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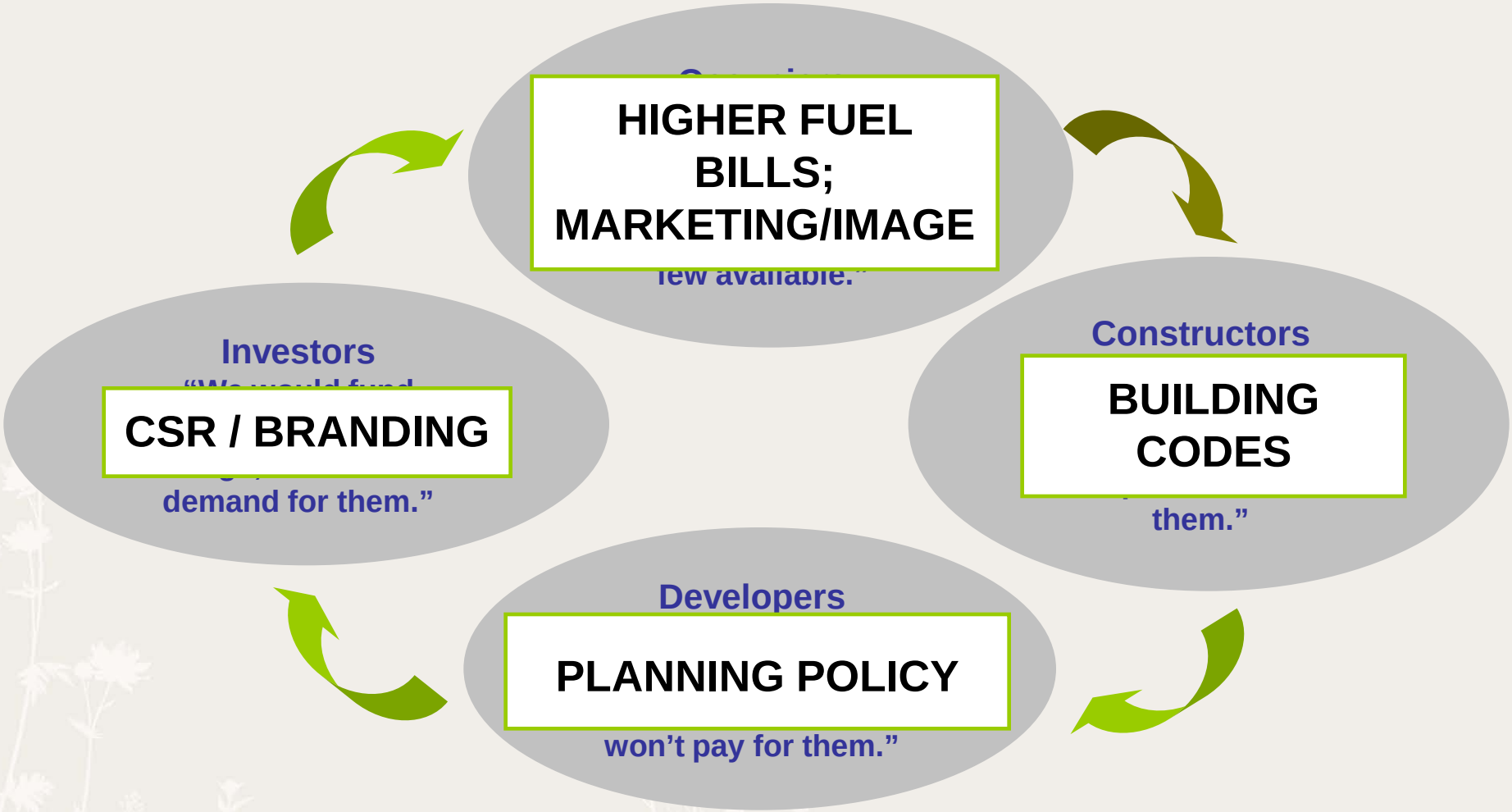
Green Urban Design: Lessons from around the globe

Claire Bonham-Carter, Director of Sustainable Development, EDAW

Policy Drivers in the United Kingdom

Drivers for change

Drivers for Change

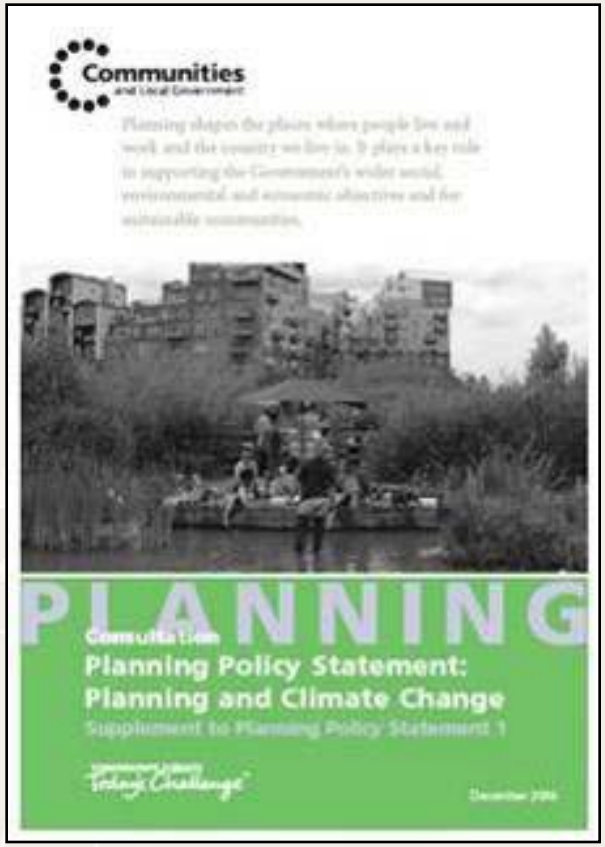


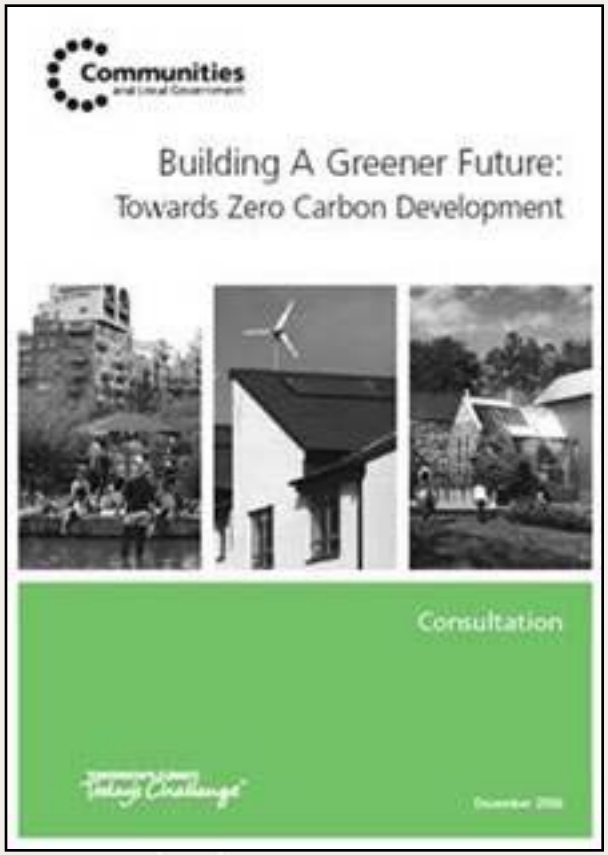
UK Government position

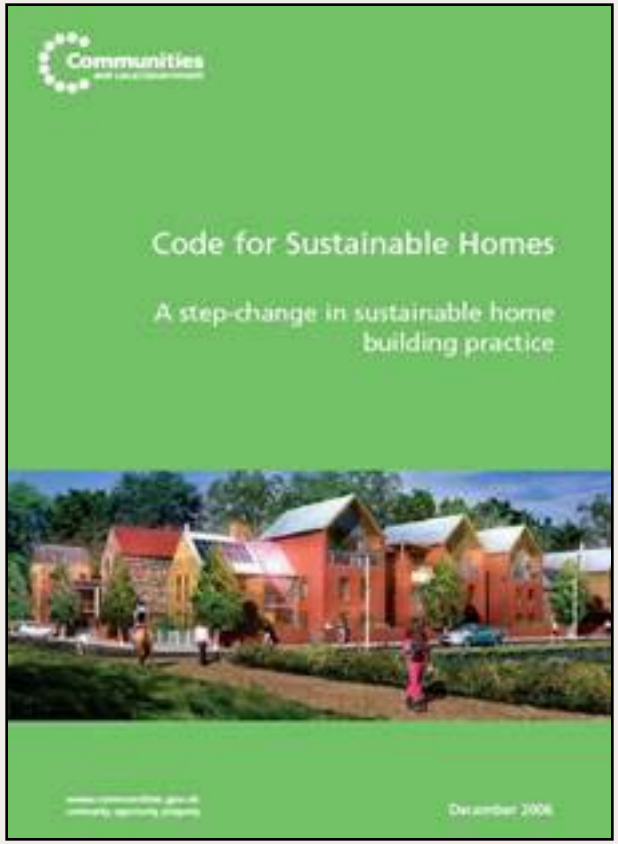
- “The evidence that climate change is happening, and that man-made emissions are its main cause, is strong and indisputable”

- “The Government believes that climate change is the greatest long-term challenge facing the world today. **Addressing climate change is therefore the Government’s principal concern for sustainable development.”**

