

Beddington Zero Energy Development



Case Study Report

Produced for the Housing Corporation
by BioRegional Development Group



Introduction

Our planetary means

If everyone on the planet consumed as much as the average person in the UK, we'd need three planets to support us.¹

It takes around 6.3 hectares of biologically productive land to support each person in the UK, whereas the actual available productive area on Earth is only 2.2 hectares per person. This footprint includes the amount of forest required to absorb the CO₂ emissions attributed to a person's lifestyle and activities. Ecological footprinting informs us that the UK needs to reduce its consumption of fossil fuels and virgin materials by two-thirds to live within the means of one planet. To achieve this reduction we must develop sustainable ways of living. Only by meeting more of our everyday needs from local, renewable and reclaimed resources can we hope to achieve this target.

The role of construction

Over half of all of the resources consumed across the world are used in the construction and running of buildings. 5% of energy generated globally is used to construct buildings and 45% is used to heat, light and ventilate them.²

Addressing the environmental sustainability of the construction and occupancy of buildings is fundamental to meeting our two-thirds eco-footprint reduction target. However, for a development to be truly sustainable it must offer more than reduced environmental impact alone. Developments must address the social amenity, creating sustainable communities with spaces people want to live and work in. Developments must also offer financially sustainable solutions which are viable within a market economy.

The importance of housing

The environmental, social and financial issues surrounding sustainable development are particularly important in the housing sector. Housing contributes approximately 27% of all CO₂ emissions in the UK.³

The Government's National Strategy for Sustainable Development sets out 10 key principles and 147 indicators to measure progress towards achieving their sustainable development objectives. 70 of these indicators can be linked to housing and community issues, illustrating the importance of housing to sustainability.

The Housing Corporation's approach

The Housing Corporation is committed to integrating Government policy on sustainable development into its ethos. The Corporation aims to provide a better quality of life for residents by encouraging housing associations to adopt sustainable development principles.

The Housing Corporation invests in and regulates a sector that owns and manages more than 1.45 million homes (approximately 7% of total English

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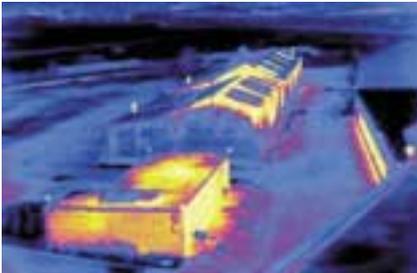
If everyone on the planet consumed as much as the average person in the UK, we'd need three planets to support us



Building at higher densities on previously used sites will reduce the number of homes which need to be built on greenfield sites



A typical UK lifestyle has an ecological footprint of 6.3 hectares per person. To meet our environmentally sustainable target and live within our planet's capacity we need to reduce this to 2.2 hectares.



Investment in energy efficient homes helps to reduce fuel poverty by cutting running costs for tenants



The village square at BedZED. A place for chance meetings and social interaction on the mixed-use, mixed-tenure development



BedZED comprises 82 homes, office space and live-work units. It is the UK's largest eco-village.

housing stock), housing at least twice that number people. If investment levels are maintained and the transfer of former local authority stock continues, housing associations will own and manage around 4 million homes in 10 years time. This would make the sector the largest provider of social housing in England. Housing associations are already the largest provider of new social housing.

The Corporation expects housing associations to foster environmental, economic and social sustainability issues, as indicated in their strategy document, *Building on Success* (2001-04). Tools to help associations do this are being developed with the support of the Innovation and Good Practice Unit at the Housing Corporation.

This leaflet introduces the BedZED development as a case study to show how sustainable development can be achieved by social housing providers. The leaflet is targeted at housing association staff involved in development, investment and refurbishment in relation to social housing provision. Environmentally sustainable design and investment in energy efficiency can reduce running costs for tenants with any extra initial capital costs being recouped through lifecycle savings.

Introduction to BedZED

Beddington Zero (fossil) Energy Development or BedZED, is the UK's largest eco-village. The development was designed by architect Bill Dunster and developed by the Peabody Trust. The BioRegional Development Group was instrumental in locating the site, and worked with the design team to source construction materials and provide 'green' lifestyle services. Together we are showing how green living is a real, attractive and affordable option. Energy efficiency, renewable energy and water conservation are successfully integrated with a car club and local organic food deliveries.

