Allen Pyke Associates

Sustainable Design Handbook

Version 1.1
February 2010

Landscape Institute
Registered practice

URBAN DESIGN GROUP

iema
INSTITUTE OF ENVIRONMENTAL MANAGEMENT & ASSESSMENT

ISO 9001 : 2000

INTRODUCTION

The Sustainable Design Handbook has been developed in conjunction with the Sustainable Design Checklist in support of Allen Pyke's Environmental Policy and our continuing commitment to environmentally sensitive design.

The handbook provides a summary of environmental issues to be considered at each stage of the design process and a list of current sources of further information on each subject. Staff are expected to keep abreast of current best practice and are invited to contribute to the ongoing development of this Handbook.

The Sustainable Design Checklist provides the opportunity to assess, record and improve the environmental performance of all Allen Pyke schemes throughout all stages of the design and management process. The checklist is intended for use on all projects.

For further Information on the Sustainable Design Checklist refer to the relevant section of this document. A completed sample is included as an appendix.

Allen Pyke's environmental policy responds to a concern about environmental degradation borne from unsustainable development and a professional obligation 'to protect, conserve and enhance the natural and built environment for the benefit of the public (extract from object of Landscape Institute)'.

ENVIRONMENTAL POLICY

As a practice Allen Pyke Associates recognise that landscape design plays a key role in determining the overall sustainability of a project. We are fully committed to maintaining and enhancing all aspects of the environment through the work we undertake. We seek to minimise impact on resources and to advise clients of best practice where ever possible.

Design
The practice has developed a Sustainable Design Handbook and Checklist. The handbook is reviewed monthly and updated accordingly. All projects undertake reviews where the Checklist is considered, providing the opportunity to assess, record and improve the environmental and sustainable aspects of a scheme.

When specifying materials for use of schemes we make every effort to avoid materials from non-renewable sources and to recycle waste materials on-site. We encourage clients to consider Sustainable Urban Drainage on their schemes and to make best use of water resources, where possible retaining water on site for irrigation purposes.

We promote bio-diversity on our projects and where required will always refer to the expert opinion of Ecologists or Arboriculturalists for specialist advice. We also promote initiatives such as Healthy Living strategies for all schemes and seek to incorporate these principles in to all urban and landscape design projects. We seek to ensure that management and maintenance objectives are considered at the early stages of the design process to ensure that the longer term viability of a project meets the appropriate sustainability levels.

The practice adheres to all government guidance for planning, development and sustainability. We regularly work on developments which achieve 'Very Good' or above Eco-Homes; Code for Sustainable Homes level 4 and above. We constantly monitor current thinking and guidelines to ensure best practice is applied across all our schemes and train staff accordingly.

Travel
Our work often requires us to travel to sites or meetings across the country, where possible we encourage use of public transport. The office is located within 5minutes walk from a mainline train station and a number of bus routes. Driving to work is discouraged and no provision is available for staff parking. Cycle storage and shower facilities are provided for staff. Please refer to our Green Transport Policy for further details.

Resources
Within the office we employ a private company for weekly collections of all materials for recycling and have an active policy of avoiding waste and promote recycling of paper and other items such as used computer equipment. Where possible products used within design teams and administration are produced and sourced from ethically preferable sources.
A member of staff is responsible for ensuring that all equipment used within the office consumes minimum resources and reviews all new purchases in this respect.

Review
This Environmental Policy (EP) is reviewed formally on an annul basis and informally on a monthly basis as part of the regular management meetings. The Director responsible for the EP monitors progress and issues relating to the policy and reports to the office every two months at office meetings.

CONTEXT

ENVIRONMENTAL ISSUES

Humans have always adapted their surroundings to suit their needs; however, a growing global population with an increasingly profligate lifestyle has led to a degraded environment and a threat to our habitat.

The Intergovernmental Panel on Climate Change ((IPCC), the leading body for the assessment of climate change established by the United Nations) states that warming of the climate system, contributing to rising sea levels and extreme weather events (in turn threatening habitat), is unequivocal and that green house gases released due to human influence is very likely the cause.

They forecast that green house gas emissions at or above current rates will lead to greater changes than those observed so far and therefore recognise the need to both prepare for change (both existing and anticipated from current output) and to mitigate against future change by reducing emissions. The IPCC postulate that global warming could lead to some impacts that are abrupt and irreversible and suggest that unmitigated climate change would be likely to exceed the capacity of natural, managed and human systems to adapt.

RELEVANCE TO LANDSCAPE

In response to the IPCC's report the Landscape Institute (LI) held a conference on climate change to publicise the issue in relation to landscape and later published their position statement 'Landscape architecture and the challenge of climate change', discussing the role and responsibility of a landscape architect in enacting change. The latter begins by quoting national forecasts established for this century by the UK Climate Impacts Programme (UKCIP), who predict hotter drier summers and warmer wetter winters (35-50% drier by 2080), an increase in the frequency of some extreme weather events and rising sea levels.

The LI recognise that these factors could significantly effect landscapes through the intensification of the urban heat island effect, increased droughts, increased flooding, loss of land to rising sea levels, decreased air quality, ecological change and altered landscape character. Consistent with the IPCC's conclusions the LI propose amending conventional practice to both mitigate change, and adapt to it. They recognise that the sustainable design and management of multifunctional spaces is essential to these objectives and claim landscape architects, if technically equipped, have a significant role to play in promoting and delivering a sustainable future.

It is recognised that the role of the landscape and in turn a landscape architect is key to achieving a positive environmental outcome for a project. A sustainable solution may not look radically different from a traditional landscape but must embody conscientious design and specification within. In order to achieve an improved environmental performance for a project it is therefore necessary for designers to be concerned for and critical of more than just the aesthetic or functional outcome of a space. To this end, it is important that landscape architects are technically equipped to identify and mitigate potential environmental issues associated with their projects.

http://news.bbc.co.uk/weather/hi/climate
www.ipcc.ch
www.landscapeinstitute.org/policy/positionstatements.php
http://news.bbc.co.uk/1/shared/spl/hi/sci_nat/04/climate_change/html/climate.stm

APAL SUSTAINABLE DESIGN CHECKLIST

WHY DO WE NEED A SUSTAINABLE DESIGN CHECKLIST?

As stated previously, scientists recognise the dangers of continuing environmental change and suggest avoidance and mitigation principles, both embraced by the Landscape Institute. In addition, the government, the wider construction industry and the public are increasingly aware of, and motivated by, environmental issues and sustainable design.

At a government level this is reflected by the initiative; Code for Sustainable Homes, which seemingly endorses and requires sustainable development. However, whilst the document contains a valuable sentiment, it is heavily biased towards improving the profile of buildings, and does not enable full evaluation of the environmental credentials for a development as a whole, nor specifically the landscape contribution. Nor is there a recognised industry standard that does so.

This may be because, whilst the construction industry is widely acknowledged as embodying huge environmental damage through resource consumption and waste, the landscape is perceived as green and therefore a mitigating element, or at worst, benign. This is of course a fallacy, as will be illustrated during the course of this handbook.

