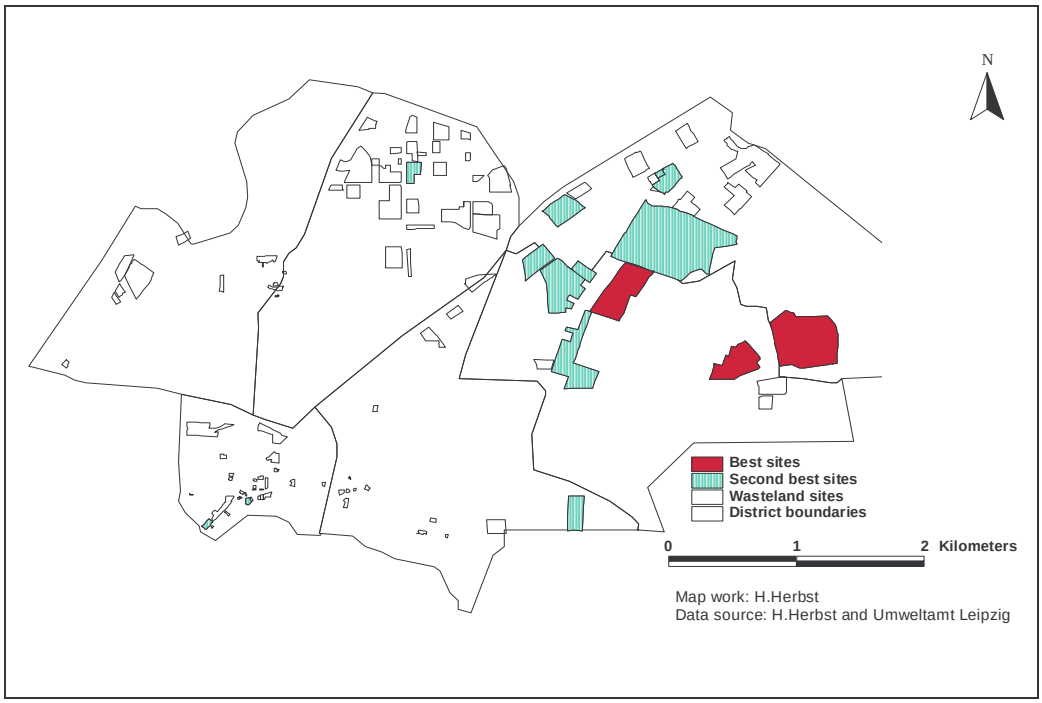
Final results

The final compilation of results was carried out as described in section 3.4.4. The hierarchical optimisation method was carried out using a random ranking of the four final scores which resulted in the identification of the sites regarded as being most suitable as urban wildlife areas - see Table 24 and Figure 10. A more detailed map of the results is found on the CD-ROM, Figure 6 (see “results of the study” on accompanying CD-ROM).

Table 24 Characterisation of sites most suitable as urban wildlife areas

ID	Area (ha)	Naturerlebnis-potential	Usability	Potential use	Greenspace network	Site placed	Site category
p13	10.72	3	3	2	3	1	agriculture
h2	19.96	5	4	2	3	1	agriculture
p3	7.24	5	4	2	3	1	other
h8	1.56	3	3	1	3	2	agriculture
s11	3.39	3	3	1	3	2	agriculture
p7	3.65	3	3	1	3	2	agriculture
p6	9.67	3	3	1	3	2	agriculture
p8	9.88	3	2	2	3	2	agriculture
h18	2.95	3	5	1	3	2	building plot
h16	4.50	3	5	1	3	2	building plot
so24	1.55	3	5	1	2	2	building plot
sa25	0.04	2	5	3	2	2	empty plot
sa4	0.31	3	3	3	2	2	empty plot
v2	0.34	3	2	2	3	2	empty plot
h13	0.32	3	5	1	3	2	industry
h19	36.69	5	2	1	3	2	military
v13	0.19	2	4	3	2	2	other

Figure 10 Location of sites evaluated as being most suitable as urban wildlife areas



4.1.4 Results of the use of the evaluation method in Birmingham

The evaluation method was tested in a study area of Birmingham with the aim of verifying that the method can be undertaken using different data from that available in Leipzig, with which the method was developed and executed. Figure 7 on the accompanying CD-ROM shows the data used in the evaluation method (see Figure 7 “results of the study” on CD-ROM). It was not possible to undertake a full evaluation of the sites since no data on site characteristics was available (no field survey having been undertaken). Although the value of the sites according to their location was determined using the data available, it would still be necessary to undertake a site survey to determine which of these sites are suitable as urban wildlife areas. (The results are shown in Figures 8 and 9 in “results of study” on the accompanying CD-ROM).

The use of the data acquired from Birmingham also revealed some weak points in the wasteland tools, which were dealt with where possible:

- Different designations of deficiency areas - in Birmingham “wildlife action areas” denote areas deficient in wildlife areas. Since these have already been identified, there is no need to undertake the step of defining deficiency areas. Thus the wasteland tools were amended to enable the use of data on existing deficiency areas as well as the calculation of deficiency areas using data such as wildlife areas etc..
- The problem of dealing with large datasets. Due to the large amount of data present in the Birmingham datasets, the processing of the evaluation took a long time. This is a known problem with large datasets and can be reduced by selecting the appropriate

features of the datasets present in the study area to reduce the amount of data to be processed.

- The wasteland tools are not able to deal with long names of feature themes, since these do not fit into the boxes prepared in the dialogues. The help file was amended to let the user know that the data theme could only have a name using up to 20 characters. The names of feature themes are easily altered in the Theme menu in ArcView.
- Multiple entries for sites if the site is composed of several different land parcels, each land parcel consisting of one entry in the feature theme's table. This means that the result for one site will involve multiple entries in the database table, each of which will obtain an identical result. This in itself is not problematic but is something the user must be aware of when interpreting the results.

4.2 Strategies

4.2.1 General policies on the regeneration of urban wastelands

European policies

The European Commission supports the recycling of wastelands since

- "*redundant, derelict or contaminated land…is at a greater scale than during any period in industrial urban history*" and such land is unfavourable for building due to the high costs of clean up and re-use of such sites (EC 1996).
- Another reason is that "*land recycling has the potential to achieve the retention of greenfield sites and protection of countryside, open space and wildlife.*" (EC 1990, EC 1996).

The Commission also recognises the importance of an integrated area-based approach and the importance of partnerships and participation in the process of regeneration (including residents' groups, NGOs etc.) as well as the need for public sector intervention (EC 1996).

German laws and policies

In Germany the federal laws govern the policies relating to the use of land and thus regeneration of wasteland. Planning policies based on these laws are produced by the Länder (States) as well as by regional and local authorities in the form of land use or development plans. The main laws and policies relating to the regeneration of wasteland in Leipzig are summarised in Table 25.

Table 25 Summary of German laws and policies relating to the regeneration of wasteland in Leipzig

Laws or policies	Statement related to regeneration of wasteland	Source
Raumordnungs-gesetzt (env. planning law)	The use of wastelands should be given priority over the use of open space Where sites are no longer used, surface sealing should be removed	§2(2) RordG §2(14) RordG 1998
Bodenschutz-gesetz (soil protection law)	On sites that are no longer used, sealed surface should be removed and the soil returned to its productive state	§5 BbodSchG 1998
Baugesetzbuch (Building code)	Sealed areas should be kept to a minimum	§1a BauGB 1998
Policy of the Land of Saxony	Minimise demand on land and development of greenfield sites Emphasis on hard end uses of wastelands but considers ecological and spatial effects of their development	SMUL 1994
FNP - land use plan, Leipzig	Re-use of wasteland in industrial/ trading estates for hard end use	Stadt Leipzig 1994
LSP -landscape plan, Leipzig	Development of wastelands should have priority over development of greenfield sites; Need to increase number of greenspaces and improve environment in city	Stadt Leipzig 1999a
STEP - urban renewal plan, Leipzig	Need to convert empty housing plots (Baulücken) to greenspaces	Stadt Leipzig 2000a

English laws and policies

The main legislation of land use planning in England is based on the Town and Country Planning Act of 1990 and the Planning and Compensation Act of 1991 (HMSO 1992). In addition to this legal basis, guidance is also given in the form of circulars, research reports etc. providing an informal approach to planning regulation.

Derelict and vacant land has been a policy concern since the 1970s (WHITBREAD, MAYNE & WICKENS 1991) and since then policies have fluctuated between the importance of hard end or soft end uses of derelict land, although there is now a more flexible approach incorporating both types of end uses (see HANDLEY 1996, CULLINGWORTH & NADIN 1997). Urban policy was refocused in the 1990s from property led regeneration to a partnership approach with a focus on the involvement of the community (ADAIR et al. 2000, DETR 2000b), which has thus affected the way wasteland regeneration is handled.

An important policy (noted in Table 26) is the push to develop brownfield sites in preference to greenfield sites, which is also supported by the green belt policy. The latter endeavours to limit the extent to which larger towns and cities can expand into the surrounding countryside and should thus encourage new investment away from the “easy option” of greenfield sites to locations in the built up area (BCC 1993).

Table 26 Summary of English laws and policies relating to the regeneration of wasteland

Laws or policies	Statement related to regeneration of wasteland	Source
Urban white paper *Section 4.33*	Need to regenerate brownfield sites for economic or social uses to stop them becoming "*not only a wasted resource but a problem for the whole community*"	DETR 2000b
Derelict land policy	-Make the best use of finite supply of land - Bring previously developed land back into constructive use	DoE 1991b
Housing policy & sustainable dev.	60% of housing should be accommodated on brownfield land by 2008	DETR 2000a
Green belt policy	Protection of green belt and re-use of available inner city sites	DTLR 2001a
West Midlands planning guidance	- Greenfield sites should only be released when there is no alternative - Development should occur in built up area	DoE 1998
UDP – Unitary Development Plan Birmingham	- Recycling of derelict land for development or "positive use", without compromising on the quality of the urban environment - Some development on greenfield sites is unavoidable	BCC 1993:3.18 BCC1993:2.15

4.2.2 Policies on the creation or protection of open space, particularly as urban wildlife areas

<u>European policies relating to the use of wasteland as open space</u>

The European Union (EU) makes the following points with respect to urban greenspaces:

- The loss of green space both within and around urban areas threatens both biodiversity and the quality of life of citizens (EC 1997)
- Wastelands may be valuable due to their variety and abundance of wildlife, although some people may feel unsafe or uncomfortable on such sites (EC 1990)
- Urban wildlife areas provide a "*resource for educational activities and nature familiarisation.*" (EC 1990:2.4)

The resulting European policies are as follows:

- Ecological values should be strengthened in urban regeneration processes, ecological links in the urban ecosystem should be restored
- Natural open space should be integrated in the urban fabric. Ways need to be found to overcome people's objections to this sort of green space (EC 1996).

German laws and policies relating to the use of wasteland as open space

As with laws relating to the regeneration of wastelands, the interpretation of the German nature conservation law varies nationally, each Land having its own law in addition to the Federal law.

Table 27 Summary of German laws and policies relating to the use of wasteland as open space

Laws or policies	Statement related to the use of wastelands as open space	Source
New draft of BnatSchG §2 (12)	"*Of particular importance is the provision of sufficient sites for quiet recreation in or near to urban areas*."	BnatSchG 2001
Raumordnungs-gesetz	Areas for relaxation (Erholung) should be secured	(§2: 14) ROG 1998
Development plan of Saxony	- Role of wastelands as urban greenspaces - Need for greenspaces close to homes for people to experience nature	SMUL 1994
FNP - land use plan, Leipzig	- Social and aesthetic importance of greenspace and role of nature conservation to ensure people have direct contact with nature; role of wastelands in this respect. - Recommends amount of greenspace/ inhabitant. - Requirement for sites for compensation measures.	STADT LEIPZIG 1994
LSP - landscape plan, Leipzig	- Ecological importance of wastelands - Importance of wastelands for enabling people to experience nature but problem of acceptance of such sites.	STADT LEIPZIG 1999a

The social and aesthetic importance of greenspace is identified at all planning levels and the city of Leipzig identifies the role that wastelands could play here, particularly in areas deficient in green spaces (STADT LEIPZIG 1999a). Wastelands are also seen as potential sites for the implementation of compensation measures for development to improve the ecological value of such sites (see section 4.2.5). The laws and policies relating to the use of wastelands as open space are summarised in Table 27.

English laws and policies relating to the use of wasteland as open space

The importance of open space for providing people with contact with nature is emphasised at different levels of planning, both by planning and nature conservation bodies (English Nature being the statutory nature conservation authority in England). The value of wastelands with respect to wildlife is identified by the city of Birmingham and "urban commons" are included amongst the constant natural assets in the city (the stock of natural capital in terms of habitats, which should be kept constant). A summary of the policies and strategies related to nature conservation is provided in Table 28.

Table 28 Summary of English laws and policies relating to the use of wasteland as open space

Laws or policies	Statement related to the use of wastelands as open space	Sources
Government urban policies	- Need to provide sufficient greenspace for people - Importance of urban wildlife areas - Community involvement in local greenspaces - Regular contact with the natural environment	DETR 2000b & DETR 2001b
Nature conservation policy §3 PPG9 §15 PPG9	- Open space increases attractiveness of urban areas and benefits environment, human health and wildlife and relieves pressure on countryside. - "*skilled adaptation of derelict areas" can provide wildlife habitats*."	DoE 1994a
English Nature's policy	Importance of wildlife and role of "*accessible natural greenspace"* in quiet enjoyment of, and contact with nature	EN 2000
Planning and compensation act	Local authorities are required to identify areas of open space, and protect and create valuable open spaces	DoE 1991a
UDP policies Birmingham §26, §27, §3.38, §3.48, §5.20	- Environmental education and community involvement in nature conservation - Regeneration of wastelands with the objective of maximising wildlife value wherever possible - Development should not have adverse effect on the framework of open space - Public space should be provided for large developments	BCC 1993
Nature conservation strategy - B'ham	- Identification of "urban commons" as habitat type and their importance for local people's enjoyment of nature - Linkage of open spaces to provide a green network	BCC 1997

4.2.3 General regeneration strategies

European Strategies

European policies regarding urban regeneration are laid down in the action framework for sustainable urban development (EC 1997). Financial assistance is then provided to urban areas in difficulty on the basis of these policies, through the European Regional Development Funds (one of the EU's structural funds) (DETR 2000c). The use of these funds emphasises the importance of partnerships and the linkage to the wider strategic plan of the area (DETR 2000c).