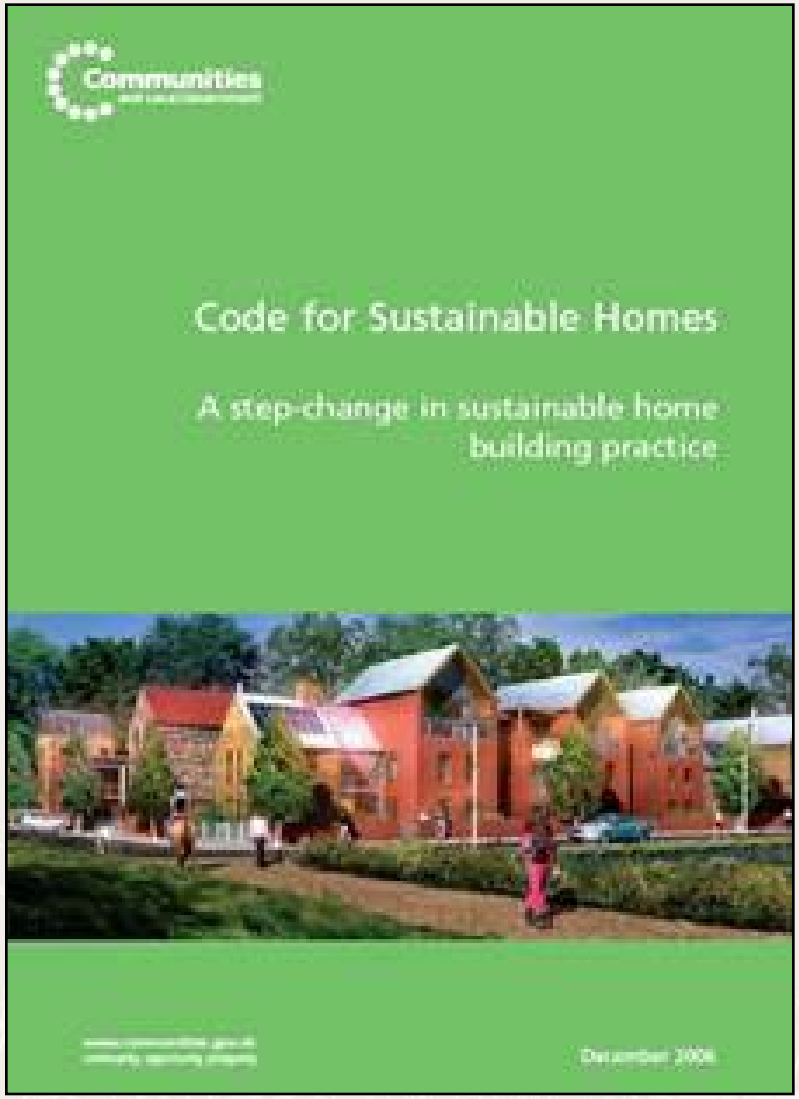
UK: Suite of policy tools: Zero carbon by 2016 / 2019







Code for Sustainable Homes



THE CODE FOR SUSTAINABLE HOMES

FINAL CERTIFICATE
(issued at the post construction stage)

What Your Code Star Rating Means

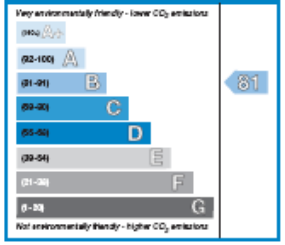
The Code considers the effects on the environment caused by the development and occupation of a home. To achieve a star rating a home must perform better than a new home built to minimum legal standards, and much better than an average existing home.

How this home scored

Category	Percentage % of score attained (10 20 30 40 50 60 70 80 90 100)	What is covered in the category
Energy		Energy efficiency and CO_2 saving measures
Water		Internal and external water saving measures
Materials		The sourcing and environmental impact of materials used to build the home
Surface water run off		Measures to reduce the risk of flooding and surface water run-off, which can pollute rivers
Waste		Storage for recyclable waste and compost, and care taken to reduce, reuse and recycle construction materials
Pollution		The use of insulation materials and heating systems that do not add to global warming
Health and Well being		Provision of good daylight quality, sound insulation, private space, accessibility and adaptability
Management		A Home User Guide, designing in security, and reducing the impact of construction
Ecology		Protection and enhancement of the ecology of the area and efficient use of building land

Further detailed information regarding the Code for Sustainable homes can be found at www.communities.gov.uk/thecode

CO_2 Rating



The CO_2 rating is a measure of a home's Carbon Dioxide (CO_2) emissions. This rating is shown on your Energy Performance Certificate as the Environmental Impact Rating. This Certificate is available from the seller, and also includes information on how you can improve the home's performance.

The Code measures the sustainability of a home as a complete package, and takes into account other aspects of energy use as well as wider sustainability issues, such as water and waste

The Environmental Impact Rating is shown here for information only and does not form part of the Code for Sustainable Homes. Neither BRE nor the assessment organisation is responsible for the accuracy of this number

Communities and Local Government

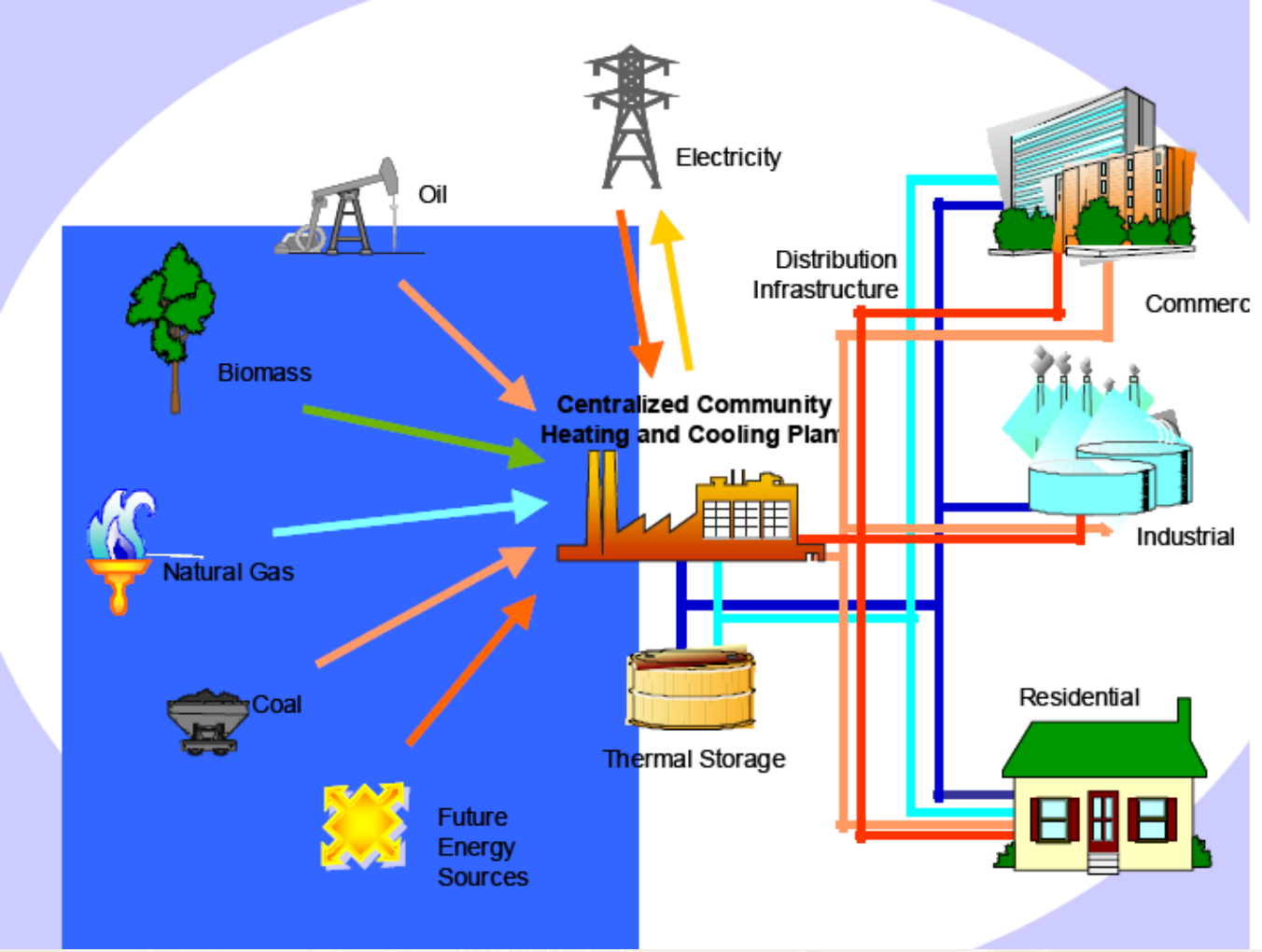
The path to zero carbon homes

Date	2010	2013	2016
Energy efficiency improvement of the dwelling compared to 2006 (Part L Building Regulations)	25%	44%	Zero carbon
Equivalent standard within the Code	Code level 3	Code level 4	Code level 6

Planning and Climate Change: Supplement to Planning Policy Statement 1

- "Spatial distribution, location and design of new development should be planned to limit carbon dioxide emissions"
- "expect proposed development to connect to an identified decentralised energy system, or be designed to be able to connect in future"
- "co-locating potential heat customers and heat supplier"

District Energy Systems: what are they



Planning and Climate Change: Supplement to Planning Policy Statement 1

- Percentage low carbon/renewable energy in new development
- Specific areas should expect significant proportions of renewables

