Planning Policy

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OXFORD CITY COUNCIL

Oxford City Council

Natural Resource Impact Analysis

Supplementary Planning Document

Draft

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SECTION 1: INTRODUCTION

Context

1. In recent years more has become known about the impact we are having on the natural resources and the world around us. It is now widely recognised, for example, that the levels of CO^2 released into the atmosphere as a result of our ever-increasing demand for energy are having a detrimental effect on the environment and weather patterns are changing as a result. Alongside this, our demand for materials, both natural and man-made, is depleting resources at an increasing rate.

2. This SPD has been produced at a time when the debate on these issues is being held at the highest levels; government policy at European, national and regional levels is being updated and strengthened in an attempt to control our demand for energy and natural resources, and the impact we have on the environment. The impact of the built environment, both in terms of its demand for resources and the levels of energy it uses, is currently a focus for this debate.

3. Oxford City Council has a longstanding commitment to making Oxford more sustainable, to do what it can to address these issues at a local level. Incorporating sustainable design and building principles in developments is one important way that this commitment can be realised. These principles must be considered from the start of the design process and not seen as an additional bolt on at a later stage.

Benefits of sustainable building

4. Whilst the wider environmental benefits of building sustainably are well known (lowering demand for energy, the emission of greenhouse gases and the use of natural resources for example) there are also more local and immediate benefits of building in this manner. High quality, sustainable, building design and construction creates pleasant living and working environments. Studies have shown that alongside such benefits, the avoidance of sick building syndrome, higher levels of workplace morale and satisfaction with living environments can be positive consequences of sustainable building. Recent and projected rises in energy [1] and water prices mean that the running costs of buildings are on the increase and as such the incorporation of measures to reduce the demand for energy in a development also has significant financial benefits too. A recent survey by CABE indicated that house buyers were prepared to pay a financial premium for homes with sustainability issues at the heart of the design [2]. The role of corporate responsibility in the decision making process of commercial companies also make sustainable buildings an attractive proposition.

Purpose of the SPD

5. The purpose of this document is to supplement those policies of the Oxford Local Plan 2001 – 2016 that address the issue of resource efficient buildings, namely policies CP.15 (Energy Efficiency), CP.16 (Renewable Energy), CP.17 (Recycled Materials) and CP.18 (Natural Resource Impact Analysis). Policies CP.15 – 18 are quoted in full in Appendix 3 of this document.

6. This document is primarily concerned with environmental sustainability and in particular the topic of resource efficient buildings. Other policies of the Oxford Local Plan address issues of social and economic sustainability and indeed other aspects of environmental sustainability (such as Policy NE.17 on Biodiversity). Together the whole raft of Local Plan policies will ensure that development in Oxford is sustainable in the wider sense of the word. The scope of this document is restricted to cover issues only of resource efficient buildings; this allows a discussion of more depth and detail, focused on a specific aspect of the sustainability debate.

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[1] Ofgem estimate that over the winter of 2004/5 alone, customers in the UK paid £5.2 billion more for their gas and electricity than they had in the previous year. “Rising Energy Prices”, Energywatch, page 1

[2] 87% of housebuyers want to know whether their homes are environmentally friendly and 84% would be prepared to pay for a more ecofriendly home. CABE and WWF (in Guardian July 26th 2004)

7. The aim of this document is to provide detailed advice and guidance and to set out how the planning authority will be seeking to apply Policies CP.15 – 18 when determining planning applications. It provides examples of measures and technologies that can be used in the development of proposals to ensure that they minimise energy use and use of natural resources, therefore complying with the policies of the Local Plan.

8. This document will be adopted as a Supplementary Planning Document and will form part of the Local Development Framework. That status will allow it to be used in the determination of planning applications as will acquire the weight of a material consideration under Section 38(6) of the Planning and Compulsory Purchase Act 2004.

9. The SPD is formatted to address each of the key policy areas in turn. Section 2 addresses the issue of Energy Efficiency, Section 3: Renewable Energy, Section 4: Choice of Materials and Embodied Energy, Section 5: Recycled Materials and Section 6: Water Resources. Each section is introduced with the background and forces for change in that policy area and contains a series of key questions on the issue and suggests possible measures and technologies that could form part of the design solution in proposed schemes.

10. The SPD addresses a wide range of measures and technologies but is not exhaustive; links and references to organisations where more detail can be found on particular issues are provided at Appendix 2. It will not be appropriate for a development to incorporate all those measures set out. There will always be a need to balance the benefits of these measures against the wider design policies of the Local Plan. Different measures will be more appropriate in different locations and for different uses. The SPD is therefore worded in general terms with some additional considerations for residential and commercial proposals.

What is an NRIA?

11. A Natural Resource Impact Analysis (NRIA) should evaluate the use of natural resources and the environmental impacts and benefits arising from a proposed development, both at the construction phase and through the subsequent day-to-day running of the buildings. On applicable developments an NRIA will be required to demonstrate how, through the design, it minimises the use of natural resources.

12. Appendix 5 sets out a suggested template for an NRIA. This template follows the format of the SPD addressing each of the topics covered. It is in the format of a series of questions which developers are asked to answer in regard to their proposal. Having answered yes, no or partially to each of the questions, developers should explain how each question has been addressed in their scheme or give the reasons why not. Please note where a significant number of questions have been answered "no" it will be advisable to amend the proposals before submitting an application for planning permission. An NRIA completed to sufficient detail and structured in the format of the template will be acceptable as part of a planning application; of course this in itself is not an indication that the proposed scheme will be acceptable in NRIA terms.

13. Developers are of course free to use their own format but consideration will be had as to whether it meets the requirements of officers and further information may be sought. It is always recommended that discussions are held with planning officers before an application is submitted; in the same way officers will be happy to provide advice as to whether an NRIA provides the correct information for a determination of the scheme to be made.

14. The final section of any NRIA must be in the form of the checklist. This checklist has been produced to provide developers with an indication of the requirements of the City Council and to provide officers with a set of measures, to use alongside the detailed information provided in the earlier sections of the NRIA, with which to determine an application. The checklist comprises a series of measurable questions and sets out the City Council's "minimum", "preferred" and "target" standards for each of these. The checklist is included at Appendix 6.

15. It is intended that the SPD, its parent policies in the Local Plan and the accompanying checklist will provide sufficient information to make it clear to potential developers what the intentions of the planning authority are in this area.

Do I need to submit an NRIA?

16. As set out in Policy CP.18 of the Local Plan, an NRIA is required for all major developments. For the purpose of this policy a major development is defined as 10 or more dwellings or 2,000 m^2 or more of floorspace. For mixed-use developments of residential and non-residential uses, the proposals will be assessed on a pro-rata basis to decide if an NRIA is required. Planning applications for developments over this threshold will be expected to include an NRIA at submission.

17. On proposals below the threshold, applicants should also incorporate the design principles and concepts outlined in this SPD and although not required, the submission of an NRIA is encouraged with applications for development below the threshold size. Please note that Policy CP.15 in particular, applies to all development, without any threshold, therefore all developments must be designed to optimise energy efficiency.

