Towards sustainable residential communities; the Beddington Zero Energy Development (BedZED) and beyond

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ABSTRACT This paper describes the design, construction and management of the Beddington Zero Energy Development (BedZED), a high density residential development that accommodates a mix of income groups and combines homes and workspaces. It dramatically reduces carbon dioxide emissions per person from the homes and encourages and supports other aspects of a sustainable lifestyle – including reduced water use and reduced private automobile use. The paper also describes and discusses the limits to what residential developments such as these can achieve by themselves in relation to reducing greenhouse gas emissions and ecological footprints, especially those related to household choices (for instance, residents' choice to fly) and to the policies and infrastructure for the district and city where BedZED is located (for instance, the quality of public transport). The paper outlines a residential development in Brighton that drew on the experience with BedZED and describes work with the local government in the borough where BedZED is located to address these larger-scale sustainable lifestyle issues.

KEYWORDS climate change / construction / ecological footprint / sustainable communities / sustainable lifestyles / zero carbon homes

I. INTRODUCTION

The Beddington Zero Energy Development (BedZED) is the UK's largest mixed-use sustainable community. It was completed and occupied in 2002 and is located in the London Borough of Sutton, on the suburban fringe of the city.

BedZED is situated on a brownfield site[1] close to Hackbridge train station, with a tram/train station to the north. It is a high density development, at 100 homes per hectare (if you exclude the sports pitch), and was initiated by BioRegional and ZEDfactory and developed by the Peabody Trust.[2] The existing community lies mainly to the west of BedZED.[3]

BedZED was designed to create a thriving community in which ordinary people could enjoy a high quality of life while living within their fair share of the earth's resources. Ecological and carbon footprinting were used to set benchmarks for "sustainable lifestyles". The average ecological footprint in Sutton is 5.32 global hectares per person compared to a sustainable limit of 1.7 global hectares per person.[4] Average carbon dioxide emissions in Sutton are 11.17 tonnes per person per year compared to a sustainable limit of between one and 1.5 tonnes[5] (i.e. the global average that, if achieved, should avoid dangerous levels of climate

1. Brownfield land is abandoned or underused industrial and commercial land, and is generally a better choice for development than undeveloped "greenfield" land. BedZED was built on land previously used as part of a local sewage works.

2. See http://www.bioregional.com; also http://www.zedfactory.com; and http://www.peabody.org.uk.

3. You can see a detailed web map at http://tiny.cc/bedzedmap.

4. A person's ecological footprint (see http://en.wikipedia.org/wiki/Ecological_Footprint for a fuller definition) is a measure

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PHOTO 1
The Beddington Zero Energy Development (BedZED)
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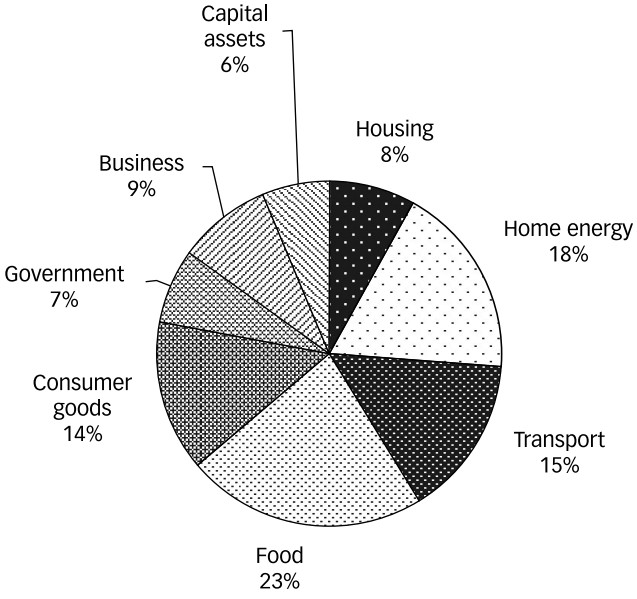

FIGURE 1
Sectoral make-up of the ecological footprint of an average UK resident (5.45 global hectares)

SOURCE: BioRegional (2008), based upon the REAP model by Stockholm Environment Institute.

of their resource use and waste generation, including greenhouse gas emissions. If you total up the earth's biocapacity and divide it by the global population, a fair share for any individual would be approximately 1.8 global hectares. Global hectares are a unit that normalizes the difference in bioproductivity between different types of land use so that one global hectare of premium cropland is equal to one global hectare of marginal cropland. For a brief introduction to ecological footprinting, see http://tom.acrewoods.net/research/eco-footprinting; also Rees, William E (1992), "Ecological footprints and appropriated carrying capacity", *Environment and Urbanization* Vol 4, No 2, October, pages 121–130; and Wackernagel, Mathis, Justin Kitzes, Dan Moran, Steven Goldfinger and Mary Thomas (2006), "The ecological footprint of cities and regions: comparing resource availability with resource demand", *Environment and Urbanization* Vol 18, No 1, April, pages 103–112.

5. Wiedmann, Tommy and John Barrett (2006), *The Ecological Footprint of Sutton*, a REAP (Resources and Energy Analysis Programme) Project, University of Strathclyde.