Strategies developed in Germany - *in particular the city of Leipzig*

Although there are some national projects for urban regeneration, the majority of the decision making is left up to the individual Länder in this area. In some Länder (such as Nordrhein-Westphalen - NRW) very well developed strategies and institutions exist for the purpose of regeneration. This is due to the extreme nature of the problem in this heavily industrialised

area and the consequences of the structural change of the 1980s and the closure of many of the traditional heavy industries (GÜNTER 1994). The Landesentwicklungs-gesellschaft (LEG) was set up by NRW to develop strategies for dealing with wasteland (TEST 1995). One of the mechanisms developed are the Gründstücksfonds, which are used to purchase sites for local authorities, which the LEG then holds in trust until the sites are either developed or put to some future use. Local authorities are able to request that the GSF purchase particular sites and can also specify the future use of the site. If no investor is found for the site the local authority is able to purchase it at the green land price (TEST 1995). This mechanism is used not only by the LEG but also by the Kommunalverband Ruhrgebiet (KVR) (the local authority organisation of the Ruhr area) to purchase sites for future use as greenspaces (TEST 1995).

Another important and well known strategy undertaken by NRW was the Internationale Bauausstellung Emscher Park (IBA – Emscher Park). This structural programme ran from 1989 to 1999 and moderated and initiated a variety of projects to regenerate wastelands as open spaces as well as for economic uses (IBA 1997, IBA 1999). Its open space strategy involved the creation of the Emscher Park with 7 regional greenways linking up different types of greenspaces including former wasteland sites. The Gründstücksfonds mechanism was frequently used to purchase sites for the implementation of model projects within the IBA. (Some of the instruments used in NRW are described in more detail in section 4.2.6.)

In East Germany the newly created Länder after German reunification are still in the process of coming to grips with the problem of the regeneration of wastelands. Although a huge amount of land became derelict after the economic and structural changes in East Germany in 1989/90 there has been no thorough investigation or registration of derelict land in the city of Leipzig or in the state of Saxony up to now (SMUL 1994, SMUL 1997). However a register of wasteland sites is being compiled by the state department for environment and agriculture (SMUL 1999).

The strategy taken by the land of Saxony to develop its grant and support programmes for dealing with wasteland categorises wastelands (or Brachflächen) with respect to the ease or difficulty of the re-development of such sites. The third category is the most important here - active intervention sites. These are sites that are unlikely to be developed for various reasons and the strategy is to convert such sites into “reserve sites” for development (using the French principle). The idea is, however, not simply to clear and fence off the site, but to integrate the sites into the surrounding area and thus improve the local environment (SMUL 1997*).*

Leipzig: **I**t is only recently that the issue of the active management of wasteland has been taken up by the city council of Leipzig. Initially the environmental department dealt with the problem on a site by site basis by carrying out clearing and security measures where necessary. However by 1997 it became clear that active intervention (as proposed by the Land of Saxony) was necessary to find new uses for wasteland sites (be it for hard- or soft-end uses) since most of the new development was occurring on the outskirts of the city on former agricultural land.

An important strategy with respect to wasteland regeneration in Leipzig is the production of the STEP - Stadtentwicklungsplan (urban development plan). This provides an instrument for guiding planning decisions throughout the city and incorporates various urban regeneration programmes (both new and old). It is divided into several parts, one being urban renewal (Stadterneuerung), within which there are several sub-programmes dealing with wasteland regeneration (see STADT LEIPZIG 2000a), for example:

- *"Mehr Grün in der Gründerzeit"* (more green in the Gründerzeit areas) - the improvement of the local environment in Gründerzeit housing. This project involves the landscaping of Baulücken (empty housing plots) and wasteland sites and use of these sites as public or private greenspaces or playgrounds, or sometimes as car parks.
- *Ungenutzte Gebäude* (empty buildings) - this involves either the improvement and re-use of buildings or their demolition and thus the creation of empty plots, which then must be given a new use (possibly as greenspaces) - to prevent their degeneration into wasteland.

Strategies developed in England - *with specific reference to Birmingham*

As stated in section 4.2.1 policies and strategies relating to the regeneration of derelict land or wasteland in England have altered over the last 20 or 30 years. Initially they concentrated on the large scale, mainly rural dereliction of coal mining and other heavy industry. The problems of inner city dereliction led to a reappraisal of the strategy and an increased concentration on urban regeneration. Grants were provided (principally the derelict land grant) to equalise the costs of developing wasteland and greenfield sites (HANDLEY 1996). Initially emphasis was put on hard-end uses but this changed after criticism from the National Audit Office and other sectors and the policy was altered to increase the flexibility of grant schemes and include recreational or nature conservation uses of wasteland sites (DOE 1991b).

Currently policies reflect both the economic and environmental importance of regeneration and thus strategies have altered to take on board both of these aspects. There is now a blending of governmental and non-governmental agencies, with local authorities working together with national statutory and non-statutory bodies to bring about both economic and environmental regeneration. Government strategies also now emphasise the need to include the community in regeneration to help prevent sites falling derelict once regeneration efforts have been completed (DETR 2000b).

Birmingham - In Birmingham efforts to deal with the problem of derelict land commenced in earnest after the economic recession of the 1980s. These efforts were based on economic and social programmes to regenerate certain areas of the city, e.g. the Birmingham Heartlands and City Challenge initiatives. In addition the city secured over 6 million pounds in derelict land grants between the mid 1980s and mid 1990s facilitating the reclamation of over 60ha of derelict land (BCC & ENGLISH PARTNERSHIPS ND). Currently the emphasis is towards economic development as this is seen to be vital in order to keep the city on a firm economic footing (WARD 2001). However there is a need to improve the environment and make the city a more attractive place in which to live and work.

In the 1990s Birmingham City Council and the regional agency of English Partnerships (Advantage West Midlands) produced an investment strategy for the redevelopment of underused land and buildings in Birmingham. The sites are categorised into 3 classes according to their priority for regeneration and thus where resources should be concentrated. The investment strategy includes the regeneration of land as quality open space (BCC & ENGLISH PARTNERSHIPS N.D.).

The city of Birmingham also holds information on wasteland since statistics of derelict land are required every few years for the government's derelict land surveys, which means that records go back to 1982 (further surveys having been carried out in 1988 and 1993). The creation of the National Land Use Database (see section 4.2.5) has meant that a more detailed survey of derelict and vacant land is required adhering to the new standards, which makes

reporting change and results of surveys easier to compare (MORTON 2001). A record is also kept of contaminated sites by the Environmental Services Department on a separate system and site investigations are carried out if and when necessary[1] (GOODMAN 1998, MORTON 2001).

4.2.4 Organisations dealing with the regeneration of wastelands as urban greenspace

Organisations in Leipzig

The relationships between the main organisations involved in the regeneration of wastelands in Leipzig, as well as some of the policies and strategies are shown in Figure 11. A brief explanation of the diagram and details of the most important organisations are given below.

City council

Different departments deal with different types of wasteland sites, depending on their responsibilities.

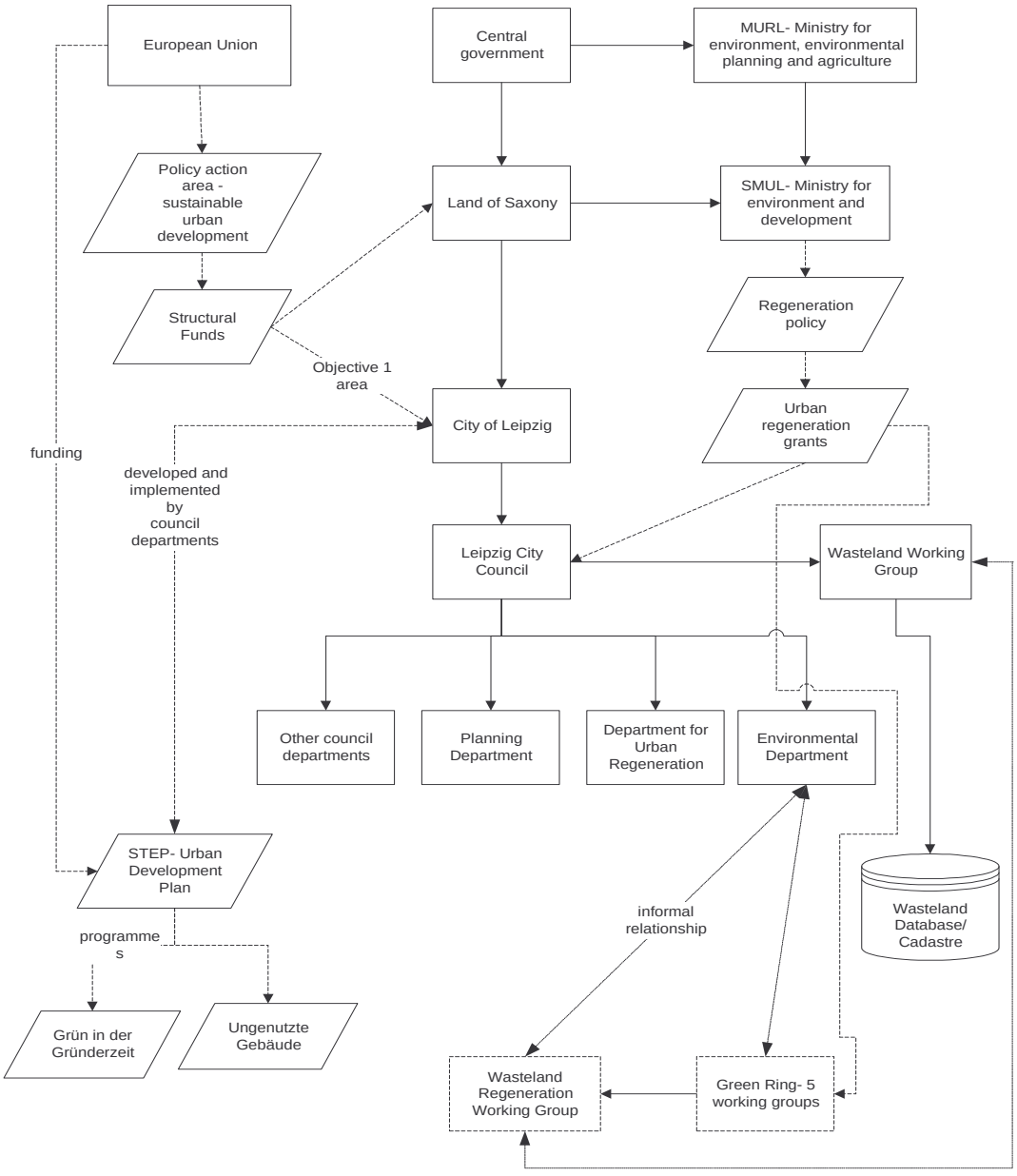
- *Stadtplanungsamt (Planning Department)* deals with the redevelopment of wasteland on industrial or trading estates (Industriebrachen) (see http://www.leipzig.de stadtentwicklung/step). Active intervention sites (those not developed by the private sector) should be purchased by the city and prepared for redevelopment (STADT LEIPZIG 1999b).
- *Amt für Stadterneuerung und Wohnungsbauförderung* - ASW- (Urban Regeneration) deals with Sanierungsgebiete (regeneration areas) in the city.
- *Umweltamt* (Environmental Department) keeps records of problematic industrial sites, for instance where rubbish has been dumped or where contamination is possible or sites which cause public complaint. Surveying and recording of contaminated sites is dealt with independently by the department.
- *AG Brachflächen* (Wasteland Working Group) - in addition to the work of the various individual departments a working group dealing with wasteland issues was set up in 1998 by the Environmental Department as the need was seen to develop a co-ordinated approach to the regeneration and management of wastelands. The group consists of representatives from 10 council departments but is also open to outsiders. The aims of the group are to:
  - Develop a co-ordinated and holistic management strategy for wastelands
  - Survey and document wastelands in the city
  - Develop a database and GIS of wasteland sites
  - Elaborate development concepts for individual sites - for example through obtaining grants for soft-end uses for the site or producing a strategy for dealing with problematic sites.

The advantages of the working group are that it minimises duplication of work and ensures that the same level of information on wastelands is shared by all departments. It also provides

[1] N.B. Authorities are required to record and make information available on the topic of contaminated land - according to the 1990 Environmental Act

a useful service for persons interested in using or developing sites as suitable sites can be identified quickly, which can then contribute to the redevelopment of brownfield rather than greenfield sites (ZABOJNIK 2001).

Figure 11 Organisations and strategies associated with wasteland regeneration in Leipzig



Green Ring

This is the other main organisation active in the conversion or use of wasteland as greenspaces in Leipzig. The organisation was set up in 1997 with the aim of ensuring an environmentally sustainable development of the regional cultural landscape. It is a non-statutory organisation made up of representatives from the city of Leipzig and the surrounding districts and authorities, NGOs and private persons, membership being entirely on a voluntary basis (SINNING 2000).

A regional management concept was also developed in 1998 (Regionale Handlungskonzept) to define the overall aim and development goals for the region as well as a catalogue of projects, including key projects, to be implemented in the future (SINNING 2000, ZABOJNIK 2000).

The organisation consists of 5 working groups including one for the regeneration of wastelands, the latter dealing with the practical regeneration of wasteland sites, mainly for soft-end uses. Funding for these projects mainly comes from the Land of Saxony's regeneration grants, a prerequisite of which is that the sites must be in local authority ownership (SMI 2001).

Organisations in Birmingham

In Birmingham there are several different organisations, both statutory and non-statutory that are active in the regeneration of wasteland sites to urban greenspace, as outlined in Figure 12. A brief description of the main actors in the regeneration of wasteland to greenspace is given below.

English Partnerships

English Partnerships is the government regeneration agency, which was set up in 1993[1] with a view to "*the promotion of the regeneration of areas of need through the reclamation, development or redevelopment of land and buildings.*" (DOE 1994B). This supposedly initiated a "*new approach to vacant land"* and the agency intends to draw together the derelict land and city grant regimes of the Department of the Environment, making a "*one-stop shop for grant aid*" (CULLINGWORTH & NADIN 1997:160). It has many powers including compulsory purchase, land assembly and preparation and can provide advice, take a stake in joint ventures, provide loans or guarantees and generally support development (CULLINGWORTH & NADIN 1997). In 1999 it was re-established by combining the roles of the Commission for the New Towns and the national functions of the Urban Regeneration Agency (DTLR 2001b).

It is now divided into 9 regional development agencies, which carry out its work on a regional level, working together with both statutory and non-statutory bodies. Resources are targeted at regeneration areas and between 1999 and 2000 Advantage West Midlands reclaimed 124ha of wasteland (ADVANTAGE WEST MIDLANDS 2001). The roles of the agencies are:

- To promote sustainable regeneration through improving and protecting the environment

[1] English Partnership was set up in 1993 under Part III of the Leasehold Reform, Housing and Urban Development Act 1993- source Handley 1996

- Improve the quality of life of people and their capacity to participate in regeneration activities
- Support the integration of different programmes. (DTLR 2001b).