BedZED comprises 82 homes, office space and live-work units. The village has a mix of social housing, shared ownership, key-worker homes and private houses for sale at prices comparable to more conventional homes in the area. It is designed for a comfortable, yet highly resource-efficient way of life. The development strives to achieve environmental, social and economic sustainability.

Foundations for the future, a guide on sustainable design funded by the Housing Corporation (published September 2002), promotes sustainability in social housing through reference to three main themes: *Sustainable communities, sustainable tenancies and sustainable buildings*. In this document, we introduce BedZED using these themes and refer to the checklists for sustainability associated with each theme. Issues relating to sustainable tenancies (including terms of tenancies and quality and landlords services etc.) are discussed in this leaflet, but do not directly relate to the work of BioRegional at BedZED and hence do not have their own distinct section.

BedZED targets

- Environmental: low energy and renewable fuel, including biomass combined heat and power (CHP) and photovoltaics (PV), zero net carbon emissions, integrated water conservation strategies, reclaimed materials, Green Travel Plan, and biodiversity measures.
- Social: mixed tenure, two-thirds affordable or social housing, lower fuel and water costs, community space, sports pitch, child-care facilities, 'village square', private gardens for most units.
- Economic: Locally sourced materials, workspace for local employment and enterprise, locally available renewable energy resources.

Sustainable Communities

Mixed-use development

Sustainable development planning is often misrepresented as simply an exercise in low energy design, it is as much a question of creating sustainable mixed communities. It is insufficient for a development to contribute towards reductions in global CO₂ emissions, if residents feel excluded and isolated, suffer from poor health, will not go out for fear of crime, and have nowhere to meet their friends or watch their children play in safety. Mixed-use development, of residential, commercial and community space, is pivotal to achieving integrated and successful communities with reduced car dependence.

A mixed-use development will not be deserted as purely residential areas are during the day and commercial areas are in the evenings and at weekends. This helps ensure self-policing and increased security for both individuals and premises. Providing live-work units and commercial space offers the opportunity to work locally and a stress-reducing alternative to commuting with the associated time and environmental impact savings. Mixed-use developments can also provide an increased sense of community resulting from the layering and interaction of different activities and occupation patterns. Building mixed-use developments at high densities can also reduce the need to develop greenfield sites.

In addition to having residential, live-work and commercial units, providing community facilities is important to creating and maintaining sustainable communities.

On site, units have been earmarked to accommodate a childcare facility and a doctor's surgery. Communal space is provided by a sports pitch with clubhouse and a multi-purpose space which currently houses the BedZED exhibition and is regularly used for community events. A village square with native trees and seating lies at the heart of the development, forming part of the pedestrian route through the site.



The development achieves an overall density of 47 homes/hectare. The BedZED core (ZED model) highlighted in red, achieves 100 homes/hectare

Transport and Traffic

The main aim of a sustainable attitude towards transport is to reduce the need to travel. This must be complemented by the provision of alternative sustainable modes of travel with lower associated CO₂ emissions than private car use. Calculations from BedZED suggest that a 50% reduction in fossil fuel consumption through car use can be achieved through a combination of public transport, using car clubs, walking and cycling.



Strategies for achieving this target are outlined in a Green Travel Plan which the Peabody Trust has committed to as a legal obligation under the planning agreement.

Reducing the need to travel

By providing employment opportunities and on-site facilities as part of a mixed-use development, the need for personal travel has been reduced. But, discouraging road journeys for personal transportation is not the only issue. UK Government figures show that road haulage accounts for 7% of the UK's CO₂ emissions and is the fastest growing source of greenhouse gases. Agricultural and food freight accounted for 30% of all road freight in 1999.⁴

To reduce the need to make regular car journeys to the supermarket, the use of home delivery services from supermarket chains and local organic food suppliers has been encouraged. Residents have access to an internet point and secure storage facilities for unattended deliveries. A typical household's eco-footprint due to food consumption can be dramatically reduced by choosing local and organic food.