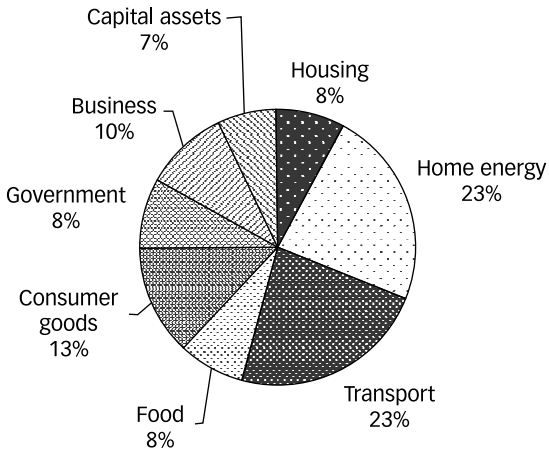

FIGURE 2
Sectoral make-up of the carbon dioxide emissions of an average UK resident (11.87 tonnes per year)

SOURCE: BioRegional (2008), based upon the REAP model by Stockholm Environment Institute.

change). Figures 1 and 2 show the breakdown of these two indicators by sector for the UK.

The strategy for BedZED remains unusual in that it tackled carbon emissions not only in domestic and office energy use but also by addressing the embodied impact of construction (which includes the carbon emissions arising from the building materials used), personal transport, food and waste. Other issues not included in these indicators were also covered: water, quality of life and strengthening the local economy. This holistic approach makes BedZED one of the most coherent visions of sustainable living in the world.

BioRegional has conducted several monitoring and evaluation exercises since the homes and offices were occupied. This paper is based upon the monitoring data, which can be downloaded or bought along with the full design details from our website.[6]

6. See http://www.bioregional.com/news-views/publications/bedzed-seven-years-on

By design, BedZED enables a reduction in greenhouse gas emissions in line with the UK's obligations if we are to avoid dangerous climate change. While it isn't possible to address the emissions from shared government and business services, which account for 25 per cent of the UK's carbon dioxide emissions, and while residents of BedZED spend much of their lives outside its modest borders, our monitoring has shown that if the rest of Europe were transformed in this fashion, we could reduce our carbon dioxide emissions by 90 per cent without sacrificing our quality of life.

The community is home to approximately 220 residents and 100 office workers. The 99 homes comprise 50 per cent housing for sale, 25 per cent key worker shared ownership[7] and 25 per cent social housing for rent. In the original design, the homes were situated on the south side of the buildings and the workspaces on the north side. The different tenure types were split into thirds. Many units designed as live/work units – where you buy a home and connected office space – didn't sell well

7. Key worker housing is provided to those in professions such as nursing and teaching, who are considered essential to an area but whose pay levels often make it difficult for them to afford housing. They can purchase one half of the value of the house and pay rent on the rest, making it easier to raise a mortgage.

FIGURE 3
Map of BedZED

SOURCE: Adapted from a plan by ZEDfactory, originally published in *Toolkit for Carbon Neutral Developments Part II*, BioRegional (2003).

in the local market, so some workspaces were subsequently converted to private homes for sale.

Communal spaces around BedZED include: the pedestrianized "living streets"; a small village square popular with young children; a sports pitch; allotments (for growing food); and a community centre called the Pavilion. This centre provides changing rooms with showers, toilets, basic catering facilities and two large spaces that are commonly used for exercise and dance classes, conferences and parties.

II. BedZED'S HISTORY

The idea of building BedZED was hatched by Bill Dunster Architects (BDA, now ZEDfactory) and environmental experts BioRegional. Bill wanted to apply his dense, mixed-use zero-energy approach to a larger scale, after his prototype, Hope House, while BioRegional had outgrown their

offices in the nearby Ecology Centre and were keen to apply their work in sustainable lifestyles.

The developers (the Peabody Trust) and BioRegional bought the site in Hackbridge from the London Borough of Sutton for 10 per cent less than the estimated highest bid. The potential environmental benefits of the planned development (including carbon dioxide savings and high quality buildings) were quantified by independent accountants at UK£ 200,000.

BioRegional and Bill Dunster Architects undertook extensive consultation on the plans with the local community, supported by a vocal local church. Detailed planning applications were approved in 1999, construction began in May 2000 and the first residents had moved in by March 2002. The homes and offices were fully occupied by October that year.

III. CONSTRUCTION MATERIALS

The energy and carbon emissions "embodied" in the construction process and materials are significant – as shown in Figures 1 and 2. The figure for typical volume house builders in the UK is around 600–800 kilogrammes of carbon dioxide per square metre. BedZED employed super insulation, double and triple glazing and high levels of thermal mass, which required an investment in more construction materials than standard houses. However, our strategy reduced the embodied impact of the scheme by 20–30 per cent, down to 675 kilogrammes carbon dioxide per square metre, so that despite the use of extra materials, it was in line with standard UK housing.[8]

8. Lazarus, Nicole (2002), *BedZED Construction Materials Report*, BioRegional Development Group, Wallington, Surrey. Figures based upon unpublished BRE research commissioned by BioRegional.

This was achieved using a variety of choices of materials. Structural steel, timber studwork and floorboards were all reclaimed materials. Concrete floor slabs were prefabricated. Bulky materials including sand, bricks and aggregate were bought within a 30-mile radius of the site. Recycled sand and aggregate was used as well as low impact materials such as local oak weatherboarding and timber-framed windows. The Forest Stewardship Council certified all timber.

