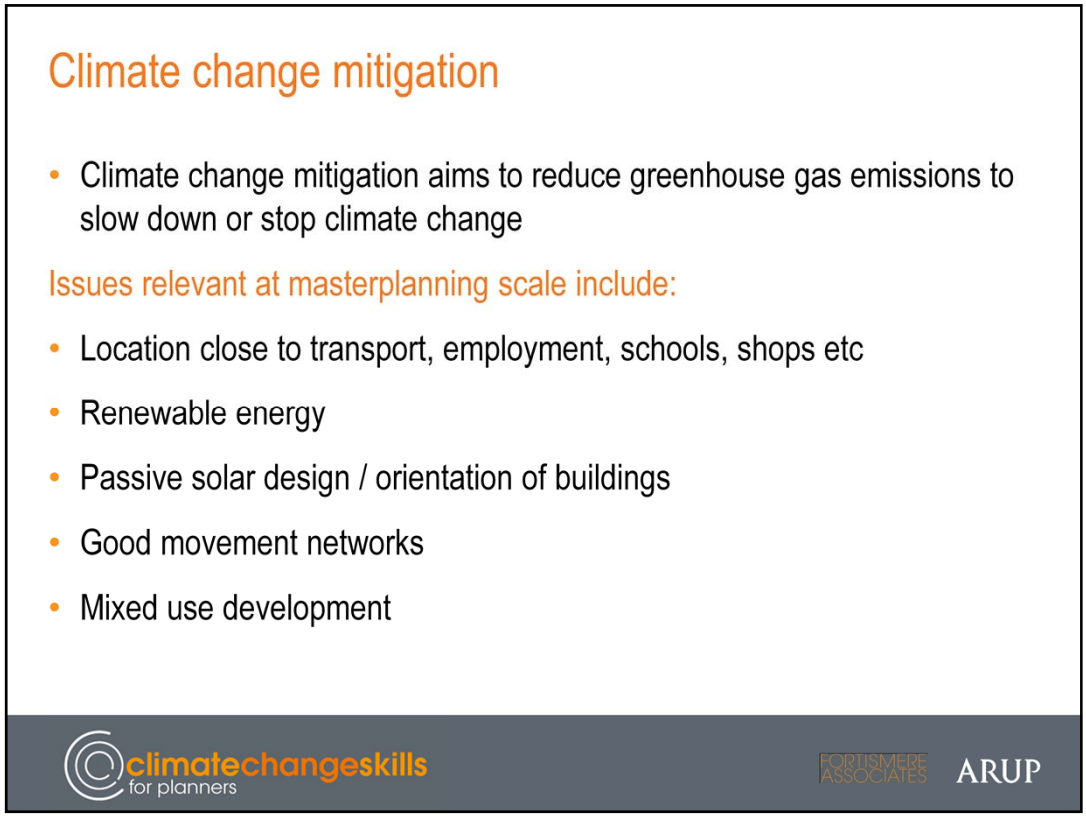
Achieving climate change mitigation and adaptation in masterplanning

Deborah Denner, Fortismere Associates

climatechangeskills for planners

FORTISMERE ASSOCIATES ARUP



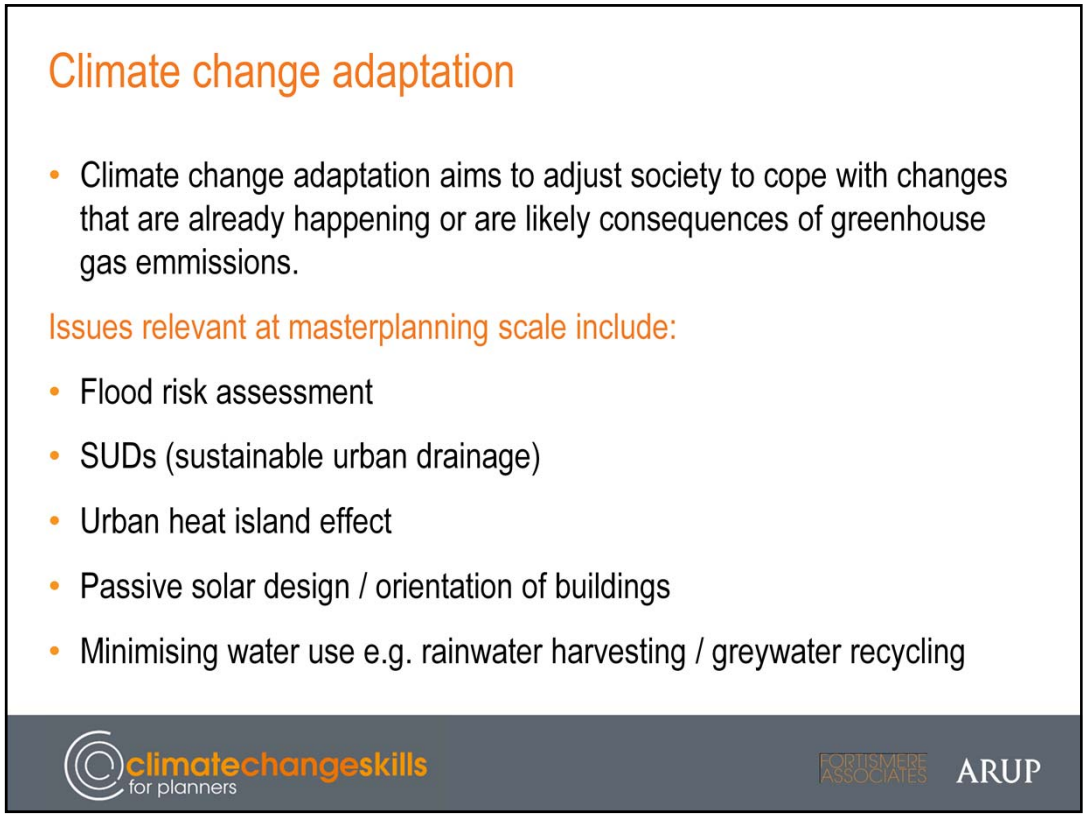
At the masterplan scale, measures to mitigate against climate change can relate to:

-First of all the location for development – so for example it is not a dormitory from which everyone will have to get into their car to commute to work, schools or shops.

-Providing low carbon energy supplies, including renewable energy – often far more efficient at the masterplan scale.

-Minimising the energy use of buildings, for example through passive solar design, and the orientation of buildings.

-Getting the structure of development right in terms of movement networks, and mix of use allowing people to lead a low carbon lifestyle



Measures to adapt development to climate change that is already underway are equally relevant at the masterplan scale.

It is difficult for an individual building to deal with flooding, for example, as effectively as it can be dealt with through a masterplan. And whilst for some sites, flood risk may preclude development, one of the case studies I will show later, demonstrates place making opportunities that solutions to flooding can create.

Likewise, sustainable urban drainage and urban heat island effects are far more likely to be effectively addressed on the scale of a masterplan, than would be possible building by building.

And just as passive solar design can minimise energy use, it is an equally important adaptation issue – requiring us to think carefully for example about how habitable single aspect south facing flats might be in a hotter future.

Again thinking about water means considering how to minimise water use through rainwater recycling or greywater harvesting.

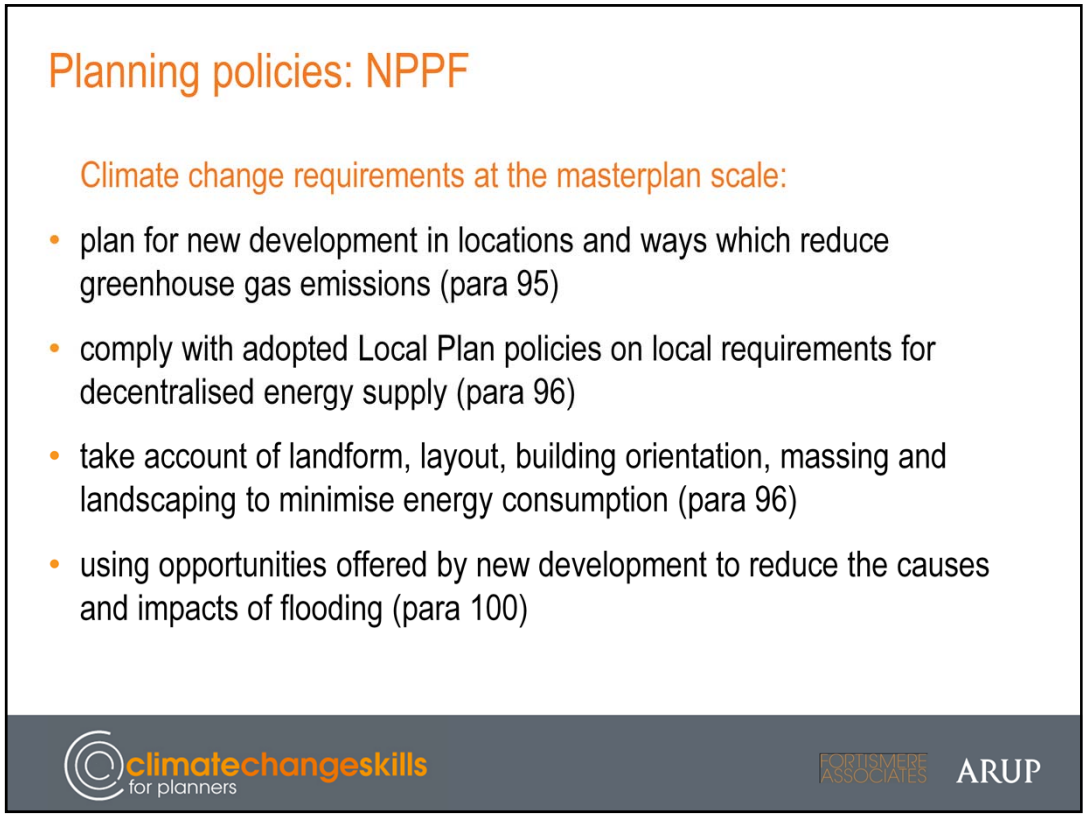
Module content

- Planning policies
- Masterplan process

Tea break

- Technical assessments
- Adaptation and mitigation strategies

climatechangeskills for planners FORTISMERE ASSOCIATES ARUP



The NPPF places strong emphasis on the role of planning in addressing climate change.

Much of what the NPPF requires planning authorities to do in terms of climate change, can only be achieved at the masterplan scale.

Examples above.

Planning policies: local authority level

We will look at how planning policies can support masterplanning for climate change adaptation and mitigation at three levels:

Local Plan / Core Strategy - strategic

Supplementary Planning Documents – area specific

Guidance for Scheme Design – project specific

The local plan, and in particular the core strategy, is an important tool for local planning authorities to tackle climate change. It is particularly valuable because it has a long term perspective, integrates social, environmental and economic issues, is democratic and widely consulted on, and requires testing and resolution of conflicting interests.

Some of the ways local authorities can proactively address climate change adaptation and mitigation through their Local Plans and Core Strategies include:

Location – ensuring development takes place close to employment, with access to public transport, facilities including schools, shops, healthcare – all of which are needed to allow people to live low carbon lifestyles.

Public transport strategies – to enable new development to encourage people to walk, cycle and use public transport rather than drive

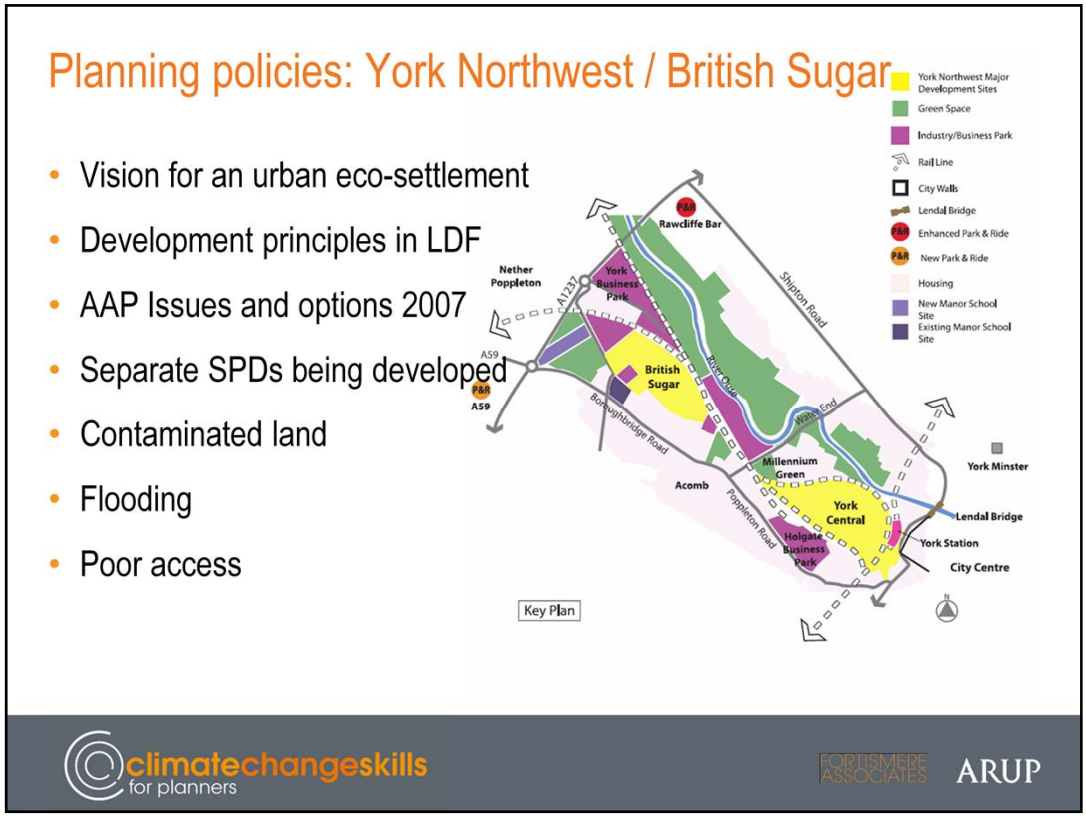
Green infrastructure – can help address urban heat island, allow rainwater infiltration, avoid flooding, and even contribute to local food production

Renewable energy generation – a local authority wide strategy is needed to identify the best sites for energy generation, whether through waste incineration, CHP or wind.

Energy distribution – can identify potential synergies between different developments, perhaps locating new housing adjacent to a retail development, could allow heat

produced generating energy for the shops to benefit nearby homes.

Water resources – might address flood control and coastal defences



York Northwest is one of four housing sites aiming to achieve Urban Eco-Settlement status in the Leeds City Region. There is a desire at each of these sites to deliver highly sustainable housing on brownfield land; making the most of sustainable locations, with access to new and existing jobs and services.

York Northwest is made up of two sites: British Sugar and York Central, which are being dealt with through separate planning documents, because of their timescales for development are likely to be quite different.

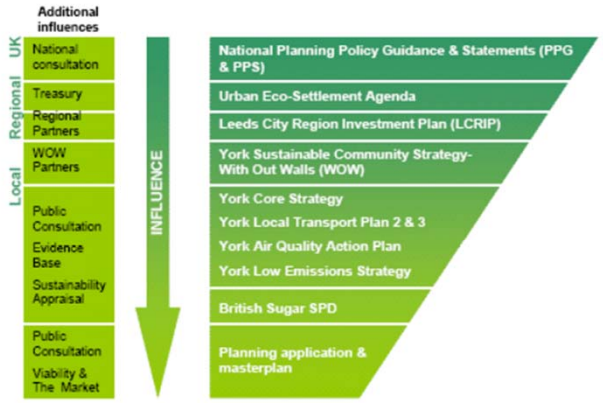
York are in the process of developing planning policies that set a clear brief for future masterplanning work, with high level principles for the site in the LDF, and more detailed site specific policies. Initially in 2007 a single AAP was proposed, and then separate SPDs because the timescales for development of the two sites are likely to be very different. York are now looking again at the AAP route – but however the policies are finally structured, the climate change principles developed by York are likely to still apply.

Before the full development potential of the area can be achieved, however, there are a number of constraints, such as contaminated land, the risk of flooding and poor access, which will have to be overcome.

The following slides quote from a draft SPD for the British Sugar site, which illustrates how local planning policies can set the agenda for climate change mitigation and

adaptation at a masterplan scale.

