

Position paper 4:

POLICY SCENARIOS AND SETTINGS

draft paper for discussion
Joe Ravetz 05-04-05

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1. Scenario settings

1.1 Scenario hierarchy

1) High level target scenarios – focusing on the end point targets e.g. in MFA / CO2 / EF.

2) Activity scenarios include several approaches to relating the model / database to the types of concerns of policy makers.

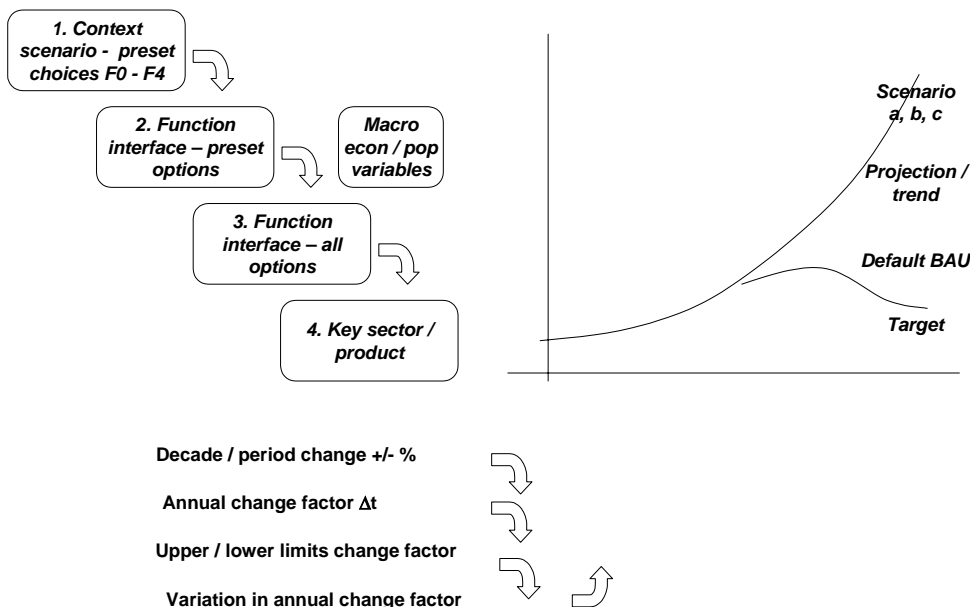
- Policy pressure scenarios – strategic trends, options and policy packages in urban / economic development.
- Policy impact scenarios – the specific impacts of mainstream policies in urban / economic development: i.e. on energy, emissions or waste.
- Non-policy scenarios – focusing on issues outside of urban / economic development, e.g. food, consumption, lifestyle.

For each activity module (e.g. transport, housing, food) there will be a pre-set scenario based on a combination of the above.

For specific regional users it is likely that individual customized combinations will be produced through a consultation process.

3) Each of the above can then be taken individually as specific items and options, through the activity module interfaces.

Multi-level scenario structure



1.2 Calculation method

The diagram also shows the mechanics of calculating scenarios:

- Each variable comes with a default BAU change factor
- This is translated into annual compound growth % (except where other growth curves may be more appropriate)
- A range is defined in terms of an upper and lower deviation from the default: by reference to targets, trends, uncertainties, and the policy ‘decision space’
- The selected point on the range is fed into the composite calculation.

In the software package the scenario settings come generally in the form of a range with three alternatives. These may be shown graphically in the form of sliders (discrete or continuous):

- High setting
- Default setting, or business as usual, reflecting existing policy & market conditions
- Low setting

1.3 Scenario parameters within REAP

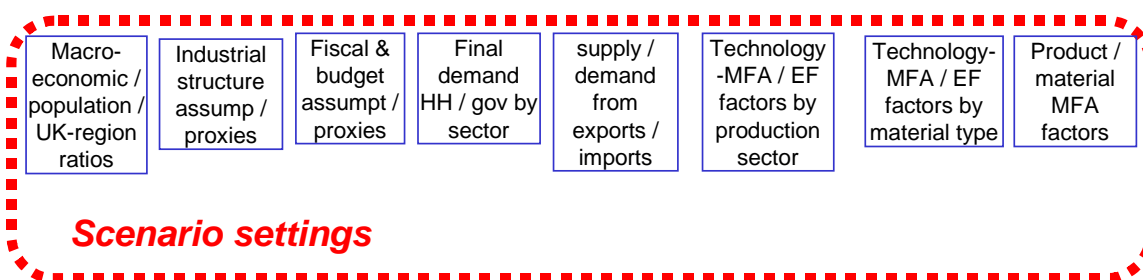
The scenario parameter settings are the medium for users to interact with the model and input their own choices of settings. Each of these may be linked both to the main model and the functional sub-models. The scenario parameter settings are input in one or other of the report / interfaces, and the settings also recorded in these interfaces.

There are two types of scenario settings which can be introduced:

- The REAP main model (IO tables and associated £ or tonne coefficients)
- The REAP activity modules (specific sectors such as transport with specific variables such as km / person / year)

The types of scenario settings within the main REAP model include:

- Macro-economic / population / UK-region ratios
- Industrial structure assumptions / proxies
- Fiscal & budget assumptions / proxies
- Final demand from HH / government / other, by sector
- supply
- / demand from exports / imports
- Technology - MFA / EF factors by production sector
- Technology - MFA / EF factors by material type
- Product / material MFA factors



Scenario settings

1.4 Time horizons

There is a structure of 3-4 time steps which need to be finalized:

- at 5-15-45 year intervals
- at 10-20-40 year intervals (conceptually simpler)

Then the steps are approx as follows:

- **2005 – ‘now’** – visible tensions between economy, environment & society.
- **2010 / 2015 – ‘soon’** - we start to see the direct effects of current decisions
- **2020 / 2025 – ‘later’ (children’s world)** – a new generation will have to live with the mistakes of the present.
- **2045 - 2050 – ‘beyond’ (grandchildren’s world)** – while there are clear targets for energy & climate, there will be challenges which we can hardly imagine as yet

1.5 High level impact scenarios

These include 4+ scenarios out of a possible infinite number, which are highly aggregated pre-set menus of trends and options. Each one is expressed in terms of main variables: EF, CO2, MFA.