Sometimes these various approaches were in conflict. For example, we imported high quality, double- and triple-glazed timber-framed windows with low u-values (i.e. that reduce heat loss) from Denmark rather than purchasing lower quality windows in the UK. The difference in embodied energy and lifecycle performance outweighed the transport impact significantly.

BedZED is designed to stand for at least 120 years, more than double the lifespan of the typical UK home, and is built for deconstruction so that materials can be re-used.

Lessons learned. It was important to think in terms of reclaimed materials and the eventual deconstruction of the building at the design stage. If the architects had designed in complex curved steel structures, or had used non-standard beam sizes, for example, it would have been very difficult to find reclaimed steel on the market at the time of construction.

IV. ENERGY EFFICIENT DESIGN

Figures 1 and 2 show how home energy use accounts for 18 per cent of the ecological footprint of the average UK resident and 23 per cent of

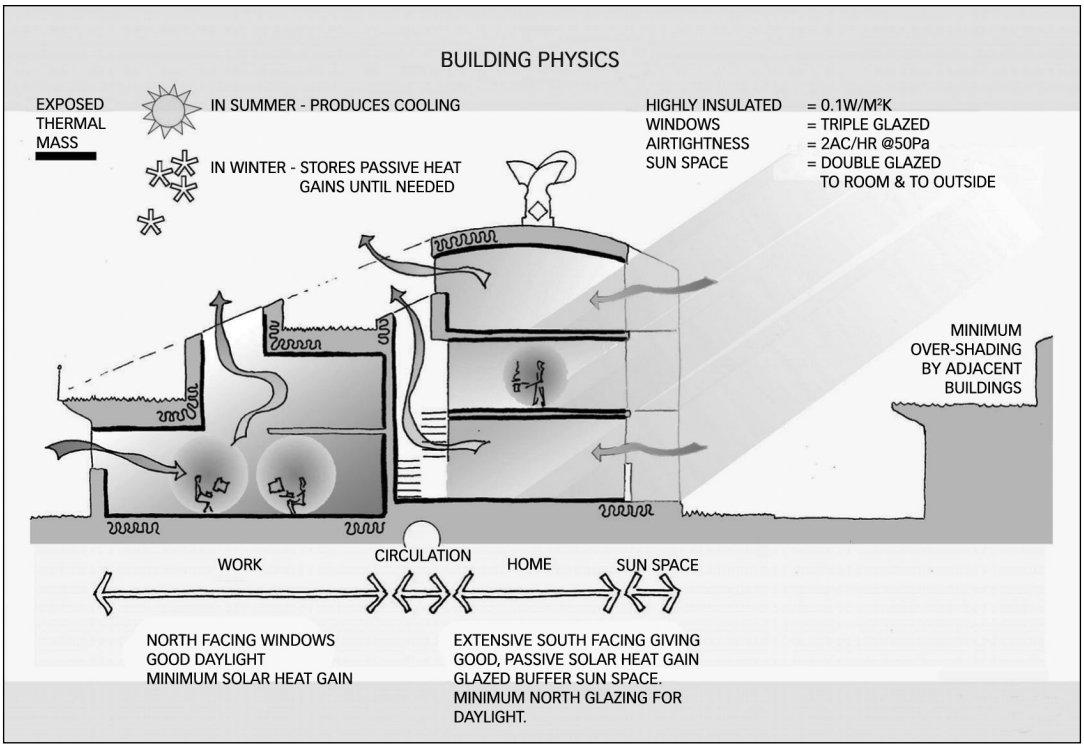

FIGURE 4
Building physics

SOURCE: ARUP, republished from *Toolkit for Carbon Neutral Developments Part II*, BioRegional (2003).

their carbon dioxide emissions. BedZED homes are kept at comfortable temperatures with fresh air, using simple passive architectural techniques rather than high-tech solutions. The design team aimed to reduce the energy demand for heating, cooling and ventilation by 90 per cent compared to the average UK home, and also aimed to ensure that buildings needed no energy to achieve this for most of the year. Of course, these particular design choices are specific to the climate in the southeast of England.

The south side of the buildings are fronted with ground-to-ceiling conservatories that are 15° off south facing. Adjoining buildings have roofs that slope at 30° to ensure that sunlight in the winter, with a low sun, can still reach the whole of the conservatory at such a high building density. These conservatories capture warmth from the surrounding air and the sun. In the summer, the windows can be opened so that the conservatories are effectively external spaces, which remain cool to prevent overheating.

Most of the remaining heat demand comes from occupants – our bodies emit approximately 100W of heat, and appliances such as ovens and televisions can provide the rest. There is a top-up system for the winter, which blows warm air out of the airing cupboard[9] and into the

9. Each home has a hot water cylinder that is stored in an "airing cupboard", so called because they are commonly used in the UK to warm and provide air for damp towels, clothes, etc.

corridors using a low energy fan. Super insulation (with 300 millimetres of rockwool) retains this heat, and dense concrete blocks provide the thermal mass to keep the homes consistently warm in the winter and cool in the summer.