A keen BedZED resident could reduce their total eco-footprint by 0.91 hectares through thoughtful food consumption

Promoting alternatives to private car use

Reducing car use has tangible health benefits. Air pollution, which contributes to respiratory problems, can be reduced and the alternatives of walking and cycling are good forms of exercise. Factors affecting people's decision to walk even short distances include quality of the local environment, levels of pollution and perceptions of safety from traffic and street crime. At BedZED, these issues are addressed by designing using 'Home Zone' principles.

Home Zones are widely adopted in parts of mainland Europe. Under the scheme, pedestrians and cyclists have absolute priority and vehicular traffic is reduced to walking pace within the zone. Home Zones provide safer environments conducive to walking, cycling and allowing children to play outdoors.

Reducing car speeds, giving priority to cyclists and pedestrians, having safe and convenient cycle routes and providing secure cycle storage facilities are all pivotal to encouraging sustainable travel. Homes have allocated cycle storage space and there are cycle parking and showering facilities for visitors and employees. BioRegional has negotiated discounts with local cycle shops, which are promoted as part of a welcome pack including cycling maps and local cycling information. This initiative aims to provide incentives for residents and workers to cycle.

ZEDcars users have reported the benefits of enjoying the mobility of a car for some journeys when the alternatives aren't suitable, and being able to share the costs of car ownership as part of a club.

Public transport

More than a quarter of all journeys in the UK are under one mile, 50% of all journeys are under two miles and two-thirds are under five miles. However, people rarely want to spend more than 15 minutes - three-quarters of a mile - walking to a shop, a transport link or a social event.⁵ These facts highlight that a successful sustainable transport network is reliant on combining footpaths and cycle routes with public transport.

The BedZED development is located on a major road used by two bus routes, which connect to local centres. Hackbridge and Mitcham Junction mainline stations are both within walking distance and offer access to Sutton, London Victoria and King's Cross, and the Croydon tram network. The provision of public transport should be a key consideration in locating suitable sites for future sustainable developments.

Car Club

Once one has purchased a car it makes financial sense to use it for all journeys. Cars enable freedom and flexibility in travel. Although many journeys are unnecessarily made by car, there are some journeys for which a car is the only practical option.

One method of reducing car ownership and use successfully operated at BedZED is the car club, ZEDcars. The service allows residents to hire a car by the hour when they need one, thereby providing mobility insurance without needing to own a vehicle. Car clubs provide a variety of vehicle sizes to suit differing requirements and can empower people who do not have access to a private car.



Joining a car club can clearly save residents money as members do not have the cost of purchasing and keeping a car on the road. Furthermore, none of the units have allocated parking and although residents can choose to buy a parking permit, this is priced at twice the cost of car club annual membership. ZEDcars is run in partnership with car club operator Smart Moves.

Experience has shown the importance of promoting car club schemes early. Enticing individuals away from their own cars takes time, residents may keep their current vehicles until they expire, or the MOT/insurance runs out, later choosing to join the club instead of replacing them.

Car clubs work most successfully in mixed-use developments with restricted private parking. For financial reasons, a 40-50% utilisation rate for the vehicles during available hours is required. The combination of business use during the day and private use in the evenings and at weekends helps to maximise utilisation of club vehicles.

Car parking

As part of the Green Travel Plan, negotiations with the local authority led to a 50% reduction in the usual parking standard to only 84 spaces. Reducing the car-parking provision has released more land for and enabled a higher development density. The financial rewards resulting from this 'planning gain' have been used to finance green upgrades. Calculations based on comparing BedZED to a more conventional volume-housebuilder solution for the same site, suggest that the reduced space required for parking and roads has contributed towards enabling over 100% more footprint to be built.

Local environment

A Biodiversity Plan was developed to maximise spaces for wildlife in the urban environment. Existing features of the site have been retained or enhanced to increase biodiversity and natural amenity value. The boundary line of mature horse chestnut trees has been retained and the existing ditches have been developed into water features.

Advantage has been taken of all planting opportunities around the site. The village square, the roof garden planters and all site landscaping has favoured native plants and is designed to encourage wildlife. Private gardens are provided to 71 of the 82 units. These are an average size of 16m² and are predominantly roof gardens located on top of workspaces. Uninhabitable roofs are finished in a sedum green roof system.