Example - Barrier Park, East London

5000+ homes, hotels, retail, new aquarium

3500 homes

Our site 1000 homes

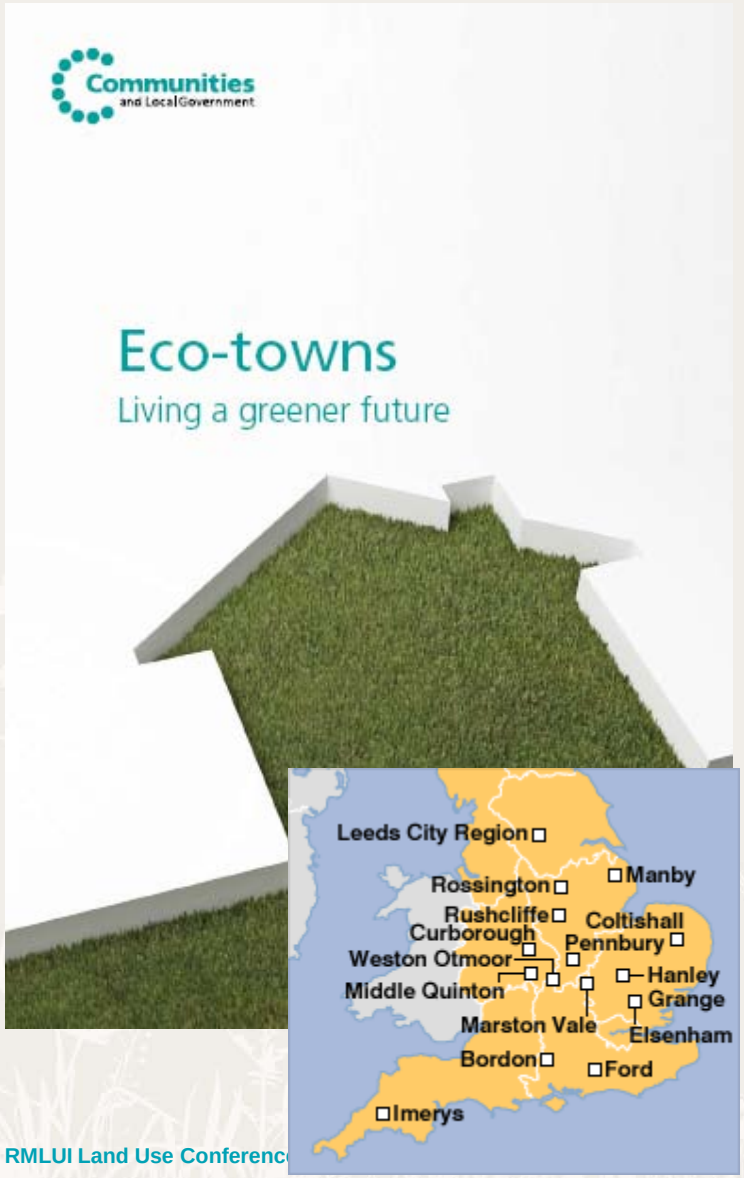
The Carbon Challenge

- English Partnerships Competition to fast track zero or near zero carbon development.
- Challenge developers to accelerate their response to climate change
- At least five sites of more than 200 homes in first year
- To achieve Code for Sustainable Homes Level Six – zero carbon, very low water use, strict materials requirements, good design, liveability etc.

Carbon Challenge: Impact on designs

Carbon Challenge: Impact on designs

Eco towns



- Ten small new towns of 5,000 – 20,000 homes
- To achieve zero carbon development and more sustainable living
- 30-50% affordable housing, mix of uses including schools, retail, business and leisure
- Public transit, cycling and pedestrian links
- 5 to be built by 2016, the rest by 2020

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Case study

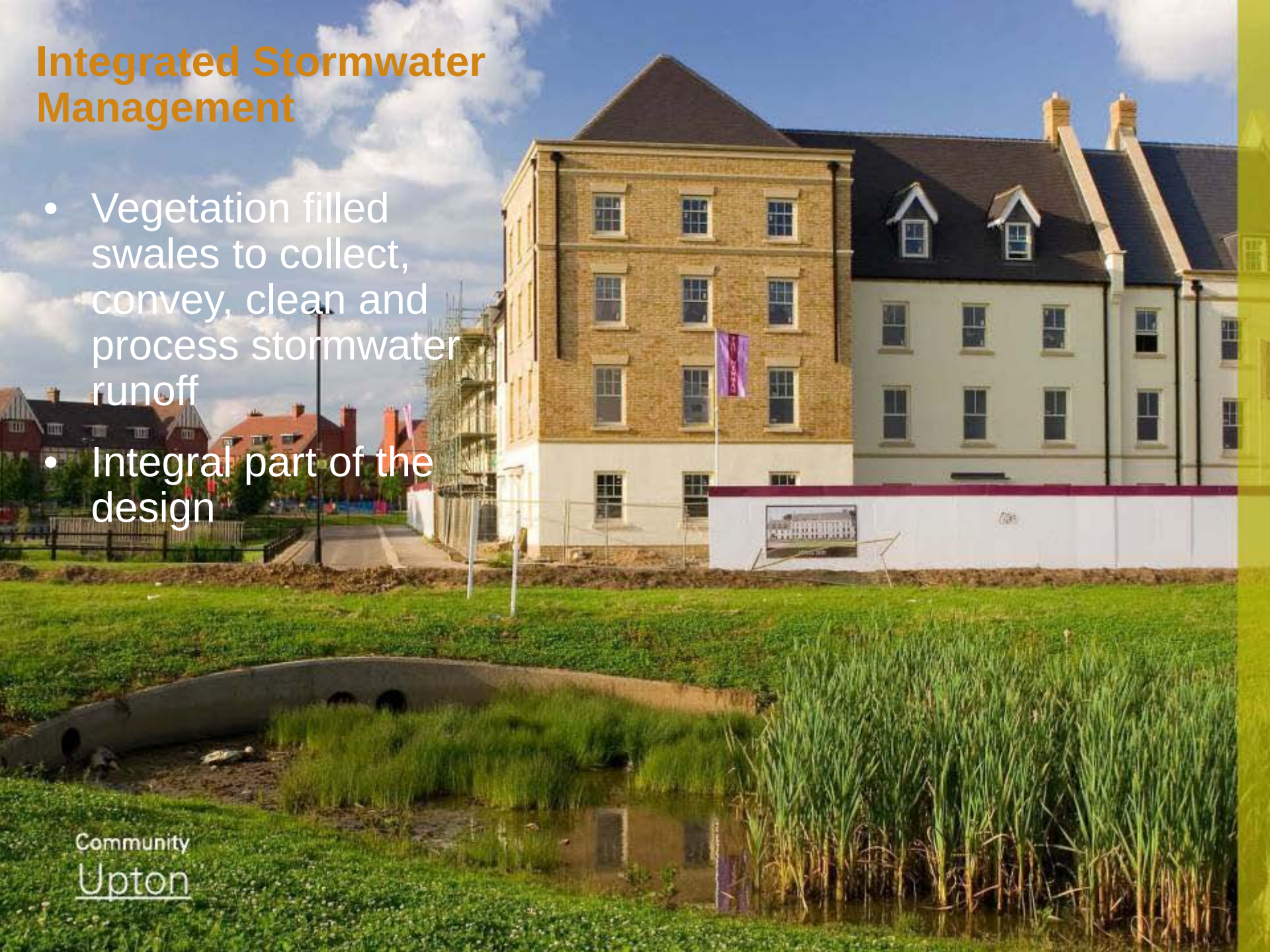
Upton, Northampton
United Kingdom

EDAW | AECOM

- 44-hectare greenfield site, 1382 homes
- Mixed-use including schools and retail
- Densities: 35 to 60 dph
- Community engagement
- Pedestrian friendly street design, promoting safety and visibility

Integrated Stormwater Management

- Vegetation filled swales to collect, convey, clean and process stormwater runoff
- Integral part of the design



Community
Upton

- All houses BREEAM Excellent (LEED Gold/Platinum equivalent)
- Some net zero carbon
- PV tiles provide approx. 960 kWh/yr
- Solar thermal systems on south facing homes
- All homes harvest rainwater

Ecology and Habitat

- 4 hectare Country Park and additional woodland area for recreation
- Interconnected foraging network
- Barn restored for bats