The iconic cowls on the roofs are part of a passive ventilation system. These draw wind into the rooms; in winter, the difference in air pressure and temperature pushes air back out through the ducts. Occupants can easily control the flow of air if there is too much of a draft coming through. A thin piece of plastic between the incoming and outgoing airflows allows an exchange of heat during the winter so that the fresh air coming in is relatively warm.

Energy efficient appliances and good daylight reduce electricity demand, as long as residents decorate with light colours. Visible, smart-energy meters in the kitchens make it clear to residents when they are using energy, with a running tally and a red light that flashes more frequently when more electricity is being used. These meters seem to have led to further behavioural improvements; the reduction in electricity consumption against the local average in 2007 was much greater (45 per cent) than when measured in 2003 (25 per cent).

Performance. Eighty-one per cent reduction in energy use for hot water (5.2kWh/person/day) and 45 per cent reduction in electricity use (3.4 kWh/person/day).

Lessons learned. The low-tech passive design worked well, although residents need to understand the principles to get the most from their homes. For example, homes can overheat in the summer if the conservatory windows are left closed; if a resident buys a large plasma TV this can quickly outweigh the benefits of an efficient fridge. Most residents learn how best to use their homes by talking to their neighbours and playing with the smart-energy meters.

V. ZERO CARBON ENERGY SUPPLY

All of the energy required at BedZED is supplied with renewable technology on-site by design, although issues with one technology have meant that BedZED (since 2005) hasn't been "zero carbon"; 80 per cent of the electricity is drawn from the national grid and all of the hot water is provided by backup condensing boilers using natural gas.

The roofs carry 777 square metres of solar photovoltaic (PV) panels, which provide up to 20 per cent of the demand for electricity. A 130kW biomass combined heat and power (CHP) unit was installed to provide the remaining electricity and all the hot water through a district heating system. The fuel intended for use was local tree surgery waste from the Croydon TreeStation, which was set up prior to BedZED by BioRegional to provide local Forest Stewardship Council-certified biomass.

The main difficulty with the prototype CHP was the tar content of the wood gas, which built up in the engine used to generate the electricity. This was exacerbated by a planning condition that required the plant to shut down overnight for six hours, which caused further problems with tars forming as the equipment cooled down. Engineers will tell you that most process equipment operates much more smoothly if you keep it running continuously. Unfortunately, the supplier ceased trading before they were able to solve the technical problems.

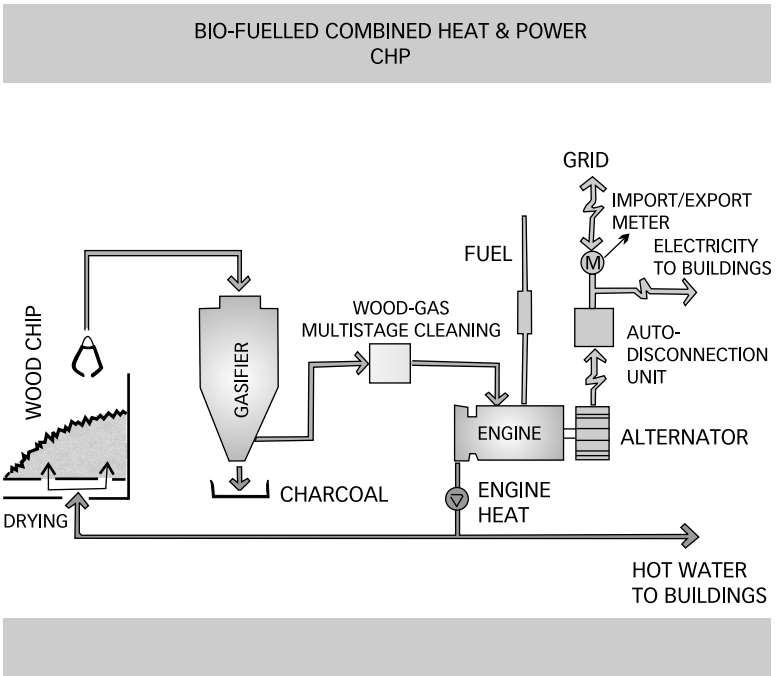

FIGURE 5
The bio-fuelled combined heat and power plant

SOURCE: ARUP, republished from *Toolkit for Carbon Neutral Developments Part II*, BioRegional (2003).

Despite these problems, the energy efficient design and the output from the solar PV panels mean that BedZED homes have reduced their carbon dioxide emissions by 56 per cent compared to the average UK home.

Lessons Learned. Choosing more proven technology and establishing a proper management entity would have avoided the problems with the CHP. New or existing energy supply companies are best placed to select, install and maintain energy equipment. For sites as small as BedZED, trying to generate all energy on-site may not be the best option.

VI. SUSTAINABLE TRANSPORT

Talk of sustainable housing in Europe remains focused on the buildings. The other major themes of sustainable consumption and production – mobility and food – are too often considered as separate subjects. While planning guidance in the UK considers these issues, a cursory glance at contemporary housing developments shows that we are still designing our communities around cars and supermarkets.

To tackle the 23 per cent of our carbon dioxide emissions that result from personal transport, we developed a comprehensive travel plan. This included:

- reduced parking spaces (fewer than one per home, compared to a planning guideline at the time of 1.5 spaces per home);
- London's first car club, which makes it easier for people to get rid of their own car and share one of three maintained by a company, and pay per mile, so incentivizing further reductions in mileage;
- free electric car-charging points along two of the four parking areas;
- a "living streets", or home zone, layout that gives priority to pedestrians and cyclists;
- good links to public transport, with a bus stop opposite the development and two train/tram stations within easy walking distance; and
- ample provision for cyclists with secure parking and storage space inside the homes.