City council

There are various departments within the city council that are involved in the regeneration of wastelands, with the Planning and Economic Development Departments probably being the main figures. Although all departments work closely together there is no formal arrangement with respect to wasteland regeneration and working groups are formed for various projects as and when necessary.

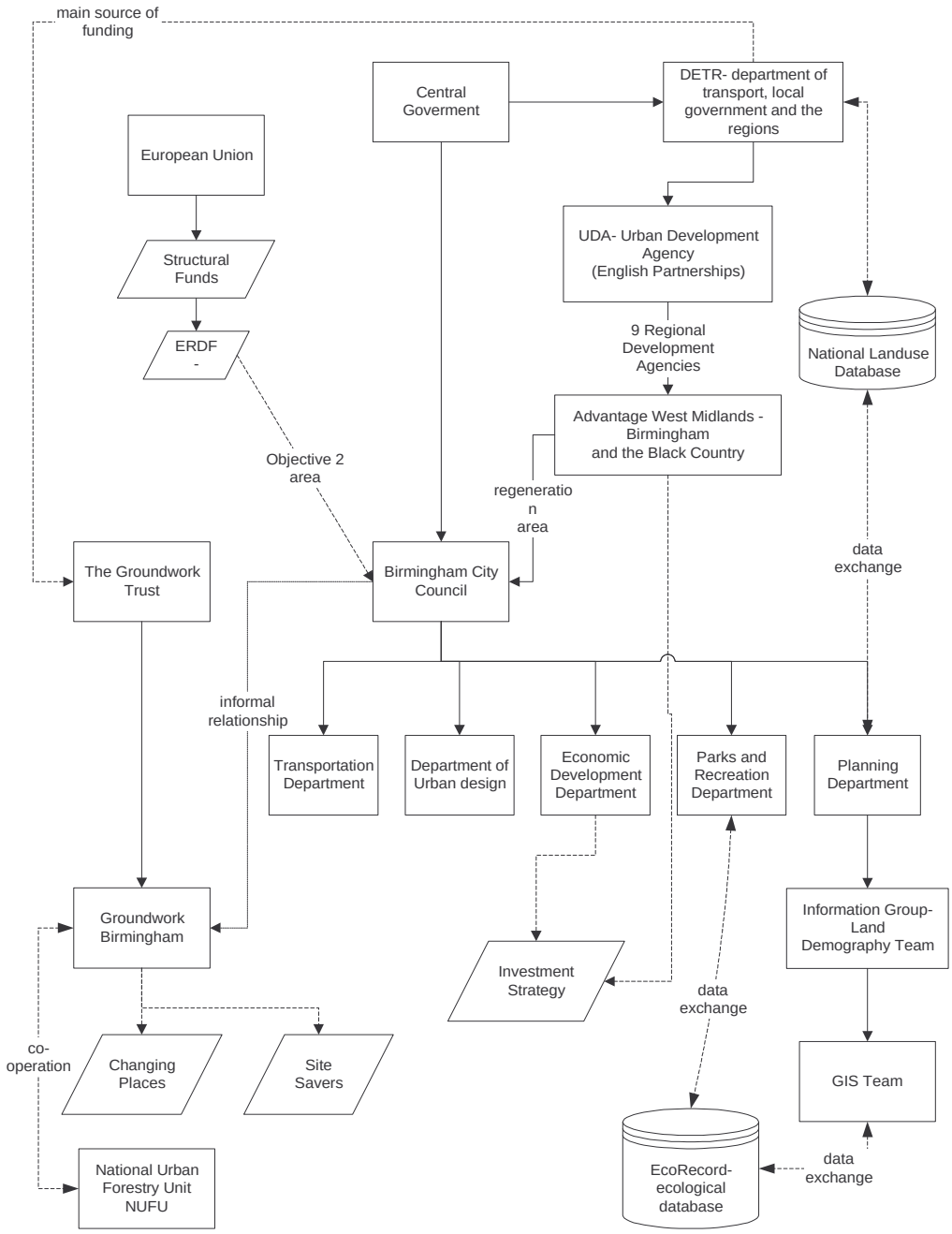
The Planning Department holds a database covering all land in the city which has a commitment or potential for development with data on the current land use of each site (land parcel) as well as various other information. Wastelands are included under different land use types such as derelict buildings, derelict land and vacant land. The database is continually updated via exchange of information from various departments involved in land use issues (MORTON 2001).

National Urban Forestry Unit (NUFU)

This was established in 1995 and is a specialist agency, funded by the government, which promotes and demonstrates best practice in urban forestry. It works in partnership with various other organisations (public, private and NGOs) (NUFU 1998a). It is involved in tree planting on wasteland as well as on public open space. Projects are carried out in a sustainable manner through community involvement and economic use of timber (where possible).

Although the NUFU is not particularly active in Birmingham it carries out a great deal of work in the neighbouring Black Country and is an important organisation in the field of wasteland regeneration. It occasionally works together with the city council or organisations such as Groundwork in Birmingham (NUFU 1998b).

Figure 12 Organisations and strategies associated with wasteland regeneration in Birmingham



The Federation of Groundwork Trusts (The Groundwork Trust)

The Federation of Groundwork Trusts is an independent body consisting of the co-ordinating body (the Groundwork Trust) and 42 regional trusts - including the Groundwork Trust for Birmingham and the Black Country. The regional trusts are governed by a board of directors drawn from the community they serve. The trust takes a holistic approach to regeneration,

working with many different organisations and individuals and uses a bottom-up approach to bring about sustainable improvements in communities. It concentrates on 3 key areas:

- Physical environmental improvements
- Educating and involving the community
- Integrating the economy and environment (GROUNDWORK 2000, ICMA N.D).

The Groundwork Trust is undertaking several projects that relate directly to the use of wasteland sites as urban greenspaces; these are described briefly below.

Changing Places: this is the first large, national programme in the history of UK land reclamation that has delivered an ecologically informed and community led approach to derelict land restoration on such a huge scale. The programme commenced in 1996 and is due to finish in 2001. It is funded by the Millennium Commission and involves a total of 21 different projects around Britain, one of these being in Birmingham. The main aspects of the work are listed below:

- The ecological approach, enhancing natural regeneration wherever possible and "working with nature". This often lowers costs and increases biodiversity on the site.
- Ecological monitoring is carried out using GPS and GIS to ensure precise long-term monitoring of sites (see www.keygis.com/gemsweb/index.cfm) (MORGAN 2001).
- Involvement of communities at all stages of the projects and often community groups are set up to help manage the sites (for instance "Friends of the Ridgeacre" in Birmingham.
- The sites are protected by a covenant between the land owner and the Trust which protects the project purpose and holds the land for community benefit for a period of 99 years (GROUNDWORK 2001).
- The transformation of wasteland sites into country parks, woodland, wetlands, or more formal recreational facilities (GROUNDWORK 2000, ICMA N.D.).

One problem that arises is the long-term management of sites, as most are in local authority ownership, the local authorities then becoming responsible for upkeep of the site, which is not always easy on limited budgets.

Groundwork's Site Savers Scheme: this environmental regeneration sponsorship scheme arose through a partnership between Barclays PLC and Groundwork with the co-operation of BTCV (British Trust for Conservation Volunteers), the Wildlife Trusts and Scottish Conservation Projects. It is managed by Groundwork and delivered by BTCV and wildlife trusts. The communities serve as the driving force behind the projects, grants being awarded to communities with the greatest need or the most innovative scheme. Community involvement is seen to be a key issue with respect to the success of projects and their long term security.

Although Barclays provides financial assistance for training of people where necessary, Groundwork carries out the work required. Both the community and Barclays employees partake in the preparation and landscaping of sites, which are redeveloped into a variety of greenspaces including recreational areas, wildlife refuges and community gardens (WALKER et al. 2000).

Funding for Groundwork – Funding comes mainly from the national government with the EU, local authorities, the National Lottery and the private sector providing additional funds. A small part of the income comes from third party funding from local authorities or community

groups who receive grants which can then be used to pay for Groundwork´s services (MORGAN 2001).

The long term funding of Groundwork is in doubt due to the 12 year rule (from 1997) under which agencies can only receive funds from the government for a period of 12 years. However it is interesting that government policy has moved towards the policy of Groundwork (not vice versa, according to Groundwork) and since Groundwork is currently active in implementing government policy, future funding seems fairly secure (MORGAN 2001).

The Birmingham Groundwork Trust - the work of this regional trust is targeted on certain deprived areas of the city as well as all stretches of canal in the city. Suggestions for projects sometimes come from the local communities or local people or else are initiated by Groundwork themselves. Groundwork work closely with the City Council and are careful not to duplicate the work of the council, instead they work mainly with local people on small sites and thus complement the council's work on public greenspaces. Examples of projects are given in section 4.2.6.

Trust for derelict land/ Land regeneration trust

A recommendation to come out of a Groundwork Status report was the need for a national trust for derelict land. This is still in the stage of development but is being pushed ahead by Groundwork and English Partnerships (MORGAN 2001). The aim of the Trust would be to: "*act for the nation in the acquisition of land at the end of its economic life and to hold such land as trustee, working with the community to restore it to health and manage it for public benefit.*" (HANDLEY 1996).

The Trust would concentrate on transforming damaged land (that is unsuitable for hard end uses) into green sustainable assets, which would be of long term benefit to the community. The benefits of such a trust would be that, being a large organisation, it would attract sponsorship from large funding or private bodies. It would also be able to draw on a wealth of experience for dealing with derelict land and provide for long term management of the sites. The Trust would use Groundwork's holistic approach, integrating community involvement and an ecological approach to land reclamation (GROUNDWORK 1999).

Funding would be provided through endowments paid by landowners on transfer of their land to the Trust. The land would either be purchased by the Trust or handed over using long term leases, since it would be easier to implement strategies if the land were owned by the Trust and not privately. It would be a charitable company, legally separate from the government. Groundwork would probably play a role on a governance and site funding level with the Trust having a managerial role.

4.2.5 Instruments used to develop/manage wasteland sites as greenspaces

Instruments developed by the European Commission

The instruments developed by the Commission to support the above goals include the EU Structural Funds (EC 1997). The European Regional Development Fund (ERDF) is one of these funds and is used to redress the imbalances in the community by stimulating economic development in the least prosperous regions of the EU. ERDF funding is usually aimed at

projects promoted by the public sector and can be used (amongst other things) to support environmental protection and improvement measures which are linked to economic development (e.g. land reclamation, conversion of industrial sites).

Normally the EC contributes no more than 50% of the eligible cost of projects, this depending on the status of areas:

- Objective 1 areas = “regions whose development is lagging behind”
- Objective 2 areas = “areas facing structural difficulties”

The rest of the funding is usually procured through "match funding" i.e. through SRB (Single Regeneration Budget) funds in the UK (DETR 2000C).

- *URBAN II* - Leipzig is one of the cities included in a new European programme for regional development, which is funded by the ERDF. This has several focal points including the redevelopment of wastelands to create employment and also the creation of greenspaces and improvement of the environmental situation, which may include the conversion of wastelands to greenspaces (STADT LEIPZIG & TROJE BERATUNG GMBH 2000).
- *5th Framework programme* - This is another instrument of the EU which is linked to the regeneration of wasteland areas. It provides funding opportunities for research on the urban environment through the key action “city of tomorrow and cultural heritage”, one of the aims of which is to optimise the use of urban land through the re-cycling of contaminated and derelict land (EC 1997:4.3.2).
- *LIFE programme* - This provides resources for the funding of projects in urban areas and can co-finance action in nature conservation and the integration of environmental considerations in land use development and planning (EC 1997).

Explanation of instruments used in Leipzig, Germany

A summary of the main instruments used for the conversion or management of wastelands as open space is given in Table 30. A more detailed explanation of selected instruments is provided below.

- *FR-Regio* - Up until 2001 this was the main funding source for the conversion of wastelands to greenspaces. Many of its functions have now been taken over by the new grant scheme VwV Stadtentwicklung. Nevertheless, it is still of interest as it provides grants for the development of concepts for the regeneration of wastelands.
- *VwV Stadtentwicklung* - This provides the main source of funding for the conversion of wastelands to greenspaces in Leipzig. It is used not only by the City Council but also by the Wasteland Working Group of the Green Ring to finance wasteland regeneration projects. This grant provides 75% of funding, the other part of the funding either comes from the local authority or other funding sources. The grant can be used not only for planting and landscaping of sites, but also for the planning of sites. The conditions of the grant maintain that projects should be in line with current regional and spatial planning guidelines and funding is only available to local authorities (SMI 2001).
- *Eingriffsregelung* (Compensation measures) - In Germany developers are required by law to compensate for any damage occurring to nature or landscapes in the process of intervention or developments. Changes to the planning code in 1998 provided both temporal and spatial flexibility with regard to the execution of these measures

(AMMERMANN et al. 1998, KÖPPEL 1998, MEYHÖFER 2000). This provides local authorities with the opportunity to create or improve habitats (for instance on wasteland), which can then be funded through compensation payments. In Leipzig a cadastre of compensation measures is being created, including planned and implemented measures, all of which will be assigned to particular developments. With regard to the creation of greenspaces on wastelands the Environmental Ministry of Saxony has recommended the inclusion of activities such as the demolition of derelict buildings or removal of sealed surfaces as compensation measures (SÄCH. STAATSMINISTERIUM FÜR UMWELT UND LANDWIRTSCHAFT 2000). There is also research being carried out for the City Council of Leipzig to determine whether an interim use of Baulücken (empty housing plots) as greenspaces can be used as "floating compensation measures". There are however problems to be overcome since such sites automatically have planning permission so could be developed and the compensation measures would have to be transferred elsewhere - a problem both economically and ecologically. This idea is, however, likely to be pursued since the city has recently specified its aim of implementing 50% of all compensation measures in the inner city, which will entail the use of such plots (ZABOJNIK 2001).

- *Gestattungsvereinbarung* - This instrument is currently being developed by the urban regeneration department in Leipzig and a pilot study has been carried out to evaluate its effectiveness. It is a permissive agreement for the interim use of wasteland for a minimum of 5 years between the owner and the city, but does not affect planning permission for the site. The city accepts responsibility for the management of the site for 3 years, after which the owner must carry the costs. The owner is, however, able to obtain tax exemption if the site is opened to the public so he/she can also gain from the agreement. There are still problems to be overcome regarding liability and the unwillingness of owners to allow an interim use of their land (BÖTTCHER 2000). Cases where it has been used include a school's use of a site as a playground and car park, and the conversion of wasteland to greenspace for neighbouring residents. However in the latter case the site owner also owned the surrounding flats so had a personal interest in improving the local surroundings.
- *Enteignung* (compulsory purchase) - Due to the political and financial implications of this instrument it is very rarely used (ZABOJNIK 2001).