Community
Upton


Winner of the RTPI Sustainable Communities Award 2007
Community
Upton

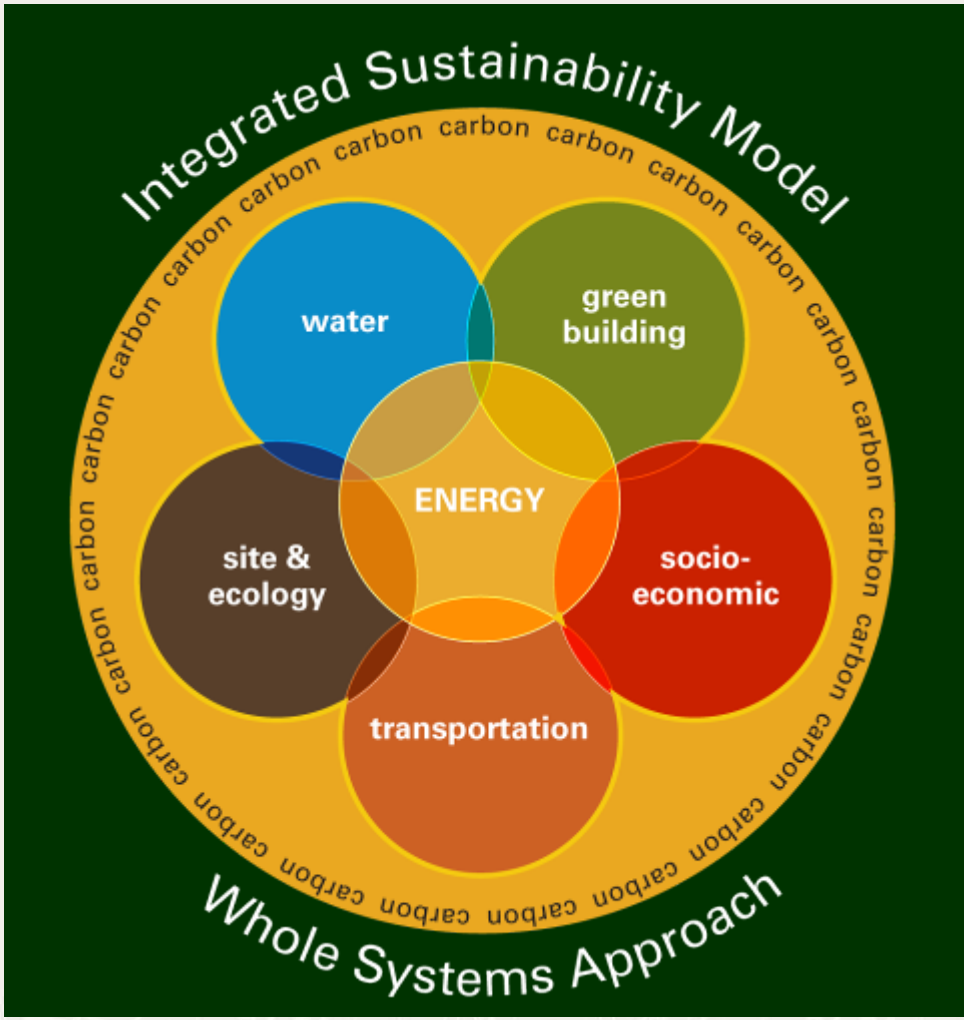
EDAW | AECOM

Quantification of Sustainability costs and benefits

Sustainable Systems Integration Methodology

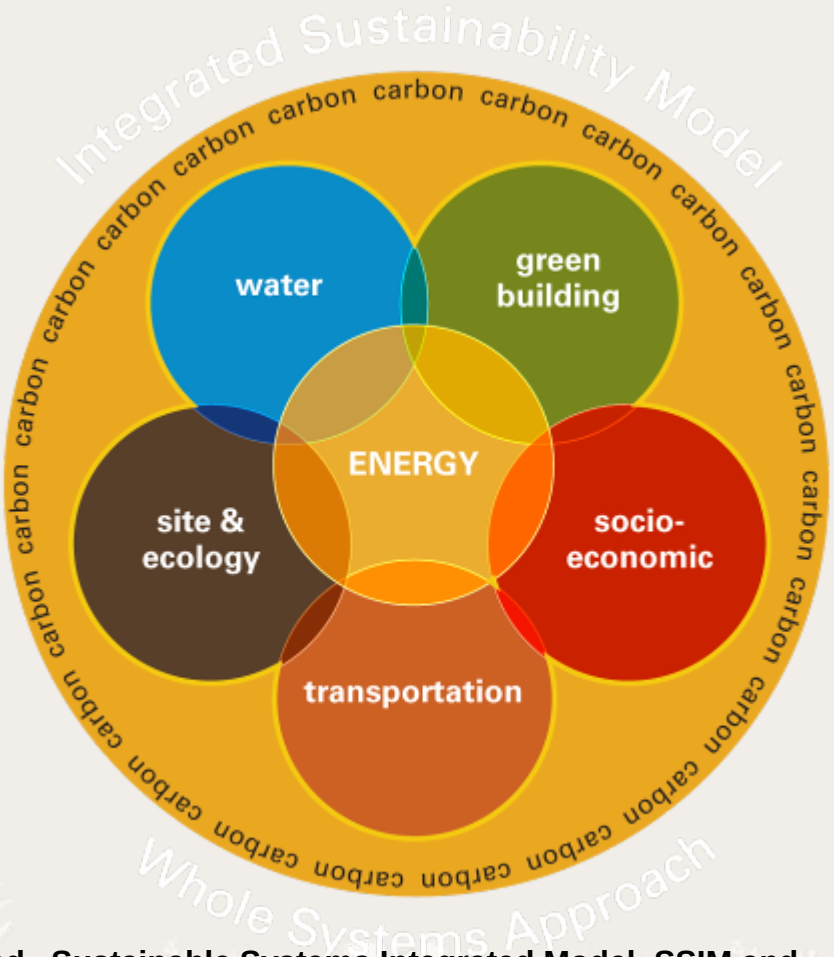
Integrated Whole Systems Thinking

- Tool for analyzing most appropriate and cost effective sustainability measures for a particular site
- Developed in part due to help clients address California's carbon reduction targets
- "Best sustainability bang for your $$"
- Good – Better – Best options

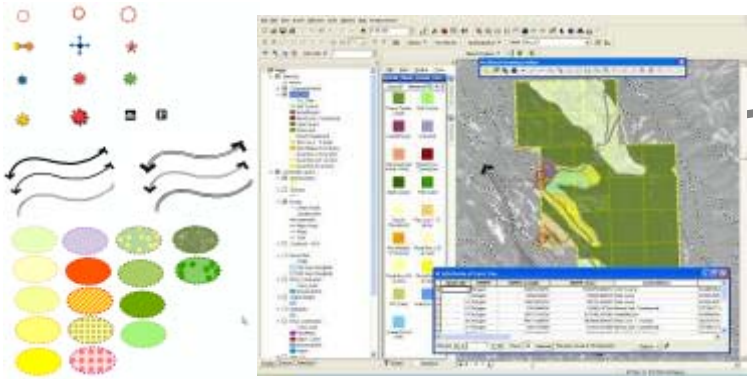


Sustainable Systems Integration Model - **SSIM™**

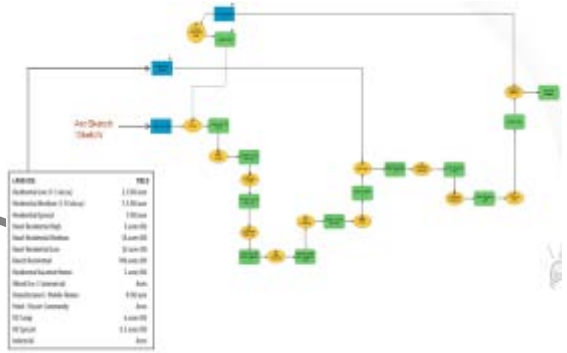
- Urban / Community Form
- Transportation
- Building Energy
- Public Realm Energy
- Ecology – carbon sequestration
- Ecology – urban heat island
- Community Agriculture
- Water & Wastewater
- Socio-Cultural
- Green Building / Materials
- Greenhouse Gas Emissions / Carbon



GIS Interface, SSIM



Draw alternative concepts



Use Yield Model, Urban Form Analysis to identify most sustainable scheme

Model & Generate Land Program

SSIM

Model good, better, best packages for each sustainability issue identifying sustainability benefits, costs and cost savings

Get SSIM cost / benefit Results

Tanguu, China

Scheme alternatives

Scheme 1

Scheme 2

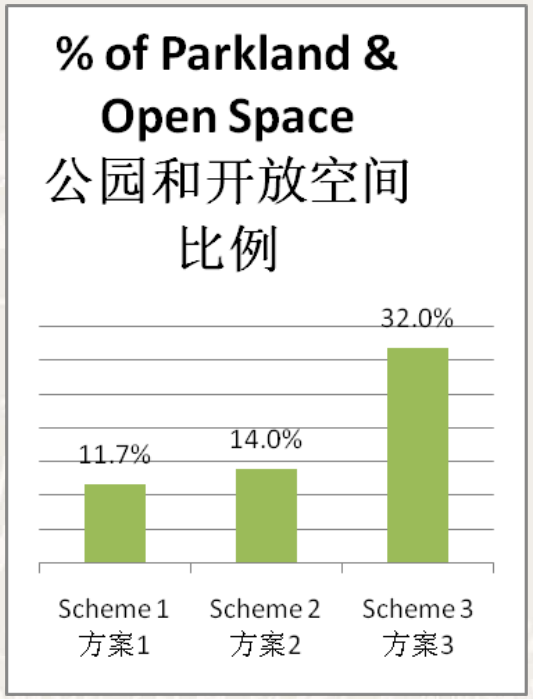
Scheme 3

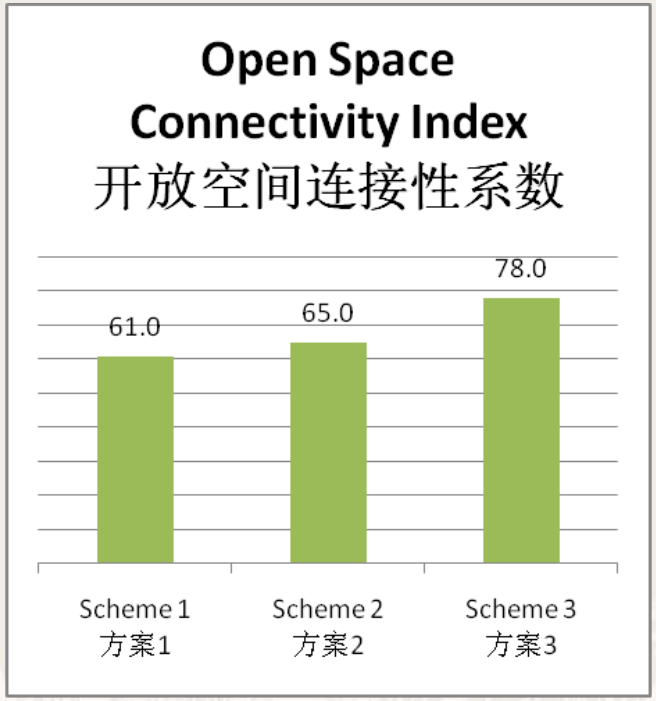
Develop alternative schemes and assess sustainability indicators

