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## Briefing: Adapting to a changing climate

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**Climate change is already with us. It is the greatest emerging humanitarian challenge of our time. The effects of changing weather patterns and more extreme climate events can be seen around the world. Examining the scale of the global challenge through the threats posed by a changing climate across Europe and in the UK, this paper indicates that leadership and policy responses are needed at all levels – international, European national and local. The urban environment amplifies the impacts of climate change and adaptation of our towns and cities is essential to accommodate this change. Regional and local planning can make a major contribution to tackling climate change by shaping decisions that reduce carbon dioxide emissions and positively build community resilience to problems such as extreme temperatures or flood risk. Looking to examples of best practice across local authorities in Europe, the EU-funded green and blue space adaptation for urban areas and eco-towns (GRaBS) project is showcased. This paper presents the case for climate change adaptation and, in particular, argues that people or places facing poverty and disadvantage must not be disproportionately affected by climate change, or by policy or practice responses to it.**

### 1. THE SCALE OF THE CHALLENGE

The physical effects of climate change can be seen in the UK and around the world. The UK climate impact programme (UKCIP) latest report highlights the fact that global sea level rise accelerated between the mid-nineteenth and mid-twentieth centuries and is now at 3 mm/year, placing millions of people living in low-lying coastal regions at risk of flooding (Defra, 2009a). The planet is also getting hotter, with 11 of the 12 hottest years on record occurring between 1995 and 2006 and periods of drought becoming more frequent (UKCIP, 2007).

Consequently, climate change is increasingly acknowledged as the greatest emerging humanitarian challenge of our time. According to a recent report by former United Nations (UN) secretary-general Kofi Annan's think-tank, the Global Humanitarian Forum (GHF, 2009), climate change is causing 300 000 deaths every year and is affecting the lives of 325 million people. The report estimates that, by 2030, the number of people affected by climate change will double to 660 million, impacting the lives of 10% of the world's population. According to the study, 99% of fatalities due to weather-related disasters

are in developing countries. In developed countries, climate change disproportionately affects the most vulnerable groups in society (the elderly, the disabled and lower-income households), as well as having a major economic impact.

An example of the scale of the challenge is in Kenya, East Africa, where severe drought has created what has been coined the world's first 'climate change refugees' (Vidal, 2009). The nomadic Borana tribe, used to a life travelling in search of water and pasture for livestock, no longer has cattle to herd – all the animals have died of starvation as a direct consequence of drought in 2009. The Borana people are being forced to change their traditional nomadic way of life and to settle in one place.

However, the drought in Kenya has not just affected nomadic tribes. According to Save the Children, the impacts are widespread throughout the country with ten million Kenyans facing food crisis. Less than 20% of Kenya's land is suitable for farming and rapid population growth is outstripping food production. The food crisis has been attributed to a combination of factors, including crop failure due to the drought, high food and water prices (water prices rose by 110% from July 2008 to July 2009) and livestock disease (StC, 2009).

The impacts of climate change are not only witnessed in the developing world. In the UK, many people are now having to cope with far more extreme weather conditions. According to the government's public service website DirectGov, winter rainfall has consistently risen in England and Wales since records began in 1766; over the past 45 years, the amount of rainfall in any period has also become heavier (DirectGov, 2009). With increased flooding forcing people from their homes and causing huge amounts of damage to property and infrastructure, DirectGov estimates that flood damage currently costs the UK approximately £1 billion per year.

The problems related to individuals' and governments' immediate experience of climate change (heatwaves, drought, flooding and storms) are, however, now making it more likely that climate change impacts will be taken seriously and attract active policy interest, a theme picked up recently by Giddens (2009). For example, Hurricane Katrina and the 2003 European heatwave made a significant impact on the governments and citizens of developed countries owing to public concern sparked off by these 'close to home' climate-related disasters. Research by Wood and Vedlitz (2007) found that only a small percentage

of people in developed countries agree with the statement 'My life is directly affected by global warming and climate change', but political momentum is growing in response to the need to reduce emissions and adapt to a changing climate.