Explanation of instruments used in Birmingham (England)

A summary of the main instruments used to deal with the use of wastelands as urban open space is given in Table 29. A more detailed explanation of selected instruments is provided below.

- *Single Regeneration Budget /Government regeneration funding* – One of the main sources of funding for the Regional Development Agencies (RDAs) is the single regeneration budget (SRB). This was created in 1993 and brought together twenty previously separate funding programmes from five governmental departments, incorporating the old derelict land reclamation programme (CULLINGWORTH & NADIN 1997, DTLR 2001B, SMITH 2001). It provides funding to English Partnerships (and thus the regional development agencies), as well as to other regeneration programmes. 80% of the funds are concentrated in the most deprived areas, and local authorities are required to bid for funds from the programme. Community involvement is also an important aspect of this funding programme (PRESCOTT 1998). In addition to these funds, each regeneration agency has its own individual programmes and titles for

grants and thus the degree of support for derelict land offered by the SRB schemes varies depending on the programmes of the individual regeneration agencies (DAVIES 2001, SMITH 2001).

- *New Opportunities Fund* - This includes the Green Spaces and Sustainable Communities Programme (§23), and provides an important source of funding for greenspace in Birmingham (GRAYSON 2001). The programme is designed to help urban and rural communities understand, improve or care for their environment by creating or preserving greenspaces or promoting access to greenspaces of educational, recreational or environmental value to their community (DETR 2000b). The re-use of derelict land or land acquisition for creating and improving greenspaces of importance to communities may be funded by this programme (DETR 2000b). An example of the use of this grant is to co-fund English Nature's new 'Wildspace' grant scheme to improve Local Nature Reserves (LNRs) and thus support community greenspaces throughout England (EN 2001b).
- *Planning obligation or planning gain*- This is also referred to as a section 106 agreement (referring to the corresponding section in the Planning and Compensation Act) and is an important planning instrument that is frequently used in Birmingham to protect or create open space when development is carried out. This policy is not legally binding but is solely an agreement between the local authority and developer, the local authority being able to place conditions on the allocation of planning permission (DOE 1997). One of the uses of planning obligations is "*to offset the loss of or impact on any resource present on the site prior to development*" (DOE 1997:10). Thus if a development is to cause the loss of open space (including informal open space such as urban commons) an agreement can be made between the developer and the planning authority to protect a certain amount of open space or to create new open space elsewhere. Thus "*the community can gain some off-setting benefit, particularly when there is a loss of amenity*" (RICS 1991). However this open space must then be managed by the local authority, since the developer is only liable for future maintenance when the open space is of principal benefit to the development itself, rather than the general public (DOE 1991a, DOE 1997).

Informal instruments used in both Leipzig and Birmingham

- *Habitat mapping* – The identification of wastelands as ecologically valuable habitat can provide a degree of protection for this habitat, e.g. through the Biodiversity Action Plan as in Birmingham, or habitat mapping in both Birmingham and Leipzig.
- *Local Agenda 21* - The creation of Local Agendas stems from the recommendations of the Rio Summit in 1992 to implement a global Agenda 21. LA 21s are produced by citizens and action groups work with public, private and local organisations or people to put it the ideas into action. Leipzig has just published its LA21 which provides goals and models for sustainable development in Leipzig. This states the need for the redevelopment of wasteland sites, with the use of greenfield sites only as a last resource and recommends the interim use of wasteland sites as open space. It also specifically states the possibility of using wasteland sites as urban wildlife areas for children and young people (ELSÄSSER & KELL 2000:22). In Birmingham the Local Agenda states the need for the redevelopment of brownfield sites with the use of greenfield sites only as a last resource. It suggests the use of brownfield sites as open space as an interim use of the land (LOCAL AGENDA 21 N.D.).

- *Citizen/action groups* - The voice and actions of local people can also play an important role in the future use of wasteland sites. For example local people prevented the development of several wasteland sites in London, including Gillespie Park, Camley Street Natural Park and the Parkland Walk (a disused railway line, now a foot and bike path) and are now active in the management of many of these sites.
- *EXPO 2000* - Several schemes were carried out under the umbrella of the EXPO 2000 in Leipzig. The EXPO provided the impetus for undertaking interesting and innovative projects such as the sowing of a cornfield on a wasteland in Plagwitz ("Jahr Tausendfeld") and the creation of a new urban park and foot/bike paths on old industrial railway lines between the buildings in Plagwitz (DIETZE et al. 1999).

Table 29 Table of instruments used in Birmingham[1]

Name of instrument	Funding source	Description of instrument	Source
Grants			
Single Regeneration Budget SRB	DETR	Government funding for RDAs, brings together 20 separate funding programmes - community involvement important in projects	CULLINGWORTH & NADIN 1997 DTLR 2001c
Land and property budget	RDAs	Physical regeneration programmes, provision of green and recreational space	DTLR 2001C
Single Budget	DETR	Government funding for RDAs, due to take over from SRB in 2002 - gives more flexibility to RDAs	SMITH 2001 DTLR 2001C
English Environment Fund	Landfill tax	Creation and management of greenspaces- e.g. part of national forest	EP 2001
Special grants programme	Gov.	Support for voluntary organisations working at national level on projects relevant to regeneration objectives	DETR 2001a
New opportunities fund	National Lottery	Creation, preservation, improvement of greenspaces of value to community - e.g. re-use of wasteland, land acquisition for greenspaces	CAMELOT GROUP plc (2001)
Millenium Commission	National Lottery	Grants for regeneration of wasteland - now obsolete	CAMELOT GROUP plc (2001)
Woodland Grant Scheme	Forestry Commission	Can be used in conjunction with other regeneration funding for tree planting projects	NUFU 1998b, WEBB 2001
People's places scheme	BTCV, EN	Grants for disadvantaged communities to encourage active community involvement in the management of open space	EN 2001a
Planning instruments			
Planning obligation/ gain Section 106 agreements	developer	Conditions placed on allocation of planning permission - includes creation of open space/ nature reserves, planting trees, conservation measures	DoE 1997
National Land Use Database NLUD	DETR, EP, OS,	Countrywide source of statistics on the number, type and planning status of previously developed sites	NLUD 2001
Compulsory purchase order	Gov.	Compulsory purchase of sites for regeneration	CULLINGWORTH & NADIN 1997
Other instruments			
Tax relief	Gov.	Tax relief for investors wanting to develop contaminated sites	DETR 2001a
Landfill tax	Landfill operators	Taxation of waste dumped in landfill sites - operators can donate 20% of tax liability to environmental bodies in return for 90% of tax credit	DIXON et al. 1999

[1] Instruments in italics are explained in more detail in the text

Table 30 Table of instruments used in Leipzig[1]

Name of instrument	Funding source	Description of instrument	Source
Grants			
FR-Regio	ERDF via Saxony	60% of funding, concepts for wasteland regeneration	SMI 1997
VwV-Stadtentwicklung	ERDF via Saxony	Surveying, planning, clean up of contamination, site clearance, demolition, removal of surface sealing, landscaping, purchase (10% of total). 70% of funding provided for project	SMI 2001
Städtebauförder-mittel	Land Saxony	Demolition, site clearance, creation of open space- only in designated urban redevelopment areas	SMI 1997
Wohnungsbau-fördermittel	Land Saxony	Creation of open space, ecological improvements	STADT LEIPZIG 2000b
Mitwohnungs-bauprogramm	Land Saxony	Demolition of derelict buildings in designated areas	SMI 2000
Contaminated land grants	Land Saxony	Surveying and clean up of contamination	SMUL 1997a
Sächsische Stiftung Natur und Umwelt	Compensation measures	Protection and management of nature and landscapes and environmental education	BNATSCHG 1998
Planning instruments			
Vorkaufsrecht (BauGB §§24,25)	Local authority	Right to purchase site for future use in the public interest	BAUGB 1998
Gründstückspool	City of Leipzig	Retention of pool of sites for exchange to push ahead regeneration	STADT LEIPZIG 2000a
Eingriffsregelung-Compensation measures	developers	Compensation for damage or destruction of habitats or landscapes through development	BNATSCHG 1998
Baugebot	Local authority	Order to use site	TEST 1995
Enteignung-dispossession	Local authority	Compulsory purchase of site	TEST 1995

[1] Instruments in italics are explained in more detail in the text

Table 30 continued

Table of instruments used in Leipzig[1]

Name of instrument	Funding source	Description of instrument	Source
Other instruments			
Gestattungs-vereinbarung	Local authority	Permissive agreement for interim use of site	BÖTTCHER 2000
Arbeitsbeschaff-ungsmaßnahmen (ABM)	National government	Government programme for long-term unemployed - employment of persons to undertake jobs such as demolition, creation of open space	STADT LEIPZIG 2000a
Local Agenda 21	Local authority	Informal planning instrument which supports use of wasteland sites as greenspaces and urban wildlife areas	ELSÄSSER & KELL 2000
EXPO 2000	Local authorities	Innovative projects for the use of wasteland sites e.g. creation of local park	DIETZE et al. 1999
Tax exemptions	Government	Reduction of exemption from land tax if site used as public open space	BÖTTCHER 2000

4.2.6 Practical implementation - the use of wasteland sites as urban wildlife areas

There are various processes involved in the use of wastelands as urban wildlife areas, which vary according to the intensity and formality of the project being carried out. In some cases wasteland sites are used informally as "urban commons" and in other cases urban wildlife areas may be created from scratch on former wasteland sites. These processes are described in detail below with reference to specific sites.

General implementation

Planning and site selection

There are various different reasons for the selection of wasteland sites as urban wildlife areas, as explained below:

- Public opinion and the strong support for preservation of sites as public greenspaces. This was the case for several sites in London such as Camley Street Nature Park and Gillespie Park where public opinion was successful in preventing development of the former wasteland sites (JOHNSTON 1990).
- The ecological value of the site sometimes provides an argument against development of the site and the protection of the site for nature conservation.
- Unsuitability of the site for development due to problems of contamination or shape, size or location of the site (see section 2.1.4). An example of such a site is Sheepwash Urban Park in Sandwell, West Midlands. This was created on a wasteland site, which due to problems of contamination and possible flooding, could not be used for immediate development (DOE 1996).

[1] Instruments in italics are explained in more detail in the text

- Planning strategies may include the use of wasteland sites as greenspaces. This occurred in the cities of Essen and Lübeck where the planning authorities specifically selected wasteland sites to be used as natural playgrounds or nature experience areas ('Naturerlebnisräume' in Lübeck) (SCHEMEL 1998, AUGUSTIN 2001).

There are of course various other reasons for site selection such as the availability of sites at the right moment, or the need to deal with sites causing social or environmental problems.

Approaches to using wasteland sites as urban wildlife areas

There are several different approaches used as explained below:

- Minimal or no interference - This is frequently the approach taken on larger sites which are already of high ecological value, or for informally used sites such as urban commons. This is the approach taken in the project "wild industrial areas" in the Ruhr area of Germany where a "*completely different approach to the development and landscaping of industrial wastelands*" is being attempted (DETTMAR 1997:12). In this project sites are made accessible to the public but minimal management is being carried out to preserve the ecological and cultural importance of the sites (DETTMAR 1997).
- Improvement of the site - The basic structure and vegetation of the site are complemented through additional planting or the creation of habitats or features (such as ponds or wildflower meadows). Simple facilities such as benches, footpaths or simple play equipment may be added. This approach was used to create informal playgrounds on wasteland sites in Essen where sometimes rustic swings and heaps of sand were added to the sites for recreational activities (AUGUSTIN 2001).
- Major landscaping works - This is the approach used when either the site is so contaminated that complete destruction of existing vegetation is required to carry out decontamination works and the site then needs to be landscaped. It can also be used when the site has little or no existing vegetation and needs to be vegetated in a short period of time to ensure acceptance by the local population. This approach was carried out at Gillespie Park where planting and landscaping were carried out almost from scratch, except for the retention of some bramble and scrub. It is also an approach commonly used in Leipzig to vegetate wasteland sites where buildings have been demolished and surface sealing removed, and the resulting bare ground needs to be vegetated in order to prevent a new state of dereliction occurring.

The cost of these approaches obviously increases from the least to the most intervention. It is difficult to give comparative costs of different approaches due to the different sizes of sites, different countries and time periods in which the work was carried out. Table 31 below provides some examples of the costs of different approaches and thus a rough indication of the range of costs.

Table 31 Cost of various projects to create urban wildlife areas on wasteland sites[1]

Project	Date of project	Size of site	Cost (Euro)	Work carried out
Site improvement				
Essen - natural playgrounds	1990s	varied	11,160/site	Some planting benches, swings
Informal greenspace-Leipzig	2001	0.5ha	1,278	Planting by schoolchildren, clearance by city (ABM)
Acocks Green-Birmingham	1999	2.3ha	177,778	Clearing, stream improvement, benches, pathways
Major landscaping works				
Sheepwash urban park (Sandwell)	1980s	37ha	1,594,370	Treatment of contaminated land, flood protection, landscaping
Camley Street natural park - London	1983-1985	0.9ha	Total = 494,254 127,549 - fly tipping 271,043 - landscaping 95,662 - nature centre	Clean up of site, landscaping, nature centre
Gillespie Park, London	1981/82	1.6ha	569,190	Landscaping, nature centre, clean up of site

Management of sites

By definition urban wildlife areas are not intensively managed but some form of management is necessary in almost all cases to prevent the site becoming completely overgrown by trees and to retain pockets of particular stages of succession. On informal sites such as pocket parks or sites belonging to or managed by urban wildlife groups, management is essentially carried out on a voluntary basis by the group looking after the site. Partnerships are also common with statutory organisations working together with local groups to manage sites. This is the strategy used on the Zeche Alma in the Ruhr area of Germany where the Forestry Department works together with the local nature conservation group to manage the site (IBA 1998, SCHWARZENBERG & SINNING 2000). On other sites, which are owned or managed by local councils, management may be carried out by contractors with little public input.

Public participation in planning and management of sites

The degree of public participation in the whole process from planning to landscaping and management of the site varies considerably.

- Projects with a high degree of public involvement: In some cases the public is involved from the beginning of the project, particularly in cases where the public has played an integral part in securing the site as greenspace. In Munich local residents formed a project group, "Grüne Schule und Spielhöfe", to convert wasteland sites to natural playgrounds and public participation was integral to the planning and management of the sites (SCHEMEL & STRASDAS 1998). Similarly, in Leipzig the local

[1] Sources: JOHNSTON 1990, AUGUSTIN 2001, TEST 1995, WEBB 2001

environmental organisation "Ökolöwe", involved a local school in the planning and planting of a wasteland site. Another example of sites that are planned and managed entirely by local people are "pocket parks". These are small, natural green spaces that are protected and managed by local people for nature conservation and informal recreation (ROSE 1990). They are found on a number of different sites, including old railway lines, quarries, old landfill sites etc. and are becoming an accepted category of urban greenspace in England.