The space around buildings plays a key role in determining the sustainability of a development, with a contribution that can be negative or positive. For example, landscape features influence microclimate and in turn building efficiency, planting design effects wildlife value on site, and all materials, whether hard or soft, embody some degree of environmental degradation.

It is therefore our role as landscape architects to ensure that we understand the environmental issues related to landscape design and are technically equipped to deliver solutions that contribute to the overall sustainability of a project. APAL staff are expected to understand the fundamental issues of environmentally sustainability, derived from personal CPD. This handbook seeks to supplement this knowledge to enable a positive contribution to the process of sustainable design.

The Sustainable Design Checklist has been devised to both prompt the consideration of sustainability issues within the process of design and management of landscapes, and to allow the environmental profile of schemes to be assessed and recorded. It is intended that the checklist will become a standard form and completed for all projects to encourage the improving environmental performance for all Allen Pyke schemes.

www.communities.gov.uk/planningandbuilding/planning/planningpolicyguidance
www.communities.gov.uk/planningandbuilding/buildingregulations/legislation/codesustainable
www.breeam.org

HOW TO USE THE SUSTAINABLE DESIGN CHECKLIST

The template sets out the main environmental issues set against each stage of the design process. A blank box to the right hand side of the page allows the project Landscape Architect to record whether and/or how each aspect has been considered and ideally how sustainability features have been incorporated into the scheme, and if not, based upon what constraints. This information will form a permanent record and will be used both to assess the landscape contribution to the environmental performance of a scheme, as well as providing a record of experience to benefit future projects.

Allen Pyke Associates — Sustainability Checklist

Project Title / Location		**Project No.**			
Project Type / Sector		**Client**			
Project Status		**APAL Ref**	2200-SC-01	**Revision**	
Eco Homes / Breeam Req.		**Date**		**Prepared by**	
APAL Drawings / Documents Ref.					

This 'Sustainable Design Checklist' is 'in house' tool to promote and record the improving environmental performance of all Allen Pyke schemes throughout each stage of a project. The Checklist highlights the key environmental issues concerning Landscape Architecture with suggestions for positive action. To be used in conjunction with the APAL Sustainability Handbook. Note this list is not exhaustive.

Category	Considerations	Comments on design
1. Design - initial design stage / masterplanning etc		
1.1 Green infrastructure (multifunction+ connection = maximum beneifts)	What 'green infrastructure' is there in the surrounding area?	
	Is it possible to connect to green, or other natural elements beyond the site?	
	What additional functions are provided on site eg. water and waste management, food production, energy production, recreation, wildlife benefit, transport links, health benefits, microclimate control?	
1.2 Versatility / Adaptability	Are spaces multifunctional or capable of accommodating different uses at different times?	
	Are spaces easily adaptable, in anticipation of change of use, fashion, climate change or technical innovation?	
	Will vegetation survive predicted climate change (rainfall / temperature etc)?	
1.3 Building Efficiency / Microclimate Control	Can shade be provided for summer cooling?	
	Is light and solar gain available in winter?	
	Is summer breeze (south west prevailing) permitted through open shelter?	
	Is effect of winter wind (northerly) restricted with dense shelter?	
	Has adequate green space been provided to moderate effect of Urban Heat Island?	
	Is air pollution mitigated by proposals?	
	Can secure outdoor clothes drying space be provided?	
1.4 Renewable Energy	Is there opportunity to incorporate renewable energy provision within the scheme?	
	Has enough space been allowed for such facilities (including servicing etc)?	

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The following section sets out the environmental issues to be considered throughout the various stages of a project; design, specification, management and maintenance, and job running.

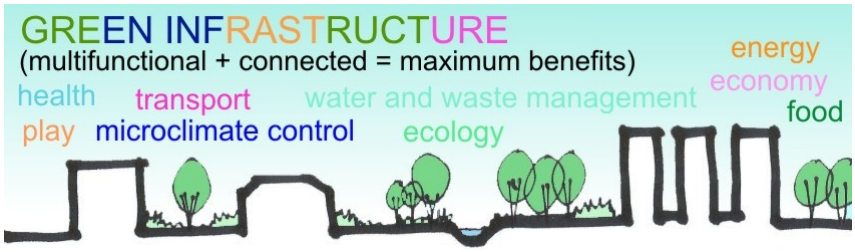
DESIGN

GREEN INFRASTRUCTURE

The term 'Green Infrastructure' typically describes a network of green spaces and other natural elements that are arranged and managed to deliver a wide range of environmental, social and economic benefits from site level through to the national scale.

The principal idea of Green Infrastructure is to maximise the benefits from the environment, through the sustainable and efficient use of spaces and elements, to provide multifunctional and interconnected landscapes.

This position usually discourages landscape providing for a single function (eg. a park for recreation) and instead promotes the design of spaces accommodating numerous overlapping functions (eg. a park for recreation, ecological interest, water management, transport links and food production). In addition, spaces and elements are no longer seen in isolation, but as part of a wider environment, with the potential to positively contribute on a scale wider than the site level (eg. vegetation within the park extending into the surroundings to offer wildlife corridors).



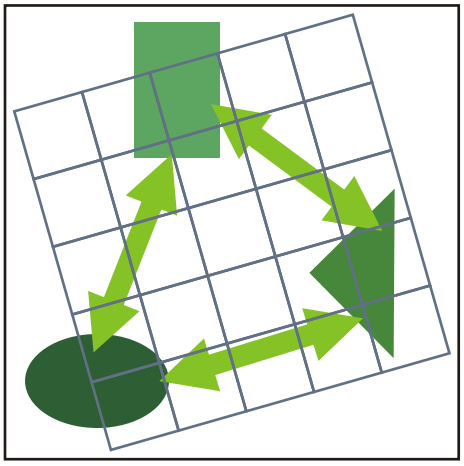
VERSATILITY / ADAPTABILITY

It is important that a landscape is versatile in its day to day function and easily adaptable over time, to maximise the efficiency of a space and to reduce associated costs.

Consistent with the principles of 'GI', a space should aspire to be multifunctional, accommodating where possible and appropriate additional benefits. For example, a space may be intended primarily for car parking, but could also be designed in such a way as to allow play, market gatherings and sculptural interest when not utilised for parking, thus adding value to a development.

A space should also be designed to avoid early obsolescence through an ability to anticipate and adapt to changes in the way people use outdoor space (eg. due to fashion, technological advances or climate change).

Www.greeninfrastructure.eu Responsive Environments, Bentley et al, pages 56-75
www.naturalengland.org.uk/ourwork/planningtransportlocalgov/greeninfrastructure
www.sustainablecities.org.uk/green-infrastructure
www.landscapeinstitute.org/PDF/Contribute/GreenInfrastructurepositionstatement13May09.pdf



MICROCLIMATE CONTROL / BUILDING EFFICIENCY

Development should be sensitive to existing microclimate conditions to avoid reliance on excessive site manipulation and the inclusion of mitigating landscape features. Where this is not possible landscape design can greatly improve negative conditions, and can even reduce the operational energy in buildings by modifying wind and solar radiation.