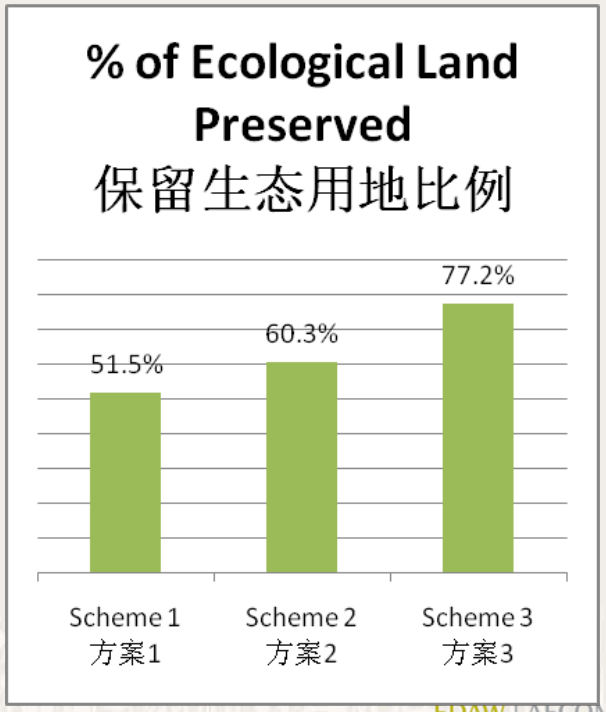
Plan Comparison

Scheme 1 **Scheme 2** **Scheme 3**

E.g: Sustainability Indicators

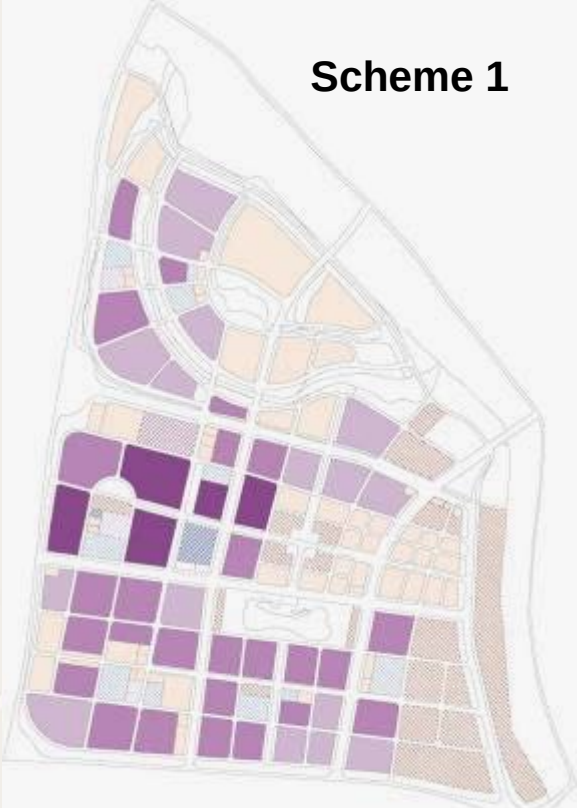






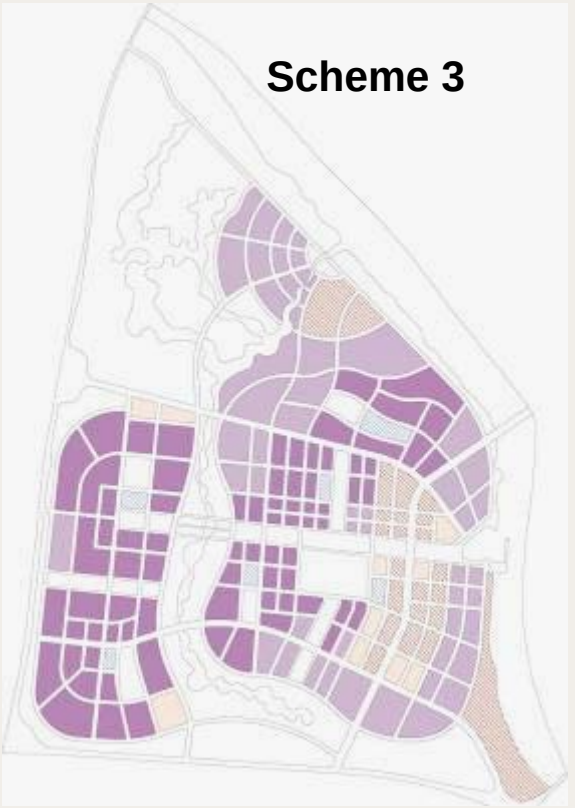
e.g. Access to Local Services

Scheme 1



Scheme 2

Scheme 3



Access to Local Services

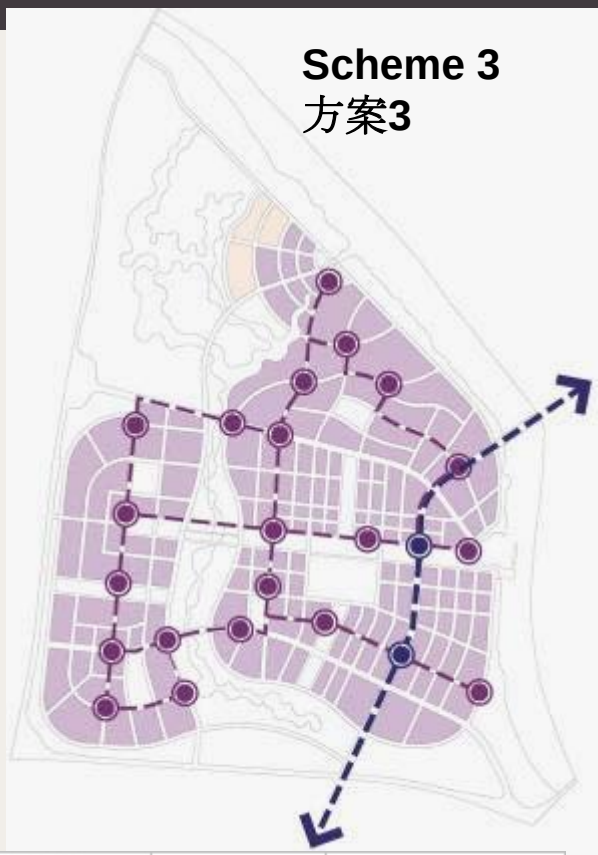
	Government Plan		Government Enhanced Plan		Preferred Plan	
	Total Hectares	Within 400m Radius	Total Hectares	Within 400m Radius	Total Hectares	Within 400m Radius
1 Local Service		82.1		92.2		114.6
2 Local Services		112.3		119.0		140.4
3+ Local Service		33.4		0.0		0.0
Total	**279.6**	**194.4**	**215.0**	**211.2**	**268.6**	**255.0**
Coverage percentage		**70%**		**98%**		**95%**

e.g. Access to Transit

Scheme 1
方案 1(原控规)

Scheme 2
方案2

Scheme 3
方案3



Access to Transit- Parcel within 400m Radius of Bus Stop or 800m Radius of Rail Station

	Government Plan		Enhanced Government Plan		Preferred Plan	
	Total Hectares	Transit coverage	Total Hectares	Transit coverage	Total Hectares	Transit coverage
Retail + Office	143.5	37.3	59.7	59.7	30.5	30.5
Mixed Use	0.0	0.0	45.4	45.4	64.9	64.9
Residential	279.6	20.6	169.6	146.1	203.7	193.8
Institution	35.9	0.0	24.8	24.8	0.0	0.0
Tourism	0.0	0.0	70.4	70.4	27.1	27.1
Total	**459.1**	**58.0**	**370.0**	**346.5**	**326.2**	**316.3**
Coverage Percentage		**13%**		**94%**		**97%**

Selected Scheme - 3

HOMES 住宅	Residents 居住人口 Dwellings 住宅 Population Density 人口密度 Gross Housing Density 毛住宅密度 Net Housing Density 净住宅密度	
JOBS 工作	Jobs 工作 Jobs to Housing Ratio 工作与住宅比例 % of Jobs Walkable from Transit 可步行至公交站点的工作比例	
ECOLOGY 生态	% of Parkland & Open Space 公园和开放空间比例 Parks per 1000 Population 每1000人所拥有公园面积 Open Space Connectivity Index 开放空间连接性系数 % of Ecological Land Preserved 保留生态用地比例 % Land with Impervious Surfaces 不透水地面比例	
RESOURCE INPUTS 资源消耗	Energy Use per Person 人均用电量 Water Use per Person 人均用水量 Gasoline Consumption per Person 人均用油量 Vehicle Kilometres per Person 人均机动里程量	
WASTE OUTPUTS	Carbon Emissions per person 人均碳排放量 Stormwater Runoff 暴雨径流 Solid Waste Generated 固体废弃物	
FINANCE 财务	Reference Cost per capita 人均参考成本 Reference Cost per Ha 每公顷参考成本	RMB/Hs 人民币/公顷

80322865.02

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Low – Carbon Program Development

Examine each core theme & model good, better, best options

Building Energy	*Domestic Water*	*Transportation*	*Public Realm*	*Renewable Energy*
•good •better •best	•good •better •best	•good •better •best	•good •better •best	•good •better •best