Planning policies: British Sugar Site, York

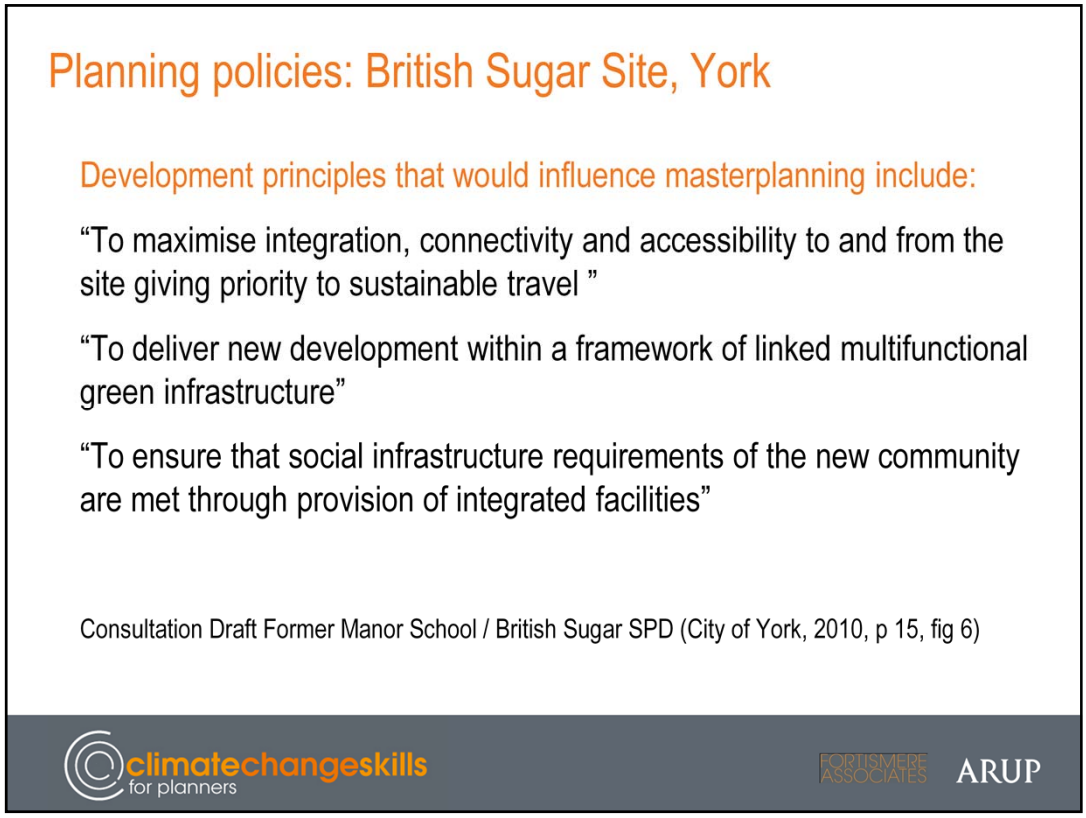


Consultation Draft Former Manor School / British Sugar SPD (City of York, 2010, p 14, fig 5)

climatechangeskills for planners FORTISMERE ASSOCIATES ARUP

Policy Flowchart taken from the Former Manor School / British Sugar Supplementary Planning Document (City of York, 2010, page 14)

Clearly some of this is now out of date with NPPF now at the top.

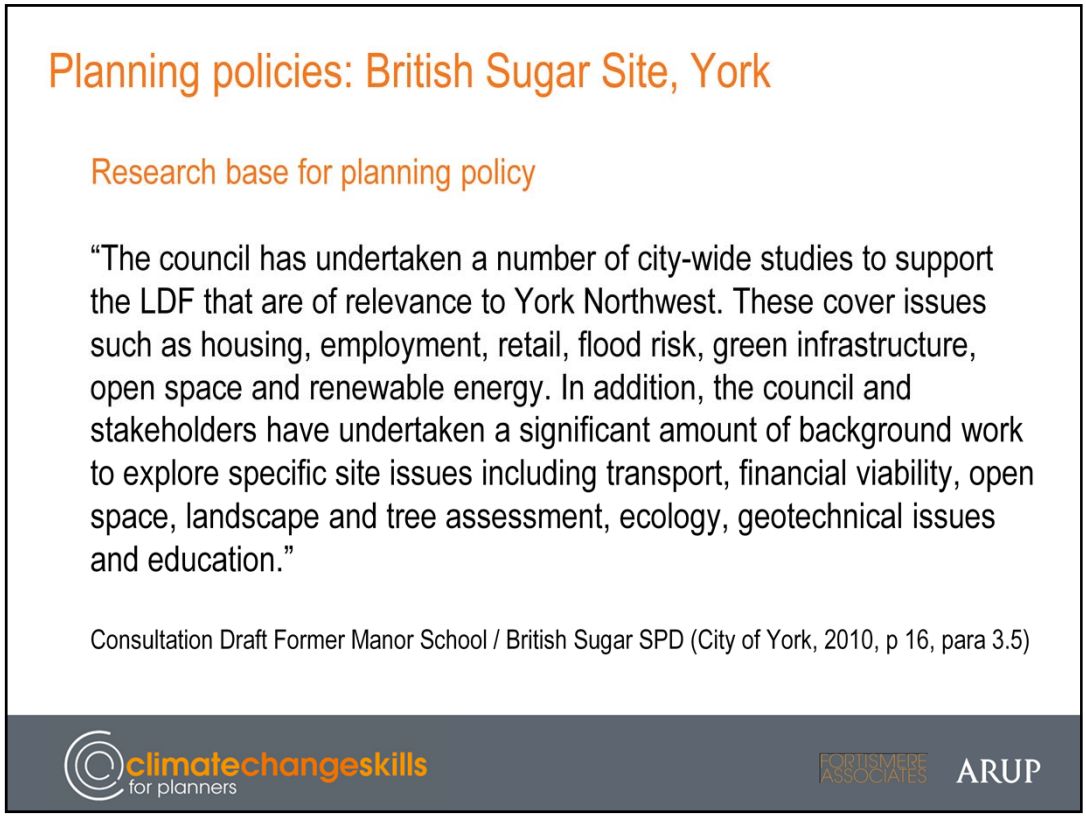


An example of this is York's LDF where a section on the British Sugar Site, sets out aspirations for this to become an Urban Eco-Settlement.

This is a site where development of around 1300 homes, together with open space and community facilities is proposed.

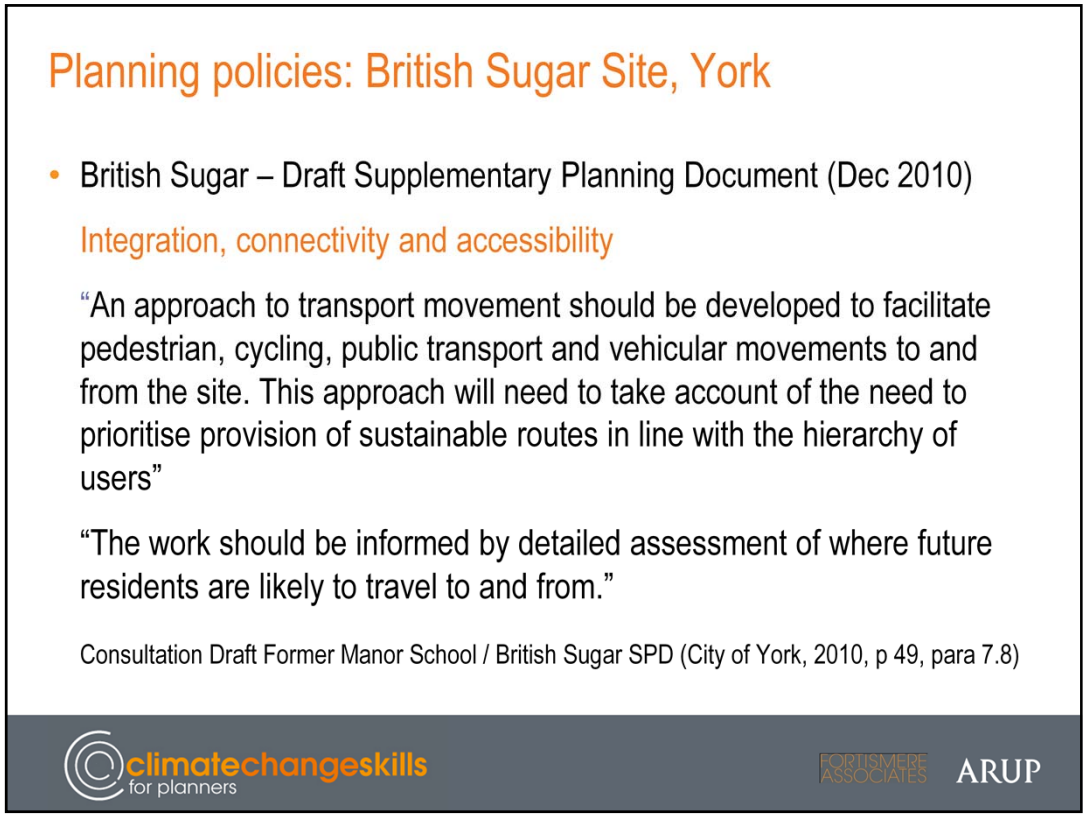
Development principles are set out in the LDF, which provide a clear brief for the future development of the site, in terms of climate change goals.

Examples above.



In addition to setting an aspirational vision for the future of the York Northwest sites through development principles, the LDF also refers to the research base, commissioned by York to support development of the site.

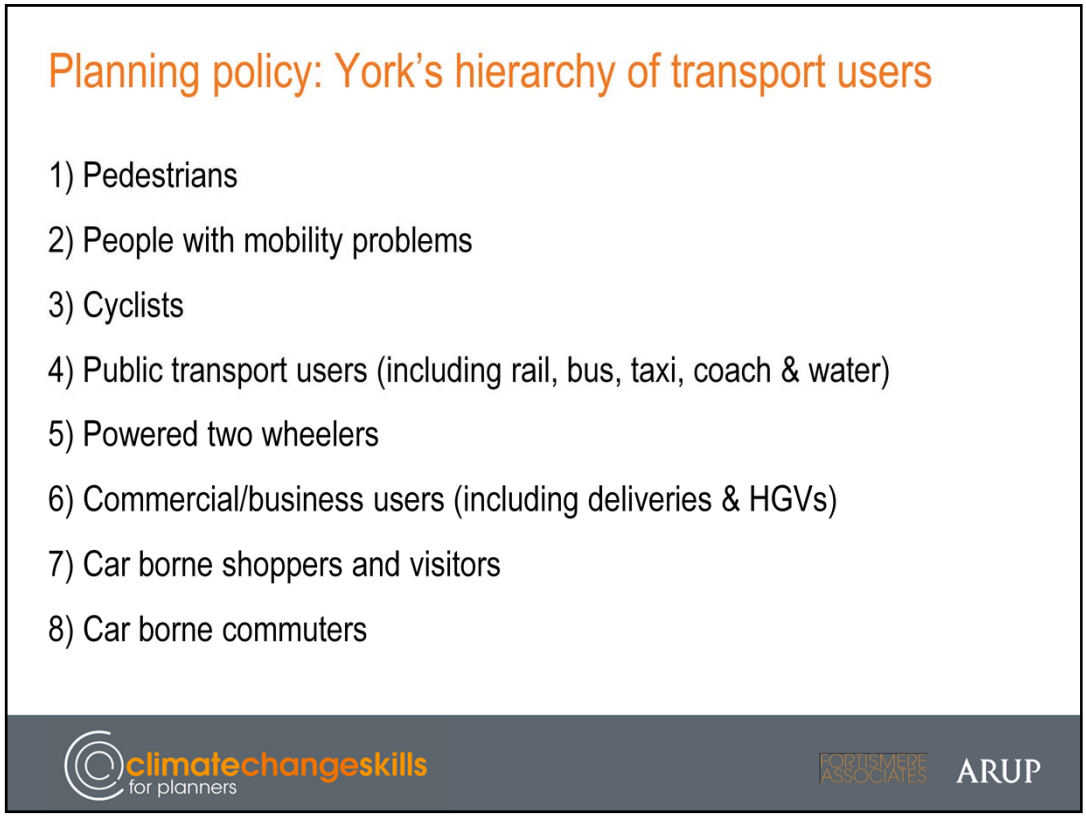
This provides the technical assessments of required to develop a strong approach to climate change adaptation and mitigation.



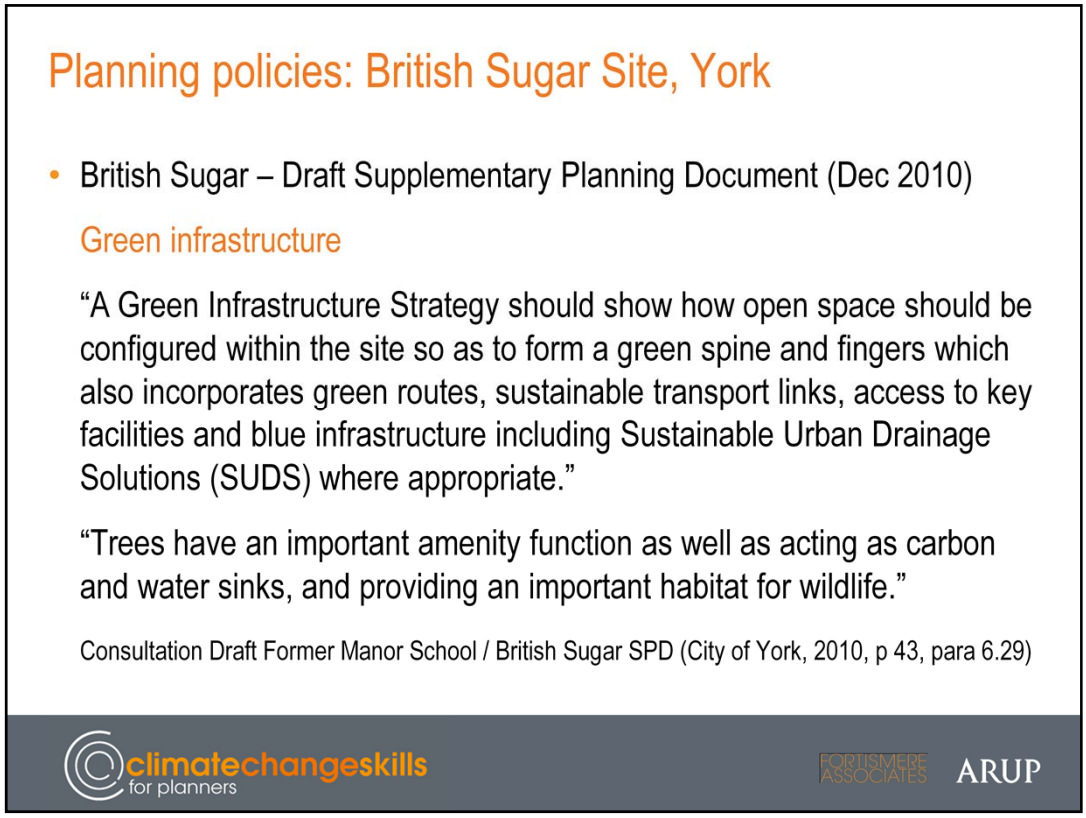
The British Sugar SPD, which gives very clear guidance about the priority that must be given to integration, connectivity and accessibility.

It provides a strong vision for development, that sets the agenda for a masterplanning approach to climate change adaptation and mitigation.

This can be illustrated through some extracts from the SPD – here dealing with movement networks.

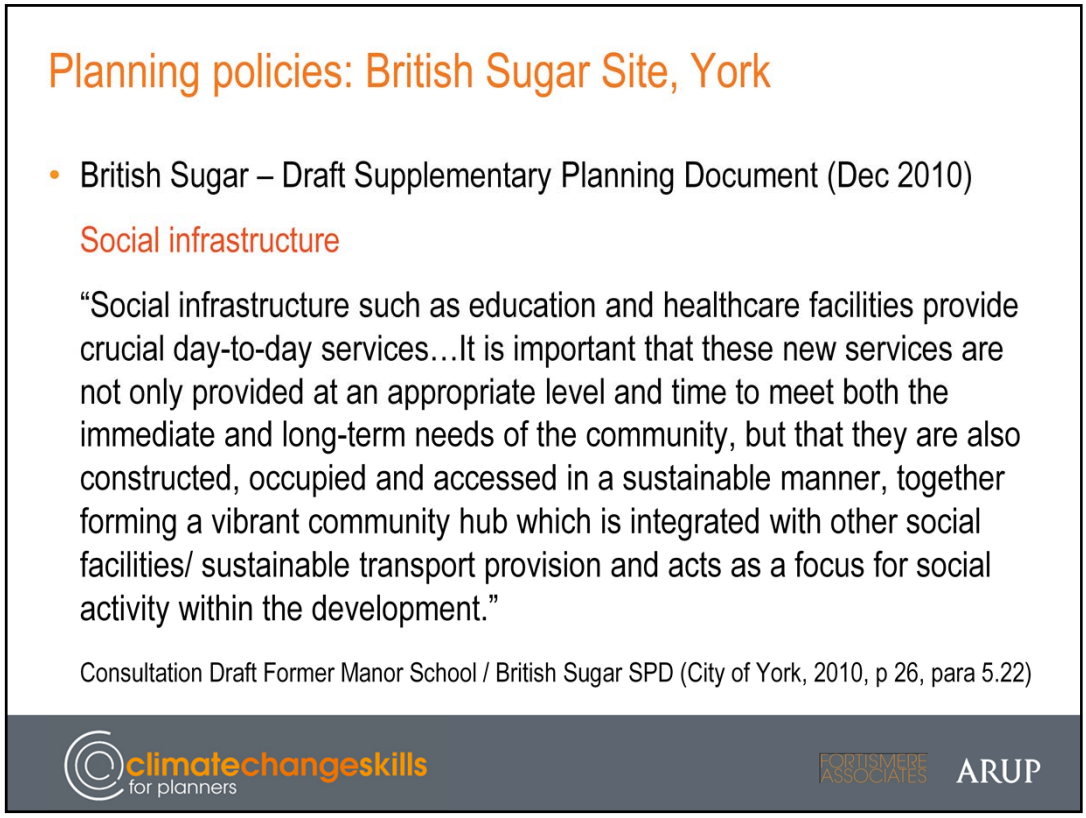


The SPD refers to York's transport plan, which reinforces the policy argument for low carbon forms of movement and transport.