Passive solar access and shade

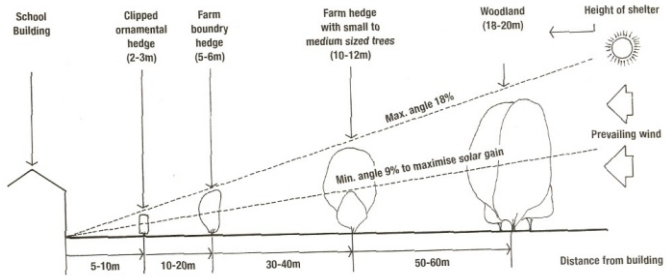
In winter the sun can positively heat a building whilst the summer sun can overheat. It is therefore desirable to provide solar access to the building in winter and shade in summer. This can be achieved by positioning deciduous vegetation (trees and climbers) to the south of buildings.

Wind modification/ insulation

Vegetative shelter can reduce energy use in buildings by 5-20%. In summer a building can be positively ventilated by wind whilst in winter removal of heat is undesirable. It is therefore desirable to permit summer breezes whilst preventing the worst of winter winds. The best compromise is to create dense shelter to the north (coldest winter winds) and open shelter to the south west (prevailing wind all year).

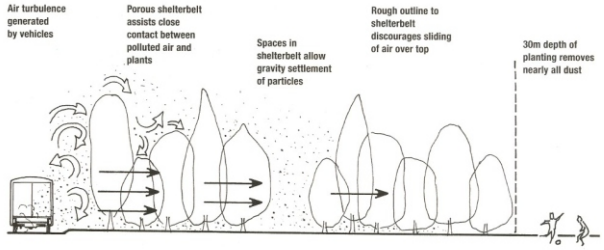
Urban heat island

In essence, the Urban Heat Island effect describes extremes in temperature caused by development, which consumes materials effective at retaining heat. Green space can help to moderate temperatures, providing an antidote through trees, green roofs, climbers etc.



Air pollution

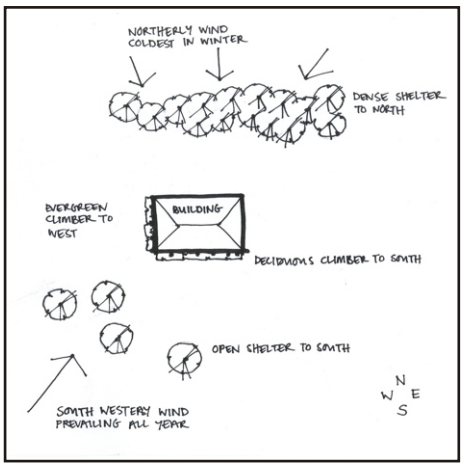
Vegetation is highly effective at ameliorating air pollution; with a 30m depth of planting eliminating dust whilst even a modest line of trees can achieve 25% reductions.

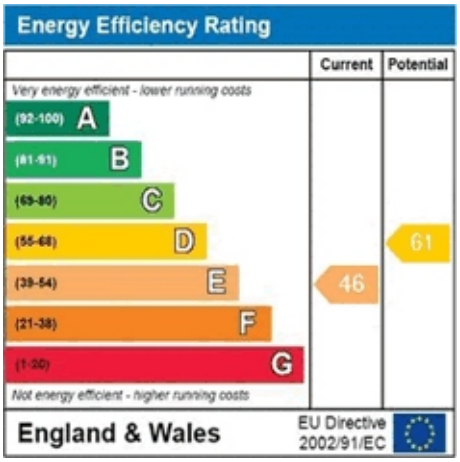


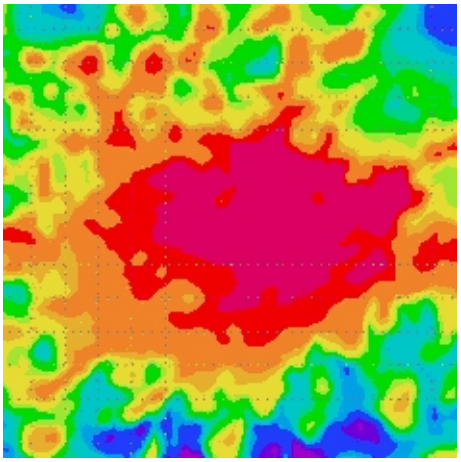
Noise pollution

Vegetation does little to reduce the effects of noise. A solid barrier as close as possible to source is the most effective solution, however, planting is often complimentary to the cause, acting as a visual screen and providing wind shelter.

www.communities.gov.uk/planningandbuilding/buildingregulations/legislation/codesustainable
www.breeam.org School grounds: a guide to good practice; DFEE; pages 62-65
www.energysavingtrust.org.uk/business/business/building-professionals
www.asla.org/contentdetail.aspx?id=24980 Residential Landscape Sustainability; Clayden et al







RENEWABLE ENERGY

A renewable energy source is one that can be continually exploited because it replenishes itself. The search for viable renewable energy sources is a matter of growing urgency as non-renewable sources of energy become more difficult and expensive to discover and exploit.

The major sources of renewable energy include solar, wind, bio, geothermal, and hydropower. These sources have advantages and disadvantages and lend themselves to different applications and climates.

Solar energy - Energy derived from the sun , works well in areas that have a good supply of direct sun light. Used mainly for heating buildings and water, drying crops and producing electricity.

Wind energy - Energy derived from the wind eg. wind turbines to make electricity, windmills for mechanical power, and wind pumps for pumping water or drainage.

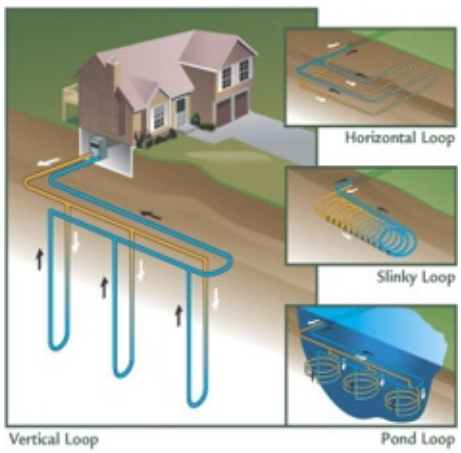
Bio-energy - Fuel derived from biological sources ie. organic material which has stored sunlight and provides in the form of chemical energy. As a fuel it may include wood, wood waste, straw, manure, sugar cane, and many other by-products from a variety of agricultural processes. NB. The use of bio-energy can be controversial in instances where the fuel is grown on land which would otherwise support sensitive habitats or essential food crops.

Geothermal energy - This is harnessed heat created deep beneath the earth's surface.

Hydropower - hydraulic power or water power is derived from the force or energy of moving water. Prior to the widespread availability of commercial electric power, hydropower was used for irrigation, and the operation of many machines, such as watermills, textile machines, sawmills, dock cranes, and domestic lifts.

Mechanisms for harnessing and/or utilising renewable energy within a scheme should be encouraged where practicable. Specific requirements of renewable energy supply should be accommodated within design (eg. Conflict with trees).