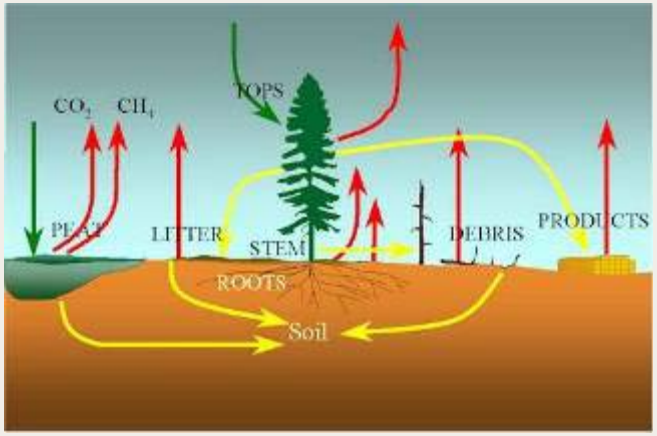
First-Costs | **Life Cycle Costs** | **Environmental Benefit** | **Market Cost Acceptance**

Optimized Packages for Each Core Theme

Packages Combined into Master Sustainability Programs

Energy and GHG Offsets: Landscape Ecology

- Biodiversity
- Green Infrastructure Networks
- Micro-Climate
- Carbon Sequestration
- Urban Forestry
- Community agriculture
- Urban Heat Island



Community agriculture

	Water Need	Min. CO2eq Reduction	Food Source Benefit	First Cost	Operating Cost (community liaison)
Good – 30 AC	60 AcFt/Yr	**71 tons** per year	**16%** of annual household produce demand met	**$0*** *or $185K if developer is operator	**$75,000*** *additional if developer is operator
Better – 80 AC	160 AcFt/Yr	**195 tons** per year	**45%** of annual household produce demand met	**$0*** *or $225K if developer is operator	**$75,000*** *additional if developer is operator
Best – 150 AC	300 AcFt/Yr	**368 tons** per year	**85%** reduction in offsite produce need for households	**$0*** *or $300K if developer is operator	**$75,000*** *additional if developer is operator

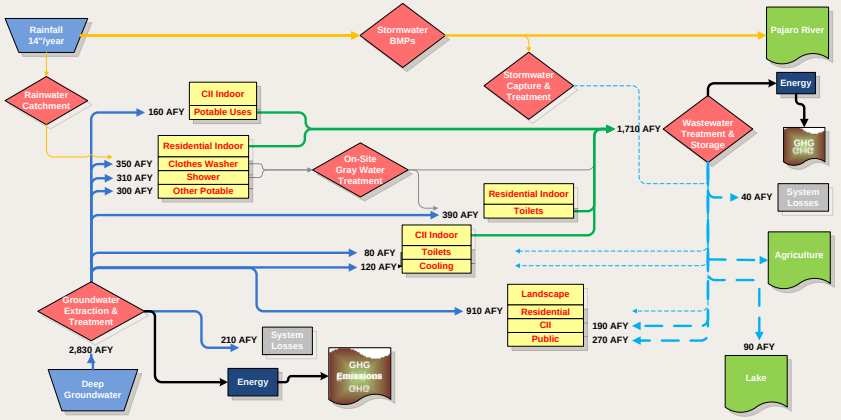
Carbon Sequestration

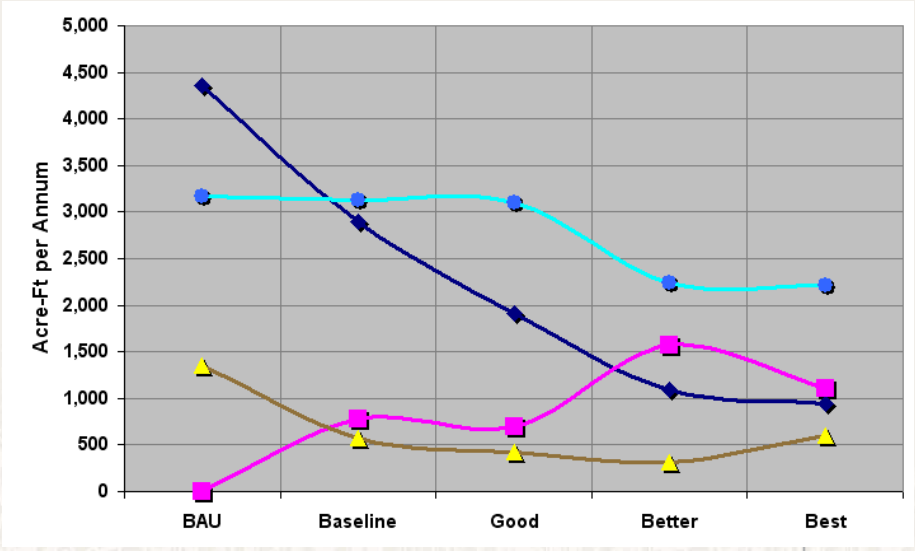
	Water Need (first 3-5 years only)	First Cost	Operating Cost	CO2eq Reduction (annual ave 90 yrs)	Total Community CO2 Sequestration (annual average over 90 years)
Base case	-	-	-	-	6,900 Tons from community landscape
Good – **100 AC**	150 AcFt/Yr	$150,000	In existing OS mgnt. budget	808 tons	7,708 tons per year
Better – **300 AC**	450 AcFt/Yr	$450,000	In existing OS mgnt. budget	2420 tons	9,320 tons per year
Best – **500 AC**	750 AcFt/Yr	$750,000	In existing OS mgnt. budget	4033 tons	10,933 tons per year

Source: EDAW 2008, US EPA, Ko et al, Shasta Co Pilot Program

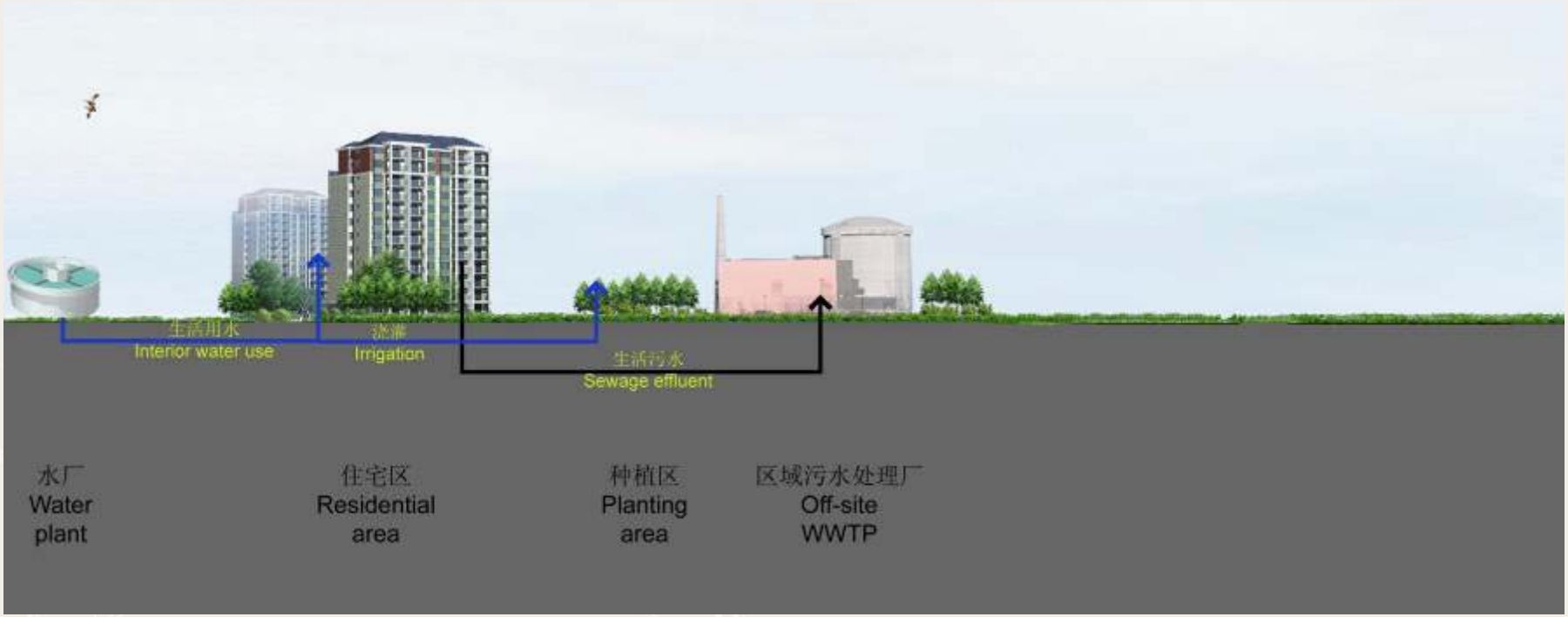
Sustainability Measures: Domestic Water Reduction

- Land Use
- Landscape palettes
- Building Fixtures
- Treated sewage effluent reuse
- Stormwater reuse
- Rainwater capture
- Gray water reuse