Effective delivery on climate change will require comprehensive and integrated action on mitigation and adaptation. Mitigation relates to actions that reduce carbon dioxide emissions and therefore reduce the severity of climate change. Adaptation relates to actions to build resilience to the unavoidable impacts of climate change. The latest report of the Intergovernmental Planning on Climate Change (IPCC, 2007) concluded that if all greenhouse gas emissions were held at 2000 levels, a further global average warming of 0.3–0.9°C can be expected by the end of the century owing to greenhouse gases currently in the atmosphere. Both mitigation and adaptation are therefore essential.

## 2. DEVELOPING AN INTERNATIONAL CONSENSUS

At the international level, the Kyoto Protocol, an international agreement made in 1997 linked to the United Nations Framework Convention on Climate Change (UN, 1998), set binding targets for industrialised nations (and separately the EU) to reduce greenhouse gas emissions over the five-year period 2008–2012. To strengthen the protocol's environmental integrity, support the credibility of carbon markets and ensure transparency of accounting, the UNFCCC established a Kyoto Protocol compliance mechanism (UNFCCC, 1998). This involves a committee that is separated into two branches – a facilitative branch (which provides advice and assistance to parties in order to promote compliance) and an enforcement branch (which determines consequences for parties not meeting their commitments). The compliance committee can make use of a number of steps to ensure and assist with compliance, including expert review. Ultimately, a party's eligibility may be withdrawn or suspended if it fails to meet the criteria of the compliance committee.

The Kyoto Protocol includes measures to adapt to the adverse effects of climate change and provisions for a UN adaptation fund. This fund helps to finance adaptation programmes and projects in developing countries that are parties to the Kyoto Protocol.

The 2007 UN climate change conference saw the adoption of the Bali action plan (UNFCCC, 2008). This plan placed significant importance on climate change adaptation, identifying (UNFCCC, 2009)

adaptation as one of the five key building blocks required (shared vision, mitigation, adaptation, technology and financial resources) for a strengthened future response to climate change to enable the full, effective and sustained implementation of the Convention through long-term cooperative action, now, up to and beyond 2012.

The most recent UNFCCC climate change conference, the successor to the Kyoto and Bali meetings, took place in December 2009 in Copenhagen. Both the science and solutions that relate to climate change are moving at an unprecedented pace. In order to shape and agree on an effective and ambitious international response to climate change with adaptation as a key objective, parties at the Copenhagen conference needed to

consider the most up-to-date climate data available, including the latest IPCC report.

## 3. THE EUROPEAN CLIMATE CHALLENGE

The latest IPCC report predicts with very high confidence that climate-related hazards will mostly increase throughout Europe, but that these changes will vary according to regional geography (IPCC, 2007). The report states that up to 1.6 million people annually will be threatened by sea level rise and by coastal flooding related to increasing storm incidence and severity. Flash floods are expected to increase throughout Europe, and winter floods are likely to increase in maritime regions. Frequent and prolonged droughts, along with increased risk of fire, will result from warmer and drier conditions in southern Europe and the Mediterranean region.

The European Commission (EC) has responded to the IPCC report through the recently published white paper *Adapting to Climate Change: Towards a European Framework for Action* (EC, 2009). The paper identifies the EU's vulnerability to the impact of climate change and sets out why an adaptation strategy is needed at EU level. It looks at the impact of climate change on a number of sectors, including the following.

- (a) *Human health and wellbeing*: as Europe experiences more extreme climate events, weather-related deaths and diseases could increase.
- (b) *Agriculture*: potential impacts on crop yield, soil fertility, livestock management and location of production.
- (c) *Water*: quality and availability of water resources.
- (d) *Energy*: direct effect on both the supply of and demand for energy. Increasing summer temperatures will add to the demand for cooling and the impacts of extreme weather events may affect electricity distribution.
- (e) *Infrastructure*: extreme climatic events have significant economic and social impacts, especially where infrastructure (e.g. domestic and commercial buildings, transport, and energy and water supply) is damaged.