- Top down approach: In other cases a completely top-down approach is taken with the public having almost no involvement in the work or management of the site. This is more commonly the case with larger sites where contamination or dangers on the site limit the amount of public participation that is possible. This was the case with Sheepwash Urban Park due to the degree of contamination and presence of mine-shafts and other dangers on the site, however local organisations were involved in the planning of this site (DOE 1996). Another reason for the exclusion of people from the initial stages of projects is that such novel ideas as an urban wildlife area on an area of former wasteland might not be popular with local residents in an area of industrial decline (DOE 1996).

There are, however, examples of projects on large sites where public participation has been carried out successfully throughout the project. An example is the Lower Swansea Valley project, an ambitious regeneration project in Wales involving a large area of derelict and contaminated industrial land. In this project local people were involved in the planning of the project through the creation of planning panels as well as in actions such as tree planting on the site (TEST 1995).

Use of wasteland sites as urban wildlife areas

The use of most urban wildlife sites created on wasteland sites is mainly of an informal nature although many are used for educational purposes, sometimes with specially developed educational facilities such as classrooms or interpretation centres. For example Stave Hill (in the Docklands of London) is used by schools to carry out ecological projects and the children are involved in research and monitoring on the site (TRUE 1998). Many other urban wildlife areas also provide opportunities for local schools to use the sites for environmental or biological studies, e.g. Gillespie Park, Sheepwash Urban Park, Zeche Alma. Other uses of urban wildlife areas include teaching courses, schools, youth groups, play-schemes, clubs, barbeques and fun activities as well as quiet recreation (JOHNSTON 1990).

Wardens are often key people in the success of projects as they can provide an impetus to the project and form a key link between the management and planning of the project and the users (local population) (see DOE 1996). The presence of wardens and the involvement of the local community in the planning and management of sites are also found to help reduce incidents of vandalism on urban wildlife sites (JOHNSTON 1990). This is even true of community gardens created on wasteland sites in some of the roughest and poorest areas of New York, which had previously been frequented by drug-pushers and used for anti-social activities and fly-tipping. Local people act as watchdogs and prevent vandalism, which is otherwise prevalent on urban greenspaces, from occurring to these sites (GRÜNSTEIDEL 1999).

Organisations involved

The different organisations involved in the use of wasteland sites as urban wildlife areas can be divided into three main groups:

- Voluntary groups - In a large number of cases voluntary groups are responsible for either one or more tasks of planning, creation and management of urban wildlife areas. These groups range from local initiatives (such as the initiative to protect Gillespie Park from development), to "friends groups" (often formed to manage or partake in the management of sites), to more official groups such as urban wildlife trusts. They may work alone or together with local councils or other organisations in the management and planning of urban wildlife areas.
- Local authorities - Local authorities are frequently responsible for those sites in their ownership (unless a lease is given for the site to another organisation). They may work together with local people or local organisations in the planning and sometimes also in the management of urban wildlife areas. However, there are sometimes problems with the involvement of local people for tasks which are the responsibility of council staff as this may contradict the rules of the workers' unions (JOHNSTON 1990).
- Regeneration agencies or organisations - Regeneration agencies are often involved in the case of large regeneration projects or regions having to deal with a large amount of dereliction. Examples of such organisations are Groundwork, Kommunalverband Ruhrgebiet (KVR) and the IBA- Emscher Park. Usually these organisations will work together with local councils to ensure that the most appropriate approach is taken to regeneration. This is not always the case, for example in the regeneration of the Lower Swansea Valley the City and County Councils remained in charge of the project (TEST 1995).

Instruments used to implement projects

Various different types of instruments are used to secure the funding and use of wasteland sites as urban wildlife areas. A detailed description of different instruments relevant to the creation of urban wildlife areas in Leipzig and Birmingham is found in section 4.2, but some examples of some of the instruments used in other areas are described below:

- "Ausgleichsmaßnahmen" or compensation measures paid by developers - There are several examples of the use of this instrument in the Ruhr area, one of which is the Zollverein in Essen where landscaping measures including the creation of a wetland area were financed using this planning instrument. The management of the site is paid for by the investor, but the problem is that this only covers a certain length of time and after this management reverts to the local authority (AUGUSTIN 2001).
- Gründstücksfonds Ruhr (GSFR) and Gründstücksfonds Nord-Rhein Westfalen (NRW) - These agencies purchase land for local authorities and hold it in trust until the local authority wishes the site to be used or developed in some way. If there is no investor interested in the site, the local authority is able to purchase the site at the green land value (TEST 1995). This instrument was used in the project "wild industrial areas" in the Ruhr area where the GSF-NRW purchased most of the land of 3 large industrial wastelands for the creation of extensively managed greenspaces (IBA 1997).
- ÖPEL (Ecology Programme Emscher Lippe) – This grant programme from NRW was used to finance 90% of the projects in the Emscher Landscape Park (one of the projects of the IBA- Emscher Park). For instance the landscape park Duisberg Nord was created using funding from NRW's grant programme as well as EU social funds for ABM (employment creation) projects (SCHEMEL & STRASDAS 1998, KVR 1999)
- Local authorities often provide some sort of funding for urban wildlife areas, either through their own involvement in the management of the site, or through the provision

of grants. For instance local education authorities in London contribute to the costs of the site and teaching materials for Camley Street Nature Park and Gillespie Park.

- Pocket parks - In the county of Northamptonshire 75% of the initial development costs of pocket parks are funded by the County Council's "pocket park grant" scheme (ROSE 1990).
- Contracts or agreements- Leasing agreements, contracts and sponsorship agreements are all instruments that can be used to organise and regulate the use of wasteland sites as urban wildlife areas. For instance, on Zeche Alma in the Ruhr area several instruments were used:
  - A "Pachtvertrag" (leasing agreement) was drawn up between the owner (Thyssen) and the forestry department.
  - A formal contract was made between the forestry department and the Gründstücksfonds (KVR) to regulate the management of the site (IBA 1998, SCHWARZENBERG & SINNING 2000).

Often one of the prerequisites for obtaining grants is the long-term security of the site. In many cases sites are owned by the local council, and may be leased to local groups or wildlife trusts for a minimal sum. This works well when dealing with public bodies, but is much more difficult to arrange with private landowners, although it has been managed in some cases, for instance by the "Kids Company" in Vienna and for the interim use of a wasteland site in Leipzig (SCHEMEL & STRASDAS 1998). It is rare that small organisations can afford to purchase sites themselves, thus the future of many urban wildlife areas remains uncertain (see GRÜNSTEIDEL 1999).

4.2.7 Case study sites - wastelands to urban wildlife areas

Burbury Brickworks

Background information

Burbury Brickworks is situated in the district of Sparkhill to the south east of Birmingham city centre. It was originally a brickworks which was later used as a tip for both domestic and industrial waste and has now been converted to an urban wildlife area. The site covers approximately 4.5ha alongside the river Cole and is located in an area of predominantly industrial and residential use with high unemployment (22.9%) and poor quality housing (BCC 1993). There is a need to improve the environmental quality of the area, including the sub-standard provision of open space, since the current amount of open space is 0.99ha/1000 population, well below the 2ha minimum standard in Birmingham (BCC 1993).

Conversion of the site

The site was purchased by Birmingham City Council in the late 1980s and part of the original site was later used for commercial developments. The remaining 4.5ha was considered to be too highly contaminated for development so was set aside as open space. The original plan for this area was to completely clear and landscape the site but, due to the high ecological value of the site the plan was amended and hot-spots of contamination were treated and part of the site was capped with a layer of clay to prevent leaching. The site still suffers from gassing and

outlet vents allow methane to escape. A derelict land grant was used to carry out the necessary work on the site (WARD 2001).

Current management of the site

The site is currently managed by the Parks and Recreation Department of Birmingham City Council, but little management is required except for birch clearance and occasional mowing. Wardens from the city's Parks and Recreation Department undertake some activities on the site to involve the local population - such as vegetation management or interpretive walks. The site suffers from a lack of investment as some basic repair work is needed to deal with the problem of flooding on the site (partly due to the capped surface layer). There is, however, little vandalism on the site, possibly due to its poor signing and lack of direct access from residential areas with roads and the river acting as a barrier to access.

Relationship to current policies and planning instruments

As noted above, the site forms part of the greenspace network of the city and the River Cole Walkway runs through the site (see Figure 10 in "results of study" on accompanying CD-ROM). It is designated as a Site of Importance for Local Nature Conservation (SLINC), and forms an important link on one of the city's key wildlife corridors. It is also part of the Millstream project, the purpose of which is to set out a comprehensive and practical scheme for the management and development of the river Cole corridor, including protection and enhancement of the open space and nature conservation areas (BCC 2001).

There is a current proposal for improvement of the local area, involving re-design of the neighbouring business park, which would involve improvement of the walkway running through the site, and thus improve the access to the site. These and other site improvement works could be funded through Section 106 agreements which can be specified in the planning proposal (BCC 2001). These changes are in accordance with the draft alterations of the Unitary Development Plan for Birmingham, which also envisages an improvement of the open space and protection of nature conservation in this area (BCC 2000a).

Figure 13 View of Percy Road site from Burbury Brickworks (photo: H.Herbst)

Percy Road site

This site is included in the Burbury Brickworks case study as it directly affects the development and future use of the Brickworks site. This 0.8ha wasteland site in Percy Road is situated across the river from Burbury Brickworks (see Figure 10 in "results of study" on accompanying CD-ROM). It is currently owned by the Economic Department of the city of Birmingham but has been offered to the Parks and Recreation Department for a period of 5 years for provisional use as a greenspace. If made accessible as a greenspace the site could provide access to Burbury Brickworks from the other side of the river Cole and thus open up the Brickworks to a large population who are currently lacking access to public greenspaces.

There are various options available for conversion of the site and lots of local enthusiasm for the project. Two schools lie within 500m of the site and could play a part in the project or a local community group could be involved in the planning and could also apply for funding for the project. The improvement of the site could be incorporated into Groundwork's Site Savers Scheme (see section 4.2.4) but since the site is already in the Council's hands, it is most likely that the Council will be the main actor in the project. The site also lies within the Sparkbrook, Sparkhill and Tyseley Area Regeneration Initiative, which benefits from government regeneration funding (SRB) for regeneration initiatives and so could provide some funding for the project (BCC 2001). A further possible source of funding might be the Health Department since the site is situated directly next to a health centre and thus could form part of heart patients' fitness programmes (a new health initiative involving the prescription of daily walks for heart patients) (GRAYSON 2001).

If the site is made into a public greenspace it will play an important role in widening the existing green network and improving access to Burbury Brickworks and sites on the other side of the river. Restructuring of rangers' posts will mean that the stretch of river will become more important, both in the eyes of the Parks and Recreation Department and the local population.

Selly Oak - Birmingham Batteries

Figure 14 Photo of Selly Oak site (photo: H.Herbst)

Background information

Birmingham Batteries extends over 20ha and is situated in the district of Selly Oak to the south west of Birmingham city centre, close to the University of Birmingham. It is bordered to the east by the railway and the Birmingham and Worcester Canal, to the north by Queen Elizabeth Hospital and to the south by the Battery Retail Park (see Figure 11 in "results of study" on accompanying CD-ROM). The surrounding area has a lower than average unemployment rate (10%) and a relatively high quality environment with 2.15ha of open space per 1000 people (compared to the 2ha minimum standard). There are still some pockets of deprivation and a shortage of open space in some areas, since much of the open space is privately owned.

The site was formerly used by a battery factory (which closed in 1961), builders yard and for tipping of waste, as well as for allotment gardens (BCC 2000b). Ownership of the site is mixed, some being privately owned and some leased to the Health Authority with the allotment gardens falling under city council ownership (BCC 1995). Some of the allotments are still in use, but others are vacant, partly due to problems of contamination from the waste tipping sites (GRAYSON 2001). Part of the area is dominated by steep hillsides and valleys,

probably resulting from the tipping of waste in the past. In the northern part of the site the Bourne Brook runs through the site from west to east.

Ecological information

The site is designated as a Site of Local Importance for Nature Conservation (SLINC) by the City Council and several tree planning orders exist on the site (BCC & LAND CARE ASSOCIATES 1997, BCC 1997). The site is of particular ecological interest due to the wetland area of the Bourne Brook and the area of ancient woodland (designated as a Site of Importance for Nature Conservation) to the north of the site (see Figure 11 in "results of study" on CD-ROM). Other parts of the site include areas of unimproved grassland which are being invaded by scrub, with stands of lupin and golden rod, which are particularly impressive in early summer.

Conversion of the site

Currently a development proposal has been submitted to the Council by the food retailers Sainsburys for development on the southern end of the site and public consultation has been undertaken. A new road is also proposed in the vicinity of the Bourne Brook. A review of the development proposal is necessary to take into account the worries and views of both the Council and local population, since there was vociferous and well-founded opposition to the proposal. Public consultation and involvement will continue throughout the planning process to ensure that the most appropriate decisions are taken and the needs of the local people are taken into account. Some of the area will be retained as open space and clean up of contaminated areas will be carried out by the developer and will be regulated by a Section 106 agreement (GRAYSON 2001).

Current management of the site

There is no current management of the site as it is not regarded as an official public greenspace, although it has nature conservation status. There have been problems with motor-cross racing on the site, which is regarded as anti-social by neighbouring residents, as well as fly-tipping on the site. Due to its location next to residential areas the site is currently used for informal recreation purposes by local residents.

Relationship to current policies and planning instruments

The site "*is located at a key crossroads of the city's linear open space network, where the Worcester and Birmingham Canal meets the Bourne brook and the Castle walkways (the filled-in former Dudley No.2 canal). It is one of only five nodes within the city where several linear open spaces converge*" (BCC 2000b:18). However the site is designated as industrial land in the Unitary Development Plan (BCC 1993), although part of the site should remain as open space (BCC 1993, BCC 1995). The development plan for the area includes the stipulation that the section 106 agreement is to include: "*compensation for any loss of allotments or open space, laying out and maintenance of walkways through the site, reinstatement of the former Dudley no.2 canal where it crosses the site, (and) measures to mitigate against impact on the nature conservation value of the site.*" (BCC 2000b:42).

The site and its future development are of great interest and importance with respect to the implementation of nature conservation policies in Birmingham. If the proposal goes as planned, it will show how ecology, nature conservation and development can work together

and show how the proposals of the City's nature conservation strategy can and should be put into practice (GRAYSON 2001). In the future an attempt will be made to obtain the status of Local Nature Reserve (LNR) for the site, which will give it a higher nature conservation status and a higher degree of protection than is currently the case.