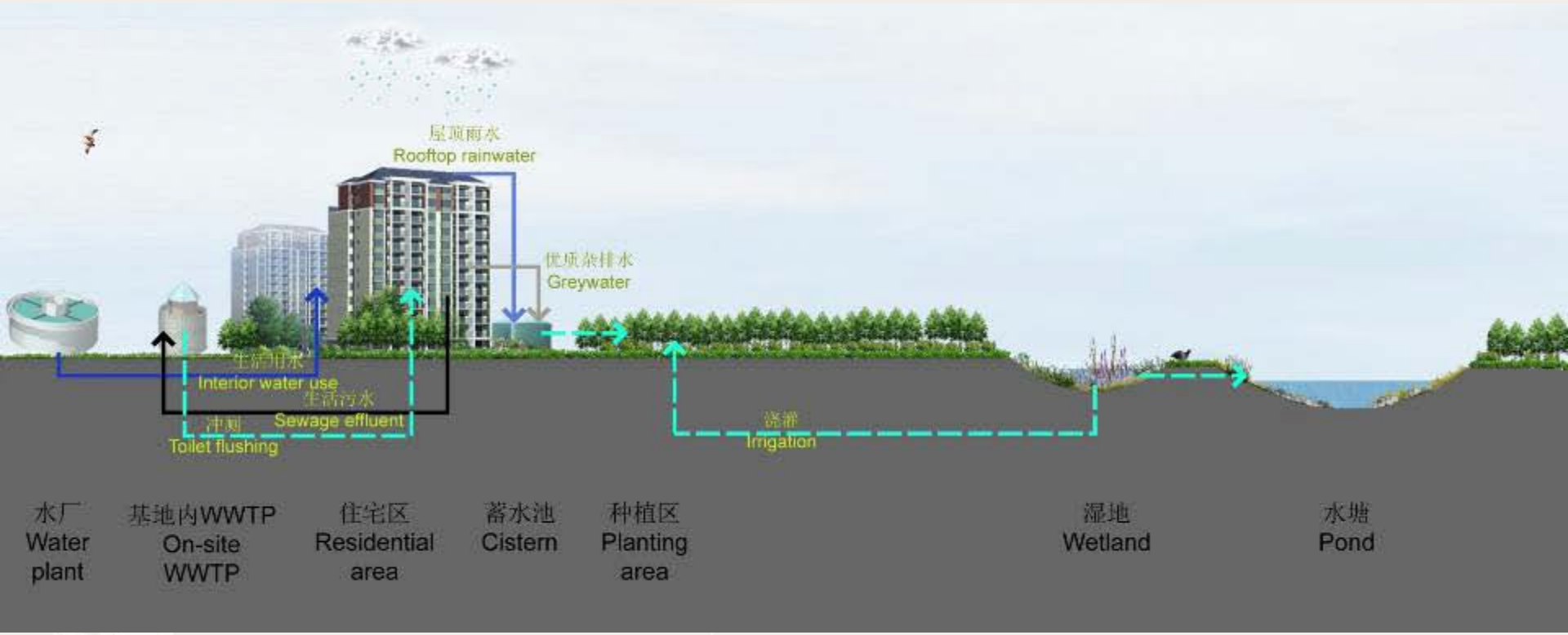




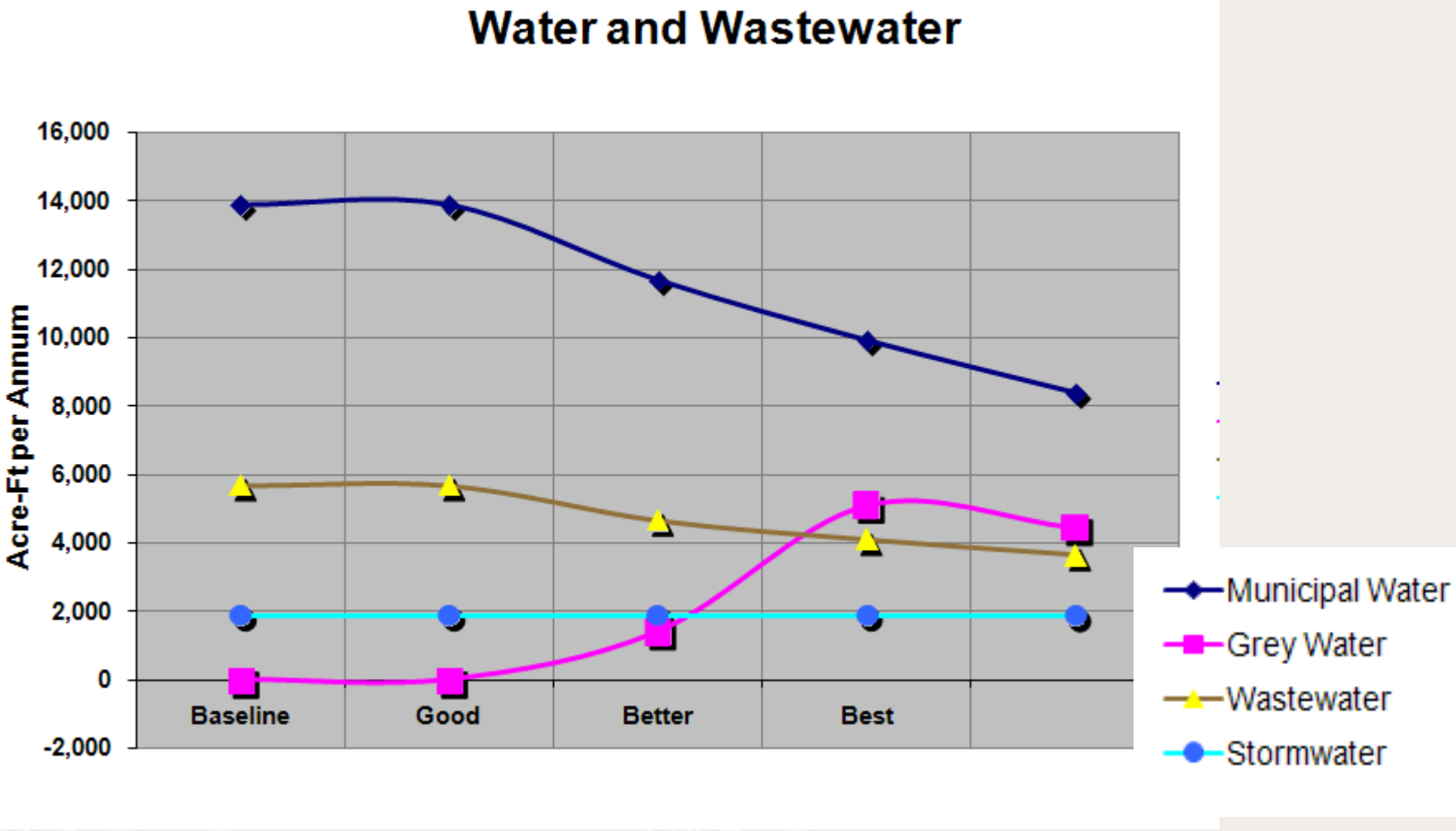
Domestic water reduction: Baseline Scenario