## 4. THE UK CHALLENGE

The IPCC report indicates that short-duration events for extreme rainfall are likely to increase across Europe, something UK citizens are already becoming increasingly aware of. In urban areas there will be greater incidents of surface water flooding (fluvial flooding) owing to extensive urban sealing, increasing runoff (Wilby, 2007); this was a major contributor to the UK floods of 2007. The Pitt review (Pitt, 2008) emphasises that this is already a serious problem and is likely to increase under a changing climate.

During periods of high temperatures, residents of urban areas will suffer significantly as buildings store heat and contribute to the urban heat island (UHI) effect (Shaw *et al.*, 2007). This can result in temperature differences of up to 7°C between centres of large conurbations such as London and their surrounding rural areas (Wilby, 2003). But, as noted by Oke (1987), even small urban centres demonstrate a UHI effect. Heatwaves are expected to increase in frequency and severity (Meehl and Tebaldi, 2004) and the UHI effect will accentuate the affects of regional warming by increasing summer temperatures relative to out-lying districts.



In the past 12 months, the UK government has shown strong leadership in tackling and adapting to climate change. The Climate Change Act 2008 makes the UK the first country in the world to have a legally binding, long-term framework to cut greenhouse gas emissions (HMG, 2008). The Act creates a framework for building the UK's ability to adapt to climate change and gives the Secretary of State the power to direct reporting authorities (organisations with functions of a public nature and statutory undertakers) to produce reports on

- (a) the current and future predicted impacts of climate change on their organisation
- (b) proposals for adapting to climate change.

Such reports should contain

- (a) a summary of the statutory and other functions of the reporting authority to ensure that they are taking into account the risks presented to all their functions
- (b) an assessment of the current and predicted risks to that organisation (or its functions) presented by climate change
- (c) a programme of measures to address the risks highlighted above, including any policies or practices that are already being implemented.

The UK government has been consulting on the statutory framework and institutional arrangements at the strategic level for the effective delivery of climate change adaptation under the Act (Defra, 2008).

## 5. MAKING THE CASE FOR ADAPTATION

Tackling climate change is a complex challenge, and not just a matter of reducing greenhouse gas emissions. Changes in climate – longer summers, more severe storms, and sea level rise – are already being experienced and having serious impacts on individuals and communities throughout the world. According to the US National Oceanic and Atmospheric Administration (Adam, 2008), atmospheric carbon dioxide concentrations are now at their highest levels for 650 000 years and, as a result, many urban areas are already vulnerable to increased temperatures and flooding.

However, climate change is not just affecting human lives, it is also impacting the global economy. There is a strong business case for climate change adaptation. The GHF report *Anatomy of a Silent Crisis* (GHF, 2009) indicates that global economic losses due to climate change currently amount to more than US \$125 billion per year, and these are expected to rise to US \$340 billion by 2030. Adaptive measures are essential to help manage these costs and adaptation technologies also provide an economic opportunity for 'green growth'. In 2006, Sir Nicholas (now Lord) Stern (former World Bank chief economist and the then head of the government economic service) reported that the costs of taking action to address climate change – both through mitigation and adaptation – would be much lower than the costs of inaction over the medium to long term (HMT, 2006). Action today will make adaptation in the future easier and cheaper, and open up a wider choice of response options.