Brandts Aue

Background information

This 4.4ha site was formerly a military training site and later part of the site was used as a dogs' sports ground. It incorporates four different land parcels, 2 ha of which are in city ownership. The site is located in the heavily built up districts of Möckern and Gohlis in the north west of Leipzig and is bordered on one side by a railway line and on the other side by allotment gardens (see Figure 12 in "results of study" on accompanying CD-ROM). Despite the close vicinity of the Leipziger Auewald (an ecologically important flood plain forest) the surrounding residential areas are deficient in local greenspaces (GOTTHARDT & SPEIKERMANN 1994).

Figure 15 Aerial photograph of Brandt's Aue (photo: Umweltamt, Leipzig)

Before conversion the site consisted of a large area of sealed and compacted ground surface including the ruins of buildings and a large amount of fly tipping.

Ecological information

Before work was carried out the site contained a mixture of habitats including ruderal flora, meadow, wooded areas, bushes and hedges. These habitats were added to by the planting of

an orchard, seeding of a meadow and planting of single scattered trees as part of the improvement works carried out on the site. The increase in landscape value was assessed to be 66% in a study of the state of the site before and after the planned measures had been carried out (ADRIAN LANDSCHAFTSPLANUNG 2001).

Conversion of the site

The site was selected by the City Council for improvement due to complaints by residents about the state of the site, continued fly-tipping and also the suggestion by the owner that something should be done with the site. Part of the privately owned land has been sold to the city council but the rest is in the hands of a middle man and the owner is undecided about whether to sell the remaining land or not. The work that has been carried out up to now includes demolition of buildings present on the site, removal of surface sealing, clearance of rubbish, and landscaping measures as described above. An asphalt path has been laid along the course of an old "trampelpfad" (informal path) through the site.

The conversion work was funded through a mixture of grants (a so-called "Fördermittlemix"): a grant for the land privately owned was obtained from the Stiftung für Natur und Umwelt (LANU) (foundation for nature and the environment) and a second grant from the FR-Regio (derelict land grant) from the land of Saxony, the latter covering 60% of costs, the other 40% being provided by the city of Leipzig. The acceptance of the site as a potential compensation measure means that the 40%, currently paid for by the city, could be refunded through payment as a compensation measure. Unfortunately the LANU grant had to be returned as it was not possible to purchase the land from the landowner.

Current management of the site

The site will be managed by the City Council, there are no plans as yet to involve the local community.

Relationship to current policies and planning instruments

The site is situated in a designated landscape protection area (LSG) and has been identified as an area suitable for nature conservation in the city's land use plan (FNP). It is also considered to be of regional importance by the Green Ring (an organisation working to improve the landscape in and around Leipzig).

Alte Kaserne- Heiterblick

Background information

The 32.1ha site is situated in the district of Heiterblick in the north-east of Leipzig (see Figure 13 in "results of study" on accompanying CD-ROM). The wasteland site was formerly a military training area but has lain derelict since 1990 after the Russian army left East Germany. The site is bordered by wasteland sites to the south and west, an industrial estate to the north and residential areas to the east. The residential area to the east is a high density, high rise development from the 1980s (in Paunsdorf). A new residential development (Kiebitzmark) is being constructed to the north-east of the site with approximately 3000 inhabitants in mainly detached houses (DR. POSER, WETT & PARTNER 1996). The local population suffers from a lack of public greenspaces, the only official ones being Paunsdorfer

Wäldchen (a small woodland) and a new park next to the motorway in Kiebitzmark. There are however, a high number of wasteland sites in the area that are used as urban commons, especially by local children.

Figure 16 Heiterblick Kaserne (photo: H. Herbst)

Ecological information

The site is of particular importance for nature conservation incorporating habitats, which are protected by nature conservation law (§26 BNatSchG 1998). These include semi-natural standing water features and wet grasslands. Several dragonfly and amphibian species found on the site are classified as red data book species and a bunker on the site provides a roosting place for bats. The changes in relief on the site are partly due to the former use of tanks, which made the deep holes in which ponds have now formed (DR. POSER, WETT & PARTNER 1996).

Conversion of the site

The Kaserne forms part of a planned crescent of greenspaces in the north east of Leipzig (the "Grüne Bogen"). A competition was held for landscape planners to design the future use and development of the Kaserne based on the principles of natural succession, integration of the existing vegetation and making "*die Natur erlebbar*" (allowing people to experience nature) (STADT LEIPZIG 2001b). The winning design uses raised paths to provide access to the wetter parts of the site and a system of footpaths crossing the site (HÄFNER & JIMENEZ N.D.). The buildings still existing on the site will be demolished, except for the bunker, due to its importance for bats. There is also need for rubbish clearance and possible treatment of contaminated areas of the site (DR. POSER & WETTE & PARTNER 1996). Since the project is still in the planning stage there is no precise information on the planned measures since

funding must first be secured. The total cost is estimated to be 164,227 Euro for management and development of the site and 245,420Euro for making the paths (Quinger 2001).

There have been meetings between the City Council and the local citizens' group to discuss strategies for the site. No direct involvement of the local population has resulted from this, but the local residents have signalled their interest in the site (QUINGER 2001).

Current management of the site

Since 1990 the site has been managed by a nature conservation organisation but once the project is underway, management will revert to the site's owner (i.e. the city). Sheep grazing has been used to keep succession at bay and retain the open landscape of the site. However succession is still a problem and work needs to be done to retain the ecologically important grasslands. Management is also required to maintain the complex of wetlands so that a stable population of animals can exist (DR. POSER & WETTE & PARTNER 1996). This was previously carried out unknowingly by the military driving tanks over the site but this is unlikely to be an acceptable solution either to nature conservationists or to local residents!

Relationship to current policies and planning instruments

The site is identified by a white space in the land use plan of Leipzig since at the time the land use plan was drawn up, the future use of the site was uncertain (STADT LEIPZIG 1994). The landscape plan identifies the ecological importance of the site and recommends the retention and development of existing habitats (STADT LEIPZIG 1999a). The inclusion of the site in the "Grüner Bogen" secures its future as a greenspace but the proposed building of a road through the north of the site is likely to have a negative effect on the use and ecological value of the site. There is some discussion on the possible implementation of at least part of the project through compensation measures (Ausgleichsmaßnahmen), but the problem here is that the site is already of high ecological value and such measures can only be carried out where the ecological value of the site can be improved (QUINGER 2001).

5 Discussion

The discussion is divided into three sections relating to the hypotheses defined in section 1.2.

5.1 Importance of wastelands as urban wildlife areas

5.1.1 Overview

The value of wastelands as urban wildlife areas depends very much on the site's characteristics. Some sites are of great value as urban wildlife areas – the so-called "urban commons" - whereas others may develop into urban wildife areas with time, or may require some changes before they may be considered to be suitable as urban wildlife areas.

The importance of wasteland sites for flora, fauna and people has been discussed in detail in chapter 2. Many of the characteristics described are those that make many wasteland sites valuable as urban wildife areas: for instance the diversity of species and habitats found on many wasteland sites, the suitability of the vegetation to the local environment or the provision of habitats for many animal species all year round. It is these characteristics of wildlife areas that in turn provide people with the opportunity to experience nature and wildlife on a daily basis, i.e. close to where they live or work.

5.1.2 The importance of urban wildlife areas

Before discussing the importance of wastelands as urban wildlife areas there are several issues to discuss regarding the importance of urban wildlife areas:

Urban wildlife areas provide the sort of nature or greenspace that people want and need - Since urban wildlife areas provide people with the opportunity to experience and be near nature it is important to determine whether or not people actually want this type of greenspace. Although there are several studies investigating how people use wasteland sites or greenspaces (see for instance NOLDA 1990a, KEIL 1998), there are very few which look at what people think or feel about greenspaces. There is some evidence that people appreciate wildlife, and that it is not the rare species that excite the everyday person, but rather encounters with the common-place wildlife, such as butterflies, birds or more rarely seen creatures such as hedgehogs or foxes (see HARRISON et al.1987, MILLWARD & MOSTYN 1988, COLES & BUSSEY 2000).

Peoples' opinions on the management and type of habitats found in urban areas tend to be mixed with some people appreciating the more wild habitats of urban wildlife areas and others finding such unkempt vegetation to be an eyesore (see also HARRISON et al. 1987, EC 1990). This is reflected in the following statement: *"I would like all the debris cleared away, the wood tidied up and the fallen branches removed, with due respect, like I keep my garden and we could all have a nice environment to live in once again."* (BUSSEY 1996:248).

Part of the problem here lies in a lack of understanding of more "wild" habitats as well as the differences in personal opinions. Johnston recognises this need for more explanation of urban wildlife, alongside the need for people to have contact with nature on a daily basis (JOHNSTON 1990).

Despite the fact that there is both social and ecological evidence for the importance of urban wildlife areas in towns and cities, there is also a need for a mixture of greenspaces to fulfil all the requirements and wishes of the diverse range of ages, interest groups and social groups in urban areas. If one uses the classification of nature proposed by Kowarik, urban wastelands can be seen to represent the fourth type of nature – the urban-industrial nature - with the original landscape (woods, wetlands etc.), agriculturally influenced cultural landscape (fields, meadows etc.) and landscaped nature (parks, street trees etc.) comprising the other three types of nature. All of these have their place in the urban landscape and should be valued as types of nature in their own right (KOWARIK 1993).

The need for urban wildlife areas - Urban wildlife areas form an important resource for people living in urban areas. Since in most European countries over 80% of the population lives in towns or cities there is a call for sites where people can experience wildlife in their daily lives. Urban wildlife areas often provide children with the only possibility to explore and play on their own in an urbanised and regulated landscape. The value of wastelands in providing such opportunities has been demonstrated in studies on the use of wastelands (see WOODWARD 1988, NOLDA 1990a, KLEINHANS 1995, KEIL 1998). As stated in chapter 2, this has important repurcussions on the development of children, both physically, mentally and socially (see section 2.2.3).

Urban wildlife areas and the current approach to urban nature conservation - The current approach to urban nature conservation in England and Germany is discussed in section 2.3. The change of emphasis from the formal nature conservation approach of species and habitat protection to the importance of nature for people in towns and cities is of great relevance with respect to the creation or management of sites as urban wildlife areas. Such sites provide people with the opportunity to experience nature near to their homes, which ties in with English Nature's efforts to improve access to, and provision of local greenspaces (EN 2001c).

The experience of nature is important, not only for the psychological and physical benefit to people, but also for the re-building of their relationship to nature. This may in turn lead to an increase in respect and understanding of nature and help to serve the goals of urban nature conservation (JOHNSTON 1990). More evidence is required to support the link between an understanding of nature and support for its protection but experience in various projects dealing with the creation of urban wildlife areas reveals a strong feeling of bonding between people and the sites and a notable lack of vandalism on the sites (JOHNSTON 1990). The attitude people take may extend beyond the site itself, to the conservation of nature in a wider sense and thus help the nature conservation movement in the long-term: *"though the urban conservationist's primary concern is on his own doorstep, he is also a powerful voice in arguing the nature conservation case beyond the city walls."* (Vole magazine quoted in SMYTH 1987:66).

5.1.3 The value of wastelands as urban wildlife areas in the study area in Leipzig

The investigation into which wasteland sites were most valuable in the study area in Leipzig revealed that out of 105 sites surveyed, only three were identified as being very suitable as urban wildlife areas and fourteen identified as being relatively suitable. The results must, however, be interpreted with caution, as alterations to the ranking of the main criteria would produce different results, even though the sensitivity analysis carried out identified those sites that were found to be most suitable regardless of the ranking sequence used. For instance if the evaluation method is carried out ranking the criterion "potential users" as the most important criterion, the most valuable sites tend to be concentrated in inner city areas with

high population density. Another aspect to be considered is that the evaluation method assesses the current situation and not the sites' potential, thus there may be other sites, which - with minor alterations such as the removal of a fence and clearing up of rubbish - have the potential to become valuable urban wildlife areas.

A large proportion of the suitable sites were located on the outskirts of the city. Such sites can be considered to be border-line between urban and rural wasteland and the results of the evaluation thus reflect the relatively high value that such semi-rural sites can have as urban wildlife areas. The problem is of course, that these sites tend not to be in the areas of high population density where people are in need of wildlife areas, but on the urban fringe where there is more likely to be access to greenspaces (although this is not necessarily the case in all suburban areas).

Many of the sites regarded as being suitable as urban wildlife areas were classified as agricultural plots. These tend to be large sites with a diversity of vegetation and also, importantly, free access and lack of dangers. In some cases natural features were found on these sites (such as streams), which increased their value compared with inner-city sites where natural features are usually absent in the man-made urban landscape. Although no formal survey was carried out to investigate the use of those sites identified as being valuable as urban wildlife areas, the general information collected for all sites included indications of the current use of the sites. An interesting fact emerged; the three sites which had been assessed to be most valuable showed evidence of use for walking, biking or play activities and have been observed to be frequently used by local people for recreation. This provides some support for their importance as urban wildlife areas but a more detailed investigation would be necessary to confirm this supposition.

5.2 Evaluation of the importance of wastelands as urban wildlife areas

5.2.1 Overview

The evaluation method developed and described in chapter 3 demonstrates a way in which the importance of wastelands as urban wildlife areas can be determined. There are always problems with the use of evaluation methods (as noted in chapters 2 and 3) and the reliability of the method depends on various factors such as the quality of the data and careful use of the method (KILCHENMANN & SCHWARZ VON RAUMER 1999). Another difficulty is discussed by Jarvis concerning ecologists' acceptance of evaluation methods that use simplified ecological characteristics (such as habitats or land use type) (JARVIS 1996). However the method developed here is not supposed to replace ecological surveys and evaluation methods and does not aim to identify the pure ecological value of sites. Instead it should provide an additional evaluation method through which the importance of the sites for people to experience nature on a daily basis can be evaluated.