At least 3 car club members at BedZED have sold their cars since joining the club.



Most of the homes have access to a private garden. There is great potential for the biodiversity of a site to be increased particularly with the use of local flora and fauna



Sustainable Buildings



The buildings benefit from 300mm of super-insulation in the walls, this is 2 to 3 times thicker than would be used in conventional homes



Photovoltaic cells integrated into the glazing generate energy and provide internal shading



A-rated washing machines can save up to 360 Kwh/household /year equating to 170 kg of CO₂ saved.

Environmental performance

The Beddington 'zero (fossil) energy development' is Britain's first urban carbon-neutral development. It achieves high standards in environmental performance through the implementation of three strategies:

- Energy-efficient design of the buildings - reducing heat losses and utilising solar gain to the point where it is feasible to eliminate conventional heating systems altogether
- Energy efficient and hot water saving appliances to reduce demand
- Use of renewable energy sources - wood-fuelled CHP and PV power integrated into the sunspace roofs means that the development will become a net exporter of renewable energy

Energy-efficient design of the buildings

Energy efficiency can be increased through considered zoning of activities. The spaces for employment and community use are placed in the shadow zones of the housing terraces, this avoids the tendency for summer overheating of workspaces and the need for energy-wasting fan-driven ventilation or air-conditioning. The workspaces are lit via large north-facing rooflights to ensure adequate daylighting and reduce the energy demand for artificial lighting.

Insulation levels are considerably higher than those required by the Building Regulations. The buildings benefit from a 300mm 'overcoat' of super-insulation to the roofs, walls and floors. This keeps in the warmth, so that all the heating needed is provided by sunshine, human activity, lights, appliances and hot water. High quantities of thermal mass provide enough heat storage to prevent over-heating in the summer and to store warmth for slow release in the winter.

Triple-glazed, krypton-filled windows with low-emissivity glass, large panes and timber frames further reduce heat loss. Well-sealed doors and windows give a good level of airtightness. Heat exchangers in the passive, wind-driven ventilation system recover up to 70% of the heat from the outgoing stale air.

The BedZED homes achieve a theoretical SAP rating of 150, score a provisional 'excellent' rating on BRE EcoHomes. Targets were set for a major reduction in total energy demand and a 90% reduction in space heating demand compared to a standard suburban home built to 1995 Building Regulations. Early data suggests that the development is performing as predicted and well below UK averages.

Energy efficient appliances

'A'-rated domestic appliances were specified throughout the development. Such appliances can cost a little more to buy, but return considerable energy savings and reduced running costs. A good 'A'-rated refrigerator can use 50% less energy than an equivalent 'C'-rated model.

Low-energy light bulbs are used at BedZED, these consume approximately one-fifth of the energy of a standard bulb. If every household in the UK replaced one 100W bulb with a 20W energy-saving equivalent, the energy saved would be equal to the output of Sizewell-B power station.

Alternative Power Sources

The Government has set targets for the amount of energy to be produced from renewable resources; 5% by 2005, 10% by 2010 and 50% by 2050. The main source of energy is a Combined Heat and Power (CHP) plant which runs on chipped tree surgery waste. The CHP has been sized so that over the course of a year it generates enough electricity to provide for all of the development's needs, this makes BedZED a zero fossil energy development. Waste heat from electricity generation provides hot water for the homes and offices. This is distributed via a district heating system of insulated pipes. Water of constant temperature is delivered to oversized domestic hot water cylinders positioned in cupboards located within each dwelling. The cupboards can be opened to double up as radiators in cold spells. Additionally, the homes are fitted with one small radiator and a heated towel rail.

The CHP generator engine is fuelled by a combustible mix of hydrogen, carbon monoxide and methane gases, produced from woodchips by an on-site gasifier. These come from local tree surgery waste which would otherwise go to landfill. The CHP is approximately 30% more efficient than conventional electricity generation as productive use is made of heat energy that would otherwise be wasted. Generating on-site also avoids the losses in transporting energy via the high voltage national grid.