Performance. Residents drive an average of 2,318 kilometres/year, which is 64 per cent lower than the local average. Some of this can be attributed to a higher than average proportion of social tenants but it is also evidence of significant behaviour changes.

PHOTO 2
BedZED pedestrianized areas and cycle parking
© Tom Chance 2008

There are very few electric vehicles at BedZED, but 10 households and most offices have joined the car club and half the residents own a bike.

Unfortunately, BedZED residents fly an average of 10,063 kilometres per year, three times the local average. Several residents interviewed are relatively wealthy professionals who love international travel. Another possible reason for this amount of flying is that residents stand to save significant amounts of money on their utility bills, which they might spend on holidays.

While the layout of the site and the transport facilities provided have obviously changed the approach that many residents take to **local** mobility, it hasn't translated into a deeper understanding of the impact of transport. This is true more generally of residents' attitudes towards climate change and shows that further measures are needed to adequately reduce their emissions – whether through face to face engagement, market incentives or some other means.

Lessons learned. The transport plan was very effective but wider changes are needed. Transport infrastructure in south London and Surrey needs to change to effectively prioritize low carbon modes of travel. The concept of filtered permeability tells us that people will follow the most convenient means and that the infrastructure beyond BedZED's boundaries effectively makes it more pleasant and convenient to drive most of the time. Moreover, if residents want to buy more food than they can source on-site, the most obvious choice is to drive up to a not particularly local supermarket.

Residents need more of their essential community facilities and shops within walking distance, and the regional transport infrastructure needs to make the area more permeable for public transport users and cyclists than for motorists.

VII. WATER

Water consumption is not included in the calculation of a person's ecological footprint and there is little one can do within a medium-sized property development to address carbon emissions from water treatment. But south London suffers from two local water problems: flooding, due to a lack of capacity in the drainage systems; and insufficient water supplies, due to a low amount of per capita rainfall and a high per capita level of water consumption.

Sustainable urban drainage systems (SUDS) were designed to tackle the flooding problems. These include permeable paving, green roofs planted with sedum, and a soakaway ditch planted with local species. These reduce flooding and boost biodiversity, creating a feeding ground and migration corridor for birds and insects.

Wastewater is treated on-site and used to flush the toilets, with excess water going to the soakaway ditch. Between 2002 and 2007, a greenwater treatment plant based on "Living Machine" technology provided this, using a mixture of biologically active sludge and reed beds.[10] Since then, Thames Water has been running a trial for an alternative technology – an active membrane bio-reactor – which does the same job but (to simplify) uses a membrane to filter clean water rather than reed beds. Both systems work but their energy use makes them less environmentally friendly than

10. For more information on the Living Machine technology, see, for example, http://en.wikipedia.org/wiki/Living_machines.

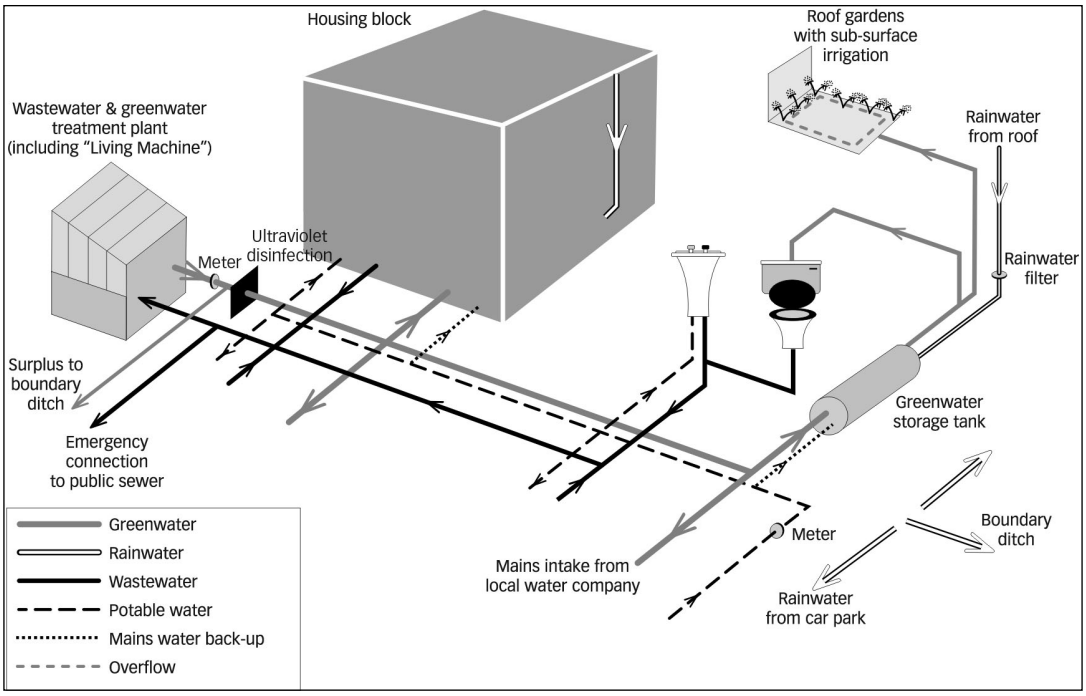

FIGURE 6
The BedZED water distribution system

SOURCE: Adapted from Albion Water (2002), unpublished diagram used in the BedZED exhibition centre.

sending the wastewater into the main regional sewage treatment systems. They can also be relatively expensive to run. Although useful for locations that are poorly serviced, we don't think they are worth installing on-site in places like London. Sometimes, the on-site "autonomous house" ideology can be counter-productive.