5.2.2 Requirements of the evaluation method

The method was developed in such as way so as to try to fulfil as many of the requirements for an evaluation method as possible (see FISCHER 1983, KILCHENMANN & SCHWARZ VON RAUMER 1999). These are explained briefly below:

- The evaluation process was made as simple and transparent as possible so that it can easily be followed and understood.
- Commonly used scientific methods were applied in the evaluation process and all steps were founded with well-researched scientific evidence.
- Appropriate aggregation methods were used to aggregate the sub-criteria for each of the main criteria. This was necessary since the presence of complementary or non-complementary criteria and the variations in scoring systems meant that it was not possible to use the same aggregation method throughout.
- The results for the four main criteria were kept separate to prevent information being lost. Although they can be aggregated in the final stage of the evaluation process, the separate scores are still clearly identified in the final table.
- The method was made as flexible as possible to enable the use of slightly different data, particularly in the evaluation of the locational characteristics of the site - for instance different types of greenspace data. It was not possible to make the method flexible regarding the allocation of scores to the various criteria or alterations to the aggregation methods, although in some cases this might be necessary (for instance if the sizes of sites being dealt with were significantly different). In theory it is possible to alter these sections of the evaluation process, but a degree of programming expertise would be needed to understand and alter the programming scripts. The greatest flexibility occurs in the last stage of the evaluation method where the user is free to rank the different criteria in the order he/she regards appropriate and thus influence the final outcome of the evaluation.
- The division of the evaluation criteria into site and locational characteristics meant that, as far as possible, all the important aspects of wasteland sites with respect to their importance as urban wildlife areas were considered. It is of course possible that if the evaluation method were developed by a different person that other criteria may have been used, but those used were based on a thorough investigation of the characteristics of such sites as well as research into the literature on wastelands and urban wildlife areas. One aspect not considered in the evaluation process was that of planning. Further criteria could be added to determine the value of sites with respect to aspects such as planning permission, land ownership etc.; this is regarded to be a possible further step in the development of the method.

5.2.3 Problems regarding the evaluation method.

One of the problems regarding this (and other) evaluation methods is that of errors. This is especially problematic in geographic information systems where errors may be carried over to different processes and result in large cumulative errors. Wilke emphasises the importance of the quality of data used in GIS, not only in the geometric and scientific precision, but also with respect to the completeness and usability of data (WILKE 1995). Quality not only refers to the data used but also to the methods used to analyse and model the data (WILKE 1995). There are several different stages at which errors can occur during the evaluation process (see WILKE 1995, MARTIN 1996):

- Data collection – Possibly the most significant and most probable source of error is likely to occur at this stage. Errors may occur during data collection in the field due to mis-interpretation, mis-classification etc. If existing data is being used, either in analogue or digital form, the data may be incomplete, out of date, or only available at an inappropriate scale.

- Digitising data - Both the raw data and the digitisation process may be prone to errors either through incorrect delineation, identification or classification of features.
- Manipulation of data - The transformation of data through spatial analysis or aggregation of data in the evaluation process may magnify errors if they are carried through from the original data. For instance if the population data for a polygon is incorrect, the resulting calculation of population density for wasteland sites situated near to that polygon will also be wrong, as will the final result for the related main criterion. Errors may also occur through mistakes in the spatial analysis methods but in this case the results of the evaluation method were checked carefully to ensure that the spatial analysis had been programmed correctly.

The main source of data error likely to occur in the evaluation method is in the quality of the data available. Population data is perhaps the most problematic as it is difficult to obtain data precise enough to give an accurate assessment of the population density within 300m of each wasteland site (see section 5.2.5). It is also difficult to ensure that population data is up to date, particularly on the urban fringe where development may take place relatively quickly (particularly in Leipzig) for which no population data is available. The other type of data whose quality may vary is that on greenspace (either with respect to networks or deficiency areas) since this depends very much on the amount and type of data available in digital format.

Other problems:

- The evaluation method concentrates on the current situation and does not take into account temporal changes, which are especially relevant to wasteland sites. The difficulty here is that it is almost impossible to model the development of wasteland sites as there are so many factors which would have to be taken into account. For example, with respect to the development of vegetation a variety of factors would have to be considered such as substrate, seed source, disturbance of the site by activites such as car parking, storage of materials etc.
- The suitability of a site might change (for better or for worse) through relatively minor alterations, such as removal or dumping of rubbish, removal of a fence etc. The possibility of change and its likelihood must be taken into account when interpreting the results of the evaluation. For instance a site with a low usability score may in fact require only minor changes to make it suitable as an urban wildlife area so should not be dismissed but instead should be looked at in more detail to see where the problems lie and how much input would be required to overcome them.
- A further problem has been identified in the aggregation of the four main criteria in the final stage of the evaluation process. The sensitivity analysis used to identify the most suitable sites identified sites which actually obtained a low score for some criteria and thus should not really be considered suitable as urban wildlife areas (see section 3.2.8). This is a problem with the use of the hierarchical optimisation (ranking) method as it does not necessarily use all values so sites with low scores in the lower ranked criteria may obtain a relatively high score overall. Possibly a more appropriate way to use the ranking method is to make an informed decision about the importance of the different criteria and rank them accordingly and then judge the suitability of the sites on the basis of this decision.

Errors can be (and were) avoided as far as possible but if errors are known to have occurred at some stage of the evaluation process, due to poor data quality for example, this must be taken into consideration when interpreting the results.

5.2.4 Automisation of the evaluation process - wasteland evaluation tools

The automisation of the evaluation process as an extension in ArcView (GIS) has various benefits, which are listed below:

- The evaluation process can be carried out quickly and can cope with a large amount of data.
- The programming of the evaluation method (in particular the scoring and aggregation methods) means that its application does not depend on the accuracy and expertise of the user in allocating/aggregating scores and thus diminishes the possibility of subjectivity and/or error in the execution of the method.
- Computer programming provides a means of testing the rationale of evaluation methods, programming language being very precise and logical. Weak points in the evaluation method were identified through the programming process and improved to ensure that the entire process was carried out in a logical fashion.
- The use of GIS in the evaluation process meant that calculations could be carried out, which would have been almost impossible (or very time-consuming) by hand - for instance the calculations for population density.
- The automisation of the evaluation process means that the evaluation method can be carried out many times using different data and the results can then be compared.
- The flexibility of the wasteland tools with regard to the selection of appropriate data feature themes means that they can be applied in different regions with different input data, as was demonstrated by the use of the evaluation method in both Leipzig and Birmingham.
- The combination of GIS and the evaluation method (i.e. a type of SDSS) provides a more rational, objective and non-biased approach to decision making than would be possible through manual execution of the evaluation method (see Carver 1991).
- The great advantage of the wasteland tools is that they can be used as an extension in ArcView and thus provide a practical application of the evaluation method. The division of the tools into three separate stages: evaluation of site characteristics, locational characteristics and compilation of results means that the tools can be used either as a complete set to produce a final result, or to determine interim results for the different stages to provide the information required by the user.

However despite the benefits that the wasteland tools provide, several difficulties were highlighted in the course of their development:

- The expertise and time required to programme the steps involved in the wasteland tools was under-estimated. Although the programming was carried out independently of the research project, it entailed enough work to be counted as a project in its own right!
- It is difficult to develop a set of tools which allow the user complete flexibility with respect to the choice and weighting of criteria. Web-based decision methods (such as that developed by CARVER et al. (1996)) offer the user the opportunity to select constraints and to weight criteria according to their opinions. Although this provides the user with flexibility, the results then depend very much on his/her expertise. In order to develop such a flexible evaluation method it must be developed in conjunction with the GIS. In this research project the evaluation method was developed independantly and then programmed into the GIS, which meant there were limits as to how flexibly it could be applied.

5.2.5 A comparison of the use of the evaluation method in Leipzig and Birmingham

A very interesting observation resulting from the implementation of the wasteland tools both in Leipzig and Birmingham was the difference in the availability of digital data in the city councils of the two cities. This may be due to various factors such as the amount of time and money invested in GIS by the authorities, external data available (such as Ordnance Survey data in the UK), compatibility of data between different departments and different organisations and the organisation of GIS facilities in the authorities - to name but a few. The problems regarding data availability and accuracy are outlined in section 3.5 and will not be discussed in further detail here. However the application of the wasteland tools depends on the availability of digital data (e.g. for greenspaces, wildlife areas, etc.). Some data can be digitised in a short space of time (for instance foot or bike paths) but other data is more time-consuming to obtain and digitise and the lack of such data in digital form will make the use of the wasteland tools non-viable.

An example of one type of data whose availability varied considerably was population data. In Birmingham this is available in the form of census data in digital form, whereas in Leipzig data is only available for districts (rather larger units). In both cases more precise data is required for the evaluation, which in Birmingham is also for be available for enumeration districts (smaller units than wards) and in Leipzig can be obtained for residential blocks but the latter is complex and expensive to obtain. An optimal solution in Leipzig would be the availability of population data for the different residential structural types (as used in the evaluation process in Leipzig) but unfortunately this data does not exist.

Another major difference between the two cities was the the availability of digital data on wastelands. In Birmingham several different categories of wasteland sites are identified and are available in digital form. One reason for the comprehensive and up to date coverage of wasteland data is the requirement to produce data for the government's statistics on land use and land use change, and now for the National Landuse Database (see Table 29). In Germany there is no national coverage of wasteland (or Brachflächen) and thus less incentive to keep up-to-date information on such sites. The development of a wasteland cadastre in Leipzig is a positive step, but due to the large number of sites and the complexity of the cadastre it will be difficult to attain and maintain an accurate record of wasteland sites throughout the city.

5.2.6 Potential for the application of the wasteland tools

The tools can certainly provide an aid to decision making processes within local authorities, but a prerequisite for their use is the availability of the required digital data. If this is available, the only time consuming part of the process is to carry out the field survey of the wasteland sites. However this could be carried out either directly by the local authorities or in collaboration with a local university or institute of higher education, if the resources are not available within the authority. Naturally if the digital data is not available, and if the wasteland sites themselves have not been digitised, it becomes more problematic and time consuming to implement the evaluation method.

Without the use of decision-making aids the future use of wasteland sites often depends solely on chance. Development of many sites is inevitable (and in many cases appropriate) but the identification of sites that are currently or potentially valuable as urban wildlife areas means that projects can be implemented and resources put to use where they are likely to have the most effect.

5.3 Discussion of strategies used to convert or use wastelands as urban wildlife areas

5.3.1 Comparison of strategies in England and Germany (Leipzig and Birmingham)

General policies on the regeneration of wastelands

The general policies on the regeneration of wastelands are fairly similar in both Leipzig and Birmingham. National policies emphasise the importance of regenerating wastelands to a positive use and making the best use of the finite supply of land (DOE 1991a, BNATSCHG 1998). In both Leipzig and Birmingham policies support the development of wastelands/brownfields over greenfields in order to prevent an uncontrolled spread of development and to bring investment back into the inner cities (BCC 1993, STADT LEIPZIG 1999a). In England this is particularly relevant with respect to the construction of houses on brownfield land (see DETR 2000b). In contrast in Leipzig the high number of empty apartments in the city means that there is little pressure for yet more housing development and current policies support an improvement of the urban environment through a reduction in housing density and the greening of inner-city wastelands (especially empty housing plots) (STADT LEIPZIG 2000a).

Policies on the creation or protection of open space

Both Birmingham and Leipzig recognise the importance of open space in urban areas although the emphasis on the type of open space is somewhat different. Whereas in Leipzig policies refer to greenspace, those in Birmingham are more specific in stating the importance of urban wildlife areas or "natural greenspace". This is echoed by the national nature conservation policy in England which also recognises the importance of urban wildlife areas (EN 2000).

Another interesting comparison is the attitude of the city councils to the use of wastelands as urban greenspaces or urban wildlife areas. It is interesting to note that whilst Leipzig recognises the ecological and social importance of such sites, there are no instruments for their protection whereas in Birmingham urban commons are protected as part of the natural assets of the city (BCC & LAND CARE ASSOCIATES 1997). On the whole Birmingham seems more willing to protect wastelands for their existing social and ecological value, whilst Leipzig leans more in the direction of protecting those that are ecologically valuable and 'improving' others through landscaping measures (STADT LEIPZIG 1999a). The attitude to wastelands varies throughout Germany with regions such as the Ruhr area recognising and supporting the importance and use of wastelands as urban wildlife areas.

Strategies for regenerating wastelands to greenspace

The main difference in the strategies dealing with the regeneration of wastelands in Leipzig and Birmingham to greenspace is the level at which these are developed. The different political structure in England and Germany means that in England most regeneration strategies are developed at the national level, whereas in Germany the individual Länder are responsible for the development of regeneration strategies (although this is guided by federal laws). Another major difference is that strategies have only recently been developed in

Leipzig to deal with the problem of the regeneration of wastelands (at the most since 1991), whereas in Birmingham strategies have been developed since the beginning of the 1980s.

The longer history of regeneration in England, and for instance in Länder such as NRW, means that a variety of institutions and organisations have developed to cope with the issues of regeneration. The Groundwork Trust is an example of such an organisation in England and (as discussed in section 4.2.4) is active in the regeneration of wastelands to urban greenspaces. In Saxony there are no major non-governmental organisations dealing with urban regeneration, the only non-statutory organisation contributing to wasteland regeneration in Leipzig being the Green Ring.

The organisation of wasteland regeneration within the city councils also differs in Leipzig and Birmingham. In Leipzig a working group was set up to deal with the difficult and complex issue of wasteland regeneration as this required inter-departmental action. In Birmingham the issue of wastelands is no longer so problematic and on the whole the departments tend to work on their own issues, working groups being set up between different departments as and when necessary. It is possible that with time a similar approach will be taken in Leipzig as it is unlikely that all departments will need to be involved in all the issues regarding wasteland regeneration once the number of wasteland sites decreases.

Both cities have recognised the importance of compiling records of wasteland sites. In Birmingham this forms part of the land use information, which is required not only by the city, but also by central government for the National Land Use Database. The data is integrated into a well-developed GIS and most planning information is also available in digital form, which makes updating and accessing information relatively simple. In Leipzig the data on wasteland sites is still being compiled and there is currently very little planning data available in digital form, that which is available being scattered amongst different departments. This makes any form of evaluation or investigation process time-consuming and complex to undertake. It is hoped that the situation will improve in the near future but there first needs to be development in terms of the availability of GIS and sharing of data between departments.

Instruments used in Leipzig and Birmingham for use of wasteland sites as urban greenspaces (in particular urban wildlife areas)

The wide range of grants available in Birmingham from a range of different sources contrasts with the provision of grants in Leipzig, the latter being almost entirely in the form of urban development grants from the Land of Saxony (see Table 29 and Table 30, section 4.2.5). The availability of grants for the creation of natural greenspaces from the National Lottery and other funding sources in England demonstrates the national interest in the provision of wildlife areas for people and the importance of involving people in both the creation and management of these sites (see for instance EN 2001c).

One source of funding which is of particular importance both in Leipzig and Birmingham is European funding via the ERDF (European Regional Development Fund). This is provided indirectly through urban regeneration grants, such as the “Stadtentwicklung” (urban development) grant in Saxony.

Interestingly the planning instruments used to convert or secure wastelands as greenspaces are similar in Leipzig and Birmingham. In both cities some sort of compulsory purchase order is available (although this is rarely implemented) as well as compensation measures for

development. However the compensation measures are undertaken quite differently in the two cities, with them being a legal requirement in Germany, whereas the use of Section 106 agreements in England is left very much up to the local planning authority. The current development of a cadastre of compensation measures in Leipzig and the possibility to carry out such measures away from the place of intervention (or development) provides a perfect opportunity for using this instrument to implement compensation measures on urban wastelands. Although in theory this results in an increase in the ecological value of the site, there is a danger that the widespread use of this instrument on wasteland sites will eliminate these wild playgrounds from the urban landscape.