Photovoltaic panels allow electricity to be generated directly from the sun's energy. PV use globally is increasing by about 10% per year as the costs of the technology falls. The payback period for photovoltaics is about 13 years if the electricity is used to displace transport fossil fuel, with its high tax levels (compared to 70 years payback against domestic use of fossil fuel). The development boasts 777m² of high-efficiency mono-crystalline PV panels integrated into the sunspace roofs and the CHP building. These panels generate enough solar electricity to power 40 electric vehicles for approximately 8,500 km/vehicle/annum. Charging points provided on site encourage the use of electric vehicles.

Maximise water efficiency

Early strategic decisions about collection, usage, conservation and treatment of water can be significant determinants of the building form and may impact on surrounding land requirements. Household water demand has risen steadily during the past two decades to an average of more than 150 litres per person per day. This is all treated to drinking water quality, although most of it will be used for flushing toilets watering gardens, and washing cars and clothes.

By combining water recycling and conservation strategies with specifying water efficient fittings and appliances such as washing machines, spray taps, showers and dual-flush low-flush toilets, reductions in mains water usage of 40% are achieved. Such appliances may have higher initial costs, but save on the consumption of metered water. Follow-up advice on reducing water use is expected to see residents cutting their water consumption by up to 50%. A typical household could save £48, an enthusiastic household could save up to £106 per annum.



The Combined Heat and Power (CHP) plant runs on chipped tree surgery waste which would otherwise be sent to landfill



Visible utility meters in the kitchens allow residents to monitor their performance and encourage reduced energy and water use



Using porous materials on roofs should also be encouraged. The sedum roofs specified absorb some of the rainwater and help reduce the speed of run-off



Local bricks were free-issued to the contractor to encourage waste reduction on site. In the UK, an estimated 13% of building materials are sent to landfill unused.



Divided bins are located in each kitchen to promote waste segregation and recycling



Locally sourced reclaimed timber used in partitions to reduce embodied energy.

Disposal

There are opportunities to use water more efficiently and reduce distribution requirements through local water treatment, improved water utilisation and offsetting demand by substitution with rainwater and greywater.

Foulwater is treated using a small-scale, on-site sewage treatment system. This integrated technology consists of a reedbed housed in a large green house. Water is treated here and supplemented with harvested rainwater and stored in underground tanks where it is used for flushing toilets and irrigating gardens. Car parking spaces and pedestrian areas are finished with porous block paving over gravel to minimise surface run-off and to help absorb rainwater peaks thereby reducing the stresses on drains and river systems. As water drains through these layers it is filtered and returned to the groundwater with a reduced level of pollutants.

Minimise waste in construction

48% of all waste in the UK is generated by the construction industry. Contractors should be encouraged or even contractually obliged to introduce specific waste reduction, monitoring and control measures. Targets should be established to reuse or recycle waste produced during construction and any demolition works.

A target was set to reduce the amount of waste sent to landfill during construction to 5% of the total amount of the construction material used (by weight). The strategies employed to help achieve this included following CIRIA (Construction Industry Research and Information Association) best practice guidelines and the separation of waste construction materials on-site into segregated skips to ease reclamation and recycling.

To reduce the amount of wasted bricks, the brickwork contractor was free-issued with enough bricks for the job plus 3% extra to allow for wastage. The contractor was therefore motivated to reduce the amount of bricks wasted, as they had to pay for any shortfall.

Waste strategy during occupancy

A typical UK household produces 1 tonne of waste per year. BedZED residents are encouraged to reduce the amount of waste they send to landfill by 60% of a typical household's quantity. This target is established as a planning condition.

Each home includes an under-sink bin divided into 4 sections as part of a fully integrated recycling strategy which extends to on-site composting facilities funded via the landfill tax scheme. There are multi-material recycling points on site, for metal, glass, textiles, plastics, paper and card. The recycling provision complements the London Borough of Sutton's comprehensive recycling strategy.

Reduce the amount of resources used and energy embodied within them

Wherever possible, construction materials used are recycled or reclaimed, products with low embodied energy, and those not associated with habitat destruction.

The energy used to produce and transport materials and products - the embodied energy - can account for up to 10% of the overall energy used in the lifetime of a building. Materials should be specified which are as close to their natural state as possible, and from local sources.