Here an extract on green infrastructure makes the role this has to play in addressing climate change clear.

It also paints a picture of a place that's likely to be a joy to live in.



In this extract from the SPD on social infrastructure, again there is a very clear steer about the facilities which are an essential part of day to day life and should be integral to the development.

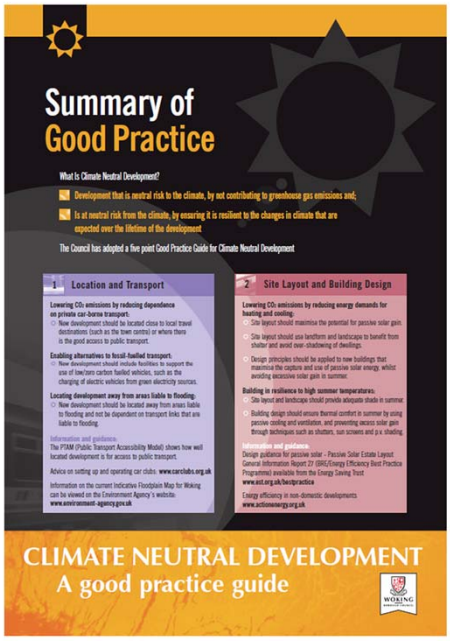
This is fundamental to York's vision for creating a place that is not a dormitory, but a new neighbourhood. By thinking about the activities of day to day life, the SPD points towards a development where people are not car or even public transport dependant.

Huge potential saving of carbon emissions for a new place where 3,000 people may live.

Planning policies: Woking

Climate change good practice guides

- 1: Location and transport
- 2: Site layout and design
- 3: Energy
- 4: Sustainable drainage (suds)
- 5: Water conservation and recycling

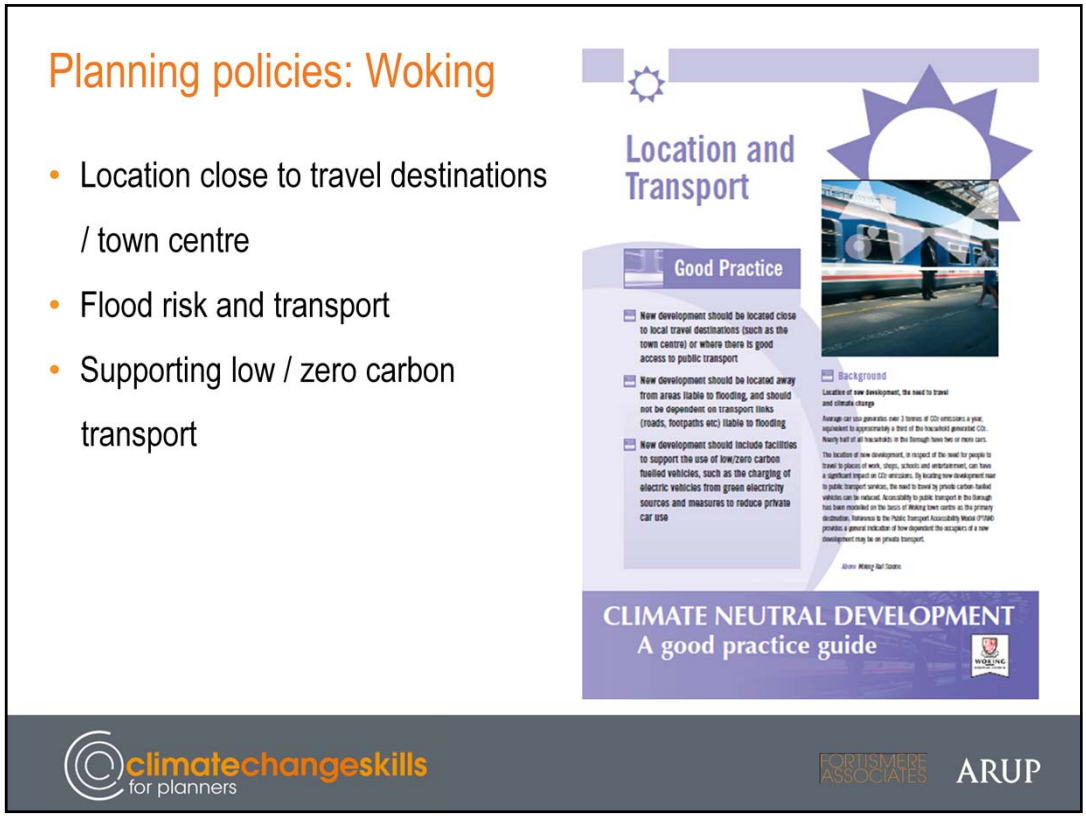


climatechangeskills for planners

FORTISMERE ASSOCIATES ARUP

Going into even further detail than an SPD, Woking have produced a series of climate change good practice guides, which have relevance to all sorts of development, but particularly to masterplans.

These guides are organised thematically, and can be used to set the agenda for conversations with scheme promoters at during pre-application negotiations. They also act as an aide memoire or crib sheet for designers, to test their own thinking.

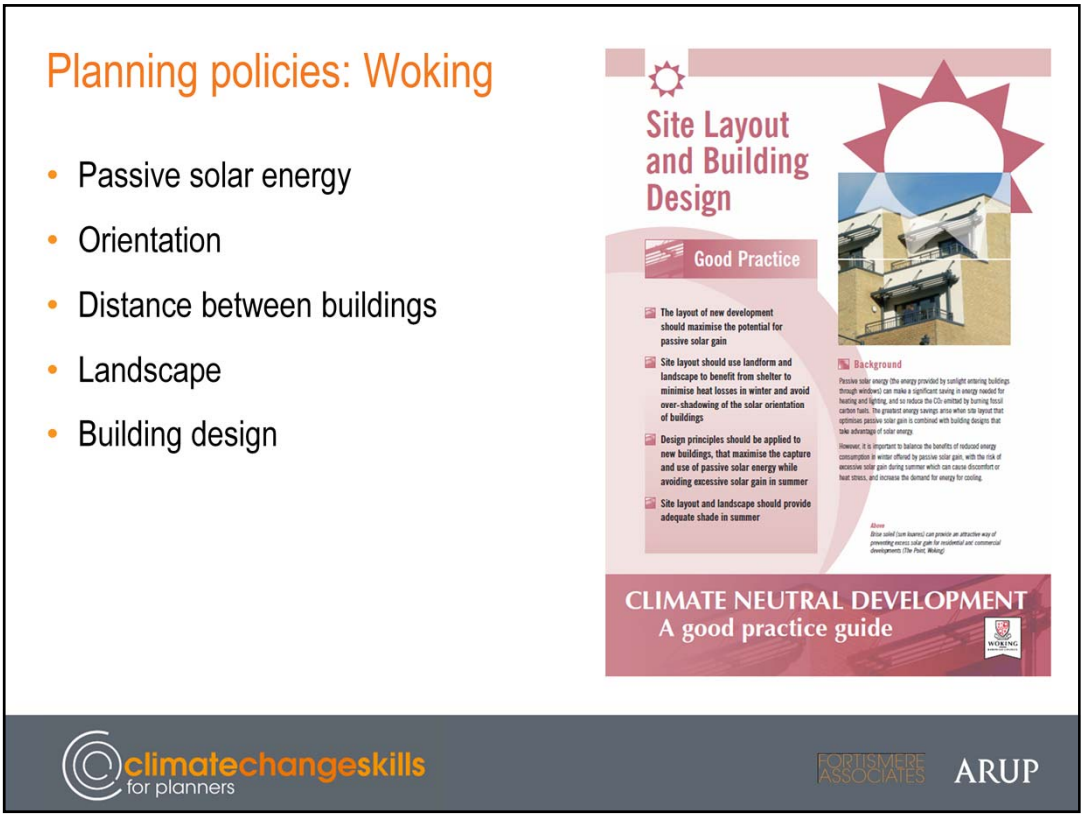


Lowering Co2 emissions by reducing dependence on private car travel:

- New development should be located close to local travel destinations (such as the town centre) or where there is good access to public transport.

Enabling alternatives to fossil fuelled transport

- New development should include facilities to suport the use of low carbon vehicles, such as the charging of electric vehicles from green energy sources



Lowering Co2 emissions by reducing energy demands for heating and cooling

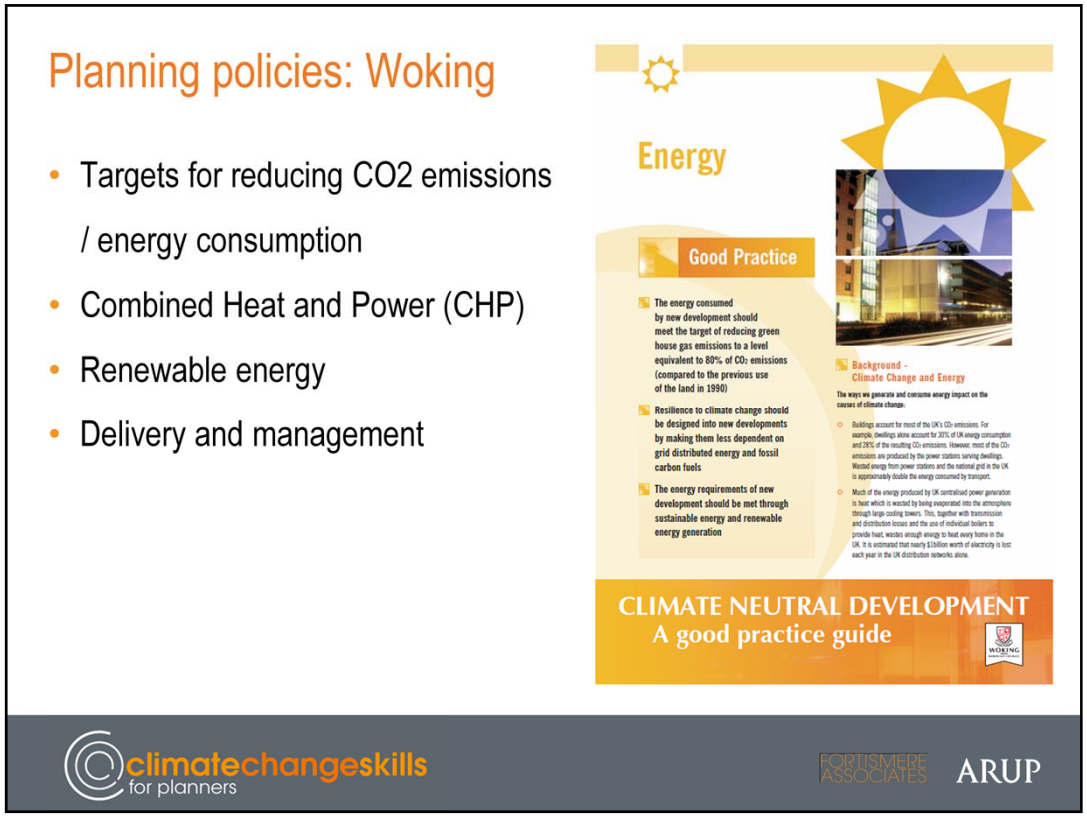
- Site layout should maximise the potential for passive solar design

- Site layout should use landform and landscape to benefit from shelter and avoid overshadowing of dwellings

- Design principles should be applied to new buildings that maximise the capture and use of passive solar energy, but avoid excessive solar gain in summer

Building in resilience to high summer temperatures

- Site layout and landscape should provide adequate shade in summer
- Building design should ensure thermal comfort in summer by using passive cooling and natural ventilation and preventing excess solar gain through techniques such as shutters, sun screens and pv shading.



Reducing Co2 emissions by building developments that use sustainable and renewable energy

- Setting targets for reductions in Co2 emissions
- Resilience to climate change should be designed into new developments by making them less dependent on grid distributed energy and fossil carbon fuels

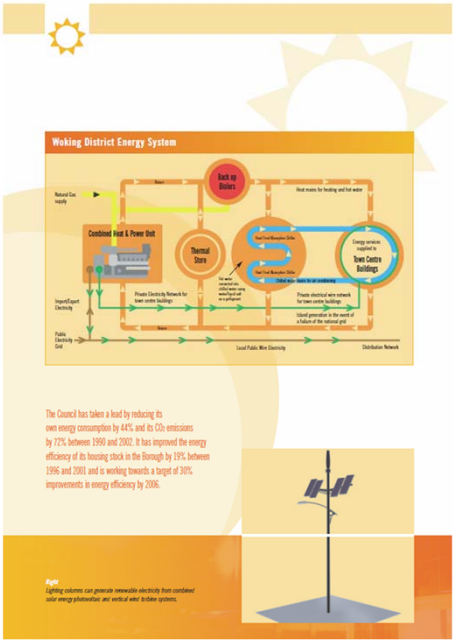
Note – whole discussion about a de-carbonised grid

- The energy requirements of a new development should be met through on site generation of sustainable and / or renewable energy

Planning policies: Woking

District energy system

"The Council has taken a lead by reducing its own energy consumption by 44% and its CO2 emissions by 72% between 1990 and 2002. It has improved the energy efficiency of its housing stock in the Borough by 19% between 1996 and 2001 and is working towards a target of 30% improvements in energy efficiency by 2006."



And it uses the example of its own district energy system to illustrate the benefits to energy consumption and carbon emissions.

Planning policies: Woking

- Sustainable Urban Drainage (SUDs)
- Within the curtilage of development
- Public amenity benefits
- Wildlife conservation / biodiversity
- Storage of rainwater for re-use – irrigation or flushing WCs

climatechangeskills for planners

FORTISMERE ASSOCIATES ARUP

Responding positively to predicted increases in rainfall by ensuring that

- New development should include appropriate SUDs for the disposal of surface water
- Wherever possible SUDs should be provided within the curtilage of the development
- The opportunity should be taken to develop SUDs which provide benefits such as public amenity or wildlife conservation

Planning policies: Woking

- Measures to reduce water consumption
- Rainwater harvesting
- Recycling of greywater
- Integrated approach to water demand and rainwater disposal

climatechangeskills for planners

FORTISMERE ASSOCIATES ARUP

Reducing dependence on mains water in new development by providing:

- Measures to reduce water consumption
- Facilities for rainwater harvesting and recycling of grey water
- An integrated approach to water demand and rainwater disposal that combines the benefits of SUDs with reduced consumption

Planning policies: Woking

- Applicant's checklist
- Each of the five guidance topics
- To be returned with applications
- Sets agenda pre-application

climatechangeskills for planners

FORTISMERE ASSOCIATES ARUP

The five climate change guidance sheets culminate in an applicants checklist

Questions on each of the five guidance topics – yes / no

To be returned with applications

Sets the agenda for pre-application discussions about climate change in a very helpful and accessible way

Planning policies: group exercise

Design your own climate change checklist

to be returned with masterplan planning applications

- 1: Location and transport
- 2: Site layout and building design
- 3: Energy
- 4: Sustainable drainage (suds)
- 5: Water conservation and recycling

climatechangeskills for planners FORTISMERE ASSOCIATES ARUP

Having talked about some of the ways planning policies can provide the foundations for climate change issues in masterplanning, we are going to look at the masterplan process that might follow.

Masterplanning creates proposals for buildings, spaces, movement strategy and land use in three dimensions, together with a delivery strategy.

The CABE document *Creating Successful Masterplans* provides one way of defining masterplan stages.

RIBA Work Stages

- Stage A – Appraisal
- Stage B – Design brief
- Stage C – Concept
- Stage D – Design development
- Stage E – Technical design
- F, G, H – Pre-construction
- J, K – Construction
- L – Post practical completion

RIBA Outline Plan of Work 2007

climatechangeskills for planners

FORTISMERE ASSOCIATES ARUP

Another way of defining the different stages in a masterplan process is by using the RIBA work stages. Design teams often use this to describe the stage they have reached in their design process.

Stages A to E are probably most relevant to masterplanning.