To reduce water consumption, rainwater is collected and mixed with treated wastewater to flush the toilets. Efficient appliances, fixtures and fittings in the buildings further reduce mains water consumption without residents needing to change their behaviour.

Performance. Residents use 72 litres of mains water per day, 58 per cent lower than the London average.

VIII. WASTE AND RECYCLING

It isn't possible, with such a small site, to adequately address waste reduction and re-use through design. Parts of the food strategy sought to reduce packaging and food waste, but beyond this we would be dependent upon community-led initiatives or community engagement exercises.

BedZED is also too small to warrant on-site waste treatment facilities, so homes and workplaces use the standard local authority recycling

service. Waste collection from containers placed directly outside every flat would have been too time consuming for the recycling service. So residents have to carry their waste to shared bins around the site. This typically leads to lower recycling rates.

Segregated bins in homes and recycling bins next to every waste bin make recycling relatively easy. But the biggest impact has come from community initiatives such as Freecycle, a residents' newsletter, a community composting group and informal peer education/pressure.

Performance. Residents recycle or compost 60 per cent of their waste; BioRegional's offices only send 13 per cent of their waste to landfill. The recycling rate seems to have increased significantly since 2002 (when it was 26 per cent), and much faster than the local average (which has risen from 25 per cent to 30 per cent over the same period).

IX. FOOD

As shown in Figures 1 and 2, food accounts for 23 per cent of the ecological footprint of an average UK resident and 8 per cent of their carbon dioxide emissions. The environmental and social impacts of food are incredibly complicated and British citizens have been exposed to a number of simplistic concerns in recent years, from food miles and organic methods to Fairtrade and vegetarianism. It isn't that these concerns are invalid, but that they can, in isolation, misrepresent the total environmental and social impacts through the lifecycle of the food we consume.

In general, BioRegional promotes a few simple measures for sustainable communities that should improve the situation:

- reduce food waste through better shopping habits and cooking skills;
- encourage people to cook more food from scratch rather than buying highly processed ready meals;
- reduce the amount of meat and dairy in their diets;
- eat more local, seasonal and organic produce; and
- buy food from more independent shops and buy fairly traded products, to build stronger and more resilient local and global economies.

BedZED is quite small and it wasn't possible to start a viable café, shop or restaurant on-site, so the scope to promote these lifestyle choices is limited. However, the community has since started a local produce market on Sundays and Mondays and runs cafes that serve healthy, low-meat meals for local residents and workers on Monday, Tuesday and Friday lunchtimes. On a larger scale, you can influence the shops, cafes, restaurants, hotels, schools, hospitals, community centres and other amenities that both account for a large amount of the food we eat and have a big influence over people's own choices.

We took two simple measures here: to provide growing spaces, including allotments, individual gardens for every home and the conservatories; and arrange for a vegetable box scheme so that residents can get doorstep deliveries for a healthy, low-meat diet with plenty of local, seasonal, organic vegetables.

Due to the personal and complex nature of food, we haven't gathered any robust data on what BedZED residents and workers are eating.

X. QUALITY OF LIFE

We looked at two aspects of the quality of life of residents: comfortable, healthy homes and offices; and a site plan that encouraged active, sociable lifestyles.

a. Homes and offices

The passive ventilation system and thermally massive, well-insulated design of the homes should keep rooms at a comfortable temperature with fresh, dry air to prevent health problems such as asthma. Our surveys suggest that, in the winter, 84 per cent of residents find the homes sufficiently warm and fresh, whereas in the summer 56 per cent think their homes are too warm and a slight majority find the air slightly stuffy.

Part of this may be because residents haven't come to grips with managing their homes properly. Most of the residents (71 per cent) have installed curtains or blinds in their conservatories, with the vast majority (90 per cent) citing privacy as their main reason. We have also found that a lot of residents use their conservatories as living spaces in the winter, which will either cool the home or require a lot of electricity to heat up the conservatories. Leaving the inner doors between the conservatory and the home open in the summer, and not fully opening the outside windows, will overheat the homes. Leaving other windows closed overnight reduces the cooling effect they were designed to provide.

All of these slight modifications are perfectly understandable, but it does raise questions about the flexibility of passive designs. It wouldn't take many changes to the architecture at BedZED to deal with these quirks, and comfort in the homes remains much better than the average new-build home in the UK.

In the original designs, every home at BedZED had a private garden. At such high density (100 homes per hectare) the architects provided roof gardens. During construction, Peabody cut the individual private gardens from the social housing blocks, so they share a smaller number of communal gardens along with the other shared spaces. Again, these gardens contribute to a higher quality of life for residents.