52% of the construction material (by weight) was sourced from within a 35 mile radius of the site, reducing pollution and energy impacts from transportation and to encourage local industry. 15% of the total amount of materials used were reclaimed or recycled, diverting materials from landfill and reducing embodied energy.

Specifying local materials contributes towards the local distinctiveness of the project. Materials such as oak weatherboarding are characteristic of the vernacular architecture and have helped reinforce local identity. The weatherboarding was amongst 200m³ of (Forest Stewardship Council) FSC certified timber used. The FSC label is considered the highest form of accreditation, particularly for biodiversity and conservation.

However, not all of the components are available locally at affordable prices. The windows are Danish, as no British manufacturer was found who could supply the volumes and specification at a competitive price.

The BedZED Embodied Impact Analysis completed by the Building Research Establishment (BRE) indicates that the estimated environmental savings made through 13 key material sourcing choices are approximately 20-30% of the total materials impact. These 13 choices were achieved either cost neutrally or with cost savings.

There are potentially large savings in embodied CO₂ resulting from the informed specification of materials.

Specifying local oak weatherboarding instead of brick cladding could save 154 kg of CO₂ or 0.03 hectares per year for a 4 person household, based on a 60 year life-span for the building. Such specification would also save approximately £4000 for a 100m² 4 person dwelling.

Specifying timber framed windows instead of uPVC framed windows could save 44kg of CO₂ or 0.01 hectares per year for a 4 person household, based on a 60 year life-span for the building. Such specification would also save approximately £1000 for a 100m² 4 person dwelling.

Unhealthy materials

Certain materials have been avoided due to their potential health risks to builders, occupants and future generations. Reference should be made to the Association for Environmentally Conscious Building (AECB) for independent, subjective and precautionary advice. It may be advisable to limit use of some materials to those in certain categories referring to BRE guidance documents where appropriate.



Potential eco-footprinting savings from energy, water and waste strategies at BedZED could be as much as 1.71 hectares per resident.

Initial data for water, heat and electricity consumption between 21st August and 1st October 2002 for a selection of all monitored households, shows BedZED to be performing in-line with predictions and well below UK annual averages.

- Average energy used for water heating in the 14 monitored homes is approximately 40% less than average UK dwellings of equivalent size.
- Electricity consumption for lighting, cooking and all appliances in the monitored homes was on 58% less than that for an average Londoner.
- Water consumption has been recorded at an average of 55% less than what would be expected for homes in London.

Conclusions

This report aims to communicate how the BedZED ethos has been translated into practical strategies to reduce environmental impacts. It further highlights the importance of early strategic thinking and commitment to providing integrated solutions to sustainable community development.

Many of the lessons learnt and techniques refined at BedZED are transferable to other projects, whether involving new build, refurbishment or successful community management through ongoing energy and water efficiency and waste reduction.

As a model, BedZED can be tailored for different uses and locations, but the core principles of local sourcing, integrated mixed-use development linked with solar design, renewable power, and maximising the community, economic and amenity values, are widely applicable.

While reversing global warming trends is vital to the future, planning communities that fail to address all aspects of modern life is itself unsustainable. A holistic development strategy encompassing a wide range of issues is able to reduce costs and minimise problems at the planning and design stages.

Much more will be known about long-term maintenance and management issues in the years to come as the community develops and the green lifestyle initiatives mature. Providing that the financial and lifestyle benefits of this wholehearted approach can be demonstrated to developers, businesses and residents, it may be possible to bypass the incremental approach to innovation with its marginal benefits, and more towards environmentally, socially and economically sustainable communities.



The savings resulting from sustainable strategies for travel, food, energy, water and waste could save 3.5 hectares.

By minimising personal air travel, introducing sustainable workplace methods and committing to further lifestyle changes, another 0.79 hectares can be saved.

This enables us to reach our two-thirds reduction in eco-footprint.

Key BedZED Principles

- Reduce energy requirements to the point where renewable energy generated on site is a viable option for the entire energy supply.
- Reduce mains water consumption by using rainwater and treating water on site for recycling.
- Design for a lifestyle less dependent on the car by developing diverse mixed-uses on site, promoting car clubs and electric cars as part of an integrated Green Transport Plan.
- Maximise the use of local, reclaimed and recycled materials and materials with low embodied energy.
- Integrate 'green lifestyle' services such as recycling and on-site composting, bulk home deliveries of groceries and local organic food to make it easy for people to choose a green lifestyle and green transport options.