Masterplan process: Bath Western Riverside

- Fielden Clegg Bradley Architects for Crest Nicholson

climatechangeskills for planners FORTISMERE ASSOCIATES ARUP

As a way of illustrating the masterplan process, I am going to use the example of a scheme called Bath Western Riverside, designed by Feilden Clegg Bradley for Crest Nicholson.

7.65 hectare site to the south of the River Avon and west of Bath city centre

This aerial view from the south west illustrates the partially operational gas works in the foreground

and the now derelict portion of the site to the east formerly occupied by the Stothert & Pitt engineering works.

You can see the Royal Crescent in the top left corner of the photograph.

Masterplan process: Bath Western Riverside

- Bath Western Riverside Supplementary Planning Document

climatechangeskills for planners FORTISMERE ASSOCIATES ARUP

Here the masterplan process is underpinned by an SPD setting out Bath and North East Somerset Council's vision for the redevelopment of the BWR site.

The SPD area is outlined in yellow.

The city centre is pink.

This describes the council's aspirations for development seamlessly knitted into the fabric of Bath, with a mix of uses for living and working, reinforcing Bath's World Heritage Status.

This places sustainability and climate change goals clearly on the agenda:

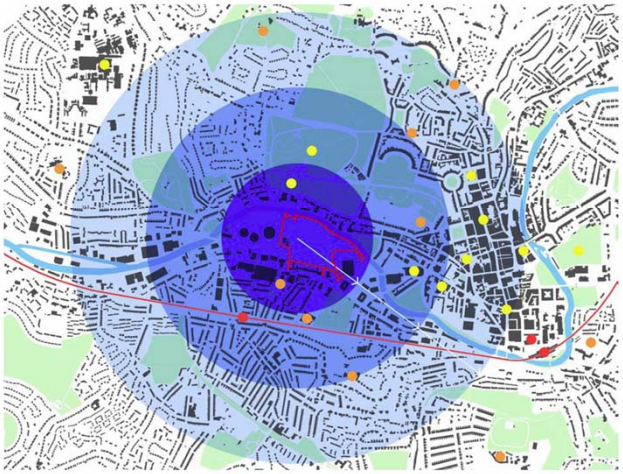
To create a beacon of sustainable development and living through the concept of 'embedded' sustainability.

Achieve a significant modal shift from the private car to public transport, cycling and walking.

Ensure that the wider Bath community benefits from the regeneration of BWR.

Masterplan process: Bath Western Riverside

- Context appraisal



climatechangeskills for planners

FORTISMERE ASSOCIATES ARUP

To illustrate some of the work done by the architects during the appraisal stage, this drawing shows a context appraisal:

Red – main public transport interchanges

Yellow – hospitals, cultural buildings, amenity spaces

Orange – schools

Important information to ensure a development is well connected to its surroundings.

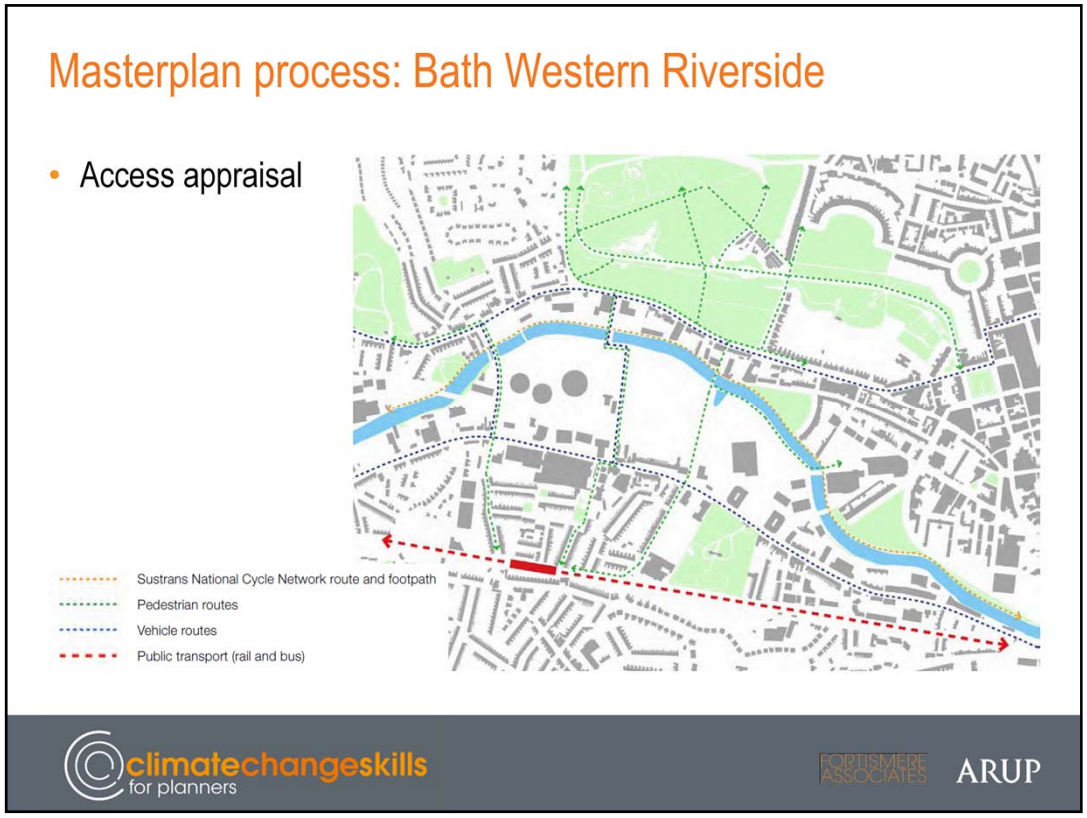
Approximate walking distances are indicated by the blue circles, each circle representing approximately 5 minutes or 400 metres for a typical adult walking speed (approximately 4.8 kph or 3.2 mph).

Selection of primary and secondary schools within walking distance

Oldfield Park Railway station is 6 – 7 mins walk from the centre of the site.

Bath Spa Central station and bus station are about 20 minutes walk.

This type of analysis is important in masterplanning to reduce carbon emissions associated with transport – by designing new places that allow people to walk, cycle or take public transport in their day to day life.



Again at the appraisal stage, the architects have looked at access to the site.

This helps demonstrate how well connected the site is in terms of public transport, walking and cycling routes

As the basis for an access strategy that minimises carbon emissions associated with transport.

Masterplan process: Bath Western Riverside

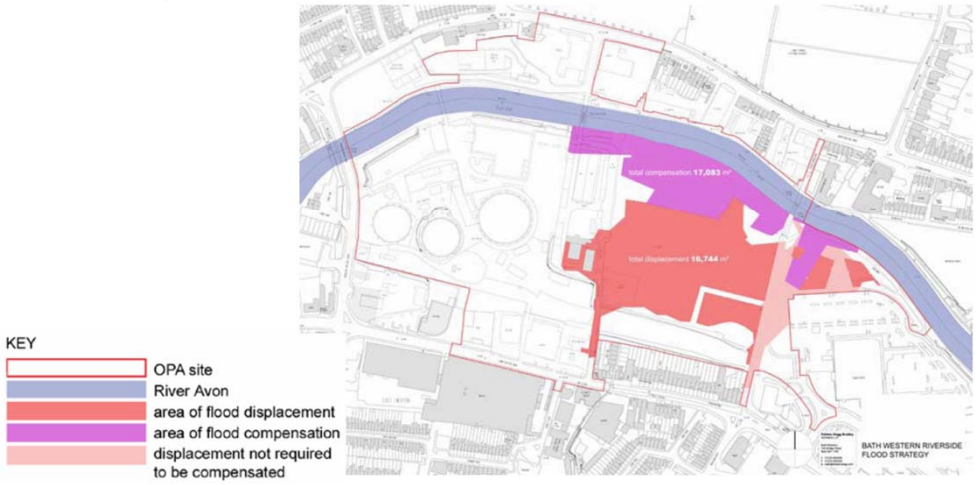
- Flood risk appraisal

climatechangeskills for planners FORTISMERE ASSOCIATES ARUP

Again, as part of the site appraisal, flood risk analysis was carried out, shich shows that a large area of the site could be affected by a 1 in 100 year flood.

Masterplan process: Bath Western Riverside

- Flood displacement strategy



climatechangeskills for planners FORTISMERE ASSOCIATES ARUP

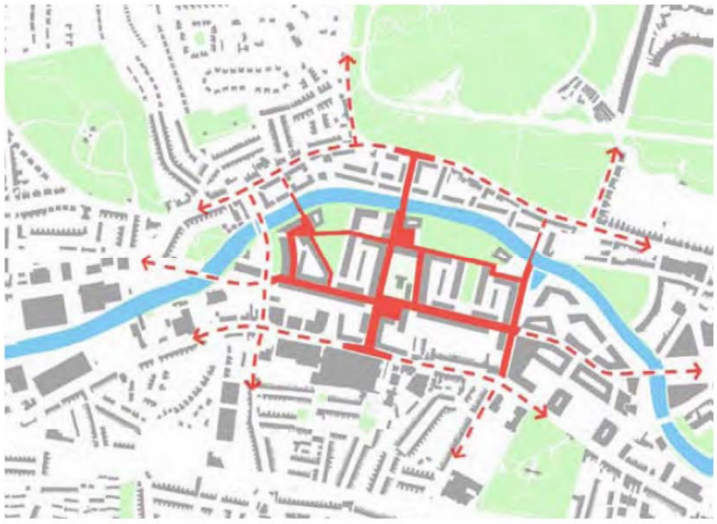
Obviously those are just a small sample of the appraisal work carried out, which very directly inform the design strategies developed by Fielden Clegg Bradley.

Here for example, is a diagram showing the flood displacement strategy for the site, raising the red area of the site, where buildings are to be constructed, and creating a lower landscaped area, that could be allowed to flood.

In this case the purple area of flood compensation becomes a riverside park – so the need to deal with flood risk provides a fantastic facility, and helps give the development a unique identitiy.

Masterplan process: Bath Western Riverside

- Street pattern



climatechangeskills for planners

FORTISMERE ASSOCIATES ARUP

Again building on the analysis of movement patterns, a strategy is developed for street patterns across the site.

This is intended to be consistent with the pattern elsewhere in the city, and to create a place where it is easy to walk around and find your way.

Masterplan process: Bath Western Riverside

- Mixed use strategy

climatechangeskills for planners

FORTISMERE ASSOCIATES ARUP

Lastly building on the context appraisal work, a mixed use strategy has been developed, which will be essential for the vitality of the new place.

Providing the facilities that people need for their daily lives helps reduce carbon emissions allowing people to shop, go to the gym, eat out, or take their children to nursery without getting into their cars.

Masterplan process: Bath Western Riverside

- Energy strategy:

- Improved u-values and air tightness
- Low energy lighting and appliances
- 10% renewable energy generation (biomass CHP and solar hot water)
- Communal heating systems – CHP and shared gas boilers
- Energy Services Company (ESCo)

climatechangeskills for planners FORTISMERE ASSOCIATES ARUP

Masterplan process: Bath Western Riverside

- Implementation plan:
- Parameter based outline planning application
- Followed by detailed applications for phased development
- ESCo to deliver energy supply
- Rapid transport system – employment and facilities in city centre
- BUT a design code could have given greater assurance

climatechangeskills for planners FORTISMERE ASSOCIATES ARUP

As masterplan work progresses towards a planning application, thinking carefully about implementation is essential to ensure that the strength of climate change strategies is maintained in a completed development.

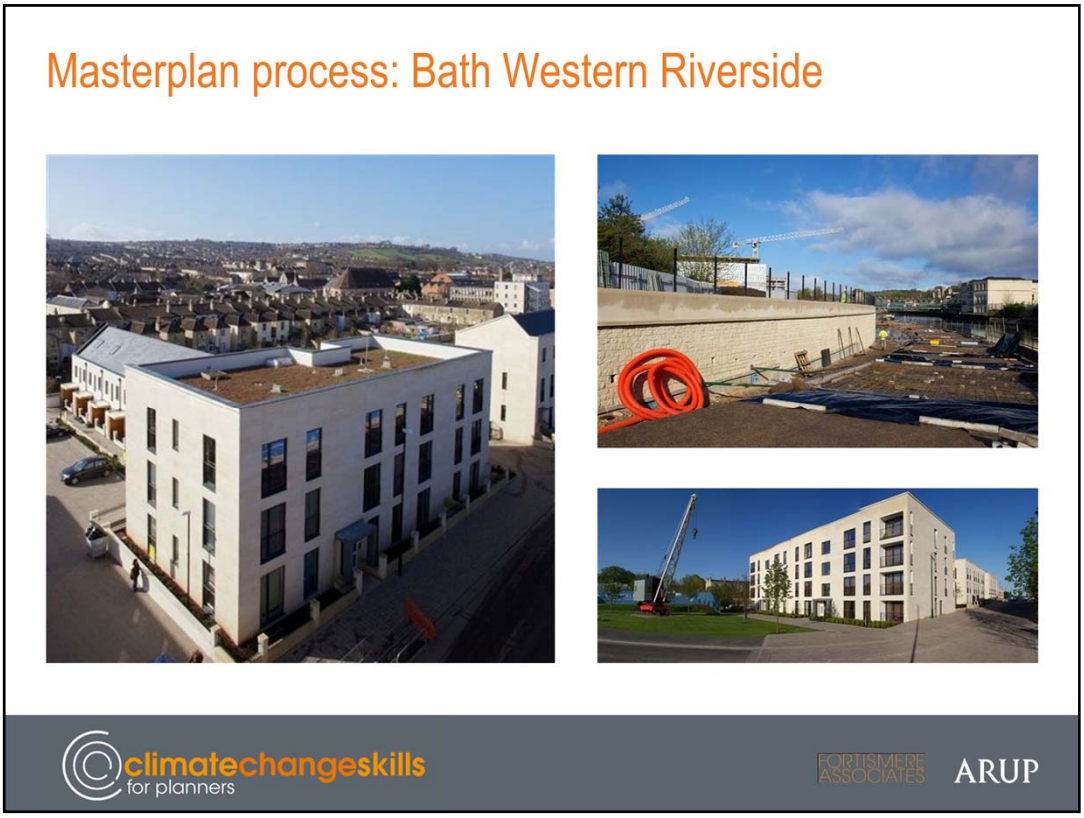
At Bath Western Riverside, a parameter based outline application was submitted, followed by detailed applications for phased development. This means that at outline application stage the principles of the development were fixed – for example the amount and mix of development, the range of building heights, their footprints, street pattern, open spaces etc. This requires careful thought about what needs to be fixed at the outline stage, and measures to address climate change issues such as flooding, can be an important part of this.

An ESCo was established to deliver energy supply.

And the local authority took a lead in the delivery of a rapid transport system, giving quick access to employment and facilities in the city centre.

However, when CABE reviewed the scheme, it advised that a design code could give further assurance.

Design Codes are documents that can sit alongside outline planning applications to illustrate the way in which detailed designs should be developed. They vary enormously in content and quality – so should be used with caution, but can be valuable for masterplans that will be phased over long periods of time, particularly where development parcels are likely to be sold off to different developers. They could be used to guide detailed designs in achieving climate change objectives – for example, describing orientation for passive solar design, use of materials with low embodied energy.

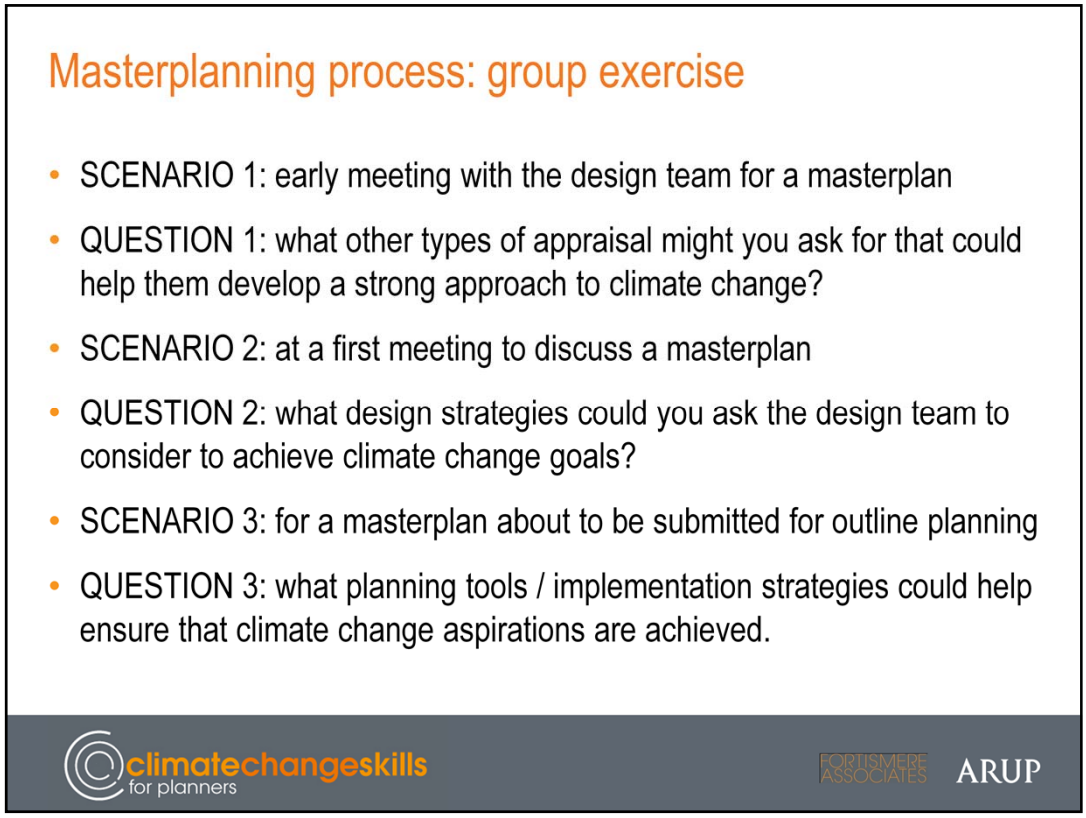


These are recent photographs of Bath Western Riverside, now under construction, with the first phase of development complete.