## 6. PLANNING FOR ADAPTATION

Planning can make a major contribution to tackling climate change by

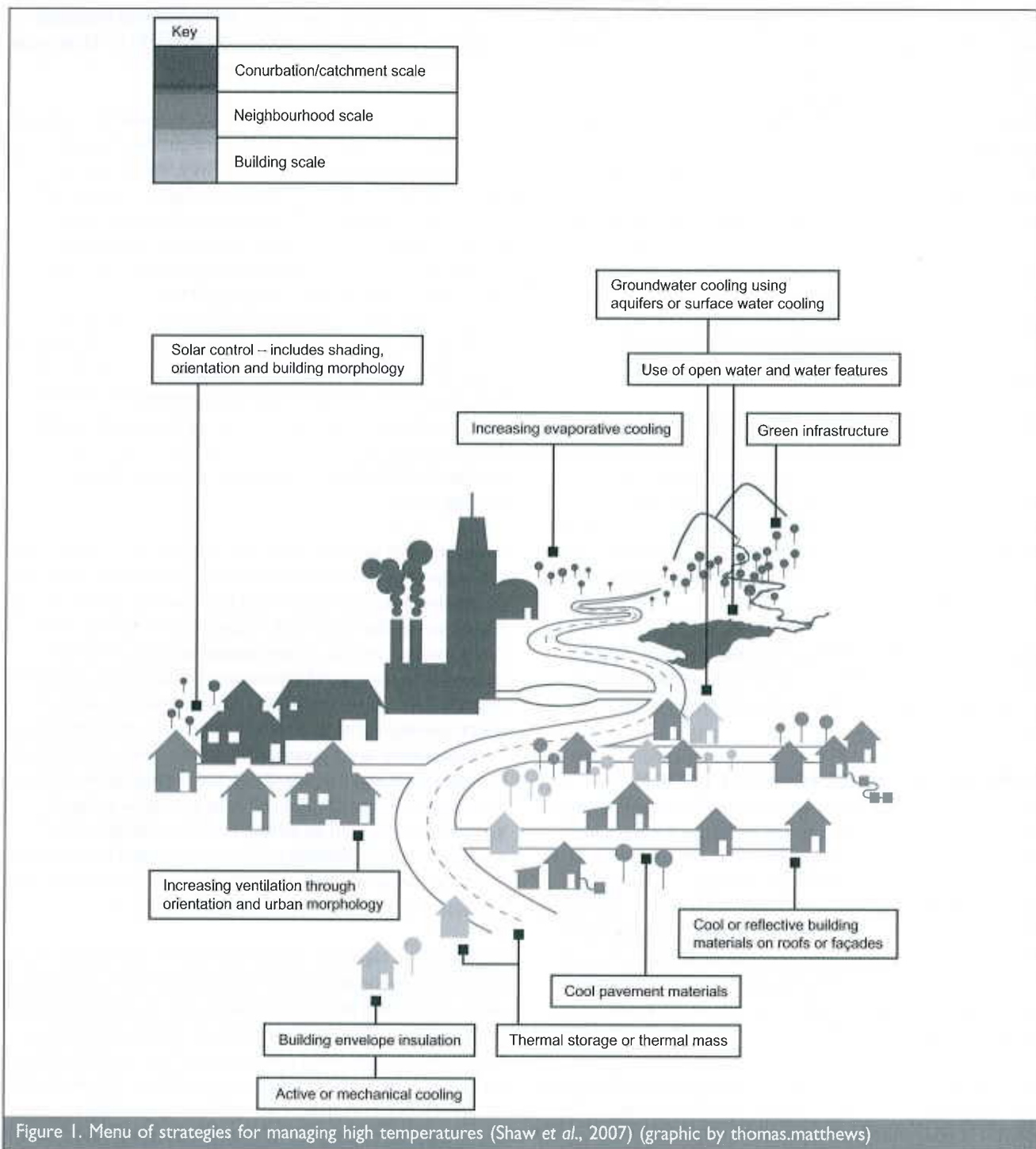
- (a) shaping decisions that reduce carbon dioxide emissions
- (b) positively building community resilience to problems such as extreme temperatures and flood risk.