18. Developers are required to submit an NRIA with outline applications over the threshold. It is appreciated that whilst not all the information will be available to fully complete an NRIA at the outline stage, it is expected that an interim statement covering the key issues will be submitted. This will assist in the determination of the application but also in the development of detailed matters for the next stage of the planning process when a full NRIA should be submitted.

19. The City Council is here to assist in these matters and discussion on NRIA matters at the pre-application stage is encouraged. If you have any doubts, or if you would like further advice on this matter, please contact the planning department. Please note that all applicants are also welcome to contact the Sustainable Energy Officer at Oxford City Council for help and advice.

SECTION 2: ENERGY EFFICIENCY

Background and forces for change:

20. Buildings account for 45% of primary energy use in the UK and approximately 20% of that energy is thought to be wasted. Clearly this is one area that can be targeted with the aim of reducing the demand for energy produced using fossil fuels and thereby reducing carbon emissions. The new EU directive on the Energy Performance of Buildings is intended to lead to substantial improvements to energy efficiency in buildings. Key aspects of that directive are the application of a common methodology for assessing the energy performance of a building and the subsequent setting of minimum standards by member states, and a system of building certification along the same lines as those produced for electrical white goods. This will be implemented into UK law through measures including a revision of Part L (Conservation of fuel and power) of the Building Regulations that is due to come into effect on 6th April 2006 and the development of a National Calculation Methodology on the energy performance of non-residential buildings.

21. As well as the legislative aspect, there is also a financial aspect to energy efficiency. Recent years have seen significant increases in the cost of utility bills; for example Energywatch estimate that the average domestic gas bill has increased by 38% since October 2003 and the average domestic electricity bill has increased by 30% over the same period. The incorporation of energy saving measures in the initial design and construction of a building can have a significant impact on the levels of energy consumed and thus on the running costs of the building post-construction.

How will the design and layout ensure that energy is used efficiently in the scheme?

22. Solar gain
Passive and active solar gains can provide a significant contribution towards the lighting, heating and ventilation in a building. Different approaches to maximising passive and active solar gain are needed depending on the size and use of buildings. To maximise the access to the sun, buildings should have main elevations that face within 30º of due south (either to the east to maximise morning sunlight or to the west to maximise afternoon sunlight). Planning the layout of individual buildings to ensure that the main living (or working) spaces are located on the southerly facing elevations also has a beneficial effect. The rooms that occupants will spend most time in should have priority for such locations over rooms with a lower occupancy for example the circulatory or servicing spaces of a building which require less heating. Rooms that contain machinery or equipment that generate heat should be located on the northern sides of a building. To minimise the requirement for additional space heating, elevations to the south should have increased areas of glazing compared to those facing north. The area of glazing provided also has an important role in maximising the levels of natural daylight penetrating the building, hence reducing dependency on artificial lighting. It is also important however that occupants don't feel the need to resort to the use of blinds for privacy for example, which can cut out around 20% of passive solar energy.

23. Shelter and shading
It may be the case that some shade or shelter is beneficial in the summer months particularly at the start and end of the day. It is also likely that some shelter is required to protect buildings from prevailing winds. Trees in shelterbelts that protect a scheme from the prevailing south or southwest winds should be spaced at least 3 or 4 times their mature height from south facing elevations to minimise solar obstruction. Deciduous planting can be useful for providing shading from glare and overheating during the summer but still allow solar access from the low level sun in the winter through the bare branches. In the UK the sun has a low altitude in winter that means that it may be difficult to achieve much in the way of passive solar gain and daylight penetration particularly in cities where adjacent buildings may obscurethe winter sun. Ideally buildings should be positioned to avoid any such obstructions. In mixed height developments, taller buildings should generally be sited to the north.

Residential: Solar gain	Commercial: Shading
The design of residential properties should maximise the use of solar gain. Residential layouts should seek to maximise the potential of southerly orientations with main habitable rooms located on southerly elevations that incorporate proportionally higher levels of glazing. Obstructions such as projecting garages and porches and staggered plans on south sides should be avoided so as to prevent overshadowing. Care should be taken however that layouts are also designed to meet the requirements of the design policies of the Local Plan (CP.6 – 13) with clear street patterns, active frontages and passive surveillance for example.	Whilst the principles of solar gain should also be taken into account in the design of commercial properties, developments such as offices for example will require a controlled approach so as to prevent the problem of overheating. Excessive solar gain (particularly in office buildings for example) can add to the heat generated and increase cooling demands. Louvres, external blinds and roof overhangs can provide shade in the high summer but still allow maximum daylight.

24. Building form
Detached buildings can be inefficient compared to linked buildings, which reduce heat loss through the walls. To minimise the heat lost through external walls, the smallest possible ratio of the external wall and roof area to volume will maximise energy efficiency. If they are not heated, conservatories, lobbies and porches can be used to provide buffer zones between the internal spaces and the external environment. They can provide additional passive solar gain if glazed, provide an additional insulation layer, preheat air drawn into the building and prevent cold air entering.

25. Green and brown roofs
The use of green and brown roofs can also provide benefits in terms of energy efficiency. A green roof is one which has been surfaced with a growing medium, with vegetation on top of an impermeable membrane; brown roofs work on the same concept but with a broken substrate replacing the organic growing medium. Intensive roofs have deep soil profiles and can grow and support lawns and shrubs and are designed for human use; extensive roofs are based on a shallower soil profile and are generally planted with mosses and sedums and are not designed for such use. Green and brown roofs can provide buildings with more thermal mass (see below), prolong the life of the roof, reduce sound transmission, moderate surface water run-off and provide green space for wildlife and people and visual amenity. The average weight of a fully saturated extensive roof is comparable to the weight of a gravel ballast conventional roof.

How will the construction of the buildings ensure efficient use of energy and reduce overall energy use?

26. Thermal mass
The use of thermally massive materials and construction can have beneficial effects through their ability to store heat through the warmer parts of the day and release that heat through the cooler parts of the day and night. Generally heavy materials such as stone and concrete have a high specific heat capacity whilst more lightweight materials such as soft wood have a lower specific heat capacity. In order to exploit the potential of materials with such capacity, the proportion of that material exposed to the internal spaces should be maximised, for example a floor which receives direct passive solar gain could be constructed in a heavy material to maximise the level of heat it is exposed to and can therefore store for cooler parts of the day.

27. Insulation and air tightness
To maximise energy efficiency the heat lost from the building envelope must be kept to a minimum. This can be achieved through effective use of insulation. Building Regulations represent a legal minimum but do not reflect best practice. Insulating roofs, walls and floors beyond Building Regulation standards will minimise heat lost and save on energy bills. Superinsulation is the use of very thick layers of insulation to minimise heat flow. Superinsulation requires a high standard of air tightness and the use of trickle or maybe mechanical ventilation. Consideration should be had of sustainable insulation materials that are now available on the market such as recycled newspaper and sheep's wool. In conjunction with good levels of insulation, buildings should be constructed for

air tightness to minimise levels of air infiltration. Windows and doors must be well fitted to cut draughts, however it is important to use controlled ventilation to ensure good internal air quality.

28. Glazing
Poor quality glazing can result in excessive heat loss and cause condensation and draughts leading to excessive heating costs. In contrast, high specification glazing can improve thermal comfort, improve the energy rating of the property as well as bringing additional benefits such as increased security and sound insulation. Building regulations require the use of double-glazing with low emissivity (but triple glazing should also be considered).