Top right photo shows the retaining wall along the edge of the riverside park, which provides flood attenuation

Further reserved matters applications will be submitted for the rest of the site.

12 – 18 years until the whole development is completed.



At each stage in the masterplanning process, the type of conversations you are likely to be involved in as planners will be slightly different. You have the potential to set the agenda, for discussion of climate change mitigation and adaptation.

In groups around your tables, I'd like you consider the questions you might ask at a consultation meeting with a masterplan design team:

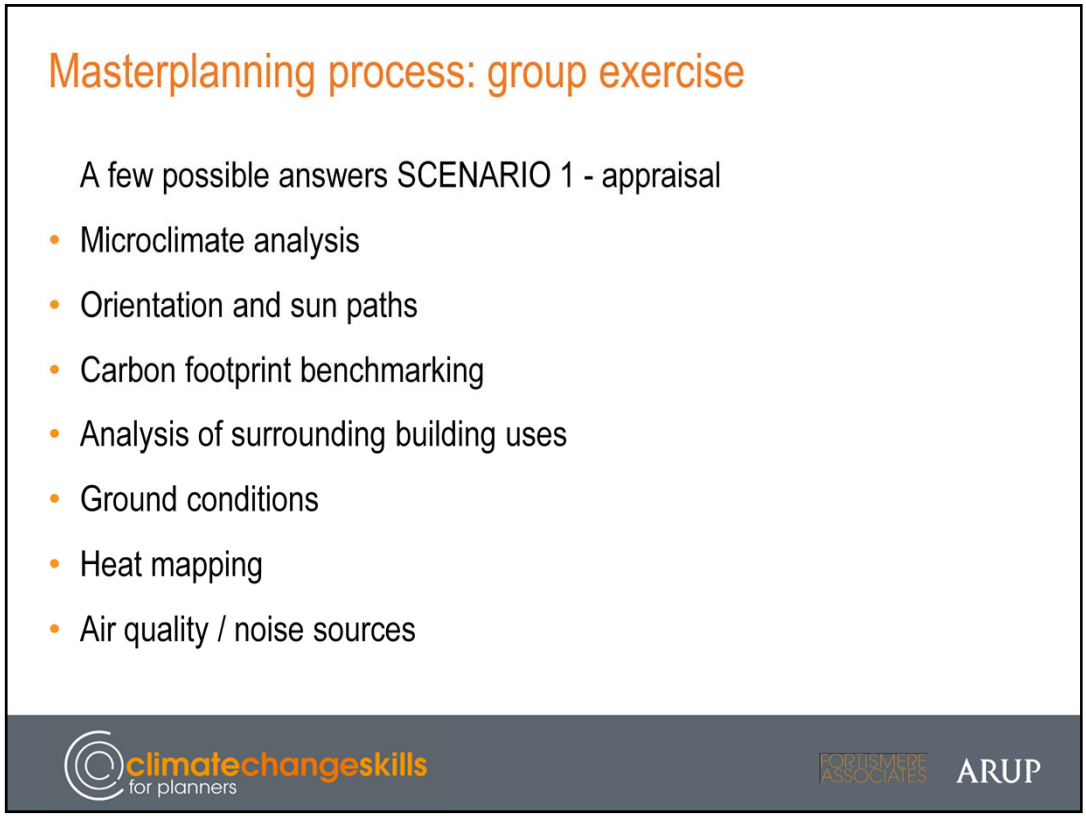
Scenario 1: Imagine yourselves at an early meeting with a masterplan team, before they have put pen to paper to design a scheme. Think about what types of appraisal they should do to inform their thinking about climate change. For BWR we looked at just 3 – flood risk appraisal, access appraisal and context appraisal. What else?

Scenario 2: Imagine yourselves a first meeting to discuss a masterplan, still well before a planning application is submitted, so with time for the scheme to develop. Think about the spatial planning or technical strategies they should consider in terms of climate change. For BWR we looked at Flood mitigation strategy, street pattern, energy, and mix of uses. What else?

Scenario 3: Imagine yourselves at a meeting to discuss a masterplan that is about to be submitted for planning approval. You are supportive of the approach to climate change, but need to ensure that a planning approval secures firm commitments, so that what has been promised is delivered on the ground. Think about the planning tools you could

use to achieve this. For BWR we looked at a parameters based planning application, and the idea of using design codes. What else?

Three scenarios as above – 20 minutes – then feedback to the room as a whole.



Microclimate analysis – e.g. help decide whether need a design that addresses urban heat island effects

Orientation and sun path – e.g. inform passive solar design

Carbon footprint benchmarking – to set measurable targets for new development

Analysis of surrounding building uses – e.g. scope to create heat networks beyond site boundaries NB. EXISTING + PROPOSED

Ground conditions – e.g. whether suitable for ground source heat pump systems

Heat mapping – identifying opportunities for renewable heat by analysis of current or potential heat supplies and demands

Air quality / noise sources – may determine whether natural ventilation is possible

Masterplanning process: group exercise

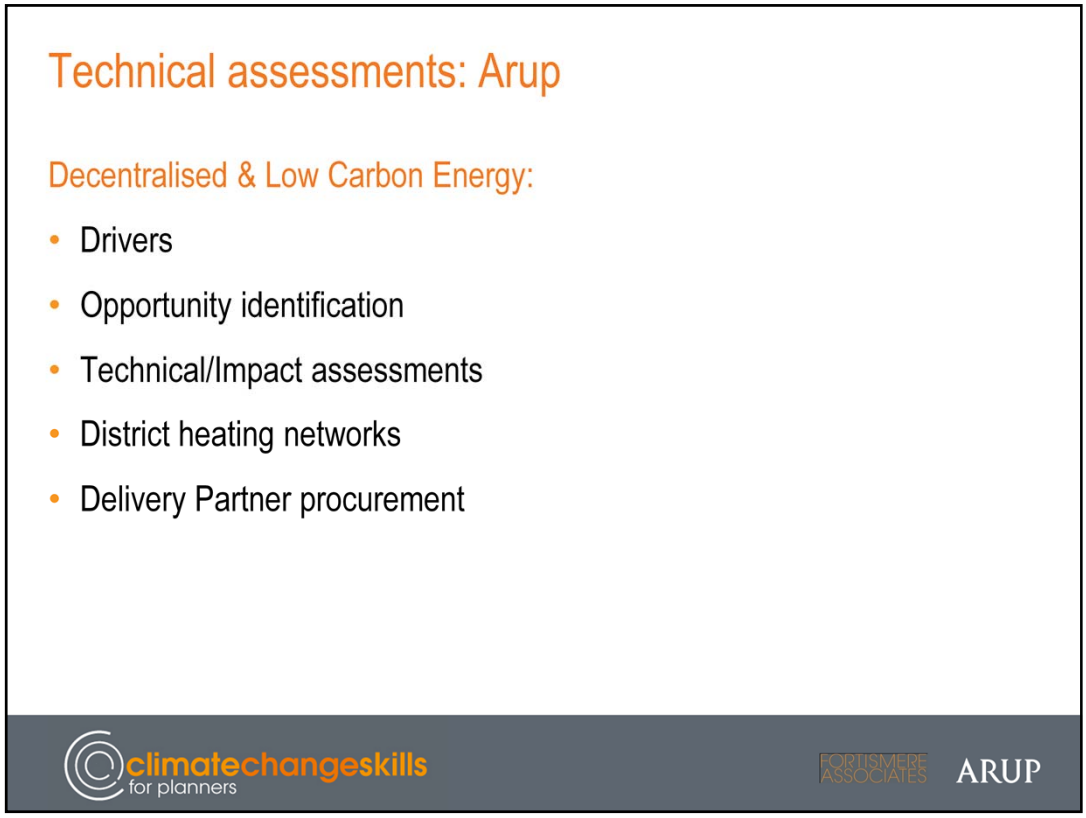
A few possible answers SCENARIO 2 – design strategies

- Construction materials – low embodied energy
- Transport – car clubs, cycle parking, bus stops, footpaths etc
- Long life loose fit design
- Earth sheltered buildings – minimise heat loss
- Green roofs / green infrastructure – address urban heat island effects
- High density development close to transport nodes
- Proximity to or provision of employment / education / retail opportunities

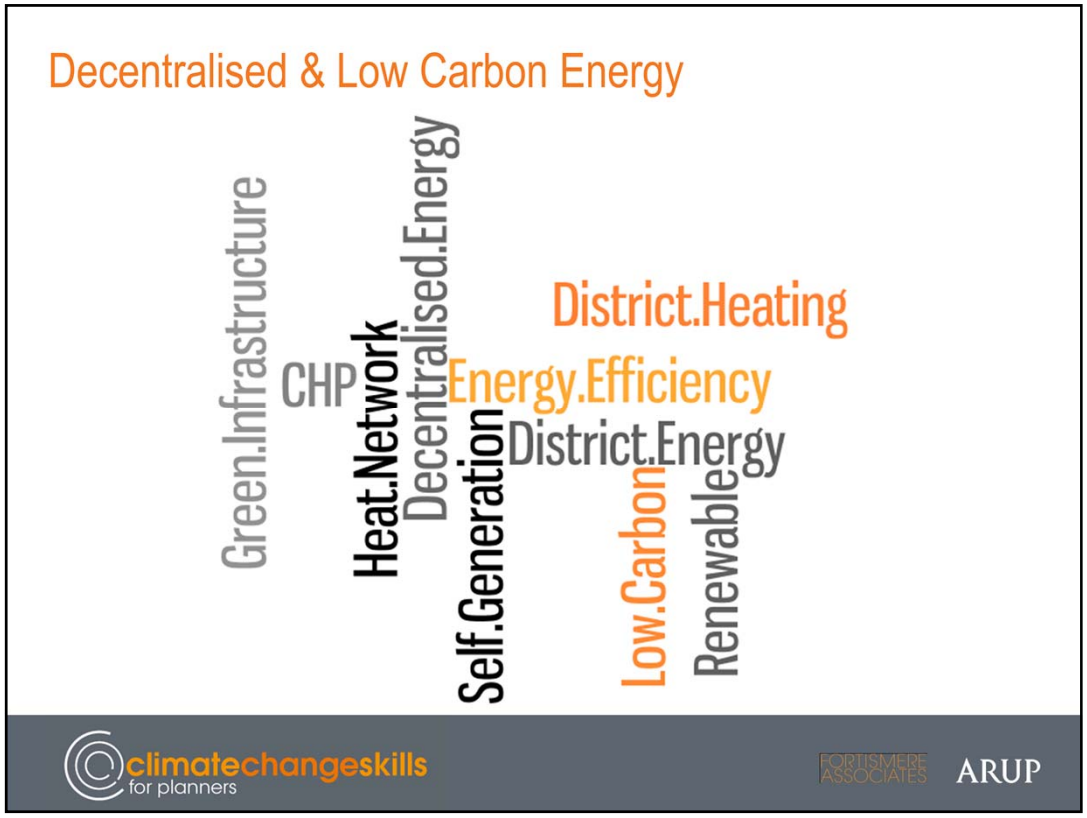
Masterplanning process: group exercise

A few possible answers SCENARIO 3 – implementation

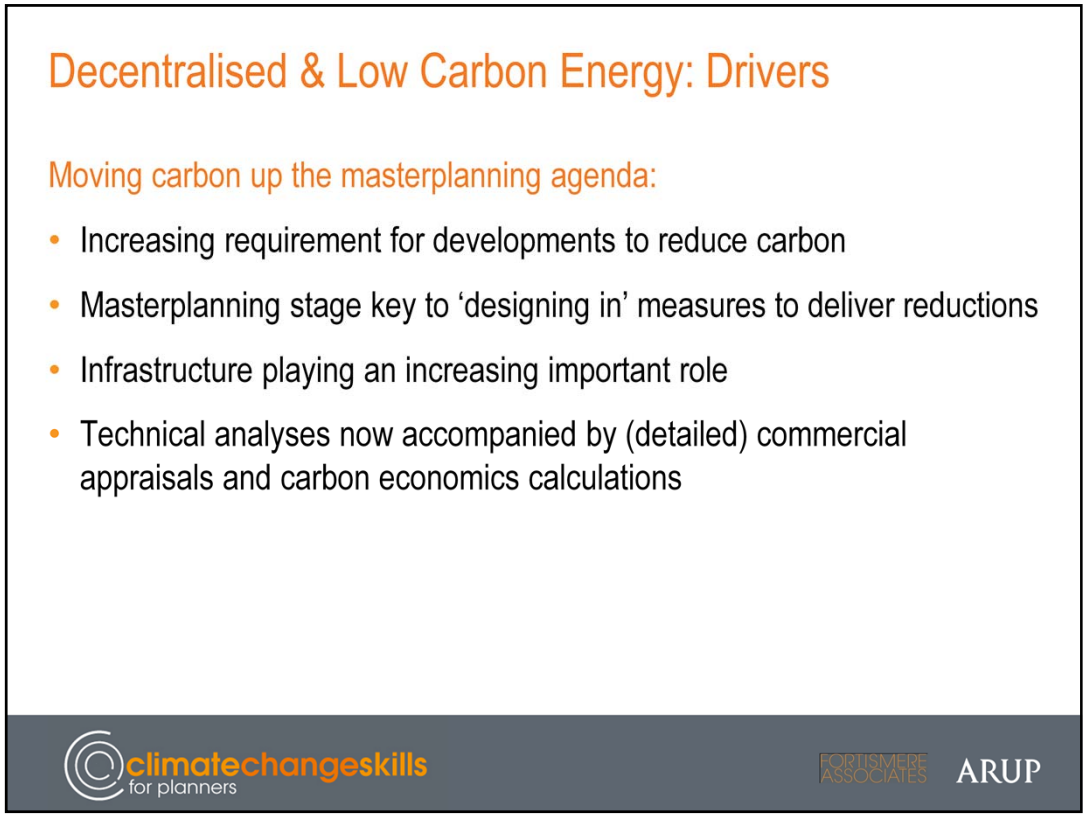
- Ensuring planning documents set clear targets / not woolly aspirations
- Might involve legal agreements, for example relating to energy supply
- Clarity about development phasing, for example when CHP delivered
- Design Codes, especially useful where sites parcelled up
- Codes can also deal with materials, orientation, micro-generation etc
- Section 106 / CIL – for example subsidy of car club / bus service / upgrading energy efficiency of neighbouring homes



2. Methods and tools for identification
3. Methods and tools for assessing opportunities
4. Introduction to DH network layouts and phasing
5. Outline of scheme delivery options and partner procurement



1. Low Carbon – the goal, decentralised energy – the method of delivery



1. Incremental tightening of UK Building Regulations requirements for reductions in non-residential building carbon emissions

1. Code for Sustainable Homes (CfSH) driving for similar trajectory in residential buildings

2. Increasing emphasis falling on low-carbon decentralised energy generation, to (primarily) displace consumption of grid-electricity

2. Self-generation requires early consideration to enable suitable site integration

3. DE and District heating a proven method of facilitating generation and distribution of lower carbon heat

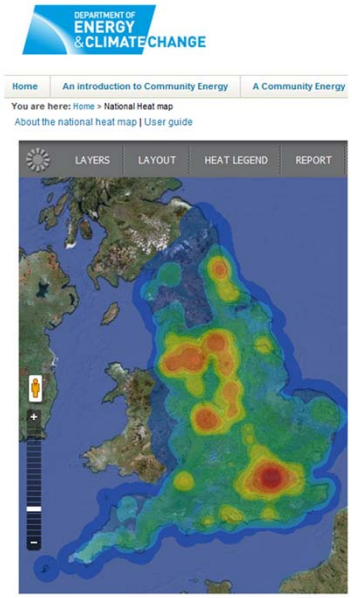
3. Related infrastructure fundamentally 'fuel agnostic' and provides future-proofing for future lower/zero-carbon generation