Planning operates at a range of scales – national, regional and local – and has the potential to get the right development in the right place, in a fair and transparent way, and informed by the imperative of sustainable development. Figure 1 illustrates how adaptation of the urban environment can be implemented through a variety of different spatial scales – conurbation, neighbourhood and individual buildings (Shaw *et al.*, 2007). Shaw *et al.* provide a menu of strategies for managing different climate change risks, detailing the range of actions and techniques available to increase adaptive capacity at different scales. As illustrated in Figure 1, the menu of strategies for managing high temperatures includes groundwater cooling using aquifers at a conurbation scale, increased ventilation through orientation and urban morphology at the neighbourhood scale, and active or mechanical cooling at the individual building scale.

However, while there is exemplary best practice in some local and regional authorities, there is a profound gap between the government's policy ambition on climate change and actual real world change. The Town and Country Planning Association points out that there is, at first glance, a strong statutory framework in place to take action on climate change adaptation through spatial planning (TCPA, 2009a). However, the TCPA report also highlights that there is no specific requirement for local authorities to act on adaptation, nor is there any secondary legislation that might define clearly the scope of action. Only 57 local (upper tier) authorities will be reporting to national indicator 188 (NI 188) on adaptation (Defra, 2009b). The majority of local authorities are thus not captured by the criteria covering 'current adaptation regulation' and are not sufficiently scrutinised or motivated to act on adaptation.

The TCPA also highlight in their consultation submission (TCPA, 2009a) that public bodies with planning functions, including local and regional authorities, influencing the sustainability of the built and natural environment may not be considered a priority for the first round of reporting, but by the time the next cycle of national indicator reporting starts towards the end of 2012/early 2013 the time to act will have passed. The opportunity to require local planning authorities, along with regional planning bodies or the proposed responsible regional authorities, to report on adaptation should not be missed. Such a requirement would ensure that planning will continue to be seen to be as an important contributor to improving adaptation resilience. Alternatively, the TCPA suggests that NI 188 should be made mandatory for inclusion in all local area agreements to ensure that the wider sustainable communities process recognises the challenges of climate change as a key priority.

Perhaps more important than the statutory framework are institutional arrangements at strategic level for the effective delivery of climate change adaptation. The TCPA is concerned that the complex situation whereby three different government departments have responsibility for climate change adaptation (the Department for Energy and Climate Change (DECC), the Department for Environment, Food and Rural Affairs (Defra) and the Department for Communities and Local Government (DCLG))



may be a barrier to achieving adaptation. The extent of the impact of this fragmentation on spatial planning is difficult to quantify, but the example of the division between adaptation expertise in Defra and planning delivery in DCLG suggests it is significant (TCPA, 2009b). In dealing with climate change adaptation, an efficient and effective framework of governance is a priority.

### 7. IMPROVING PLANNING FOR ADAPTATION THROUGH SHARING EUROPEAN BEST PRACTICE

The EU-supported green and blue space adaptation for urban areas and eco-towns (GRaBS, 2009) project, led by the TCPA, aims to

(a) improve community awareness and engagement of adaptation in the planning process

(b) identify and influence regional planning policy and delivery mechanisms.

The GRaBS project has 14 partners, drawn from eight EU member states, representing a broad spectrum of municipal authorities and climate change challenges, all with varying degrees of strategic policy and experience. Southern Mediterranean areas will need to adapt to increased and prolonged drought conditions. According to the IPCC, without adaptive measures there will be increased risk to health due to more frequent heatwaves, particularly in central and southern Europe (IPCC, 2007). GRaBS partners include the municipality of Kalamaria in Greece and the University of Catania and Etnambiente SRL (a public-controlled company within the province of Catania) in Sicily.



Scientists at a climate change summit held in Copenhagen in March 2009 presented new research estimating that sea levels could rise by more than a metre by 2100 (Adam, 2009). The implications of sea level rise thus have significant implications for a number of GRaBS partners (e.g. the low-lying Amsterdam city district of Geuzenveld-Slotermeer, Southampton City Council in the UK and Malmö in southern Sweden). Working with a partner in Lithuania (Klaipeda University Coastal Research and Planning Institute), the GRaBS project will assess the risk and implications of sea level rise across Europe and help partners develop adaptation action plans.