Residential: SAP energy ratings
The Standard Assessment Procedure (SAP) is the government's methodology for calculating the energy performance of residential properties. This calculation takes into account a range of factors that contribute to energy efficiency including the materials used, insulation, ventilation, heating systems, solar gain, fuel and renewable energy technologies.

Commercial: Energy Ratings
There is currently a choice of compliance checklists for building regulations. In response to the Energy Performance of Buildings Directive, ODPM are currently working on the NCM for non-residential buildings; a calculation engine called Simplified Building Energy Method (SBEM) is being developed. It is anticipated that this will work in a similar manner to the SAP rating.

How will the systems of the buildings ensure efficient use of energy and reduce overall energy use?

29. The systems incorporated into buildings can also have a significant impact in terms of using energy efficiently. There is little value in incorporating the design and layout measures outlined above if the systems introduced into the building are not chosen to minimise the use of energy also. Heating, lighting and ventilation systems should only be mechanised where absolutely necessary. Good design can result in no requirement for heating or mechanical ventilation and with minimal lighting requirements. Mechanical systems should not be sized to exceed demand.

30. Heating
The heating of a development is a significant factor in the level of energy demanded. Building regulations now specify that only boilers with an efficiency rating of A or B can be fitted, currently only condensing boilers are able to meet this requirement. Condensing boilers increase efficiency by recovering the heat that is normally wasted in the hot flue gases given off by a conventional boiler. The flue gas from a conventional boiler will be at a temperature of about 150ºC, but a condensing boiler can reclaim most of this heat (and the latent heat of the water vapour in the flue gases) and give off flue gases at about 50ºC.

31. Combined Heat and Power
Combined Heat and Power (CHP) units generate electricity through an engine and capture the by-product, combustion heat, for use in heating and hot water systems. CHP units can use and be adaptable to a variety of fuel sources including premium fuels such as natural gas and renewable fuels such as biomass. CHP is an efficient way of generating power as it captures the heat generated in the process that is lost in other generating methods including at the power station. CHP is most cost effective when the demand is balanced over the day, so sharing systems between buildings (district heating) can be beneficial. Also, there needs to be a consistent demand for the generated heat throughout the periods in which the plant operates (as, if the heat is not required, CHP would rank as an inefficient method of generating electricity). Transmission distances should be kept short; CHP is most efficient when users are located close to the power source. Individual micro-CHP will achieve significantly greater reductions in CO emissions than condensing boilers but less than district CHP would.

Residential: CHP
CHP technology has been around for some time at the large scale but recently several companies have recently released micro-CHP systems suitable for individual dwellings that can achieve significantly reduced CO^2 emissions. Residential units as part of mixed-use developments and possibly larger residential developments may also be suitable for a district heating system run from a larger CHP plant.

Commercial: CHP
CHP units are also well suited to large buildings such as offices, factories and shopping centres and to district heating systems in mixed-use developments where the timing of demand differs between uses or buildings.

32. Ventilation
Maximum use of natural ventilation is appropriate in most circumstances. The simplest method of natural ventilation is to create opportunities for cross ventilation. Openings on opposite walls (or even adjacent walls) can draw air through a space. Windows should be openable and trickle vents and other such devices should be installed to provide continuous background ventilation. In order to maximise cross ventilation, the building depth should be no more than five times the floor to ceiling height. For single sided ventilation, depth should be limited to around two and a half times the floor to ceiling height.

33. Lighting
Around a third of the energy used by a building goes into lighting. Energy efficient buildings should therefore make as much beneficial use of naturally available light as possible. The main factors influencing the levels of daylight in a building are the orientation and size of windows, obstructions to light admission and reflectivity of surrounding surfaces. Daylight normally penetrates about 4 – 6 metres from a window into a room and adequate daylight levels can be achieved up to a depth of about 2.5 times the window head height. The daylighting benefits of large areas of glazing need to be considered against the thermal and other properties of glazing. Even where the design capitalises on natural light, it is important to carefully select the artificial lighting system that is installed. An efficient and easily controllable system can make significant benefits in terms of energy efficiency and therefore running costs.

Commercial: building services
Commercial properties often require more in terms of building services and more complicated systems to control and regulate the internal environment. In addition to the general points identified above, proposals for commercial properties should also give consideration to the following: Ventilation: The use of atria and thermal chimneys to increase the opportunities for natural ventilation. Low pressure mechanical systems can be employed to assist ventilation, this involves providing movement for airflow through and out of a building using fans and supply / extract ducts. It is likely that such mechanically assisted ventilation will be sufficient in a climate such as ours for all except a few hours each year. An example of such a system is displacement ventilation, which introduces air at low velocity at floor level, and extracts warm stale air at the ceiling: a good ceiling height is required for this approach to work (minimum 2.75m, but the more the better). Lighting: Rooflights can provide a wider distribution of light, which is especially useful in deep-plan buildings; they can provide three times the benefit of an equivalently sized vertical window. In non-domestic buildings the window area should be about 20% of the floor area to provide sufficient light to a depth of about 1.5 times the height of the room. The use of atria, light shelves or sun pipes can also increase the levels of daylighting deeper into rooms. Sun pipes use a tube with mirrors to deflect and direct light to where it is required, and can be useful in some domestic properties too. Where artificial lighting systems are specified those that minimise the levels of heat generated and therefore reduce the requirement for cooling and ventilation should be chosen.

Residential: appliances
As the energy efficiency of a building is improved, the impact that appliances have on the total energy consumption becomes more significant. White goods such as refrigerators, freezers, washing machines and tumble dryers can add significantly to the energy load of a household for example. It is important therefore to ensure that the appliances chosen to fit out a new building are as efficient in their use of energy as possible so as not to undo the good work done in improving the energy efficiency of the building envelope. It is worth noting however that simply stating a new building will be fitted with energy efficient appliances will not be sufficient to make that building acceptable without the corresponding efficiency measures to the envelope as specification of appliances is inherently a short-term measure in the life-span of a building.

Commercial: Building Energy Management Systems
Building Management Systems and Building Energy Management Systems are used to manage and control the environment within buildings. They can operate and control the heating, ventilation, air conditioning and lighting and even be designed to control window opening and blinds. These systems can have benefits in terms of optimising energy use but if used to control windows and blinds for example, can remove control from the occupants over their local environment, which can be frustrating.

Cost implications:

34. (to be added)

Energy efficiency questions to be addressed in an NRIA:

How will the design and layout ensure that energy is used efficiently in the scheme?

1. Has an energy strategy been prepared?
2. How is the development designed to maximise solar gain where it is appropriate to do so? (orientation / living spaces & glazing on South etc)
3. Does the design incorporate green or brown roofs?
4. How will the design of the building make efficient use of energy? (linked buildings, buffer zones, thermal mass etc)

How will the construction of the buildings ensure efficient use of energy and reduce overall energy use?

5. What insulation standard will the development be built to?
6. How is the development designed to minimise air leakage?
7. What glazing standard will the development be built to?

How will the systems of the buildings ensure efficient use of energy and reduce overall energy use?