4. Commercial appraisal and modelling increasingly sophisticated to account for all fuel purchase, energy generation and related sales

Decentralised & Low Carbon Energy: Identification

DECC National Heat Map:

- Tool to help identification of opportunity
- Heat density is mapped in 4 categories:
    1. Public Buildings
    2. Commercial
    3. Industrial
    4. Residential
- Existing CHP Installations and Thermal Power stations shown
- Reporting for selected areas



climatechangeskills for planners

FORTISMERE ASSOCIATES ARUP

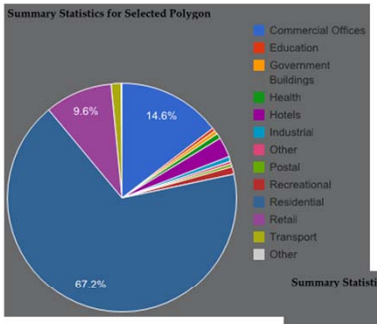
(not covering in detail as covered in previous Module)

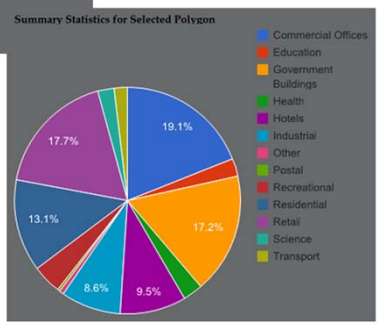
1. Displays heat density in terms of kWh consumed per m2 per year
2. Different categories recognise differing profiles of demand relative to consumption
4. Area can be selected by radius or bespoke polygon

Decentralised & Low Carbon Energy: Identification

DECC National Heat Map:

Sector	Heat Demand (kWh)	Number of Addresses	Heat Density (kWh/m2)
Commercial Offices	42,400,000	1,200	26.1
Education	5,450,000	35	3.36
Government Buildings	38,200,000	45	23.5
Health	6,410,000	56	3.94
Hotels	21,000,000	234	12.9
Industrial	19,000,000	62	11.7
Other	1,510,000	31	0.930
Postal	793,000	29	0.488
Recreational	9,280,000	94	5.71
Residential	29,200,000	5,531	18.0
Retail	39,500,000	787	24.3
Science	5,460,000	6	3.36
Transport	4,120,000	117	2.54
Total	**222,000,000**	**8,227**	**137**

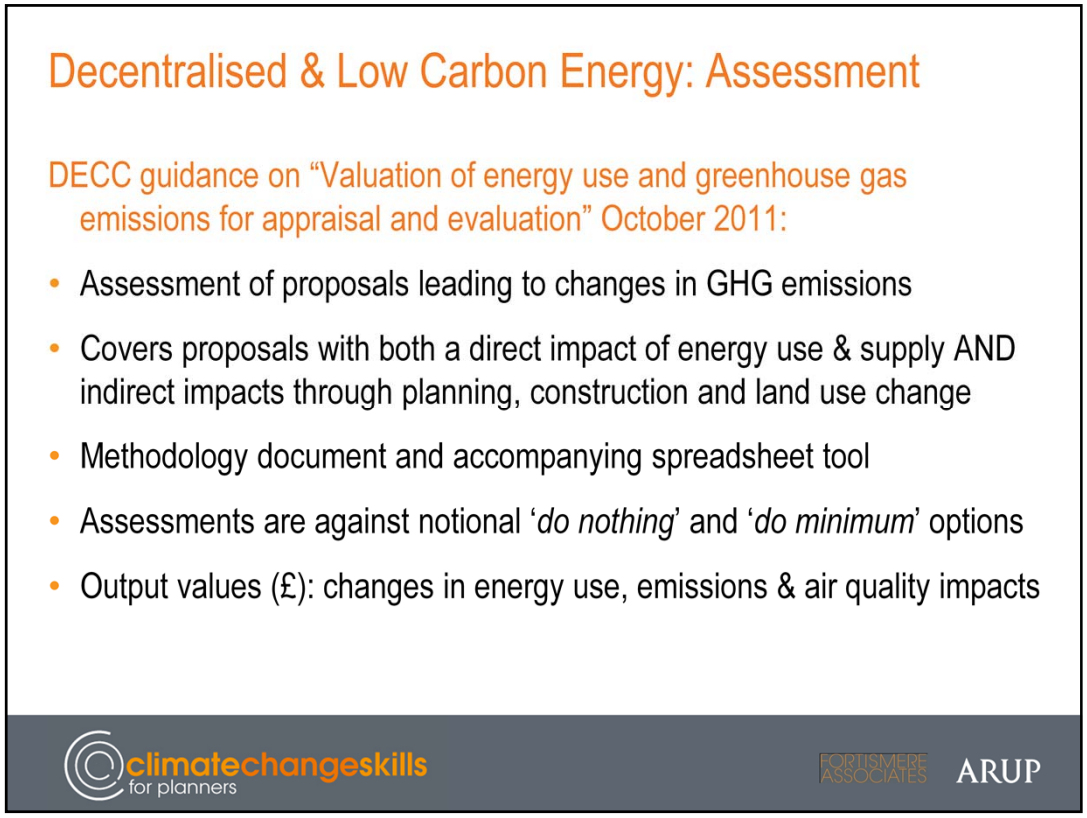




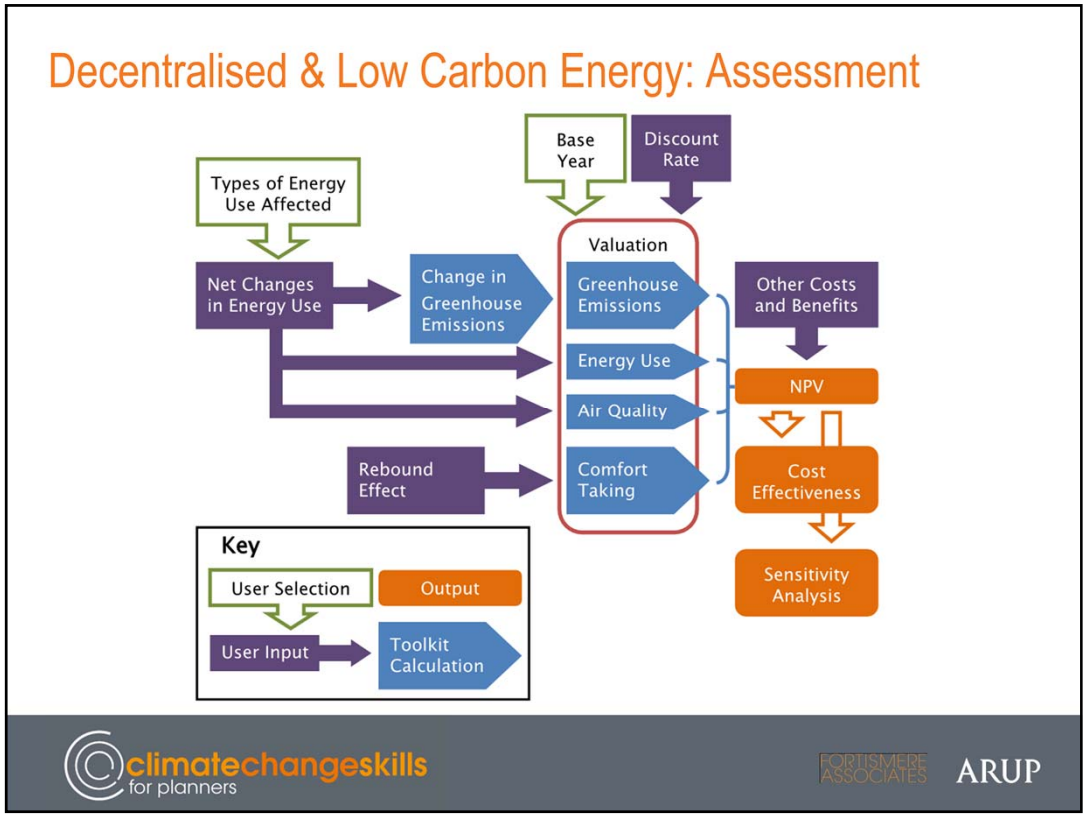
climatechangeskills for planners

FORTISMERE ASSOCIATES ARUP

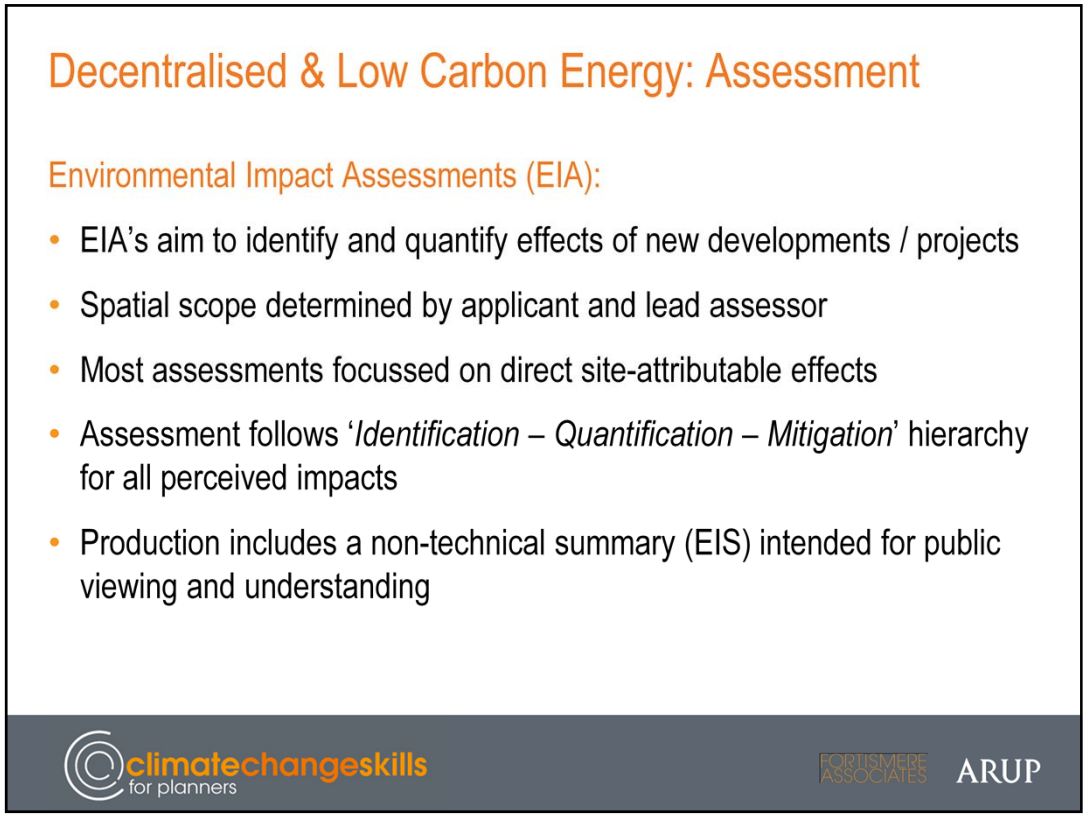
- Greater detail and sector type available via area reporting
- Similar considerations as for new/emerging schemes



1. Intended to help in assessment of proposals leading to a reduction (or increase) in energy use or GHG emissions



Graphic displays related toolkit model processes



2. / 3. Continuing point of discussion regarding true boundaries of indirect impacts for larger projects (e.g. Airports)

4. Impacts deemed 'significant' to be described, with definitions varying a matrix approach is often used

Decentralised & Low Carbon Energy: Assessment

CPLAN Carbon Impact Assessment:

- Developed by ECSC with London South Bank University
- Designed specifically to assess planning compliance
- Prototyped with local authority planners in 2008
- CPLAN Briefing Note and Presentation part of hand-outs

ecsc Energy Centre for Sustainable Communities

LONDON SOUTH BANK UNIVERSITY

Thamoswey Ltd

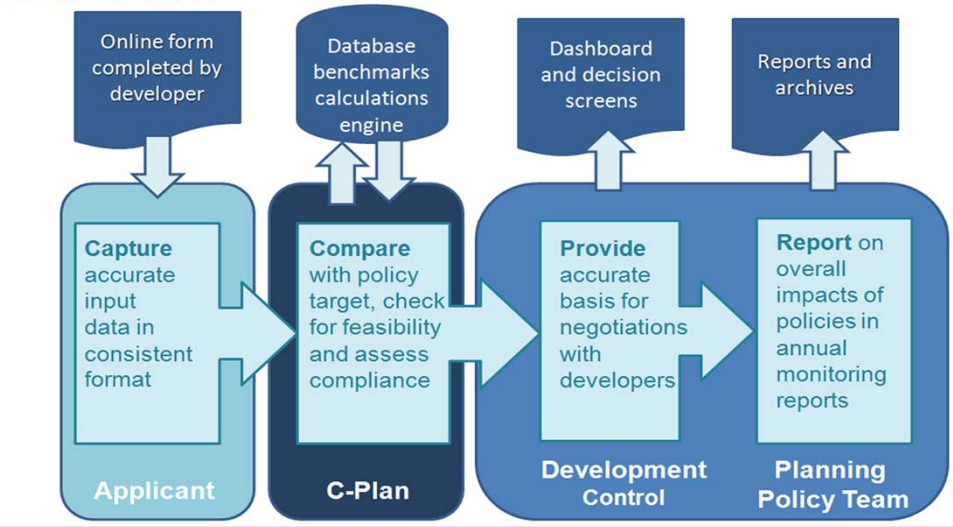
climatechangeskills for planners

FORTISMERE ASSOCIATES

ARUP

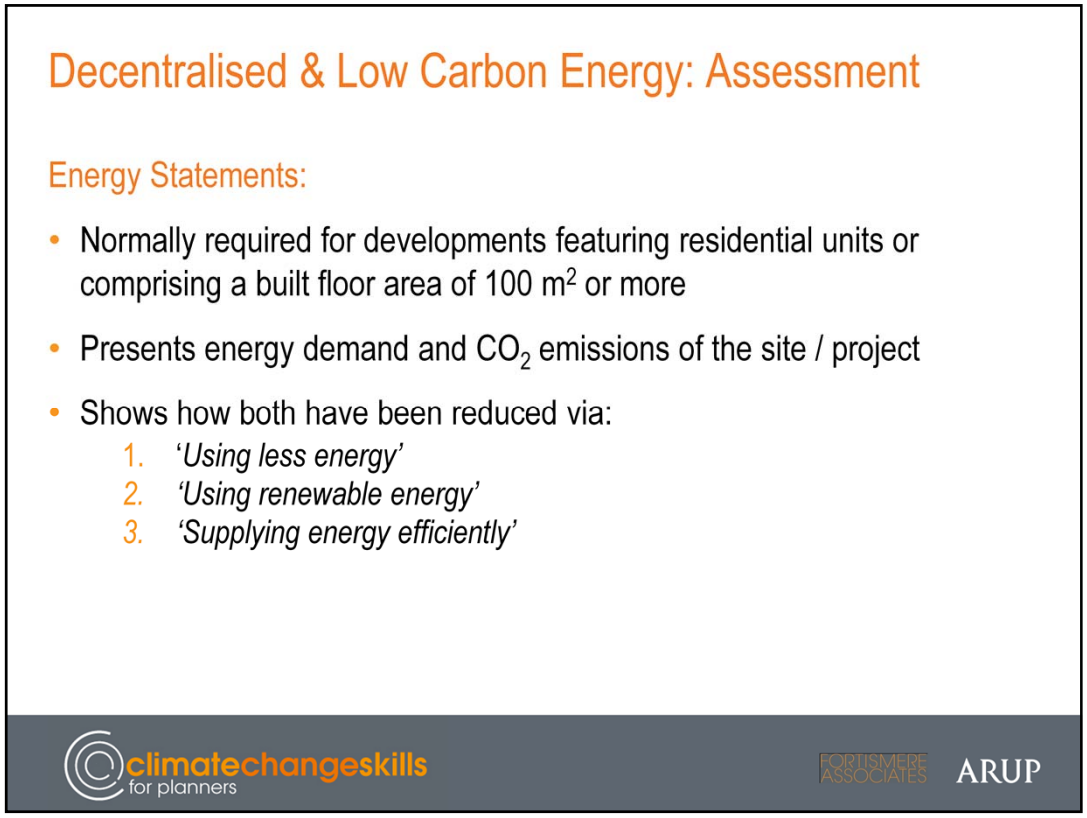
Decentralised & Low Carbon Energy: Assessment