There are a number of tools available to housing association staff involved in development, investment and refurbishment in relation to social housing provision. These should be consulted initially at the conception of a project and will inform decisions throughout the subsequent design and construction processes. The prevalence of such assessment methods and mechanisms has increased since BedZED was conceived and full advantage should be taken of them. A brief description of five such mechanisms is given below.

EcoHomes

EcoHomes is an independently verified assessment method available through organisations licensed by the BRE. Under the assessment, environmental performance is expressed on a scale of 'Pass' to 'Excellent' and is a credible label for new and renovated homes. It rewards developers who improve environmental performance through good design, rather than high capital cost solutions. Under EcoHomes assessments, although every house type is considered, the award is given to the whole development. This enables developers to use the result to promote whole sites. The EcoHomes assessment considers a broad range of environmental concerns, under seven categories: Energy, Transport, Water, Ecology and land use, Pollution, Health & well being and Materials.

www.bre.co.uk/envprofiles

Housing Quality Indicator system

The HQI system is a tool designed to evaluate housing schemes for quality rather than simply cost. The HQI system assesses the quality of a housing project under three main categories: location, design and

performance. These are subdivided into ten sections - the Indicators. An HQI assessment generates separate scores for each Indicator producing a profile of the scheme, and an overall HQI score. The system was developed on behalf of the Government and the Housing Corporation.

www.housing.odpm.gov.uk

Sustainability Toolkit

The Housing Corporation Sustainability Toolkit is designed to assist people involved in the development and management of social housing, to assess whether people might want to live in a potential development.

When submitting bids for Social Housing Grants, the governing bodies of housing associations are required to certify that they consider the bids to address a real and sustainable need for social housing. The Sustainability Toolkit provides a framework for assessing sustainability of demand and creating a summary for presentation to the governing body as evidence.

www.housingcorplibrary.org.uk

Sustainability Works

This is a guide for anyone interested in sustainable housing. The web-based tool enables users to predict Ecohomes ratings, produce a Housing Corporation Sustainability Toolkit report and make an HQI submission. This Housing Corporation funded tool is aimed at Local Authorities, housing associations, developers, consultants and residents. The tool is useful for developing policies on sustainable housing, checking the feasibility of green housing projects, implementing such projects and monitoring their performance after completion.

www.sustainabilityworks.org.uk

The Environmental Matrix for Housing

Use of the Environmental Matrix for Housing is supported by the Housing Corporation and provides a recognised approach to evaluating the efficacy of investment in terms of energy and environmental issues. It is a computerised matrix which facilitates the assessment of the environmental impact of an organisation and its assets. The Environmental Matrix for Housing can be helpful in developing an environmental policy and action plan for housing associations.

www.practicalenvironment.co.uk

Further reading and useful contacts

Foundations for the future

2002, Sustainable Homes funded by the Housing Corporation.

Building on Success (2001-2004)

2001, Housing Corporation.

Good Practice Guide & Directory

(Due for update 2003), Sustainable Homes

Green housing for the future

2001, Merseyside Green Housing Alliance, Sustainable Homes

Embodied energy - a guide for RSL

1999, Crane Environmental Ltd for Sustainable Homes

A toolkit of Sustainability Indicators

2001, Housing Corporation & European Institute of Urban Affairs

www.bre.co.uk

www.housingcorp.gov.uk

www.aecb.net

www.ciria.org.uk

www.sustainabilityworks.org.uk

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BedZED Checklist

Sustainable Development Planning

- Create a community comprising residential and workspaces with as diverse a mix of uses as possible
- Provide mixed tenure (private and social) housing and affordable housing
- Consider providing community facilities e.g. shared multipurpose indoor community space, health facilities, nursery and shop/café
- High development density
- Consider using ZED as a flagship for regenerating depressed areas
- Consider consulting with key stakeholders from neighbouring communities in relation to providing shared community facilities
- Avoid adding eco-friendly elements piecemeal to a conventional scheme

The core blocks at BedZED achieve a density of 100 units and around 200 workspaces per hectare. This probably represents the highest density of naturally lit mixed use urban grain capable of benefiting from useful amounts of solar gain, at the same time as providing good amenity and private gardens for most homes.