5.3.2 Practical implementation- wasteland sites as urban wildlife areas

As stated in chapter 2, wastelands have a high economic importance, not only from the point of view of planners, but also landowners (see section 2.2.4). It is thus often difficult to convince both these parties that the optimal use of the site is as a greenspace or more specifically an urban wildlife area. There are, however, opportunities for using wastelands as urban wildlife areas, either in an informal manner, or through formal planning measures. This is often easier when the site is in local authority ownership, as the provision of sufficient greenspaces and an attractive urban environment are some of the tasks of local government, whereas private owners are interested mainly in the economic output from their land holding.

Organisations involved in the creation of urban wildlife areas

A wide variety of organisations are involved in the use of wastelands as urban wildlife areas. In many cases more than one organisation is involved in a project, for instance regeneration agencies tend to work together with local councils, who in turn work together with local groups. Although local groups play an important role in urban wildlife area creation and management, they often require the help of a larger organisation, for instance Groundwork in the UK, to provide them with access to financial or practical assistance. On the other hand, in some cases it is the local groups who have access to funds, which are unavailable to larger agencies. When it comes to purchasing sites it is larger organisations that either own sites themselves or have the funds and capability to arrange for purchase (for instance the Grundstücksfonds in the Ruhr area of Germany); this is important in many cases as funding is often only available for sites owned by the local authority or by the organisation applying for funding.

Instruments used to create urban wildlife areas

There are a wide variety of instruments that can be used to secure wasteland sites as urban wildlife areas (as demonstrated in section 4.2.5). The case study of Brandts Aue shows an interesting mix of instruments, with three different instruments being used on the one site. This is termed a “Fördermittelmix” and is permissible as long as there is no double funding of activities.

An interesting point is that compensation measures (or section 106 agreements) were identified as a potential instrument for undertaking landscaping or site improvement measures on all of the four case study sites. This indicates the importance of such instruments with respect to securing wasteland sites as greenspaces, even if part of the site is developed (as is the case on the Selly Oak site in Birmingham).

A type of instrument whose use has possibly not been exploited fully is the use of agreements or contracts. In many cases owners are willing to give up their site for an interim or long-term use, as long as they are absolved of any responsibility for the site. The use of such agreements provides an alternative to purchasing the site to secure its use as an urban wildlife area. Experience with such agreements in Leipzig has not yet been particularly positive but the successful use of such instruments in the Ruhr area and in other cities demonstrates their potential value. Nevertheless, in reality they are only likely to be applicable in cases where the development of the site is unlikely for economic or environmental reasons.

Different approaches used to create urban wildlife areas

The three main approaches used to convert or use wasteland sites as urban wildlife areas have been discussed in section 4.2.6. There are advantages and disadvantages of all of these approaches and the approach used will depend on the planned use of the site as well as the funding available. The relaxed, low cost approach of using natural processes (as supported by BRADSHAW 2000) is possible in urban areas where the vegetation has already developed, but is difficult to countenance on sites which are completely devoid of vegetation. A common phenomenon in Leipzig is the landscaping of wasteland sites that were previously sealed with concrete or tarmac. In most cases topsoil is brought onto the site and the site landscaped with trees and a grass mixture, thus creating a "typical" urban greenspace and losing the individual character of wasteland vegetation. Perhaps a more interesting approach would be to undertake minimal landscaping and allow, at least on part of the site, natural succession to take its course.

In some cases wasteland vegetation is not suitable for an urban wildlife area, as was found on a former agricultural site in Leipzig that had become overgrown by an impenetrable stand of thistles and stinging nettles. In such cases some form of management of the existing vegetation and low-key landscaping measures are more appropriate.

On formal urban wildlife areas, such as Camley Street in London, the initial landscaping of the site has in time developed into an attractive and valuable range of wildlife habitats. The intense use and high regard for the site have demonstrated that the rather expensive initial measures have paid off (see JOHNSTON 1990).

The examples in chapter 4 have shown that there is a place for all the different approaches to the creation of urban wildlife areas but the options should be carefully considered before the approach is decided upon. In many cases expensive landscaping measures are not necessary and simple measures (as recommended by Baines and Smart) will suffice. These may include labelling the site, to show that it is a managed and valued site, restricting vehicular access to prevent disturbance and fly-tipping, and keeping the edges of the site tidy to demonstrate a level of care and management of the site (see BAINES & SMART 1991). With careful thinking and planning tragedies such as the uprooting of an old orchard to make way for a school's garden (which occurred in Leipzig) can be avoided in the future.

Management of urban wildlife areas

On almost all urban wildlife areas some sort of management is required to prevent the eventual development of the vegetation into woodland. Although in some cases woodland may be a welcome end stage, in most cases it will result in a loss of habitats that are valuable both for recreation and ecology. Reidl recommends the retention of areas of particular

successional stages (such as pioneer vegetation) in selected areas of wasteland sites whilst leaving other areas of the site to develop according to the natural vegetation dynamics (REIDL 1998). A degree of management is seen to be essential on most wasteland sites to prevent the situation which has developed in Essen where the natural playgrounds created on wasteland sites are almost all overgrown by trees; this is perhaps not the type of greenspace favoured by the local residents, especially with regard to the potential for children's play (AUGUSTIN 2001).

In most cases management will depend on the resources available as well as the use and users of the site. Often urban wildlife areas are managed by a local conservation group (as is the case with pocket parks) or their management is influenced by the activities and use of the site (particularly with more intensively used sites such as Camley Street or Gillespie Park in London). The involvement of local people in the management of urban wildlife areas is not possible in all cases but can lead to a reduction in costs and a greater feeling of belonging and a sense of responsibility for the site (JOHNSTON 1990).

Other issues related to the use of wastelands as urban wildlife areas

Liability - This is an issue which often arises with respect to wasteland sites. Owners are often unwilling to allow access to sites on which accidents could occur, for which they would be liable. This seems to be an attitude of mind as much as a real legal issue, as the overwhelming consensus in Birmingham was that this was not a particular problem, whereas in Leipzig it was an issue that was taken very seriously by the City Council. With respect to the Trust for Derelict Land (see section 4.2.4), liability was not thought to be an issue with large landowners or companies that would donate land to the Trust since they could afford to risk the unlikely occurrence of a liability problem. For sites owned by private persons or by the local council the liability issue could be overcome by including the site within the city's own liability contract (which is valid for all greenspaces dedicated to the public).

Long-term security of sites - The issue of long-term security is especially important in terms of obtaining funding for measures carried out on wasteland sites. In most cases the site must belong to the local authority but there are other possibilities for securing the long-term use of a site. One of these possibilities is currently being developed in the form of the Trust for Derelict Land (see section 4.2.4) where sites are donated to the Trust for a period of ninety-nine years (see GROUNDWORK 2001). The Grundstücksfond in the Ruhr area is another mechanism through which the ownership of the site is secured and the local councils are able to stipulate the future use of the site.

The problem of long-term security is not only that of ownership, but also of the future management of sites. This is a particular problem with respect to the use of compensation measures in Germany where there is frequently no money for the future management of the site once it comes under the responsibility of the local council. Here a similar mechanism as that used by the Trust for Derelict Land could be implemented where landowners (or for instance those paying for the compensation measure) would pay an endowment for the site, the interest from which could provide for the management of the site. Public participation is also a way of ensuring the long-term management of the site, although this depends on the on-going enthusiasm of the local group, something that cannot be ensured. It can, however, be supported by continued input from the local council or an organisation such as the Groundwork Trust or Green Ring.

Public participation - The participation of the public in both the creation and management of urban wildlife areas is of great importance with respect to the acceptance of the sites and their long-term security, as has been shown by the vociferous opposition to the loss of such greenspaces (for instance in the case of Selly Oak in Birmingham or Gillespie Park in London) (see section 4.2.6). Research at the University of Manchester has revealed that a community-led, ecologically informed approach to wasteland reclamation is beneficial for three main reasons:

- it is more cost effective and cheaper than traditional approaches;
- long-term perspective is taken, which reduces the likelihood of the site becoming derelict again;
- a holistic approach is inevitable since local people are involved in the project (see LING & GRIFFITHS 2001).

A practical example of community involvement in wasteland regeneration has been successfully implemented in Leipzig where local schoolchildren were involved in the planting and management of a site. They have since formed a working group within the school to care for the site in the future (KLEIM 2001).

Acceptance of wastelands as urban wildlife areas - The acceptance of wastelands as a type of greenspace in their own right is something that will not come about overnight. In many cities such "wild" nature is considered valuable, but there will always be people who regard such sites as being unkempt or untidy. The designation of some of these sites as sites of importance for nature conservation (as is the case of the Selly Oak site and Burbury Brickworks – see section 4.2.7) demonstrates that the ecological value of these sites is also seen to be important. The inclusion of urban commons in nature conservation strategies (as in Birmingham) or an acceptance of urban commons or wasteland as a valuable habitat - for instance industrial nature in the Ruhr area, or wasteland in London (see GLC N.D., DETTMAR 1997) - makes a positive step in the acknowledgement of their value.

In addition to official recognition of the importance of wasteland sites, there also needs to be accompanying interpretation of the value of these sites to increase people's awareness and acceptance of their importance in the urban landscape.

The relationship between policies and practice

The final point in the discussion is whether the policies laid down by different countries and cities are actually put into practice.

In both Leipzig and Birmingham the use of wastelands as urban wildlife areas complies with both the open space and regeneration policies, although in both cases wastelands are also seen to be valuable sites for development in preference to greenfield sites. The brownfield/greenfield debate is difficult to solve, since although it is sensible to prevent continuing growth, there is also an argument for improving the environment in the inner cities, which in turn would help to prevent outward growth by attracting people back into the cities. A degree of growth is inevitable and also necessary in order to keep the town or city on a positive economic footing, since if no suitable sites are available, investors will go elsewhere; thus a compromise has to be found between the two uses of wasteland sites.

The use of wasteland sites as urban wildlife areas (or greenspaces) can also be a real test of a local authority's planning policies. Local authorities frequently disregard the amenity

potential of wasteland sites as they consider them more valuable for the siting of new houses or other developments, ecology and amenity being secondary to financial gain (SMYTH 1987, ELKIN & MCLAREN 1991). However, if a site is of great importance with respect to nature conservation, and this is emphasised in local planning policies, the development of such a site would show that economic interests even come before the well thought out, long-term planning of the area. In this respect it will be interesting to see whether the Selly Oak site (see section 4.2.7) will be secured as a greenspace as planned, or whether the development proposals will go against the policies laid down in both the development plan and nature conservation strategy of Birmingham.

5.4 Conclusions and recommendations for further work

5.4.1 Conclusions

Urban wastelands can provide valuable wildlife areas on which people are able to experience and enjoy nature. Sometimes the wastelands can be enjoyed as they are – the so-called "urban commons" – whereas in other cases some sort of management or intervention is required to convert wastelands into wildlife areas that can be used by people. There is a need for increased interpretation and education about the value that wastelands may have for wildlife, both to secure wastelands in the urban landscape and to increase people's appreciation of the wild nature that exists on their doorsteps.

Through the use of the evaluation method the importance of wasteland sites as urban wildlife areas can be determined. Although this tool must be used with caution, taking into account possible data errors as well as the individual characteristics of the sites, it nevertheless provides a useful aid to decision making, especially if used in combination with planning or land use data in a GIS.

There are many different strategies in use or available to convert or use wasteland sites as urban wildlife areas. Care must be taken to ensure that the wild character of these sites and their typical ecology is not lost during landscaping or management works. The inclusion of local people in projects to create urban wildlife areas on wasteland sites is important to ensure acceptance of these sites by the local population and their continuing success. Although there are cases where people have been involved in projects, this often depends on the policies and ideals of the organisations involved. Alterations to grant specifications could help to ensure that local people are involved in the creation and management of urban wildlife areas.

5.4.2 Recommendations for further work

A problem which has been brought to light several times during the course of this research project is the lack of information available on people's views and wishes with respect to urban greenspaces and the use of urban wastelands as urban wildlife areas. It is generally accepted that urban wildlife areas are required in towns and cities so that people can have contact with nature in their daily lives. There is a definite need for research in this field to determine if people really want such urban wildlife areas, in particular the kind that develop or are developed on urban wastelands. There is also a need for research on how these should be managed and landscaped so that people obtain maximum use and enjoyment from these sites. Of particular relevance are the opinions of children, who tend to be the main users of urban wildlife areas but are rarely included in user surveys or research projects. It would also be interesting to carry out such research in different countries or different regions to determine whether cultural or regional influences have an effect on people's opinions.

Another topic for future research, carrying on from the investigation of people's views of urban wildlife areas, would be the study of people's views of a selection of wasteland sites in the study area in Leipzig. Information could be collected on whether or not people used the sites, and if so why, as well as people's opinions on the current or potential value of the sites as urban wildlife areas. In some cases people may use sites simply because there is nothing else available but in other cases they may value the wildlife of these wasteland sites. Such

information would provide a valuable insight into how wasteland sites should be managed and whether or not they are valued by the local population as part of the urban landscape.

The third topic for long-term study would be to follow the course of development of several wasteland sites into urban wildlife areas. This has been done briefly through the investigation of the case study sites in this research project (see section 4.2.7) but it would be interesting to study in more detail the development and use of sites that have been used as or created into urban wildlife areas. Aspects such as acceptance and use of sites, long-term management, ownership and liability issues and funding should be included in the study (as discussed in section 5.3.2). Public participation is another very important aspect in the creation and success of urban wildlife areas (as demonstrated by LING and GRIFFITHS 2001) and is something that should also be researched more thoroughly with respect to the long-term study of urban wildlife areas. A study of this sort would provide interesting and valuable information about the practical creation or use of wasteland sites as urban wildlife areas.

A fourth area of interest for further work is the development of the evaluation method. The method developed in this research project concentrated on the investigation of the suitability of wasteland sites as urban wildlife areas but it would be interesting to take this a step further and investigate the value of sites from other points of view. For instance criteria could be developed to investigate the value of sites for development and this could then be compared with their value as an urban wildlife area. This could make use of the approach developed by Freeman, which aimed to determine the ecological, amenity and development value of naturally regenerating sites (see FREEMAN 1997).

The GIS could also be developed further with respect to the use of the evaluation method and the decision making process. Valuable information such as site ownership, proposed land use, and other planning information could be made available in the GIS through linking the data to existing databases. This will, or course, depend on the availability of the data in digital form and the ability to access such data but such a system would be of value for decision making both in research and in practice.

Figure 17 *Acocks Green Millennium Green, Birmingham (photo H.Herbst)*

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