CPLAN Process

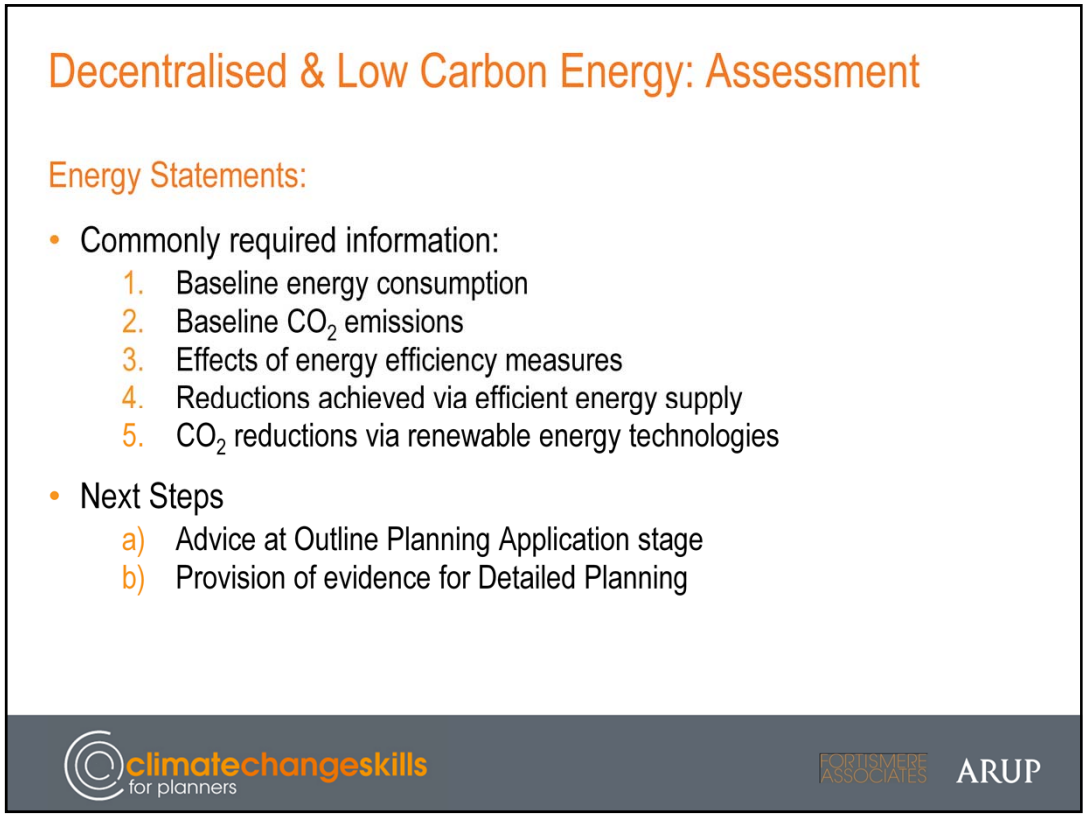


climatechangeskills for planners

FORTISMERE ASSOCIATES ARUP



3. Common hierarchy around reducing demand first then meeting what is left efficiently and via low carbon means



1. Using SAP or SBEM methodology
2. Based on gas and grid electricity use
3. Normally through construction design elements such as building fabric, windows etc
4. Includes use of CHP and / or district heating
5. Comprised (chiefly) building-integrated technology use

a. Outline steps including more detailed energy assessment at detailed design stage
b. Also evidence for any Section 106 agreement

Decentralised & Low Carbon Energy: District Heating

Distribution Networks

- Heat distribution networks represent largest cost item of DH schemes
- Pipework routing can seek to use common services trenching
- Early route optimisation advisable
- Route a function of loads to be connected and point of generation

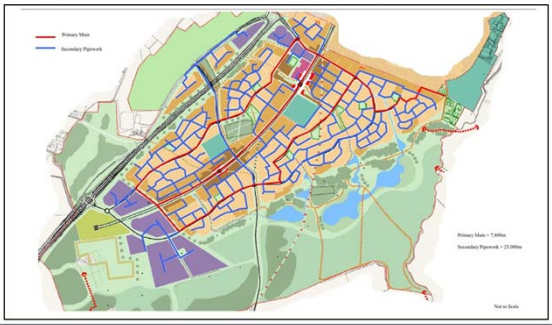
climatechangeskills for planners FORTISMERE ASSOCIATES ARUP

1. With very few exceptions – pipework and trenching costs often 50%+ of total scheme
2. With physical trenching for pipework representing a major element of network costs (especially in developed / urban areas), common services routing can seek to save on additional trench works

Decentralised & Low Carbon Energy: District Heating

Network Phasing

- DH networks sometimes phased in line with developments
- Prior appreciation of ultimate scheme extents and scale required
- Typically comprises primary and secondary pipework



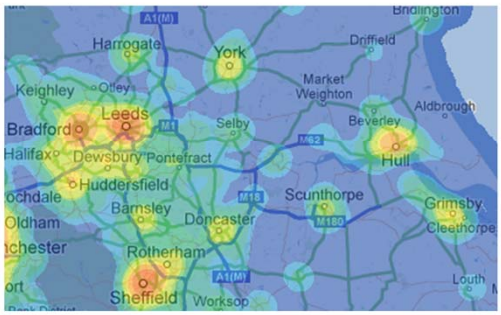
climatechangeskills for planners FORTISMERE ASSOCIATES ARUP

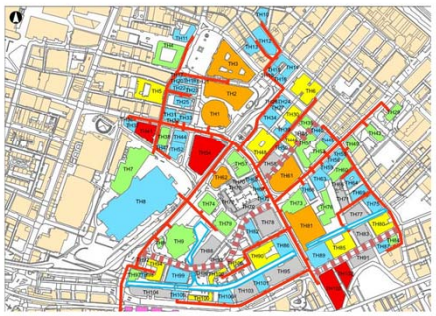
1. Network construction feature high initial capital investment
2. Initially installed pipework must have diameter and according capacity for final scheme
3. Similar to electrical distribution, primary ‘transmission’ pipework will be larger diameter (and sometimes higher temperatures), with smaller local pipework connecting to buildings, hydraulically separated via heat exchangers

Decentralised & Low Carbon Energy: District Heating

Development Layout

- Heat density a metric for DH

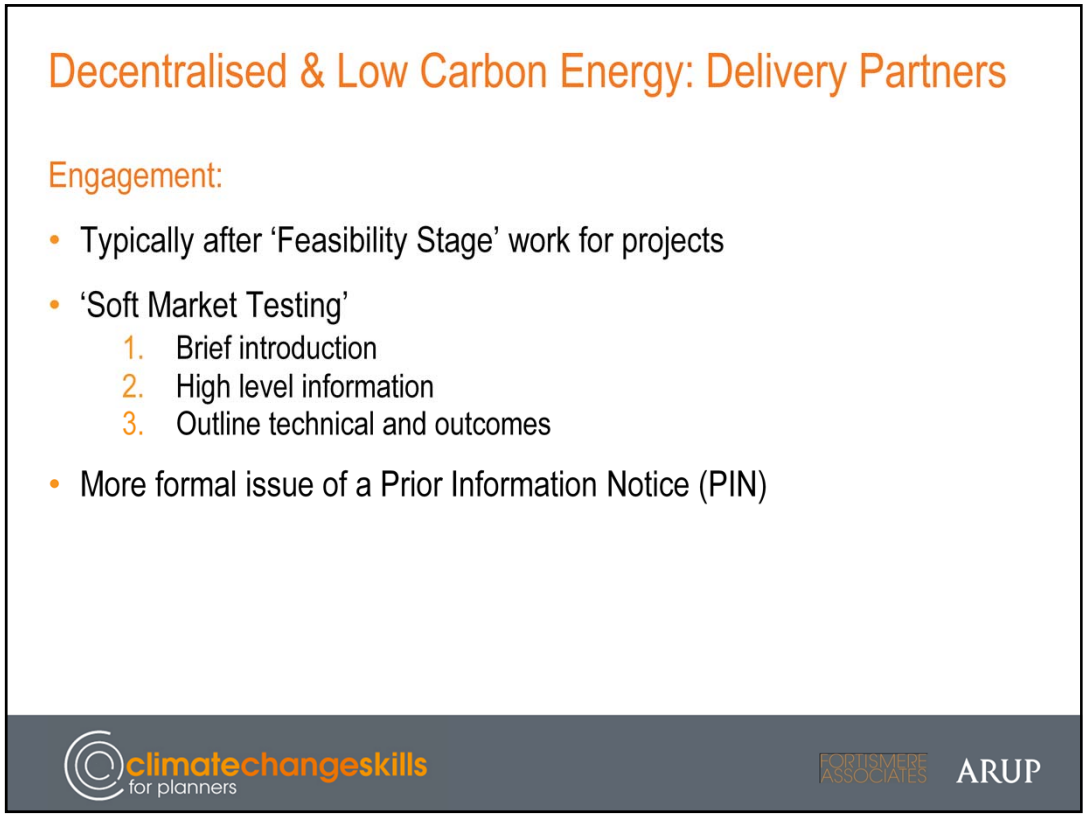




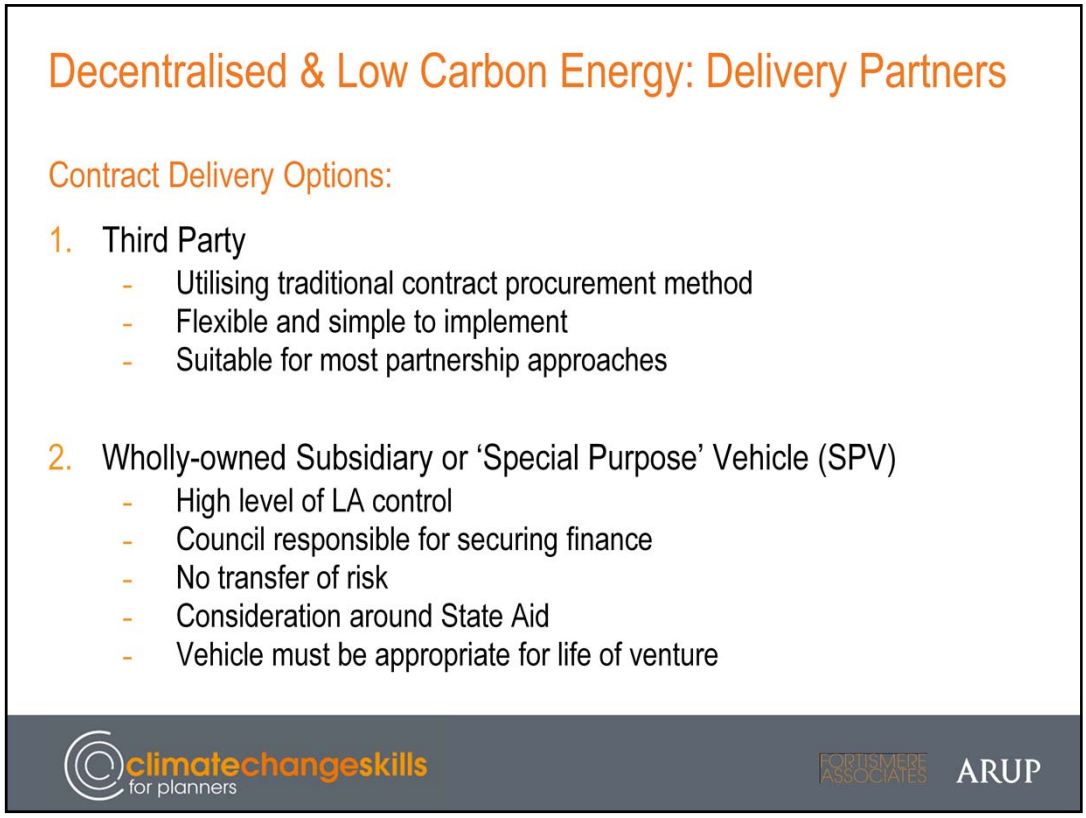
- Clear link to achieving network efficiency and cost savings
- Energy centre location a key element

climatechangeskills for planners FORTISMERE ASSOCIATES ARUP

1. Heat density a defining factor in suitability to district heating
2. Minimising of distribution pipework desirable
3. Largest diameter pipework (and therefore trenching) at point of generation and distribution

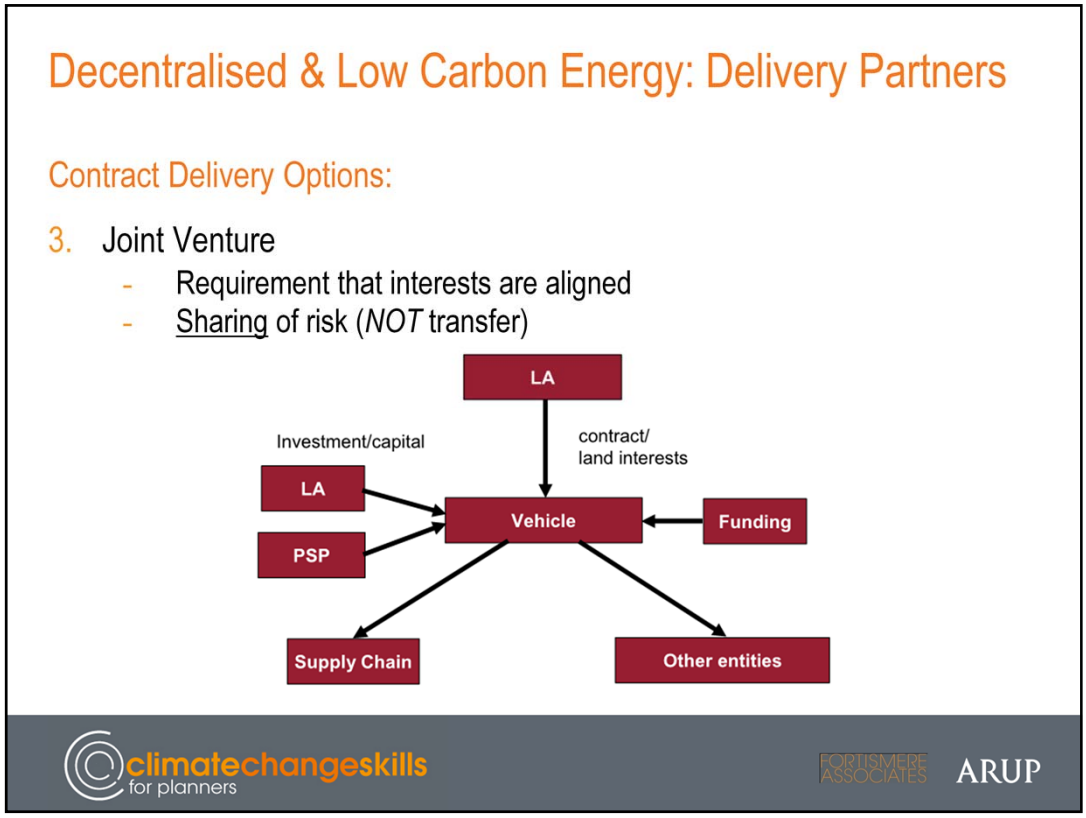


1. Opportunities first identified (possibly via heat mapping) and sufficient detail gathered/provided to facilitate a feasibility study which will feature technical outputs (maximum energy demands and possible plant capacities), less likely commercial outputs
2. Soft Market Testing involves the provision of a brief project/scheme briefing paper describing the opportunity and outlining initial conclusions & outputs of feasibility study
3. PIN a well understood process to publicise upcoming tendering of project



2. iv if assets/land/finance are transferred from Council to Subsidiary

   v) vehicle structure cannot be 'swapped' without significant transaction costs and commercial & taxation impact [source is HM Treasury Joint Venture Guidance 2010]



3. i) alignment tested via business case development and competitive procumerment
   ii) suitable when a JV structure offers better scope to manage and mitigate risks

It would be impossible to give a talk about masterplanning for climate change without mentioning the Olympic Park, which could be seen as a test bed for solutions to this challenge in the UK. It is also a great example to look at because it is so recently completed, so provides an absolutely contemporary illustration of the challenges and opportunities.

It pioneers techniques for almost every area of masterplanning for climate change - not all of which may be applicable to more modest projects – there is likely to be some element to inspire almost every scheme.

Adaptation & mitigation strategies: Queen Elizabeth Olympic Park

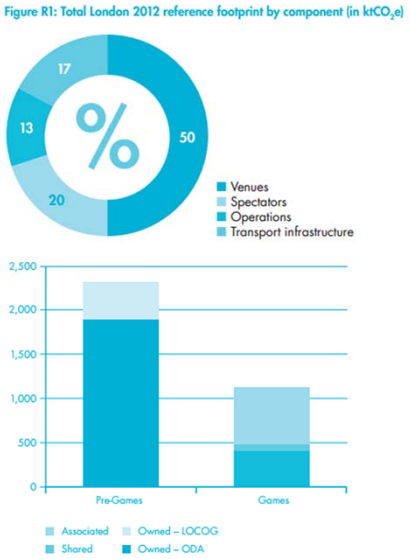
- Carbon Footprinting
- Demolition and reclamation
- District heat and power
- Carbon reduction schemes
- BREEAM and Code for Sustainable Homes
- Sustainable Drainage Systems and Flood Mitigation
- Black water recycling
- Drought resistant planting

climatechangeskills for planners FORTISMERE ASSOCIATES ARUP

Adaptation & mitigation strategies: Queen Elizabeth Olympic Park

- Carbon Footprint

  London 2012 reference footprint
- Estimated to be 3.4 million tonnes of carbon dioxide equivalents
- 50% venue construction
- 20% spectators
- 13% operations
- 17% transport infrastructure



climatechangeskills for planners

FORTISMERE ASSOCIATES ARUP

One of London 2012's most significant achievements has been to attempt to quantify its environmental impacts. In terms of climate change mitigation, and one of the ways this has been done is by measuring its carbon footprint.