Domestic Water Reduction: Best Scenario



Domestic water reduction - results



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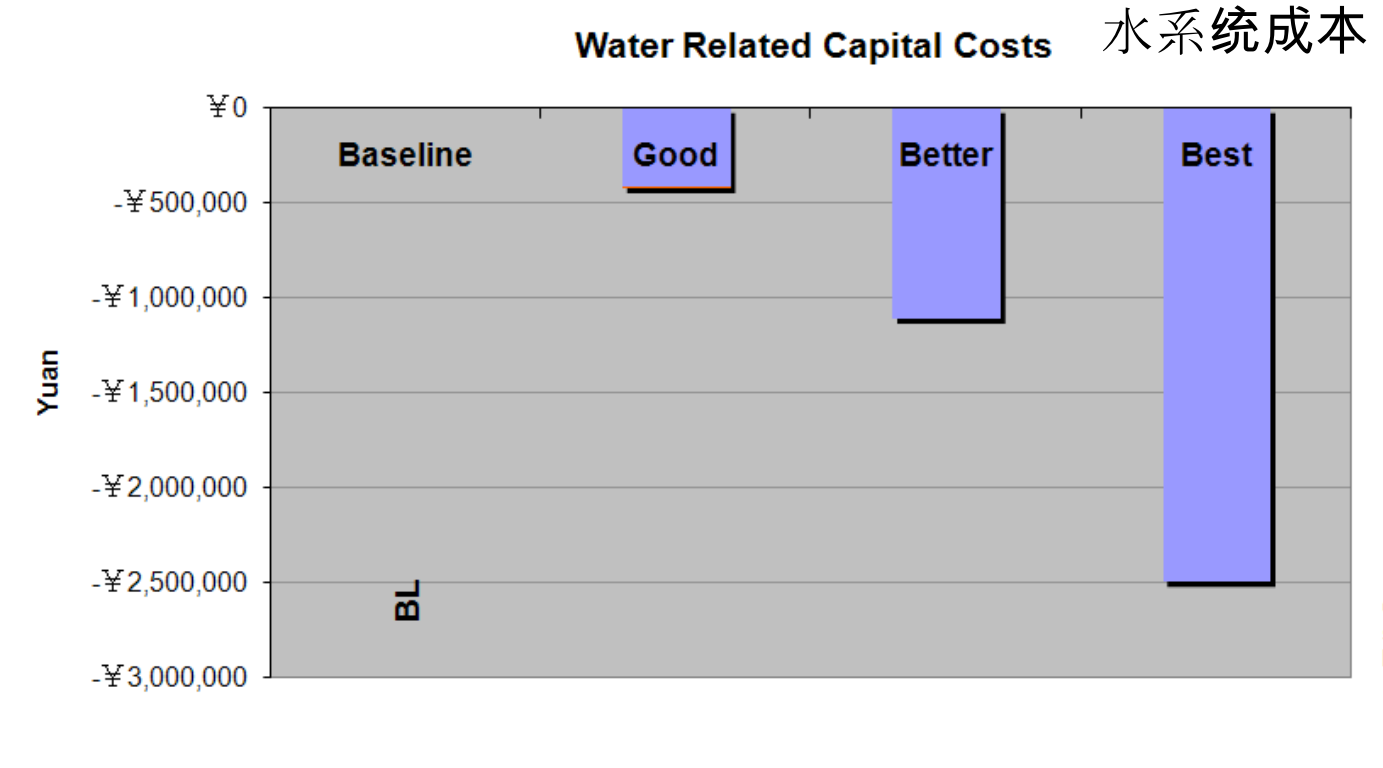
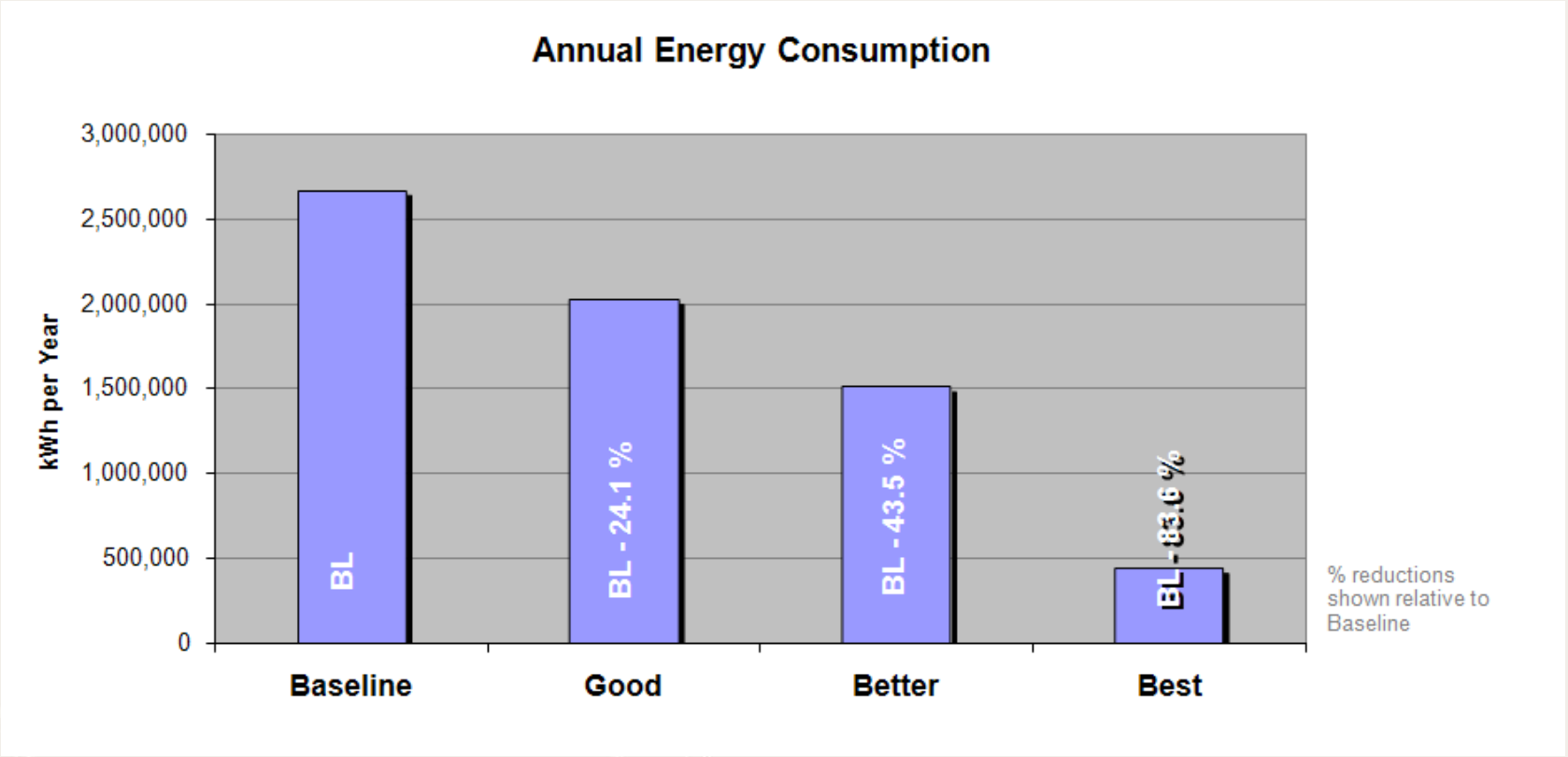


Domestic water reduction - results



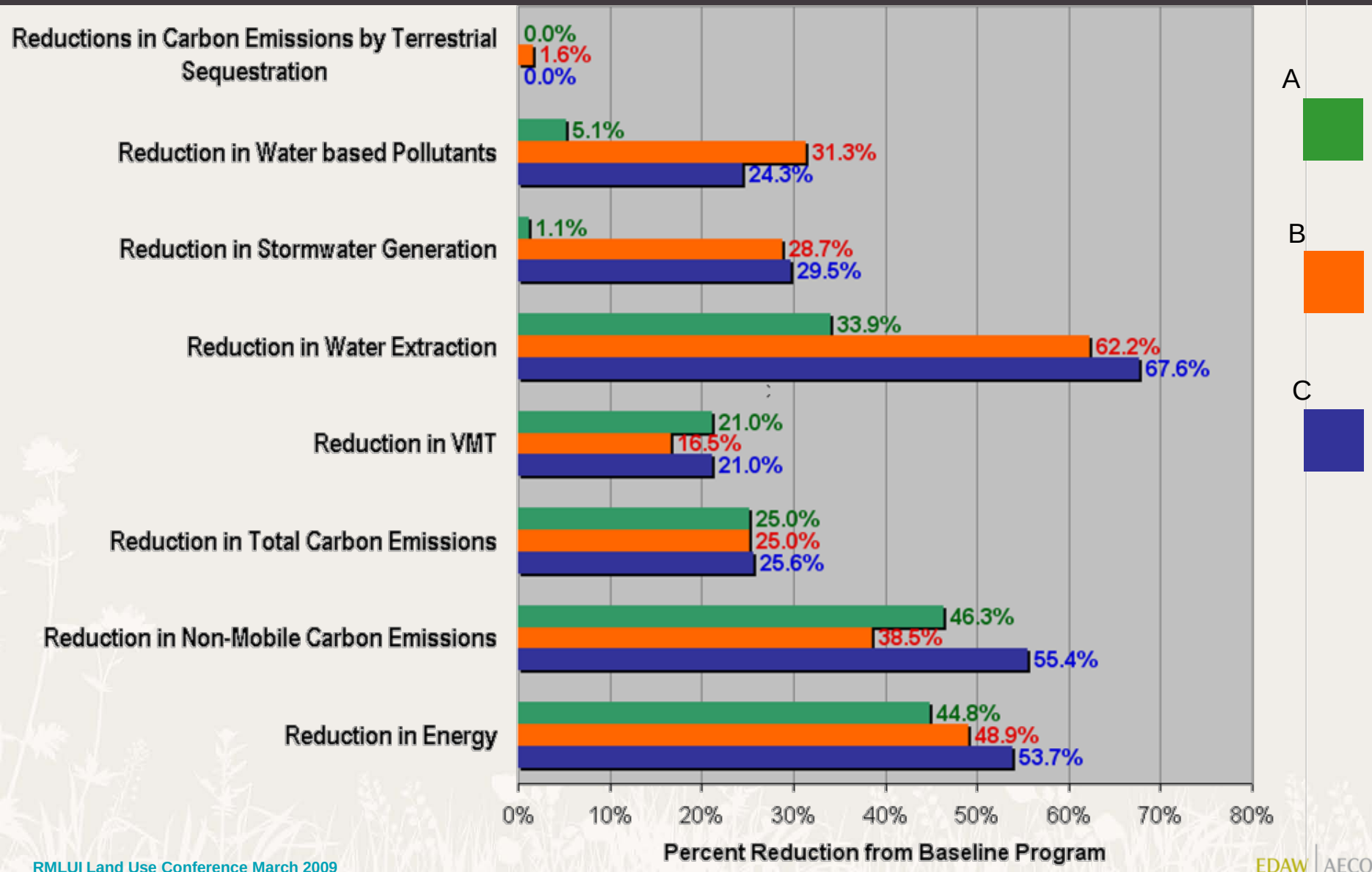
Core Themes / Measures Gaming Board

SUSTAINABLE SYSTEMS INTEGRATION METHOD

STAGE II PROGRAM SELECTION

Themes	Select Packages for These Programs		
	A	B	C
Building Energy Reductions	Better	Best	Best
Domestic Water Reductions	Best	Best	Best
Automobile Use Reductions	Better	Better	Better
Public Realm Energy Reductions	Best	Better	Better
Renewable Energy Additions	Good	Good	Good

Master Program Comparisons



Summary Example:

	Baseline Plan	Adjusted Plan	% Improv	Resid. Cost	Comm. Cost	Develop. Cost
Resid. Bldg Energy	38,000 KWhr	17,000 KWhr	56%	12% Const. $/sf w/ net pos. cash flow	6.5% Const. $/sf w/ 10 yr. amitoriz.	-$13, M (net savings)
Comm. Bldg Energy	590,000 KWhr	300,000 KWhr	49%			
Domestic Water	2,900 AC FT yr	980 AC FT yr	66%			
Transp. VMT	710,000 VMTyr	618,000 VMTyr	13%			
Carbon Footprint w/o Transp.	40,300 Mt C02eq	18,000 Mt C02eq	55%			
Carbon Footprint w/ Transp.	303,700 Mt C02eq	226,100 Mt C02eq	26%			

Summary

- Planning policy is a powerful tool for change
- Planners need to understand new issues, e.g energy
- Clear route maps showing timeline and expected achievements
- Competition / exemplar projects to lead the market
- Use of tools to quantify benefits both in terms of carbon and dollars (for planning authority and developer)

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Greener homes for the future