When procuring renewable energy it is necessary to buy from a supplier that does not sell credits (eg. Good Energy) to ensure that your purchase realises an increase in renewable production over and above government targets (nb. all electricity suppliers are required by the government to supply a specific amount of renewable energy - some suppliers simply purchase the excess of another company).



www.energysavingtrust.org.uk www.goodenergy.co.uk
www.breeam.org
www.guardian.co.uk/environment/renewableenergy
www.decc.gov.uk/default.aspx

TRANSPORT

Transporting people between buildings accounts for 22% of UK CO2 emissions and transport consumption is growing by 4% per annum. Landscape design can reduce need for travel and influence green choice of transport through appropriate layout and provision of facilities.

Layout
Layouts should provide access to public transport and encourage movement by cycle and foot. A cycle/pedestrian network should provide direct, safe and attractive routes to a range of amenities and wider transport links. Routes should be generous and follow comfortable gradients upon robust non slip materials.

Provision for cars should not discourage pedestrians or cycles from using routes. Roads should be designed with calming techniques to ensure 'mean' speeds are compatible with other users.

Facilities
Provide secure covered cycle stands and sheltered bus stops (nb. both provide opportunities to incorporate solar panels and/or green roofs).

www.sustrans.org.uk
www.eta.co.uk
www.dft.gov.uk/pgr/sustainable/manforstreets
www.dft.gov.uk/pgr/sustainable

WATER AND DRAINAGE

Water Management
Development conventionally replaces vegetation with impermeable surfaces, reducing infiltration of water within a site and increasing runoff from it, leading to flooding and polluting of water courses which in turn cause material and ecological damage. Landscape design can reduce or eliminate these negative effects through application of Sustainable Urban Drainage Systems (SUDS), whilst also improving the ecological and/or amenity value of a site.

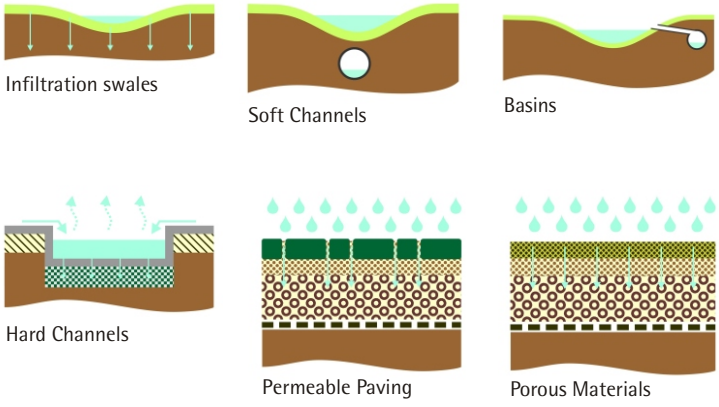
Drainage and surface water runoff
SUDS are a strategy that seeks to maintain the quality and intensity of flow from a site at pre-development levels. It seeks to deal with landing rain water as close as possible to source through the systems described below.

Good housekeeping
Regular road sweeping, dog litter bins and site education to remove excess pollutants from surfaces.

Source control
- Maximized green space cover
- Roof rainwater harvesting
- permeable pavements
- infiltration trenches and soakaways

Conveyance systems:
- Swales and filter strips
- Filter or French drains

Passive treatment:
- Infiltration basins
- detention basins
- retention ponds and wetlands



www.ciria.org.uk/suds
www.environment-agency.gov.uk/business/sectors/36998.aspx
http://sudsnet.abertay.ac.uk/index.htm
www.cambridge.gov.uk/public/docs/SUDS-Design-and-Adoption-Guide.pdf

HEALTH AND WELLBEING

Provision of well designed private and public space is essential for healthy lives (both mental and physical) that are able to incorporate sustainability practices. Whilst 75% of people prefer private gardens to a shared communal space, successful design balances opportunities for both interaction and for privacy and withdrawal.

Private spaces - Well designed private spaces can provide opportunities for retreat and interaction, safe play, food production, wildlife benefit, contact with nature, and waste reduction. However, the size and character of a private space dictates the range of social and environmental benefits that can be attained, for instance;

- 20m2 garden allows sufficient space for children's play
- 40m2 garden permits play alongside other activities (sitting out, clothes drying, storage, composting etc.)
- 50m2 can accommodate vegetable growing, bird boxes and ponds
- 75m2 garden can accommodate tree cover.

In addition to the size of a space, the following provisions should be considered to improve the potential of a garden

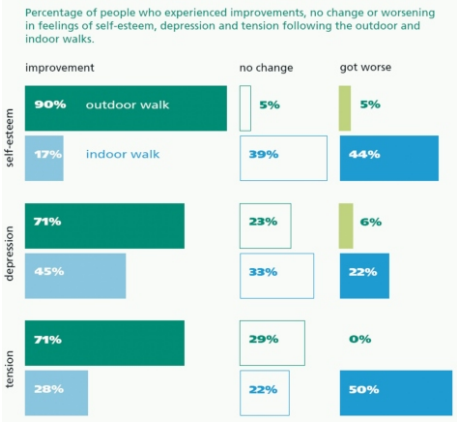
- Topsoil depths (a minimum 300mm depth to allow for future planting)
- A range of boundary definition to permit both seclusion and opportunity for neighbourly interaction
- Local recycling facilities
- Convenient and secure access

Small spaces are still important, offering opportunities for personalization, seating etc. However, where only small private spaces are provided it is important that they are complemented by nearby quality communal spaces.

Communal spaces - The majority of people prefer private spaces to communal; however, different and complementary opportunities exist within public spaces. Public space can provide a focus for local activity and encourage a sense of community, whilst providing facilities for a range and scale of activity not possible within private space. For instance, within a public space it is often possible to provide for:

- social interaction through the provision of a shared focus with appropriate seating
- larger play facilities
- allotment gardening
- recycling facilities
- substantial vegetation cover (offering social, psychological and environmental benefits)

To ensure the success of a public space, it must be clearly identified for public use and obviously associated with the intended users (ie. related to nearby building). It should also be welcoming, well surveyed, safe and appropriately maintained (with possible community input, to encourage sense of ownership). Opportunity for a range of activity is also key and it should be noted that the provision of formal play equipment can often cause tension. An option is to design a space that caters for 'natural' play but is not exclusive to this activity (ie. similar to the principles of a LAP).



www.mind.org.uk/campaigns_and_issues/report_and_resources/815_get_outdoors_get_active
www.fieldsintrust.org
www.naturalengland.org.uk/ourwork/enjoying/health/ournaturalhealthservice/default.aspx
www.buildingforlife.org

LAND USE AND ECOLOGY

Protecting, restoring and enhancing a range of habitats on site is essential to maintain the nation's diverse wildlife resource, catering for both endangered and common species.

Protecting existing ecological capital
The survey process should identify what already exists on site, with design prioritising the enrichment of existing assets before considering restoration or the creation of new habitats.