A carbon footprint for a masterplan is its total impact on greenhouse gasses that contribute to global warming.

In the original London 2012 bid, a commitment was made to deliver a 'low carbon Games'. To define performance against this aspiration meant that Games-related emissions needed to be measured and understood. This process could apply equally to any masterplan.

London 2012's carbon footprint was estimated at 3.4 million tonnes of carbon dioxide equivalents. Most is generated pre-Games: 50% from venue construction and 17% from transport infrastructure. The study demystified many preconceptions about Olympic and Paralympic Games, particularly by showing the relatively smaller role played by spectator air travel. This demonstrated that reducing carbon emissions associated with the construction of venues could have a dramatic effect on the overall carbon footprint for the Games.

As a result of this research work, the Olympic Delivery Authority set itself a target of achieving a 50% reduction in carbon emissions for the built environment by 2013

(against 2006 Building Regulations).

Adaptation & mitigation strategies: Queen Elizabeth Olympic Park

- Demolition and reclamation

climatechangeskills for planners FORTISMERE ASSOCIATES ARUP

The Olympic Delivery Authority set itself a challenging target that 90% by weight of demolition material from the site should be reused or recycled. This is relevant to masterplanning for climate change mitigation, because of the potentially very significant savings in the embodied energy of construction materials.

This had important implications for the way in which existing buildings could be demolished or dismantled. If materials were to be reclaimed they had to be carefully dismantled, inventoried and securely stockpiled. Overall a figure of 98.5% was achieved – however the majority of this was through recycling rather than re-use.

BioRegional documented the dismantling process, working with demolition contractors and reclamation specialists to survey stockpiled materials and communicate to design teams what was available.

Recycling included the cleaning and reuse hundreds of thousands of tonnes of soil which would otherwise have to be transported off site. An on-site 'soil hospital' produced clean material which has been used in the creation of the correct land levels, foundations and parklands.

One lesson learned is that recycling is cheaper and easier for contractors than re-use. The only way of ensuring that re-use takes place would be to have specific targets for reclamation, recycling and re-use.

Adaptation & mitigation strategies: Queen Elizabeth Olympic Park

- District Heat and Power

climatechangeskills for planners

FORTISMERE ASSOCIATES ARUP

An Energy Centre houses a Combined Cooling Heat & Power (CCHP) plant that provides both electricity and district heating to the Olympic Park. The district heating reduces the operational carbon emissions of the Olympic Park and its venues by approximately 20% compared with a conventional approach of individual plant rooms.

At the stage when the Olympic Park was being planned, there were very few precedents for district heating – Woking and Sheffield being notable exceptions. The cleared 2.5 square kilometre site of the Olympic Park, with its mix of venues, and residential development offered an opportunity to test the market for private investment in district heating. There was also an opportunity to tie this into the Westfield shopping centre development at Stratford City.

The Olympic Delivery Authority tendered the district heating contract in 2007 and it was awarded to Cofely, a subsidiary of GDF-Suez Energy Services for a 40 year concession to supply the Olympic Park.

The district heating system represents an approximately £100 million investment, supplies the Olympic Park Venues, the Olympic and Paralympic Village, and the Westfield site via two interconnected energy centres.

The CCHP engines are fuelled by natural gas, which is converted into electricity and hot and cooled water, distributed via a 40km network of pipes.

Both energy centres include several vacant bays that could accommodate additional plant as post Games development increases demand, or alternative technologies or lower carbon fuel sources become available.

Adaptation & mitigation strategies: Queen Elizabeth Olympic Park

- Carbon reduction schemes

climatechangeskills for planners FORTISMERE ASSOCIATES ARUP

A proposal for a permanent 120m high wind turbine on the Olympic Park was granted planning permission in September 2007. This was to be located at Eton Manor, to the north of the Park, where it was far enough from any housing, and its shadow would not be cast over any sporting venues.

However as design work progressed, there were concerns following UK incidents of a turbine blade falling off, and ice throw from a wind turbine. In addition, changes to the EU Machinery Directive made the proposed lift inside the turbine non-compliant. Because of this, and the fixed timescale for the project, the supplier withdrew, and none of the other previously shortlisted suppliers were willing to replace them.

The cancellation of the turbine forced the Olympic Delivery Authority to re-examine its commitment to achieve 20% renewable energy. To make up the shortfall, the ODA has invested £1.7 million in carbon reduction schemes in the four host Boroughs adjacent to the Park – improving the energy efficiency of homes and schools.

This budget will allow improvements to be made to 12 local schools, and approximately 2,800 homes. The scheme will focus on simple measures such as installing low energy light-bulbs and shower timers, hot water tank insulation and draught proofing, as well as loft and cavity wall insulation where appropriate.

This may be less iconic than a wind turbine, but brings tangible benefits to the communities living around the Olympic Park.

This approach also has the very important advantage of providing a means of addressing fuel poverty in existing communities around a masterplan area – it seems to me that planning policies which require a similar approach for masterplans elsewhere could be a very powerful way of addressing fuel poverty.

Adaptation & mitigation strategies: Queen Elizabeth Olympic Park

- BREEAM and Code for Sustainable Homes

climatechangeskills for planners FORTISMERE ASSOCIATES ARUP

BREEAM and Code for Sustainable Homes provide another method of setting targets for buildings within a masterplan, or quantifying their performance against climate change goals.

The Olympic Delivery Authority stipulated that permanent venues should achieve BREEAM excellent, and the Olympic Village should achieve Code for Sustainable Homes Level 4. The elegant form of the Velodrome in the picture results from a building envelope 'shrink wrapped' around the cycling track, to minimise the internal volume that needs to be air conditioned.

Some local authorities also set more detailed targets for specific categories within BREEAM or Code for Sustainable Homes Assessments.

For example Camden's LDF requires BREEAM ratings of 'very good' or 'excellent' as well as at least 60% of the credits in Energy and Water and 40% of the credits in Materials.

Adaptation & mitigation strategies: Queen Elizabeth Olympic Park

- Sustainable Drainage Systems and Flood Mitigation

climatechangeskills for planners FORTISMERE ASSOCIATES ARUP

The movement and treatment of water is fundamental to the Olympic Park's design. LDA and Hargreaves, the landscape architects for the Park's concept was for an absorbent landscape that could resist flooding. Their design includes wetlands that slow water absorption, and clean rainwater runoff.

Key objectives were to resolve problems of sewage effluent flowing onto the site from the Thames during high tides, and to mitigate potential flooding in communities to the north.

Adaptation & mitigation strategies: Queen Elizabeth Olympic Park

- Black Water Recycling

climatechangeskills for planners

FORTISMERE ASSOCIATES ARUP

Water for irrigation of the Olympic Park and flushing WCs in legacy venues is provided by the Old Ford Black Water Recycling Plant. The building has been designed by John Lyall Architects, and funded jointly by the ODA and Thames Water.

It is a pilot research project, and takes sewage from the Northern Outfall Sewer crossing the Olympic Park, and cleans it through a multi step process. This reduces overall drinking water demand by approximately 40%.

Adaptation & mitigation strategies: Queen Elizabeth Olympic Park

- Drought resistant planting

climatechangeskills for planners FORTISMERE ASSOCIATES ARUP

Drought resistant trees and plants have been specified in anticipation of higher temperatures and reduced water conditions due to climate change. Wildflower meadows planted with annuals to peak during the Olympic and Paralympic Games will be replaced with perennial meadows.

Adaptation and mitigation strategies: Leeds Aire Valley

climatechangeskills for planners

FORTISMERE ASSOCIATES ARUP

Final group exercise: using the example of the Leeds Aire Valley as a basis for brainstorming ideas for climate change mitigation and adaptation.

Some Information on Aire Valley

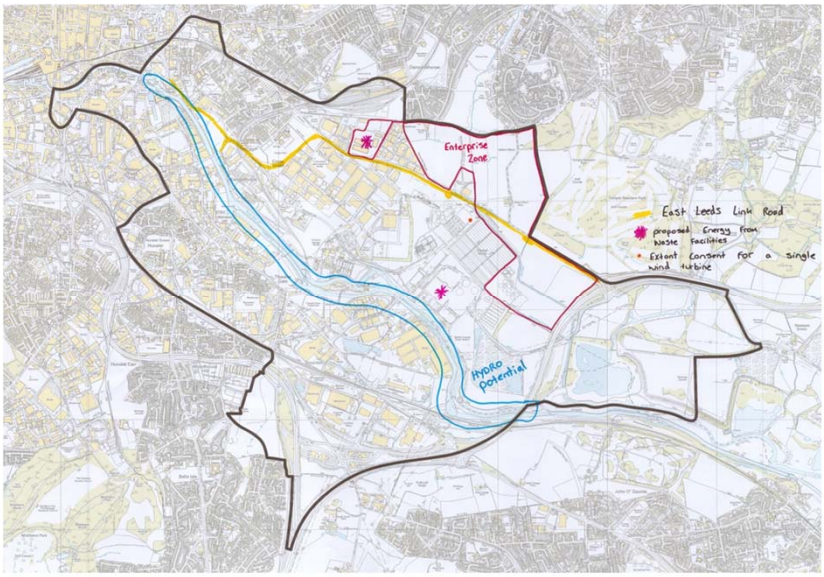
- 400 hectare site (400 football pitches)
- Between the city centre and the M1 motorway and beyond
- Leeds – Castleford railway to the south
- River Aire
- Temple Newsom park to the NE
- Wyke Beck Valley Country Park to the N
- Rothwell Country Park to the SE

- Leeds City Council is producing an area action plan for the Aire Valley.

- This promotes a mix of residential and commercial use. Up to 15,000 new homes.

- The Aire Valley is also identified as an Urban Eco Settlement (along with a number of other sites in Leeds City Region), which was developed as a Leeds City Region response to the Eco Town proposals. The sites were well-positioned brownfield sites that had the potential to deliver sustainable growth.

Adaptation and mitigation strategies: Leeds Aire Valley



climatechangeskills for planners

FORTISMERE ASSOCIATES ARUP

Arup did some work looking at the potential sustainable credentials of the Aire Valley in 2009, and to help you with the group exercise, they have prepared a briefing note, and provided a marked up plan.

•There is a large Waste Water Treatment Works called Knostrop, which is in the middle of the Aire Valley. There are no plans for this site to be moved and Yorkshire Water plan to continue to operate from the site.

•The vacant parts of the Aire valley that are not being considered for housing are part of an Enterprise Zone. This is made up of four sites (which are identified on the map).

•There is an extant consent for a single wind turbine by the Knostrop WwTW site, which is likely to be constructed next year.

•The East Leeds Link Road runs through the site providing connectivity to the city centre and directly to the M1. Whilst this is beneficial it also segregates the area from the community to the north.

•Flood risk is an issue, but Leeds City Council and the Environment Agency have designed a Flood Allevation Scheme that covers much of the Aire Valley.

•The Council's Core Strategy considers the potential for hydro power along the river.

•There are two energy from waste facilities, currently going through planning system. The first is on a large site off the A63 at Newmarket Lane (and would take municipal and commercial waste). The second would process only commercial waste and is located near the river (see map).

Thinking back to the example of Bath Western Riverside, as well as the technical strategies for the Olympic Park, we would like you to use the example of the Leeds Aire Valley to brainstorm ideas for climate change adaptation and mitigation.

Using the coloured marker pens provided, diagramatically, mark up the drawing to show some first thoughts about:

Connections that allow people to walk, cycle and use public transport – as well as making sure that exisiting communities benefit from new facilities on the site.

Where a neighbourhood centre might be located – again thinking about the benefit to people outside the red line boundary of the site. What mix of uses do you think might be needed.

Public space – where might this be located, and what might it consist of to achieve climate change goals.

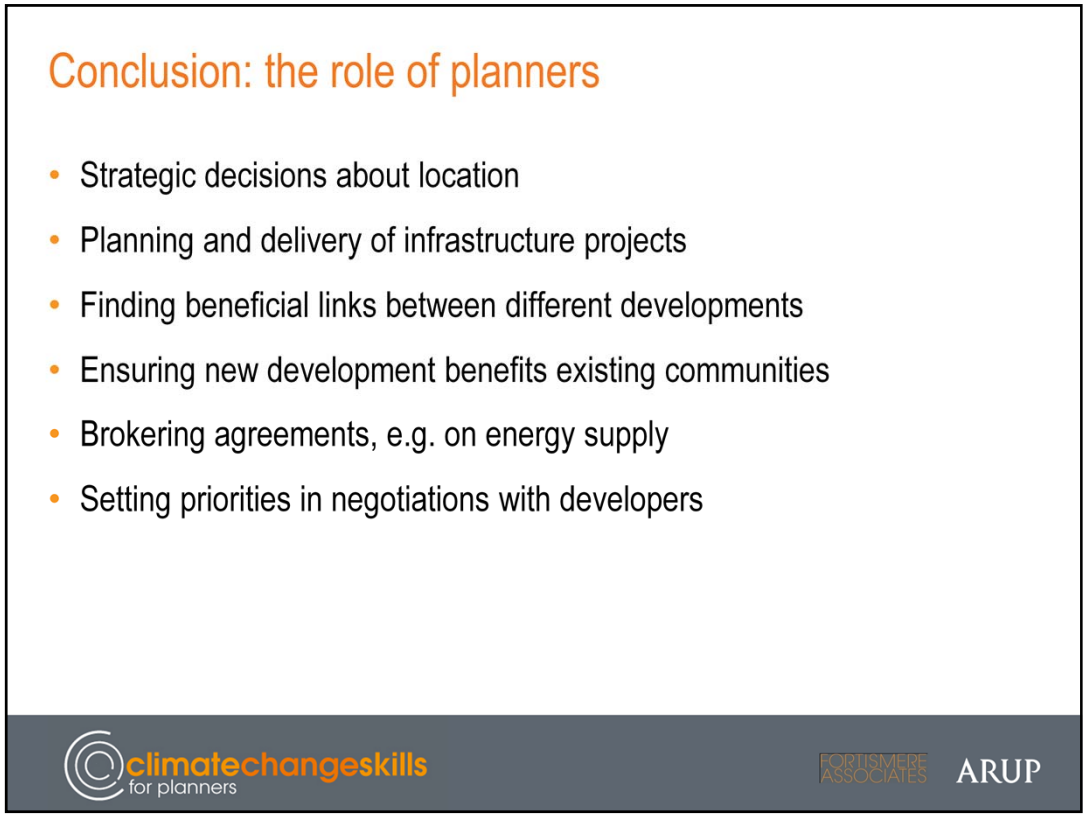
Energy – think about orientation and how that might influence building layout for passive solar design, is there a location that might be appropriate for a CCHP plant

Water – if there is a flood risk how might you deal with that, how might you

accommodate SUDs, can it be part of a landscape strategy.

For each of the above, think about the implications for planning process:

Public consultation / CPO / design codes /S106 agreements



What I have tried to show today, is the potential for planners to be influential at each stage of the masterplanning process, in helping achieve climate change mitigation and adaptation.

You are collectively in a unique position of being able to guide:

Strategic decisions about development location

Take leadership in the planning and delivery of infrastructure projects

Finding the beneficial links between different developments

Ensuring that new development benefits existing communities

Brokering agreements, for example on energy supply

Setting priorities for masterplanning in negotiation with developers

I hope I've also given you confidence that you don't have to be technical expert to push thinking on climate change forward. Very often, your role is to ask the right questions. There's also a huge amount of information available to help, some of which are listed on the next slide.

Web resources / publications

- CABE Sustainable Places web site www.cabe.org.uk/sustainable-places
- Creating Successful Masterplans: a guide for clients (CABE 2004) www.cabe.org.uk
- RIBA Climate Change Toolkit www.architecture.com
- The Environmental Handbook www.theenvironmentalhandbook.com
- ATLAS: planning for large scale development www.atlasplanning.com
- Hammarby Sjostad www.hammarbysjostad.se/glashusett/
- Woking www.woking.gov.uk/planning/service/publications
- London 2012 Sustainable Design (Hattie Hartman, Wiley 2012)
- Kings Cross (example of parameter based outline application with urban design guidelines) www.kingscrosscentral.com

Thank you: any questions?

Deborah Denner

Fortismere Associates

design@fortismere-associates.co.uk

07587 186973

climatechangeskills for planners

FORTISMERE ASSOCIATES ARUP