Most of the environmental, economic and community features offered overlap with the objectives of regeneration and neighbourhood renewal. In some areas image is as much a problem as the physical

fabric. Here, the ZED model could serve as a powerful symbol and flagship for turning round a depressed neighbourhood.

It is a common temptation to try to be 'more sustainable' by adding eco-friendly elements piecemeal onto a conventional scheme. The contradictions and trade-offs that arise limit the effectiveness of each component and of the finished whole. The BedZED experience suggests that it is no more expensive, and may even be cheaper, to aim for complete integrated sustainable solutions, rather than to stop half way.

Transport and travel

- Establish a Green Transport Plan early to use as a tool in the planning process
- Target to reduce fossil fuel car miles
- Consider the introduction of a car club
- Consider reducing parking provision
- Promotion of cycling and walking through facilities and designated routes
- Consider co-ordinating local organic food/supermarket delivery service
- Consider sustainable travel advice as part of resident induction
- Communities should be designated and designed as Home Zones

Carbon emissions calculations show that there is only limited value in building energy-efficient houses if people need to commute to and from them by car. This demonstrates the

importance of thinking holistically when striving for sustainable design. The development should be conceived with an integrated sustainable transport strategy from the outset.

Water

- Typical mains water consumption of 140 litres per person per day to be reduced by one-third
- Consider harvesting rainwater to reduce mains water demand
- Consider making provision to treat foul water on site
- Development fitted with water saving appliances and low demand fittings
- Porous paving should be specified to hard-landscaped areas
- Water conservation should form part of resident induction

Built Environment

- All construction materials selected to minimise embodied energy and CO₂
- All materials should be sourced "locally" (at BedZED it was within a 35 mile radius)
- Target should be set for amount of recycled/reclaimed materials (at BedZED it was 5%)
- If project includes demolition, maximise of use of reclaimed materials
- Timber will be used in preference to steel, aluminium or uPVC where possible
- All timber from sustainably managed woodlands, preferably certified by the FSC
- "Unhealthy" materials should be avoided in accordance with AECB and BRE guidance
- Construction methods and materials will be selected to maximise durability and recyclability at the end of the building's life
- Details are to be contained within building contract documents to ensure targets are met with records kept for verification
- The development should meet the EcoHomes 'Excellent' standard
- Carefully consider the reuse of existing buildings
- New build - Target to reduce energy demand by 30%
- New build - Ventilation should be provided by passive systems
- New build - Target to reduce total CO₂ output per dwelling by 60%
- New build - U-values to be achieved in excess of current Building Regulations
- Refurbishment - Target to reduce total CO₂ output per dwelling by 60%
- Refurbishment - U-values should meet current Building Regulations where possible
- Consider target for heat and power supply: 30% to be supplied by renewable sources
- Energy conservation should form part of resident induction

Waste

- Best practice in waste minimisation during construction by following CIRIA guidelines
- Target for waste during construction is to be set at 5% of total construction material
- Recycling and composting facilities incorporated at design phase
- Waste reduction should form part of resident induction

Local Environment

- Quality of natural amenity should be conserved and enhanced
- Consider providing community play and sports areas
- Develop a strategy for reducing pollution during construction
- Develop a strategy for reducing light and noise pollution from the occupied development
- A Biodiversity Action Plan should be produced where appropriate
- Nature conservation should form part of resident induction

¹ Brian Edwards (2001), 'Rough Guide to Sustainability', RIBA Publications, 1-3 Dufferin Street, London

² Brian Edwards (2001), 'Rough Guide to Sustainability', RIBA Publications, 1-3 Dufferin Street, London

³ Urban Task Force (1999), 'Towards an Urban Renaissance', E & FN Spon, London

⁴ Pooran Desai and Sue Riddlestone (2002), 'Bioregional Solutions', Schumacher Briefings

⁵ Richard Rogers and Anne Power (2000), 'Cities for a small country', Faber & Faber, London



**Beddington Zero
Energy Development
Case Study Report**

BioRegional