Principles for improving diversity and ecological networks
Ecological landscape design promotes:

- complexity (planting structure, age and relationships)
- dynamism
- succession
- nutrient cycling
- irregularly shaped and juxtaposed habitats (transitional ecotones are particularly diverse)
- connections (to avoid isolation)

Www.forestry.gov.uk/forestry/INFD-7KDEHU www.right-trees.org.uk/About.aspx
www.wildlifetrusts.org/index.php?section=about:publications:free
www.nhm.ac.uk/nature-online/life/plants-fungi/postcode-plants
Www.naturalengland.org.uk - Ciria's guide to timing of surveys/mitigation

RE-USE AND RECYCLING

Recycling involves processing used materials into new products to prevent waste of potentially useful materials, reduce the consumption of fresh raw materials, reduce energy usage, reduce air pollution (from incineration) and water pollution (from land filling) by reducing the need for "conventional" waste disposal, and lower greenhouse gas emissions as compared to virgin production. Recycling is a key component of modern waste reduction.

Reuse is to use an item more than once. This includes conventional reuse where the item is used again for the same function, and new-life reuse where it is used for a new function. In contrast, recycling is the breaking down of the used item into raw materials which are used to make new items. By taking useful products and exchanging them, without reprocessing, reuse help us save time, money, energy and resources. In broader economic terms, reuse offers quality products to people and organizations with limited means, while generating jobs and business activity that contribute to the economy.

Within a scheme recycling bin storage space should be provided for each home (or at least an opportunity for) and composting facilities should be provided for each household and/or community.

www.wrap.org.uk
www.recycling-guide.org.uk
www.gardenorganic.org.uk/composting/index.php

FOOD PRODUCTION

Food production and distribution embodies huge environmental costs, borne from the consumption of vast natural resources (most significantly water and oil).

The term ' food miles' describes the energy contained within a food stuff caused by distribution; to get it from field to plate. Whilst this is a topical sentiment, transportation and consequent consumption of oil is only one issue embodied within food production, and to view 'food miles' in isolation from other factors is to oversimplify the problems associated with food. For instance, it has been estimated that 80% of energy embodied in food occurs during the production phase, and consequently it is often more environmentally sensitive to purchase food transported large distances from a favourable climate, than to buy locally grown produce (which may require artificial heat and light to flourish).

Water is also embodied within food to a remarkable degree. For example, a single stem of a green bean grown in Kenya requires 4 litres of water to grow and distribute. Considering that 50% of vegetables and 95% of fruit consumed in the UK are imported, often from arid regions, it is not hard to understand why food security is an increasingly important issue; particularly when viewed against a backdrop of climate change and increasing global population.

The issue of food security will not be resolved solely within landscape design, but the inclusion of productive elements within a scheme can certainly help to serve sustainability objectives, through; reducing the inputs required for food production (efficient use of land and reduced travel to consumer), and by reconnecting people to the process of production (and potentially raising their awareness of and potentially attitudes to wider issues).

Food production can be considered at all scales and incorporated within most landscapes, not just those designated primarily for this purpose (ie. agricultural land). The following opportunities should therefore be considered:

Community spaces/ Allotments
Allocating specific space within a development for growing food is an obvious asset for a scheme and should be promoted both for its productive value and contribution as a community focus. Ideally the site should be designed and managed by local residents; to promote an active interest from the community and to reflect their desires.

Edible planting
In situations where a designated food growing area is undesirable or impractical, productive plants can still be grown (and consumed). For instance, many productive plants will also match the aesthetic or ecological objectives of a scheme, therefore providing added value within a planting proposal.

Private space
Private space should be designed to accommodate and encourage food production, by ensuring the provision of adequate space, a suitable environment (access, aspect, shelter and growing medium) and provision of complimentary facilities (eg. composting, water etc.).

Www.allotment.org.uk
Www.farmgarden.org.uk
www.farmersmarkets.net
Www.nsalg.org.uk
http://www.incredible-edible-todmorden.co.uk/
http://www.transitiontowns.org/

SPECIFICATION AND MATERIALS

All landscape components consume resources, use energy, emit pollution and create waste at each stage of their life cycle (ie. extraction, production, construction, use and disposal). This can be limited through the conscientious specification of materials.

Considering embodied energy within materials can be a useful guide to their relative sustainability, however it does not consider many important aspects of environmental performance (eg. embodied water, pollution, damage to habitats etc). Typically, naturally occurring materials such as timber, stone and aggregate embody less energy than heavily processed materials such as metals, plastics, bricks and cement.

However, transport energy can be as high as manufacturing energy for some products (eg. timber imported by ship from Canada embodies the same energy as concrete produced and distributed within UK). Therefore, it is necessary to consider not just the nature of a material when specifying, but also the mode of transport used (travel by road uses 3-10x as much energy as ship or train) and the distance traveled.

LEAN CONSTRUCTION

Every year 70 million tonnes of construction waste is generated in the UK (comprised of 10 million tonnes delivered to site but thrown away, 30 million tonnes demolition waste and 30 million tonnes excavated soil).

'Lean construction' is a term applied to efficient design, which seeks to reduce waste and over-specification through careful detailing that is appropriate for the context, matches the design form and considers an exit strategy for elements to allow reuse of materials (eg. use of screws instead of nails to secure timber or a sand base instead of cement for paving). Use of recovered materials in the form of reuse or recycling (preferred order as less processing costs associated with reuse) should also be encouraged to lessen impacts of manufacture and reduce landfill. NB. Reuse of materials should still be considered with regard to other issues of sustainability (eg. reusing timber sleepers from Canada may embody transport costs that outweigh the processing costs).

www.thenbs.com/topics/Environment/articles/shortHistoryOfSustainableDevelopment.asp
www.aecb.net
www.bre.co.uk/greenguide

HARD LANDSCAPE MATERIALS (GENERAL)

Timber
Timber is potentially the most sustainable construction material; being renewable, of low embodied energy and strong. However, most is not. Sustainable timber production must, amongst other things, consider the preservation of biological resource and manage watershed and soils. Designers should specify only sustainable timber, as recognised by the Forestry Stewardship Council (FSC).

Timber treatment and detailing
It is preferable to use durable materials to extend the life of a scheme without replacing materials along the way. Typically hardwood is more durable than softwood (eg. Oak is 2x more durable than Pine and 2-3x more durable than Spruce) and does not require preservative treatment, which itself embodies high energy inputs, is highly toxic, and hazardous to both human health and ecosystems. The following list gives an order of preference for detailing timber, in sustainability terms (most durable and incurring least environmental issues):
- hardwood
- pre-treated softwood (less hazardous)
- water borne preservative
- stain with vegetable based solvent, vegetable binder and inorganic earth or mineral pigment.

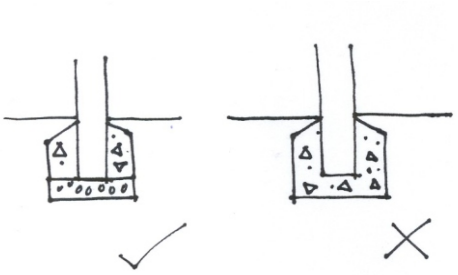
In all cases it is important to ensure that timber is discouraged from moisture uptake which compromises durability (eg. the lifespan of Oak wood is reduced from 200 years to 20 years when in contact with earth). The endgrain should be covered or cut at an angle for drainage, whilst timber posts should not sit in concrete footings.