8. Will the development incorporate high efficiency boilers?
9. Will the development be linked to a combined heat and power plant or to a district heating system?
10. How has the development been designed to maximise natural ventilation?
11. Will any mechanical ventilation to be incorporated be of high efficiency?
12. How has the development been designed to maximise natural daylighting?
13. Will the development incorporate a high efficiency lighting system?
14. Will the development incorporate high efficiency appliances (where installed)?
15. How will the heating, lighting and ventilation systems be controlled?

SECTION 3: RENEWABLE ENERGY

Background and forces for change:

35. Energy production is one of the chief sources of carbon emissions in the UK. Some 37% of UK carbon emissions originate from energy production. By using energy from renewable sources such as solar, hydro and biomass, reductions can be made in the demand for electricity generated in traditional non-renewable ways. This will help to reduce non-renewable energy use and green house gas emissions.

36. The government is seeking to encourage the development of renewable energy production and has set a target to reduce carbon dioxide emissions by 60% by 2050 and to generate 20% of UK electricity from renewable energy sources by 2020 (which includes 10% by 2010). The recent PPS22: Renewable Energy indicates the Government's intentions by making a significant step forward from the previous PPG22 of 1993, which it replaces.

37. Regional targets have been set for renewable energy generation; by 2010 the South East should generate at least 5.5% of its electricity from renewable sources and by 2026 at least 16%. The Thames Valley and Surrey Sub-region has been set the target of producing 140MW of renewable energy by 2010 and 209 MW by 2016. Oxford City Council will encourage development of renewable technologies on appropriate sites in order to contribute to meeting these targets.

38. Whilst energy can be produced using renewable sources at a national level through windfarms and biomass electricity plants for example, micro generation technologies can be incorporated into the design of buildings and can provide significant levels of energy to run them and even export to the national grid in order to provide an income source. The government see micro-generation as having "the potential to play a significant role in moving towards the government's objective of sustainable, reliable and affordable energy for all" [3]. There are various grant-making bodies offering financial support to developments that incorporate the use of renewable energy technologies, see Appendix 2 for sources of further information.

How will the design incorporate the use of energy from renewable sources?

39. Solar water heating
Solar collectors or panels containing water absorb the sun's heat and once hot, the water passes through a coil in a hot water cylinder and transfers the heat to the water in the cylinder. There are two main solar water-heating collectors: Flat plate collectors in a box which is glazed and insulated behind; and evacuated tubes where vacuum glass tubes enclose each pipe and its associated absorber plate acting as the insulation. Evacuated tubes are generally more efficient but the efficiency of flat plate collectors can be improved through the use of double-glazing or a selective coating. Solar collectors can be installed at low level or on the roof of a building or incorporated into the roof finish. The optimum location is facing slightly west of due south and at a tilt of 30 - 40º although a collector set anywhere between East and West and at a tilt of between 10 and 60º will perform at 90% of the optimum performance.

40. Photovoltaic (PV) arrays
Solar energy can be turned into electricity via the use of photovoltaic (PV) panels. These panels convert solar energy into electrical energy using a cell consisting of one or two layers of a semi conducting material, usually silicon. When light shines on the cell it creates an electric field across the layers, causing electricity to flow. Linked cells are encapsulated into modular panels which are interconnected to provide electrical power, which can be harmonised with grid electricity and fed back into the network. PV electricity supply can be isolated from the grid supply and so provide a reliable back up at periods of grid failure. PV panels are potentially very durable, as they have no moving parts. PV is one of the easiest renewable energy systems to install in the urban environment as PV panels can be fixed to or form an integral part of the roof covering, need not take up any additional land space, and do not require the specific topographical features that other forms of renewable energy do. PV arrays now come in a variety of shapes and colours, ranging

[3] DTI Micro-generation strategy and low carbon buildings programme consultation page 7

from grey 'solar tiles' that look like roof tiles, to panels and transparent cells that can be used on conservatories and glass to provide shading as well as generate electricity. Even over the winter months, a PV system can generate up to 25% of an average households total energy requirements.

41. Small-scale wind energy
The generation of energy through wind power is generally associated with large-scale wind farms in remote and exposed areas of the countryside. There is potential however for wind energy to be captured at the local level on a small scale. Small wind turbines can be installed on buildings or in the curtilage of buildings and used to supply a proportion of the base electricity load for the development or provide power for specific elements. Small-scale wind turbines are becoming more available commercially with some companies producing systems suitable for use on a single dwelling house. There are two main types of micro-turbine, those with a horizontal axis (a small version of those used in wind farms) and much rarer examples with a vertical axis. Due to the developed market, horizontal axis systems offer a cost benefit, a robust tested technology and a high output. However they require a high position and substantial foundation and they are affected by changes in the wind direction and speed. Vertical axis systems can operate at lower wind speeds, have a high output power to weight ratio and transmit minimum vibration and bending stress to walls or roofs. Analysis of the wind environment is a vital part of a profitable installation of a wind turbine: building-integrated turbines might yield less than their rated output because of turbulence, and because of lower wind-speeds at roof height.

42. Biomass
Biomass is the general term for fuel that has been grown, either directly or as a waste from managed woodlands or sawmills, and is therefore sustainable (if produced responsibly) and carbon-neutral. The most common use of biomass is for direct combustion and is therefore most efficiently used in conjunction with a combined heat and power plant (CHP) as described in Section 2.

43. Micro hydro
There is potential to use hydro technology, generally employed on a large scale, to the local level. The potential for such schemes depends on the volume and head (vertical drop) of water and the potential impact on the watercourse or water table of a project. Improvements in small turbine and generator technology mean that micro hydro schemes are an attractive means of producing electricity. Useful power may be produced from even a small stream. The likely range is from a few hundred watts (possibly for use with batteries) for domestic schemes, to a minimum 25kW for commercial schemes.

44. Ground source heat
Ground source heat pumps can be used to efficiently heat a building by drawing heat from the ground, concentrating it and delivering it to the building. There are three main elements to a GSHP system, a ground loop, a heat pump and a heat distribution system. The system works in a similar manner to a refrigerator: a closed loop system of plastic pipes filled with water and antifreeze is buried in the ground and pumped around the loop, the pump evaporates, compresses and condenses the heat and delivers it into the heating system of the building. This process exploits the stable temperature of the earth for both heating and cooling. The principle is that heat is not created but merely transferred from one area to another. The system removes heat from one side of the circuit and ejects heat to the other side. The pump requires energy to drive it but this could be provided through a renewable or sustainable method and requires less energy than conventional heating using gas, and far less than conventional heating using electricity. Heat pumps are particularly suitable for swimming pools and for buildings with under floor heating. Where buildings require pile foundations the closed loop system of pipes can be integrated into the foundations. They can be laid vertically or horizontally below the surface of the ground at a minimum depth of 2 metres beneath the curtilage of the building.

Cost implications:

45. (to be added)

Renewable energy questions to be addressed in an NRIA:

How will the design incorporate the use of energy from renewable sources?

16. Will the development incorporate active solar water heating systems?
17. Will the development incorporate solar electricity generation?
18. Will the development incorporate wind energy electricity generation?
19. Will the development incorporate the use of biomass as a fuel?
20. Will the development incorporate a micro-hydro scheme?
21. Will the development incorporate the use of ground source heat?