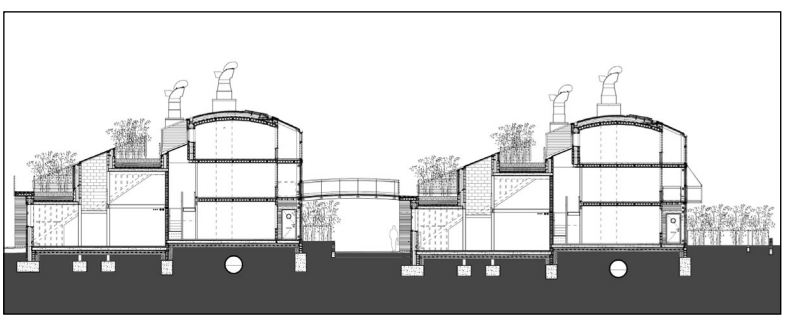

FIGURE 7
The layout of rooftop and ground level gardens

SOURCE: ZEDfactory (1999) (unpublished).

b. Site layout and facilities

The more significant achievement at BedZED has been the sense of community developed among residents and workers; they know an average of 20 people in the community by name (a benchmark for a strong community is 10), and the sense of community consistently tops the list of things people like about living and working at BedZED.

While the pioneering nature of the development – and its obvious difference to surrounding housing – has undoubtedly affected the mindset of occupants, the design considerations have also had a big impact. The layout of the site creates more informal opportunities to meet neighbours, for example when walking to the car parking areas or bus stops past other homes, or when crossing the shared bridges to the roof gardens opposite the flats. Community facilities include a village square, a sports pitch and a community centre with changing and cooking facilities. The community centre is used by 66 per cent of households, and events including the community cafes, dance and exercise classes, social events and residents' meetings are all managed by a group of residents.

The strong sense of community is not only residents' favourite feature of BedZED; it also helped residents understand how best to use their homes and green facilities. Peer education and pressure has increased recycling rates and take-up of the car club, and an understanding of (for example) the best way to keep homes cool in the summer.

XI. BedZED'S ECOLOGICAL FOOTPRINT

The results from our monitoring are quite encouraging. The average BedZED resident has an ecological footprint of 4.67 global hectares, or 4.32 if the combined heat and power station was working. If everyone in the world lived this way, we would need the equivalent of 2.6 planets to sustain us. Keen residents could reduce their footprints to three global hectares, which would call for the equivalent of 1.7 planets.

Obviously, we need to do much better than this – a keen BedZED resident can reduce their ecological footprint by 43 per cent but we need to achieve a 66 per cent reduction. The carbon emissions reductions need to be even more ambitious.

Three reasons for the unsustainable footprint of residents can be drawn from the monitoring data:

- first, BedZED residents are still jointly responsible for the shared government services and capital assets, and use almost all the same private services. These jointly account for 22 per cent of our ecological footprint, or 25 per cent of our carbon dioxide footprint;
- second, BedZED was too small a project to tackle consumer goods. This a very personal area and the best opportunities for intervention lie in large-scale community planning to promote a culture of long-lasting quality products and active sociable recreation as a better alternative to shopping; and
- third, BedZED residents live and work outside of the boundary of the site, so most of their lifestyle choices are affected by the infrastructure, products and services that enable (or frustrate) their ability to adopt sustainable lifestyle choices.

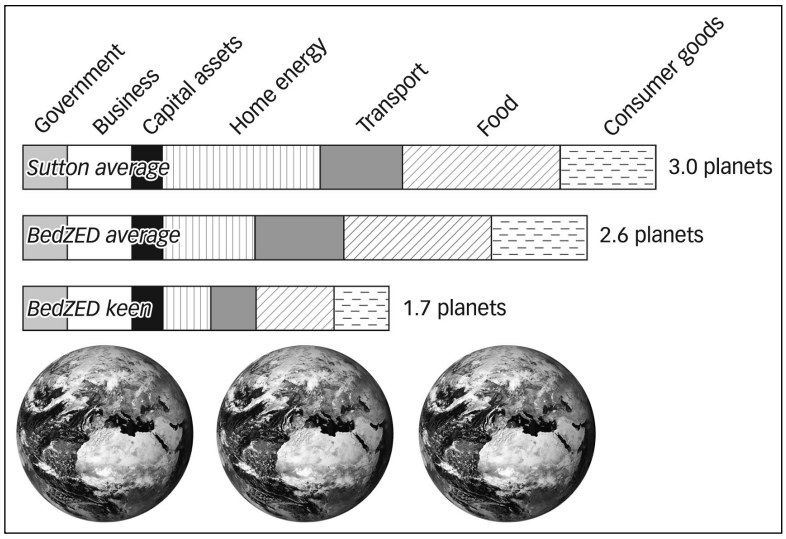

FIGURE 8
Comparing ecological footprints

SOURCE: BioRegional (2009), based upon the REAP model by Stockholm Environment Institute.

The data are encouraging, however, because they show both that you can enable citizens to significantly reduce their carbon emissions and ecological footprint through design and that it would be possible to lead a high quality of life in Sutton within our fair share of the earth's resources if we could tackle public/private infrastructure and services across the whole of Europe.