Plastic
Ideally highly processed materials should be limited, but some are the best 'fit for purpose' and are difficult to substitute. All plastics are derived from the highly polluting petrochemical industry and in addition PVC poses significant health risks throughout production. In this situation it is responsible to specify the option causing the least threat to environmental and human health. PVC should therefore be avoided in favour of HDPE.

Metal
Similar to plastics, metal is highly processed, embodies high energy and creates much pollution in production. However, it is also difficult to substitute in many applications. In the UK stainless steel is an alloy produced from recycled steel and is therefore the most benign choice of metal available.

Non metal mineral products
Unprocessed minerals (eg. aggregates and natural stone) can have a relatively good environmental profile (though dependant on working/restoration practice and transport costs), whilst processed minerals (eg. bricks, cement and concrete) consume high energy and result in many toxic pollutants. In both instances significant damages can occur at the point of extraction; creating noise, dust, habitat and landscape degradation. It is therefore important to check the Environmental Management Systems (EMAS or ISO 4001) that are in place throughout the supply chain to ensure conscientious practice. Additionally, all

Http://www.fsc-uk.org/



HARD LANDSCAPE MATERIALS (BRE)

The British Research Establishment Environmental Assessment Method (BREEAM) provides environmental ratings for building materials based on a full life cycle assessment that considers the following factors:

- Climate change,
- Water extraction
- Mineral resource extraction
- Stratospheric ozone depletion
- Human toxicity
- Ecotoxicity to Freshwater
- Nuclear waste (higher level)
- Ecotoxicity to land
- Waste disposal
- Fossil fuel depletion
- Eutrophication
- Photochemical ozone creation
- Acidification

The following table describes the BREAM rating for various landscape elements.

Element	Impact rating	Estimated life span	Ability to recycle
Hard surface materials(over pre-pared sub base)			
Asphalt	High	30	Medium
Brick pavers	Medium	30	High
Precast concrete pavers	Medium	25	High
Precast concrete slabs	Medium	25	High
Insitu concrete	High	25	High
Granite setts	Medium	40	High
Stone paving	Medium	40	High
Gravel	Low	10	Medium
Recycled glass aggregate	Low	10	High
Treated softwood timber decking	Low	20	High
Soft landscape Materials			
Bark or wood chip mulch	Low	5	Low
Grass (incl mowing)	Low	30	High
Low maintenance planting	Low	15	High
Separating elements			
Brick wall (1 brick thick)	High	45	High
Drystone wall	Low	60	High
Stone and mortar wall	Medium	60	High
Galvanized steel railings	Medium	45	High
Galvanized chainlink fencing	Low	30	High
Plastic coated chainlink with galva-nized steel posts	Low	20	Low
Pre-treated timber close board	Low	20	Medium
Pre-treated timber post and rail	Low	20	Medium
Hedges	Low	60	High

Landscape Architect's Pocket Book; Vernon et al; pages 82-83
www.bre.co.uk

LIGHTING

Lighting is an important consideration in most landscape schemes. Detail lighting design will often be done by either the M&E engineer or a lighting supplier, however the Landscape Architect should endeavour to influence the design to ensure that a number of key sustainability issues are considered. In addition to the aesthetic properties relating to the location and design of the light fitting itself, materials, the efficiency and longevity of the bulb and issues of light pollution are important.

Sustainable lighting design seeks to meet the requirements for outdoor lighting which will have the least impact on the physical environment. Where possible, buildings and their environment should be designed to permit daylight illumination and any artificial lighting required should be specified with consideration for the life cycle of the product, to include concern for; costs borne through production, installation, use, maintenance and replacement. Energy consumption should be minimised wherever possible through the use of efficient light sources, using high performance optics that are located so as to minimise waste light and the duplication of features.

Light pollution is caused by artificial light that is allowed to illuminate, or intrude upon, areas not intended to be lit. It is rapidly increasing across this country, leaving fewer opportunities to enjoy dark, starry nights and has potentially damaging impact on wildlife too. (At a local level light pollution can be a Statutory Nuisance under the Environmental Protection Act 1990.)

Ultimately lighting is only required to illuminate downwards and light lost to either the sky or other 'dead' spaces is a significant waste of energy, thereby adding to air pollution and emissions of climate changing greenhouse gases. Lighting should therefore be designed to efficiently illuminate desired areas only.

Landscape Architect's Pocket Book; Vernon et al; pages 66-72
www.environmental-protection.org.uk/neighbourhood-nuisance/light-pollution
www.cpre.org.uk/campaigns/landscape/light-pollution
Www.cibse.org/index.cfm?go=page.view&item=238 Www.bre.co.uk/greenguide

SOFT LANDSCAPE - PRODUCTION

It is important to dismiss the commonly held belief that all planting provides an environmental benefit. Throughout the life cycle of a plant much energy and resource is consumed or wasted; mostly realising a negative overall effect in sustainability terms. The grass is never greener!

Planting is a consideration on two levels; first for the impact of plant production and secondly through the environmental effect of planting on site. These two aspects are considered below:

Plant production

The process of plant production can incur many negative environmental effects which require careful specification to avoid:

- Watering: the horticultural industry wastes more than 30% of water consumed, which is typically derived from unsustainable sources. This figure could be reduced through the collection of rainwater and recirculation.
- Pest control: pollution can be caused by high intensity pesticide use in horticulture. A system of Integrated Pest Management (IPM) employing biological control, temperature management and good hygiene can help control pests whilst reducing resource consumption and subsequent pollution.
- Planting medium: peat harvested from the UK threatens sensitive habitats whilst peat imported incurs significant transport costs. The solution is to specify peat substitutes (where appropriate for planting type eg. not acid loving planting) produced from composted material accredited by WRAP (PAS 100). Where peat use is unavoidable its contribution should be reduced where possible and sourced from insensitive locations.
- Waste: waste occurs in two forms; organic waste that can be recycled as compost or mulch, and packaging that can be reused.