SECTION 4: CHOICE OF MATERIALS AND EMBODIED ENERGY

Background and forces for change:

46. When selecting the materials for a scheme it is important to consider the environmental impact of those choices over time including their manufacture, construction, finishing, operation (cleaning and maintenance) demolition and disposal. Specification of materials should consider their longevity, maintenance requirements, the levels of processing they have been through and where they are sourced.

How will the materials specified minimise embodied energy and environmental impact?

47. Embodied energy
Energy is used in the extraction, production and transportation of materials and as such an energy efficient project will minimise the levels of embodied energy in the materials selected. The total amount of embodied energy can be high; for an average office building life span of 15 to 20 years, about 7% of total energy consumption is embodied in materials. As the operation of buildings becomes more energy efficient, the levels of embodied energy will have an increasingly important part in the overall efficiency of a scheme. Different building methods use differing amounts of materials, so it is a matter of balancing the benefits of a particular building method against its impact. For instance, a design to maximise solar gain might require a solid concrete floor to store solar energy and the energy gain from this may outweigh the impact of the materials.

48. Low environmental impact
Re-used and recycled materials should usually have preference (see chapter 5); materials from a renewable source should always be chosen above those from a non-renewable source. Care should be taken to source materials from suppliers and manufacturers that have a proven environmental management record (some manufacturers have ISO 14001 environmental management systems in place) or those that publish environmental data.

49. Locally sourced materials
Sourcing materials from the locality of a site has a number of benefits. The main environmental benefit is the reduced distance for transportation they involve. Reducing the distance that materials have to travel, in particular heavy construction materials, has a significant impact on the demand for road transport and the energy that that requires. Other benefits include the enhancement of the link between the new building and the area, preserving local character and providing support for the local economy.

50. Good internal air quality / sick building syndrome
Sick Building Syndrome is officially recognised as an illness by the World Health Organisation and is a wide range of symptoms triggered by the presence of chemical, allergens, microorganisms etc in buildings, as part of the artificial nature of many internal environments (including artificial lighting and the lack of connection with the diurnal cycle that can be offered by natural light and outside views). The careful specification of materials and internal finishes and decorating materials can help to minimise the incidence of sick building syndrome and contribute to the creation of a good internal air quality. For example paints and varnishes should have a natural finish or have a low solvent content and avoid toxic volatile organic compounds (VOCs) that are found in many high gloss paints and varnishes. An alternative can be the use of natural resin emulsions that are solvent-free and biodegradable.

51. Responsible use of timber
The use of timber is significant in the building industry and the consumption of timber is increasing. Whilst timber has many environmental benefits as a building material (being renewable with low embodied energy and natural) it is important that it is specified and used responsibly. Less than 15% of the total wood and wood products consumed in Britain comes from British woodlands, most construction timber is sourced from temperate forests in North America, Scandinavia and Russia with tropical hardwood imported mainly from the Far East. The management of forestry is key to the sustainability of using timber. The Forest Stewardship Council (FSC) is an independent and international labelling scheme for timber and timber products. This scheme certifies forestry that is

managed in an environmentally appropriate way that respects the interests of local people and is economically viable. The order of preference for use of timber is as follows: re-use second hand timber; use timber composites that contain 75% or more recycled materials, use home-grown certified timber and finally use FSC-certified imported timber. Threatened imported species especially hardwoods should be avoided at all times. As far as possible the use of timber preservative treatments should be avoided as the chemical formulations of many preservatives mean that treated timber is classed as toxic waste. Careful detailing and specification of durable timber can avoid much preservative use.

Cost implications:

52. (to be added)

Choice of materials and embodied energy questions to be addressed in an NRIA:

How will the materials specified minimise embodied energy and environmental impact?

22. Will the materials be specified to ensure a low level of embodied energy?
23. Will the materials be specified to prioritise those with minimal environmental impact?
24. Will the materials be sourced locally?
25. Will the materials and systems be specified to ensure a good quality internal environment?
26. Will the timber be specified to ensure it is from the most sustainable sources?
27. Will contractors & suppliers be chosen having regard to their environmental management record?

SECTION 5: RECYCLED MATERIALS

Background and forces for change:

53. Every year in the UK around 330 million tonnes of waste is produced. Total construction and demolition waste for England and Wales in 2001 was estimated at 93.91 million tonnes, an increase on an estimated 72.5 million tonnes in 1999. 48% of this was recycled and a further 48% was beneficially re-used, landfill sites and quarries. The remaining 4% was sent to landfill as waste. Around 72.5 million tonnes of construction and demolition materials is disposed of as waste. Around 13 millions tonnes of construction waste comprises material delivered to site and thrown away unused. This costs the UK's construction industry around £193 million each year in landfill tax, excluding disposal charges. Changes in the waste management licensing regulations and the introduction of the landfill tax are two mechanisms through which the government have sought to reduce the amount of waste sent to landfill and increase the amount of material recycled. Waste production of course continues throughout the occupation of the development. Oxfordshire households in 2003 – 2004, produced 483 kg of waste per person per year. Whilst UK businesses produce 75 million tonnes of waste each year, over half of which is sent to landfill. The City Council has a target of achieving recycling levels of 18%.

How will the buildings be re-used and / or demolition waste be responsibly dealt with?

54. Re-use / conversion of existing buildings
Existing buildings can often be refurbished or extended involving a much lower demand for new resources and materials. Re-use and conversions can offer opportunities to retain the existing embodied energy of buildings and reduce the level of waste generated through demolition and the level of new resources and materials required. The conversion of basements and roof spaces and the creation of additional floors and extensions are ways in which existing properties can be successfully re-used. However existing buildings may not be orientated and laid-out in the most energy efficient manner (as set out in section 2) and may require significant improvements in terms of insulation for example. There may be opportunities to improve passive solar design through changes in the layout and glazing patterns for example. Ideally developers should only build new when all possibilities of refurbishing and re-using existing buildings have been exhausted.

55. Strategy for re-use / disposal of waste
Where demolition is appropriate and necessary, a clear strategy should be formulated for the handling and re-use or disposal of demolition waste. Contractors should also be required to implement a waste strategy, which includes a waste audit, identifying the waste streams with proposals for dealing with them which could include on-site recycling or the use of waste reclamation firms.

How will waste be minimised and the materials and construction methods used in the development make best use of recycling?

56. Reclaimed / recycled materials
The use of reclaimed and recycled materials in construction can lead to lower environmental impacts both in terms of a reduced demand for new materials and in terms of a reduced level of waste to be disposed of in landfill sites. Such materials can be sourced from demolition (e.g. reclaimed steel and timber elements and recycled masonry for use as aggregate either generated on site or elsewhere); from construction waste (e.g. broken bricks and tiles) and from waste from the manufacture of materials and components or other industries. The energy saving value from recycling needs to be considered where recycled elements are transported in from other sites or require significant levels of reprocessing; however the on-site recycling of demolition and construction waste is generally always preferable to its removal and disposal. There is a healthy and growing market for some re-used construction components such as bricks, roof slates, hardwood flooring, timber beams and architectural features. Such components are often sought at a premium and their careful removal during demolition can provide a good income source if they are not required on site.