XII. BEYOND BedZED TO ONE PLANET LIVING

BioRegional's response to this conclusion has been to develop One Planet living, a framework that helps us achieve more effective strategies for sustainable communities, companies and events. We work with partners to develop One Planet action plans covering the 10 principles below.

The following are two examples of how this evolution in our thinking has been applied.

a. One Brighton

The partnership company, BioRegional Quintain, has built this landmark community on the south coast of England, one of a network of One Planet communities around the world.[11]

The design approach was similar to BedZED. A biomass boiler and solar PV panels supply energy-efficient flats; they are investing in new offshore wind capacity to cover the remaining electricity demand. One Brighton also has comprehensive lifestyle plans, including communal

11. For more information on these, see http:// www.oneplanetcommunities.org.

Zero carbon	Sustainable water
Zero waste	Natural habitats and wildlife
Sustainable transport	Culture and heritage
Local and sustainable materials	Equity and fair trade
Local and sustainable food	Health and happiness

FIGURE 9
The ten principles

SOURCE: BioRegional, WWF (2004).

roof allotments, a cycle club, a car club, no private car parking and a set of community offices with an organic cafe.

One key difference with this project was the attention to post-construction management, of both the "hard" facilities and the "soft" community development. An energy services company has been set up to manage the renewable energy technologies on-site rather than leaving this in the hands of a company such as a property developer or social landlord, who would lack the skills to do it properly. They have also established a residents' management organization that manages communal facilities and works, with a full-time green concierge to promote sustainable lifestyle choices.

The project also puts a greater emphasis on lifestyle impacts than on buildings, so the homes require more energy for heating but have better integrated community facilities. They hope that residents of One Brighton will have an average ecological footprint closer to that of a keen BedZED resident rather than that of an average resident.

b. One Planet Sutton

One Planet Sutton evolved from our work on BedZED and the One Planet communities. At BedZED's small scale, there is little we can do about consumer goods and other lifestyle choices influenced (or even determined) by wider infrastructure, services and products. We are now working across an entire local authority, home to 180,000 people and 80,000 homes.

BioRegional has partnered up with the London Borough of Sutton to work out how every resident and worker in the borough can achieve a One Planet lifestyle. This is retrospectively fitting (or "retrofitting") the principles of One Planet living to existing buildings, infrastructure and organizations. We are aiming to enable every resident and worker to have a sustainable ecological and carbon footprint by 2025.

There are three main components to One Planet Sutton: an action plan for the council; smaller action plans for other community organizations and businesses; and practical initiatives where there are gaps (for example, in radically improving the building stock).

The council's action plan[12] integrates their existing policies and monitoring mechanisms, including their Environmental Management

12. Download the initial plan at http://www.sutton.gov.uk/index.aspx?articleid=4283.

and Auditing System (EMAS), their Local Area Agreement targets,[13] the Local Strategic Partnerships[14] and so on, all the way down to individual team work plans. It sets tough targets across the 10 One Planet living principles, including that all council buildings will be zero carbon by 2017; the recycling rates will be up to 70 per cent by 2025, with only 2 per cent of waste going to landfill; and that most or all workers in the borough will be earning a living wage, i.e. enough to pay for decent housing and education, with a little discretionary income.

Action plans for community organizations can be less rigid in their adherence to our Common International Targets for One Planet living because small businesses and community organizations have less control over their direct and indirect impacts. Our aim is to empower key community organizations such as the Federation of Tenants' and Residents' Organizations, the Chamber of Commerce and the Centre for the Voluntary Sector to work with other organizations in their sector, rather than having to provide a costly centralized service to the whole borough.

These plans imply a lot of necessary actions with no existing policies or initiatives from the public, private and third party sectors to implement them. At the time of writing we are working on two high priority practical projects to try and move things forward. Hackbridge, the suburb that is home to BedZED, is in the early stages of a major regeneration project that will include a pilot of whole-house refurbishments to make them more energy and water efficient, and the generation of renewable energy where sensible. We are also hoping to establish a local food production network, managed by a social enterprise with volunteer involvement, to produce organic food on marginal land and sell it to schools and hospitals.

It won't be possible to achieve the aims expressed in the council's action plan unless we can develop a more sustainable regional economy, making more use of local, renewable and waste resources.

XIII. BIOREGIONAL

BioRegional is an entrepreneurial charity, which invents and delivers practical solutions for sustainability. We:

- invent sustainable products, services and production systems and initiate and guide the development of sustainable communities;
- deliver them by setting up partnerships and new enterprises; and
- replicate our approach through consultancy, communications and informing policy.

Our aim is to lead the way to sustainable living through practical demonstration. BioRegional's vision is one of thriving regional economies where we meet more of our needs from local, renewable and waste resources, enabling people to enjoy a high quality of life within their fair share of the earth's resources.

Our practical work spans sustainable communities, construction materials, textiles, waste, woodlands management and products, and reviving local production systems. We also provide consultancy and training services for professionals, and engage with governments and researchers to help develop and influence public policy.

13. Local Area Agreement targets are set out in an agreement between local authorities and central government in the UK and represent the authorities' key strategic targets for the next few years.

14. Local Strategic Partnerships bring together the local authority, key public and private services such as hospitals and business groups, and wider community groups. They are organized into themes such as housing and regeneration, and allow broad partnership working towards the Local Area Agreement targets and other priority issues they identify.

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