To avoid investigating each of the above elements individually it is possible to use nurseries already recognised for sustainable horticultural practice. Such certification is provided from the Floriculture Environmental Project and the British Ornamental Pot Producers (BOPP).

www.allotment.org.uk
www.farmgarden.org.uk
www.farmersmarkets.net
www.nsalg.org.uk

SOFT LANDSCAPE - USE

Planting material and implementation

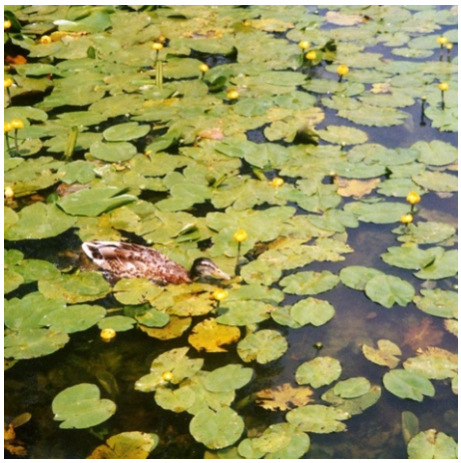
When specifying planting material and implementation techniques the following issues should be considered:

- Suitability to site: A sustainable approach relies on selecting plants appropriate to a site, rather than intensively manipulating conditions to ensure a scheme's aesthetic success.
- Site conditions and preparation: works on site should not compact soils intended for planting nor compromise existing vegetation to be retained (see BS5837 Trees in relation to construction). Planting will ideally be scheduled for between November and March to allow for rootballed and bareroot stock and only planted in suitable weather conditions (not drought or too wet). The landscape contractor undertaking implementation should be retained for maintenance to encourage responsibility for success.
- Existing planting: Maintain existing site vegetation and integrate new planting into fabric wherever possible and appropriate.
- Size of plant material: Larger plants have an immediate site impact and are more resistant to vandalism. However, they embody greater resources, are less adaptable to site conditions and are soon caught up by smaller stock.
- Planting style: Naturalistic planting styles, designed to develop a dynamic plant community (encouraging a dense matrix of roots, stems, foliage and flowers) requires lower inputs for site preparation, establishment and maintenance than traditional design composed of static shrub mass, mown lawn and specimen trees. They are more resilient to failure (resisting invasion but accommodating self sowing), resistant to pest and disease, and beneficial to a host of wildlife).
- Soil ameliorants (see planting medium on previous page).
- Plant stock: containerised plant stock requires greater inputs than field grown specimens and therefore should be avoided where possible.
- Use of chemicals: If expertly handled in accordance with manufacturer's instructions most modern synthetic chemicals are relatively safe to operatives, the public and the environment. Fertilisers, pesticides, herbicides and fungicides all embody high manufacturing energy but to substitute them would entail a prohibitive increase in the time, effort and resources expended to achieve desired effects. Therefore, it is recommended that chemicals are responsibly employed (by qualified contractors) where the benefits are obvious.
- Ancillary products: watering tubes, watering membranes and mulch should be used to promote healthy plant growth and reduce moisture loss. Supports, rabbit and strimmer guards should also be employed where appropriate to reduce plant damage/ replacements.

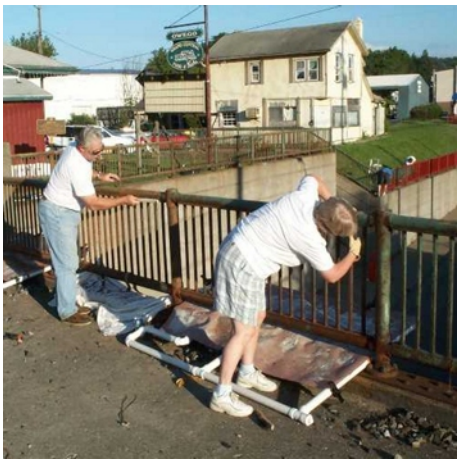
Ecological Function (See also page 11)

- Native or non native: the appropriate balance of native and exotic species selected for planting is dependent on site conditions and context. Whilst native species are better suited to a 'natural' climate and soil conditions, can offer important biological connections to their context and improved habitats to native fauna, exotic planting is often better equipped for disturbed sites and may be suitable for intensive locations.
- Provenance: the use of local material is only necessary on particularly sensitive sites and UK grown plants should suffice for the remainder (although these measures are considered unnecessary by some).

www.bre.co.uk/greenguide
www.wildflower.org.uk



MANAGEMENT AND MAINTENANCE



It is essential that adequate provision (financial and technical) is made for maintenance and management to achieve the aspirations reflected in the design and implementation process; whether they relate to food production, ecology, amenity, utility or aesthetics. A management plan should set out clearly the objectives of a site together with what is necessary to achieve these aims (allowing for evolution and revaluation of goals).

Design (discussed above) should consider the management implications of a scheme at the outset and should seek to reduce future maintenance inputs through the conscientious specification of hard and soft materials. In addition, the landscape should be designed so that it is robust and 'fixable' (with replacement materials stored or available) to ensure that the essence of the scheme can be maintained.

JOB RUNNING

In addition to design and specification, a Landscape Architect impacts upon the environment through the operational energy of premises and every day business practice. Where practicable, a Landscape Architect should seek to conserve energy and materials through their economical use.

Some decisions will be outside of the influence of a Landscape Architect (such as the location of an office, the procurement of energy and the sourcing of stationery), however, they can reduce energy expended upon a job in the following ways:

- reducing private travel through use of public transport/ conference calls
- reducing paper use through electronic storage
- recycling materials used in the office where possible
- turning off lights/equipment when not in use

www.wildflower.org.uk
www.tfl.gov.uk

Appendix 1

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- www.wildflower.co.uk
- Natural Garden; Oudolf et al
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- Plants for a future: http://www.pfaf.org/index.php

Appendix 2

Sustainable Design Checklist

Project Title / Location		**Project No.**			
Project Type / Sector		**Client**			
Project Status		**APAL Ref**	2200-SC-01	**Revision**	
Eco Homes / Breeam Req.		**Date**		**Prepared by**	
APAL Drawings / Documents Ref.					
Scheme Description					

This 'Sustainable Design Checklist' is an 'in house' tool to promote and record the improving environmental performance of all Allen Pyke schemes throughout each stage of a project. The Checklist highlights the key environmental issues concerning Landscape Architecture with suggestions for positive action. To be used in conjunction with the APAL Sustainability Handbook. Note this list is not exhaustive.

Category	Considerations	Comments on design
1. Design - initial design stage / masterplanning etc		
1.1 Green infrastructure (multifunction+ connection = maximum beneifts)	What 'green infrastructure' is there in the surrounding area?	
	Is it possible to connect to green, or other natural elements beyond the site?	
	What additional functions are provided on site eg. water and waste management, food production, energy production, recreation, wildlife benefit, transport links, health benefits, microclimate control?	
1.2 Versatility / Adaptability	Are spaces multifunctional or capable of accommodating different uses at different times?	
	Are spaces easily adaptable, in anticipation of change of use, fashion, climate change or technical innovation?	
	Will vegetation survive predicted climate change (rainfall / temperature etc)?	
1.3 Building Efficiency / Microclimate Control	Can shade be provided for summer cooling?	
	Is light and solar gain available in winter?	
	Is summer breeze (south west prevailing) permitted through open shelter?	
	Is effect of winter wind (northerly) restricted with dense shelter?	
	Has adequate green space been provided to moderate effect of Urban Heat Island?	
	Is air pollution mitigated by proposals?	
	Can secure outdoor clothes drying space be provided?	
1.4 Renewable Energy	Is there opportunity to incorporate renewable energy provision within the scheme?	