57. Aggregates and soils

Over 90% of non-energy minerals extracted in Great Britain are used to supply the construction industry with materials. The sourcing and transportation of new sand, gravel and crushed rock has significant environmental impact and as such the government has introduced the Aggregates Tax. This tax in conjunction with the Landfill Tax on the disposal of waste is designed to encourage the use of recycled aggregates. 18% of UK aggregates now come from recycled sources. On larger sites, on-site crushing and re-use is the best option although recycled aggregates are widely available and increasingly local contactors are interested in the removal of waste for off-site crushing. Where extra soil (top soil or sub soil) is required in landscaped areas, this should be provided in the form of screened soil reclaimed from other developments. Where soil is superfluous to requirements on a development, this soil should be carefully handled to protect its quality.

58. Ease of construction in design

The design of buildings should be reviewed from the viewpoint of ease of construction and managing waste at an early stage. Prefabrication, the off-site construction of aspects or modules of buildings, offers many benefits including quality, health and safety, handling of materials and quick build times on site, but it also offers the potential to significantly reduce waste. Prefabrication in a controlled factory environment can mean less waste is generated from ordering surplus materials or through materials being damaged on site. The waste that is generated under factory conditions can also be re-used and recycled more easily.

59. Future de-construction

Designing buildings and their details with deconstruction in mind enables the building at the end of its useful life-span to become the resource for future developments and complete the resource cycle. Designing buildings with their deconstruction in mind will help minimise waste to be sent to landfill and hence reduce future liability for the costs that involves, provide a source of materials for the replacement of the building or resale if appropriate when the building reaches the end of its life-span. This responsible outlook can also help minimise the risk of financial penalties in the future due to changing legislation as it is likely that legislation in this area will only be tightened over time. A deconstruction plan can be produced to document the areas addressed in the design and assist with deconstruction in the future. Examples of ways in which future recycling of elements can be protected include: avoiding composite materials, using lime-based rather than Portland cement for mortar and renders to enable easier recycling of bricks, using mechanical fixings rather than adhesives and using dry construction techniques where possible.

How will domestic / commercial waste generated in the development be dealt with?

60. Storage and access to facilities / collection

Storage facilities should be provided and accessible safely and conveniently by building occupants. Internal layouts should include space to store waste conveniently before it is taken outside for recycling or composting. A similar scheme is available for commercial properties and advice should be sought from council officers in the City Works Business Unit.

61. Composting

Land filled organic waste imposes burdens on the environment out of proportion to its volume; during decomposition methane is created which is a greenhouse gas with thirty times the global warming potential of CO^2. Composting organic waste addresses this problem and turns a waste into a valuable resource for use in gardens and landscaping schemes. Home composting achieves a significant reduction in waste for disposal and can raise awareness of the wider waste issue among users. A green waste recycling scheme also operates in the city, advice should be sought from officers in the City Works Business Unit.

Residential: recycling
All houses and flats in Oxford are included in the City Council's kerbside recycling collection. This scheme involves the collection of glass, tins, paper and clothes. Storage space for the separation of materials should be provided in any development.

Commercial: recycling
The City Council operate a collection scheme for commercial properties whereby materials for recycling are collected from the kerbside. For more details on this scheme contact City Works Business Unit.

Cost implications:

62. (to be added)

Recycled Materials questions to be addressed in an NRIA:

How will the buildings be re-used and / or demolition waste be responsibly dealt with?

28. Will the development make efficient use of existing buildings?
29. Will a strategy for the minimisation and handling of waste be prepared?

How will waste be minimised and the materials and construction methods used in the development make best use of recycling?

30. Will the development make maximum use of recycled materials?
31. Will the development make maximum use of construction and demolition waste arisings?
32. How is the development designed to incorporate materials / elements that will be simple to re-use / recycle?

How will domestic / commercial waste generated in the development be dealt with?

33. How will provision be made for the storage / collection of waste generated in the development?
34. How will the development provide opportunities / facilities for home / community composting?

SECTION 6: WATER RESOURCES

Background and forces for change:

63. Water consumption in the South East has grown significantly in recent years and is the highest per capita in the UK. As well as being a precious resource in its own right, the treatment of water through the sewage system requires large resources and energy. Minimising the amount of mains water that is used within a building is inherently good for the environment but also reduces running costs (where metered). The Thames region is among the driest in the UK, receiving an average of 690mm rainfall per year compared with an annual national average of 897mm. Extraction of water is having a severe impact on parts of the South East region.

How will water resources be conserved and recycled?

64. Water saving devices
On average 150 litres of water is used per person per day. 34% of water used at home is in baths and showers, 29% in toilets and 4% in gardens. Installing water saving devices can reduce these levels considerably. Low flush toilets, aerating taps, low flow shower heads and water efficient appliances are examples of water saving devices that can be specified and reduce water consumption. The installation of water meters has been shown to have a significant impact on the levels of water consumption by encouraging changes in behaviour among occupants. Landscaping can be designed to minimise the level of water required for its maintenance, this can include careful choice of planting and the use of wood chips.

65. Rainwater collection / harvesting
On average about 200 litres of rainwater fall on the roof of a 100m² house each day in the UK. Simple uses of harvested rainwater are garden irrigation and car washing, but it can also be used to flush toilets and for washing machines if treated through filtration. Rainwater can be easily collected at the domestic scale with the use of a water butt and the water can be used elsewhere in the property. At a slightly larger scale, rain can be collected from the roof travelling via a drainpipe into a storage tank (usually underground). A control unit monitors the water level in the storage tank and can display this information to the user. If levels drop too low, the system switches to the mains water supply and if it gets too high, an overflow trap allows the excess to be skimmed off to a storm drain.

66. Grey water recycling
Grey water is the term given to water that has already been used in washbasins, showers, baths and washing machines this water can also be collected and reused. Depending on the cleaning products used, straightforward settlement may be all that is required before grey water can be reused in the garden. There are grey water reuse systems available on the market that will filter and chemically treat grey water and make it suitable for toilet flushing and car washing. The plumbing in a building can be designed so as to connect the waste outlet of a washbasin with a toilet cistern that will cut down on the amount of clean water that is simply flushed away.

Residential: water collection
On a domestic scale the simplest method of water recycling is the collection of rainwater in water butts and the use of the water elsewhere on the property, for example watering the garden and washing the car. A water butt can be installed for a minimal outlay but is more likely to be used by the residents if installed before occupation.

Commercial: water collection
At a larger scale it becomes more appropriate to collect rainwater for storage in an underground tank that can be used to in place of or to supplement mains water for a variety of uses.

Cost implications:

67. (to be added)

Water Resources questions to be addressed in an NRIA:

How will water resources be conserved and reused?

35. How will the development incorporate the use of water saving devices?
36. How will the landscaping be designed to minimise water consumption?
37. How will the development incorporate the harvesting and re-use of rainwater?
38. How will the development incorporate the collection, treatment and re-use of grey water?