Two other partners – the London Borough of Sutton and the province of Genoa – face challenging flooding issues. They will use the risk and vulnerabilities assessment tool being developed by the University of Manchester as part of the GRaBS project to identify buildings and people most at risk – importantly, at a time in the planning process when action can be taken to adapt future developments to cope with the impact of increased rainfall.

The GRaBS project has four main objectives.

- (a) To raise awareness and increase the expertise of key bodies responsible for spatial planning and development with regard to how green and blue infrastructure can help new and existing mixed-use urban development adapt to projected climate scenarios.
- (b) To assess the delivery mechanisms that exist for new urban mixed-use development and urban regeneration in each partner country, and to develop good practice adaptation action plans to coordinate the delivery of urban greening and adaptation strategies, as well as cooperation among planners, policy-makers, stakeholders and local communities.
- (c) To develop an innovative, cost-effective and user-friendly risk and vulnerability assessment tool to aid the strategic planning of climate change adaptation responses.
- (d) To improve stakeholder and community understanding and involvement in planning, delivering and managing green infrastructure in new and existing urban mixed-use development, based on positive community involvement techniques.

The project will seek to identify how – at regional and local scales – spatial planning and urban design can provide solutions that will make communities less vulnerable to climate change risks. For example, green infrastructure such as gardens, parks, productive landscapes, green corridors, and green roofs and walls, and blue infrastructure such as water bodies, rivers, streams, floodplains and sustainable drainage systems, will play a vital role in creating climate-resilient development. However, this role is not sufficiently recognised at present and is consequently inadequately integrated into mainstream planning.

Much green infrastructure (parks, for example) is multi-functional (Handley, 2009). Parks are important not only for climate change adaptation, but also for health and wellbeing; a park acts as a reservoir for storm water, a shelter from sun and a place in which to take exercise. However, a study by the Commission for Architecture and the Built Environment (CABE,

2009) found that public parks and green spaces in England are chronically undervalued. According to the CABE report, because of a combination of historic cost accounting and depreciation, most councils in England assign their public parks a notional asset value of just £1 each, making them financially invisible and leading to repeated underinvestment. In reality, a single park's physical assets – excluding land value – can have a value of well over £100 million and can offer huge environmental benefits. In a changing climate, the role of parks has never been more important.

## 8. LIVING IN A CHANGING CLIMATE

Adaptation to climate change means learning to live with more extreme weather events and changing weather patterns, and preparing for other changes that are unavoidable. To succeed under a changing climate, individuals, organisations and governments will all have to make significant changes in both policy and practice.

Development of an international consensus on climate change is at a crucial point. As this paper highlights, the impacts of a changing climate in Europe could be severe. Leadership across Europe and a united voice emerging from the UNFCCC climate change conference in Copenhagen last December 2009 remains fundamental to ensuring a global framework on climate change that enables action across Europe and domestically. Although a binding international treaty has not yet been reached, a positive outcome is that the Copenhagen Accord recognises the urgent need for enhanced action and international co-operation on climate change adaptation, and calls for the establishment of the Copenhagen Green Climate Fund to help support the immediate implementation of adaptation action in poorer countries, particularly in Africa.

At a national level, the UK government introduced a pioneering policy with the Climate Change Act 2008. However, robust institutional arrangements at a strategic level need to be in place for effective delivery of climate change adaptation. At regional and local scales, spatial planning and urban design can provide solutions that will make communities less vulnerable to climate change risks. Planning at these scales can make a major contribution to tackling climate change by shaping decisions to reduce carbon dioxide emissions and building community resilience.

The GRaBS project has an important role to play in improving community awareness and engagement of adaptation strategies in planning and identifying and influencing regional and local planning policy and delivery mechanisms. Projects such as GRaBS will allow us to learn from and build upon the experiences of pioneering places such as Malmö in Sweden to ensure that equally successful models of sustainability are developed in towns and cities across Europe and beyond.

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