Category	Considerations	Comments on design
	Has enough space been allowed for such facilities (including servicing etc)?	
	If reliant on off site provision, is the energy distributor 'green' (from renewable source and not traded with less 'green' provider ie. ensuring benefits in excess of government imposed targets)?	
1.5 Transport (to create efficient network favouring green transport)	Does the layout favour 'green' transport?	
	Do street layouts give pedestrians safe priority and include speed reduction measures?	
	Are cycle routes and secure cycle storage (public and private) facilities provided?	
	Is access to public transport within walking distance of key facilities (inc open space)?	
	Can a 'car club' and associated parking spaces be incorporated?	
	Is provision made for 'green technologies' eg. electric car charging points?	
1.6 Water and Drainage	Do the proposals maintain the quantity and flow of water from the site to pre-development levels?	
	Is rainwater dealt with as close as possible to source eg. maximised green cover, rainwater harvesting, permeable pavements and infiltration trenches and soakaways?	
	Where required, can swales, filter drains, infiltration basins, detention basins or retention ponds and wetlands be employed?	
	Is there provision for good housekeeping to remove excess pollutants from hard surfaces eg. education, management and interceptors?	
	Are existing water bodies being maintained / enhanced?	
	Can rain water be re-used on site eg. for irrigation or inclusion of water buts in private dwellings?	
	Does design allow for predicted climate change and consequent levels of flooding?	
1.7 Ecology and Biodiversity	Is the ecology of the site understood eg. has an ecology survey been undertaken?	
	How are existing habitats being restored / enhanced/ protected (consider juxtapositions of habitats, encourage connections and propose appropriate enhancements eg. through planting, bat/bird boxes, hibernaculas, wood piles, water etc)?	
	How are new habitats being created (see above)?	

Category	Considerations	Comments on design
	Are ecological principles being followed with design (eg. complexity, dynamism, succession, nutrient cycling, irregularly shaped and juxtaposed habitats, connections)?	
	Can brown or living roof / wall systems be incorporated?	
1.8 Health and well being (to improve quality of life and encourage food production and nutrient recycling)	Is adequate private amenity space provided (check LA requirements and consider, size, security, access, aspect and soil)?	
	Are communal spaces inviting, useable and accessible?	
	Are recreational opportunities provided for all ages and abilities?	
	Are links to surrounding spaces and/or countryside considered?	
	Where appropriate, is personalisation / community maintenance and management encouraged?	
1.9 Food Production	Can allotments or community vegetable gardens be incorporated within proposals?	
	Can spaces be adapted for farmers markets (including service points etc)?	
	Can 'productive' (food) species be incorporated within amenity planting?	
1.10 Re-use and Recycling	Have private re-cycling facilities been provided for each property eg. composting, recycling and water butts?	
	Are communal re-cycling facilities provided (and located to avoid nuisance) eg. composting, recycling and water butts?	
2. Specification and Implementation		
2.1 Materials General	Consider life cycle assessment of materials ie. impacts through extraction, production, construction, use and disposal.	
	Are materials natural / unprocessed?	
	Are materials to be sourced locally?	
	How far are materials travelling and by what mode of transport	
	Has the environmental profile of materials been compared to possible alternatives on the Green Guide website or with manufacturers?	
	Are materials fit for purpose?	
	Has reference been made to preferred use of sustainable materials and techniques within proposals eg. horticultural notes (even where	

Category	Considerations	Comments on design
	not explicitly required by client/planner), as prompt to inform future more detailed proposals?	
2.2 Lean Construction	Have lean construction methods been employed within detail and specification to avoid waste (ie. robust but not over-engineered)?	
	Have recovered / reclaimed materials been specified for use in construction (including top soil/ subsoil)?	
	Have exit strategies been incorporated into the specification of materials?	
2.3 Hard materials	**Timber** – Has only FSC timber been specified (including as a secondary material)?	
	Have hardwoods been favoured over softwood where practicable?	
	Where softwoods have been specified have they are they to be pre-treated with waterborne preservative, or stained with vegetable based solvent, binder and inorganic earth or mineral pigment?	
	Plastic – Have natural materials been considered as an alternative for the purpose?	
	Can feature be recycled in the future?	
	Use HDPE in preference to PVC.	
	Metal – Have natural materials been considered as an alternative for the purpose?	
	Stainless steel is preferable as it is recycled.	
	Non metal mineral products – Are materials natural or processed?	
	Are materials to be sourced locally and what are the transport costs (environmentally)?	
	Does the durability of the material outweigh immediate environmental concerns?	
2.4 Lighting	Are fittings only directed on areas that need lighting, so as not to waste energy?	
	Has the lifecycle of the luminaire been considered (LEDs last longest)?	
	Has maintenance and ease of replacements been considered?	
	Has the light fitting been selected to minimise spillage and upwards light pollution?	
	Will lighting effect biodiversity (check lighting layouts with project ecologist)?	
2.5 Soft	**Production** – Has the effect of plant production been considered and positively	

Category	Considerations	Comments on design
Materials	reflected within drawings or the specification eg. have nurseries certified as following sustainable practices (eg. energy, water and waste management, pest control, planting medium) been recommended?	
	Can a local nursery be used to avoid excessive transportation costs?	
	Use – Are the plants specified suited to existing site conditions?	
	Do proposals specify site conditions suitable for planting (eg. notes ensuring uncompacted soils during construction, adequate growing medium, planting in accordance with BS5837, operations to take place during appropriate season, weather and soil conditions)?	
	Do proposals consider existing planting assets and integrate where appropriate?	
	Can contaminated land be bio-remediated on site?	
	Is the planting palette and style 'sustainable' (eg. naturalistic), multifunctional (amenity, ecology, screen, for microclimate and food) and appropriate to the context?	
	Does the planting fulfil the intended design objectives?	
	Have opportunities been exploited for incorporation of 'productive' (food) plants within scheme?	
	Is the size of planting specified appropriate for site and purpose (eg. larger plants embody larger impacts and are less adaptable to site conditions but may be vulnerable in public locations)?	
	Has field grown plant stock been specified over containerised (higher embodied impacts)?	
	Have benefits of chemical use vs 'natural' alternatives been considered within specification?	
	Has local / sustainable compost been specified (eg. WRAP PAS alternative to PEAT)?	
	Has mulch and watering tubes / watering membranes been provided?	
	Has adequate provision been made for future plant growth (particularly in urban situations – consider egg crate systems)?	
	Ecology - Is there an appropriate proportion of native/exotic species to suit context (natural or disturbed site/surroundings) and ecological objectives?	

Category	Considerations	Comments on design
	Is the site sensitive enough to warrant specification of plants of local provenance?	
3. Management and Maintenance		
3.1	**General** - Has a management / maintenance plan been written?	
	Does the plan adequately describe and require the inputs necessary to achieve the intended functional objectives (eg. ecological, amenity, food production)?	
	Does the management plan contain a list of available materials for replacement, together with a specification for work?	
	Hard – are features easily maintained (cleaned, fixed or replaced)?	
	Soft – Has planting been selected that requires low resource input (eg. labour, chemical, water)?	
	Is mulching specified?	
	Have benefits of chemical use vs 'natural' alternatives been considered within specification?	
	Are facilities / space provided for on site composting?	
	Does the specification require recycling of waste?	
4. Job Running		
4.1	To what extent have opportunities been taken to reduce private travel through use of public transport/conference calls?	
	Is the project paperless where possible eg. is the majority of project material filed electronically instead of printed?	

Additional comments (on project or process)