APPENDIX 1: GLOSSARY

(To be added)

APPENDIX 2: SOURCES OF FURTHER INFORMATION

Section 2: Energy Efficiency
BRE; EST; Carbon Trust; Part L; sustainable-energy.co.uk; Sustainable Energy Officer; BSRIA.co.uk; actionenergy.org.uk; CIBSE Guide F

Section 3: Renewable Energy
Carbon trust; clear skies; low carbon buildings; DTI.gov.uk/renewables; EST; greenenergy.org.uk; Sustainable Energy Officer; bwea.com; trade bodies

Section 4: Choice of Materials and Embodied Energy
BRE; Recycle-it.org; FSC; Constructsustainably.com; Constructionresources.com; AECB.net; Rethinkingconstruction.org; ccscheme.org.uk

Section 5: Recycled Materials
WRAP; Wastewatch.org,uk; RICS.org; Aggregain.org.uk; Letsrecycle.com; Recycledproducts.org.uk; OCC waste strategy; Waste strategy 2000 (DETR); Salvo.co.uk; Recyclewood.org.uk; Bremap.co.uk; City works

Section 6: Water Resources
EA "conserving water in buildings"; Water.org.uk; UKCIP.org.uk; thameswater.co.uk; sustainablehomes.co.uk

APPENDIX 3: OXFORD LOCAL PLAN 2001 – 2016

Environmental Opportunities

2.15 Energy Efficiency

2.15.1 Energy conservation and renewable energy are central to the principles of sustainable development, and are a fundamental part of design. Developers should demonstrate how the schemes have been designed to help to conserve energy by means of layout, orientation, construction, materials and landscaping of buildings.

2.15.2 Part L of the Building Regulations covers some aspects of energy efficiency and sets some minimum standards. However, the City Council will seek good design which covers all aspects of energy efficiency.

2.15.3 The City Council attaches importance to the efficient use of natural resources in new developments and the re-use of existing buildings.

POLICY CP.15 - ENERGY EFFICIENCY
Planning permission will only be granted for developments which are designed to optimise energy efficiency. Developments will be assessed against the following criteria: a. the use of appropriate materials, siting, form, orientation and layout of buildings to maximise the benefits of passive solar (or natural) heating, cooling, lighting and natural ventilation; b. the use of soft landscaping, including tree planting, to increase summer shading and reduce heat loss in winter; and c. the use of energy-efficient, renewable-energy technology, whether new or traditional, for heating, cooling, power and lighting.

2.16 Use of Renewable Energy

2.16.1 Renewable energy is the term used to describe the energy flows that occur naturally and repeatedly in the environment, for example from the sun, wind, oceans, plants and water.

2.16.2 The Government has planned a range of legislative and commercial incentives to achieve the target of generating 10% of electricity supplies from renewable resources by 2010. Government policy is to stimulate the development of new renewable energy sources, wherever they may be economically attractive and environmentally acceptable, to contribute to:

- diverse, secure and sustainable energy sources;
- a reduction in the emission of pollutants;
- the encouragement of competitive renewable industries.

2.16.3 The City Council will in particular encourage the use of solar panels, photovoltaics and, where appropriate, wind generators on all developments (both new and existing), and on residential and non-residential buildings.

POLICY CP.16 - RENEWABLE ENERGY
Planning permission will be granted for renewable energy schemes in appropriate locations.

2.17 Recycling Facilities and Use of Recycled Materials

2.17.1 One of the key aims for 'sustainability' is to minimise waste. The principle is based on reducing the quantity of waste produced, recycling the waste which is produced, and re-using recycled or reclaimed materials.

2.17.2 All new developments that attract a large number of people should include recycling facilities. They should provide enough space for small recycling areas suitable for facilities, such as bottle banks, and paper and plastic recycling bins.

2.17.3 One of the problems of home recycling is that internal residential layouts are not normally large enough for separation and recycling at home. The short-term storage of glass, paper and plastics can require specific consideration in the kitchen layout. In new residential development space should be allowed for the home recycling boxes collected by the City Council.

2.17.4 The City Council will encourage the re-use of re-claimed building materials and the use of secondary aggregates, screened soil and other re-cycled materials in all developments. Developments of 10 or more dwellings, or more than 2,000 m^2 of floorspace, must demonstrate how the design will incorporate the use of secondary materials. Examples of this could be the use of reclaimed bricks, tiles and timbers, the use of screened soil and wood chips in landscaping areas, or the use of secondary aggregates in the construction of roads.
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2.17.5 Developments, where the design does not incorporate the use of recycled or reclaimed materials, will be refused planning permission, as they would not help the City Council in achieving the Government's targets on minimising waste. Policy CP.18 requires developments above certain thresholds to submit a Natural Resource Impact Analysis (NRIA) which would include recycled materials.

POLICY CP.17 - RECYCLED MATERIALS
Planning permission will only be granted for developments of 10 or more dwellings, or non-residential development of 2,000m^2 or greater, where the design includes the use of recycled or reclaimed materials. This may form part of the Natural Resource Impact Analysis (NRIA).

2.18 Natural Resource Impact Analysis

2.18.1 The City Council will encourage all developments to combine resource efficiency and renewable energy into their design. The sensible use of construction materials, energy-efficient systems, and high technology appliances can improve living standards and reduce running costs. Examples include the following facilities:

- grey water recycling systems;
- recycled paper insulation;
- energy management systems;
- natural ventilation;
- solar orientation;
- solar water heating;
- avoidance of air conditioning;
- combined heat and power (CHP) facilities.

2.18.2 Proposed development should use fewer non-renewable resources, re-use materials, use less energy, and give more consideration to life cycle costs (i.e. the environmental costs of materials, source, transport, construction method and running costs). It is important that building materials are not toxic.

2.18.3 Developments of 10 or more dwellings or non-residential developments of 2,000 m^2 or greater must submit a Natural Resource Impact Analysis (NRIA). The NRIA should explain how the use of natural resources has been minimised in the project through energy efficiency, use of renewable energy, recycling and use of recycled materials. Large- scale developments which do not adequately address the NRIA in their design will be refused planning permission.

2.18.4 The City Council will, from time to time, publish Supplementary Planning Documents on the requirement for, and content of, a Natural Resource Impact Analysis (NRIA), and give examples of good practice in applying the above principles to different types of development proposals.

POLICY CP.18 - NATURAL RESOURCE IMPACT ANALYSIS
Developments of 10 or more dwellings or non-residential developments of 2,000 m^2 or more will be expected to submit a Natural Resource Impact Analysis (NRIA), as detailed in a Supplementary Planning Document. Planning permission will only be granted for developments, if through the NRIA, the proposal demonstrates careful attention to, and exploitation of: a. opportunities for the reduction in energy use; b. efficiency in the use of energy; c. the generation of energy from renewable energy sources; d. the use of renewable resources in general; and e. the use of recycled or reclaimed materials in their construction.

APPENDIX 4: SUSTAINABILITY OBJECTIVES OF THE NRIA SPD

NRIA SPD objectives	
Objective a	To ensure that all new developments are designed to maximise energy efficiency
Objective b	To secure more developments that incorporate the use of renewable energy
Objective c	To ensure that all large scale developments incorporate the use of recycled or reclaimed materials in their design
Objective d	To ensure that new developments avoid, where possible, the use of non-renewable resources and that consideration is given to the wider environmental impact of the materials and resources utilised
Objective e	To provide guidance to developers on what will be expected in Natural Resource Impact Analysis documents that are to be submitted with applications for planning permission for large-scale developments.

APPENDIX 5: SUGGESTED NRIA TEMPLATE

Please answer each question with “yes”, “partially” or “no” and provide as much detail as is available to support that answer. Where the answer to the question is “partially” or “no” please provide reasons for this stance.

Energy Efficiency:

How will the design and layout ensure that energy is used efficiently in the scheme?	
1	Has an energy strategy been prepared?
2	How is the development designed to maximise beneficial solar gain? (through orientation, spatial layout and systems design)
3	Does the design incorporate green or brown roofs?
4	How will the design of the building make efficient use of energy? (linked buildings, buffer zones, thermal mass etc)

How will the construction of the buildings ensure efficient use of energy and reduce overall energy use?	
5	What insulation standard will the development be built to?
6	How is the development designed to minimise unwanted air infiltration?
7	What glazing standard will the development be built to?

How will the systems of the buildings ensure efficient use of energy and reduce overall energy use?	
8	Will the development incorporate high efficiency boilers?
9	Will the development be linked to a combined heat and power plant or to a district heating system?
10	How has the development been designed to maximise controlled natural ventilation?
11	Will any mechanical ventilation to be incorporated be of high efficiency?
12	How has the development been designed to maximise natural daylighting?
13	Will the development incorporate a high efficiency lighting system?
14	Will the development incorporate high efficiency appliances (where installed)?
15.	How will the heating, lighting and ventilation systems be controlled?

Renewable Energy:

How will the design incorporate the use of energy from renewable sources?	
16	Will the development incorporate active solar water heating systems?

17	Will the development incorporate solar electricity generation?
18.	Will the development incorporate wind energy electricity generation?
19	Will the development incorporate the use of biomass as a fuel?
20	Will the development incorporate a micro-hydro scheme?
21	Will the development incorporate the use of ground source heat?

Choice of Materials and Embodied Energy:

How will the materials specified minimise embodied energy and environmental impact?	
22	Will the materials be specified to ensure a low level of embodied energy?
23	Will the materials be specified to prioritise those with minimal environmental impact?
24	Will the materials be sourced locally?
25	Will the materials and systems be specified to ensure a good quality internal environment?
26	Will the timber be specified to ensure it is from the most sustainable sources?

27.	Will contractors & suppliers be chosen having regard to their environmental management record?

Recycled Materials:

How will the buildings be re-used and / or demolition waste be responsibly dealt with?	
28	Will the development make efficient use of existing buildings?
29	Will a strategy for the minimisation and handling of waste be prepared?

How will waste be minimised and the materials and construction methods used in the development make best use of recycling?	
30	Will the development make maximum use of recycled materials?
31	Will the development make maximum use of construction and demolition waste arisings?
32	How is the development designed to incorporate materials / elements that will be simple to re-use / recycle at the end of the buildings life?

How will domestic / commercial waste generated in the development be dealt with?	
33	How will provision be made for the storage / collection of waste generated in the development?
34	How will the development provide opportunities / facilities for home / community composting?

Water Resources:

How will water resources be conserved and reused?	
35	How will the development incorporate the use of water saving devices?
36	How will the landscaping be designed to minimise water consumption?
37	How will the development incorporate the harvesting and re-use of rainwater?
38	How will the development incorporate the collection, treatment and re-use of grey water?

Checklist:

			Minimum standard		**Preferred standard**		**Target standard**		**Score achieved**
Energy efficiency	C1	Residential uses: What is the SAP rating? Non-residential uses: What is the SBEM rating?	SAP good (GS1)	pts	SAP best (BS1)	pts	SAP advanced (AS1)	pts	
Renewable energy	C2	What percentage of energy requirements will be produced by on-site renewables?	20%	pts	30%	pts	30% +	pts	
Materials	C3	What score is achieved in table 1?	X	pts	Y	pts	Z	pts	
Water resources	C4	What score is achieved in table 2?	X	pts	Y	pts	Z	pts	
								Total checklist score:	

APPENDIX 6: NRIA CHECKLIST (to be completed)

All NRIAs are required to be submitted with a completed checklist, whether the NRIA template in Appendix 5 has been used or not. This information will be used to supplement the details submitted in the earlier sections of the NRIA. Tables 1 – 3 should be used to calculate the value for questions C3 – C5.

			Minimum standard		Preferred standard		Target standard		Score achieved
Energy efficiency	C1	Residential uses: What is the SAP rating? Non-residential uses: What is the SBEM rating?	SAP good (GS1)	pts	SAP best (BS1)	pts	SAP advanced (AS1)	pts	
Renewable energy	C2	What percentage of energy requirements will be produced by on-site renewables?	20%	pts	30%	pts	30% +	pts	
Materials	C3	What score is achieved in table 1?	X	pts	Y	pts	Z	pts	
Water resources	C4	What score is achieved in table 2?	X	pts	Y	pts	Z	pts	
								Total checklist score:	

Table 1 - Choice of materials (points given where most (>60%) per element)

	Most environmentally sound = 20 points	**Environmentally sound = 15 points**	**Less environmentally sound = 5 points**	**Environmentally unsound = -25 points**	**Points achieved**
Foundations / hardcore	Recycled aggregate from on-site demolition				/20
Structural frame	FSC durable timber	Reclaimed structural steel	Recycled concrete aggregate (RCA)	Primary steel, non FSC timber, concrete with primary aggregate	/20
External walls, load bearing / masonry	Recycled brick with lime-mortar	New brick with lime mortar	New brick with cement mortar	Solid concrete with primary aggregate	/20
Internal walls					/20
Ground floor	FSC timber / hollow ceramic	Hollow RCA concrete	Solid RCA concrete	Solid concrete with primary aggregate	/20
Upper floors	FSC durable timber	Section steel, aluminium	Prefabricated RCA concrete	Concrete with primary aggregate	/20
Flat roof covering	Green / brown roof	EPDM sheet, modified bitumen, natural rubber	Recycled PVC, bitumen, stainless steel, aluminium,	PVC, steel with organic costing (PVC/PVF), lead	/20

			copper, zinc	sheet	
Pitched roof covering	Green / brown roof, FSC shingle, reclaimed tile or slate	Natural slates, clay or concrete tiles	Fibre cement or bitumen slate, copper	Zinc with PVC coating, asbestos fibre cement	/20
Insulation	Cellulose, sheep's wool				/20
Windows and doors	FSC durable timber	Untreated softwood	Aluminium, recycled PVC	PVC, Non-FSC tropical timber	/20
				Table 1 total:	/200

Table 2 – Water Resources

	High score	**Medium score**	**Low score**	
Water use	Predicted average per bedspace consumption to not exceed: Residential: <X l/h/d	<Y l/h/d	125 l/h/d ($46m^3$/bedspace/year)	
Rainwater collection & use	Maximum use for toilets / washing machines etc.	Limited use for landscaping and gardens	No use	
Grey water recycling	Maximum use for all non-potable uses	Collection and recycling for some uses	No use	
			Table 3 total:	