- F10 – deep green
- F4 – factor four – sustainable communities
- F2 – low growth – risk & dysfunction
- F1 – business as usual – balanced approach
- F0 – high growth – free markets
- F?? – wild card – other possibilities & catastrophes

1.6 Policy ‘pressure’ scenarios:

These are scenarios which are related directly to policy options and decisions in the urban / economic development sphere. They are framed as composite bundles of issues arranged around distinct pathways or strategic choices e.g. low or high impact modes of development:

- Urban regeneration – low / high impact models for built environment & local economy
- housing strategies – detailed construction analysis / lifestyle analysis
- transport – infrastructure / lifestyle comparisons

1.7 Ex-policy ‘pressure’ scenarios:

These are issues which are generally beyond the direct influence or sphere of urban / economic development policy (although they may surface in other areas).

- Lifestyle & health - food chain – rural economy – agri-environment issues – landscape policy

- Lifestyle & household – material goods – regional economy – production / consumption balance

2. *Linking policy options to REAP & REEIO:*

This section takes the example of the Northern Way programme for inter-regional strategy.

Summary

The Northern Way concept and vision involves not only 'growth' but the question of 'what kind of growth'. This involves choices and policy options in transport, housing, utilities, and economic production / consumption.

The ecological footprint (EF) is one measure being rapidly adopted at the regional scale, which helps to pinpoint and benchmark these policy options. The EF is the focus of a database / modelling system now being constructed at national and regional level, the REAP (Resource Analysis Programme). This also works with an economy-environment database and modelling system now in use by RDAs, the REWARD (Regional & Welsh Appraisal of Resources & Development). (Details in the appendix). Together these tools provide a more focused and meaningful method of sustainability appraisal.

The Northern Way policy issues and options, to which these tools can contribute, include:

- Transport: further growth in traffic – or – lower impact modes and better integration?
- Housing: further growth in construction and household energy use – or – more sustainable homes and neighbourhoods
- Energy, water, waste etc: more power stations, dams and landfills – or – alternative ways of managing demand.
- Industry: further growth in high-impact industries and branch-plants – or – more ecologically sound and socially responsible industries, more compatible with 'one-planet living'.

These and many more policy options are potentially long and complex issues – however there are basic principles which need to be debated and then analysed. For instance, the South East England Regional Assembly has declared:

POLICY CC3: RESOURCE USE

Over the Plan period, per capita use of natural resources will stabilise and begin to reduce, supported by increased efficiency of resource use in new development, the adaption of existing development, the extensive use of sustainable construction techniques and corresponding changes in public attitude and behaviour. Relevant authorities will achieve a stabilisation of consumption of resources and aim for a reduction in absolute levels of consumption in the long term, with an aim to stabilize the South East ecological footprint by 2010. In particular, authorities should require

Eco-Homes ‘very good’ as a minimum standards for all new housing and adoption of BREEAM ‘very good’ standards in all new commercial developments.

A more detailed listing of the policy issues and options is shown in the following notes.

Modelling regional policy options

As the development of the Northern Way is a kind of extension of regional strategy, it reflects the current active thinking on the nature and scope of regional strategy. The question of the **ecological footprint** (EF) then raises both technical questions on how to measure this, and the broader questions on the meaning and definition of sustainable development at the regional scale.

The angle which is particularly relevant here is that of developing and comparing **policy options**. Policy options are needed in order to identify the possibilities, and compare the impacts of alternative choices.

As far as the footprint and economy-environment modelling tools are concerned, the broad scale policy options then need to be linked through to several themes:

- Economic growth and structural change in both production and consumption
- Environmental / resource efficiency in production by industrial sectors
- Supply-side / infrastructure options for housing, energy, transport, waste management etc
- Demand-side management for energy, transport, water etc

Economic growth and structural change:

The rate and type of growth raises the question of alternative development paths. Is the RES focused on economic growth alone, or more on growth as a means to the goals of quality of life and lower external impacts? Is the shift towards services dependent on increasing imports of material goods from overseas, with increasing environmental impacts? If a low-impact high-quality path is preferred, how can this be best characterized and compared to the alternatives?

Environmental / resource efficiency

The theme of resource efficiency or resource productivity can be taken in different ways – output per investment, per employee, or per tonne of waste or emissions. As the latter environmental measures are notoriously short of good data, many assumptions need to be made. The policy options which influence the energy efficiency and emissions per unit of output in any sector, will be a combination of the financial investment, regulatory power, market development, or acceleration of technology innovation. It is fair to say that the RDA has only an indirect leverage on most of these factors. However some meaningful assumptions can be made on the overall scale of political commitment, financial investment and technological change.

Supply-side options

This type of policy option is more specific on how energy, transport or waste management might be supplied. The details for each of these can be worked out 'off-model', in terms of technology, economics, regulation, consumer preferences etc. The REAP or REEIO system then provides a template for logging the assumptions and generating profiles over time. In terms of specific sectors (details in Section 5):

- **Energy supply options:** renewables development, with implications for land use and environmental impact: fossil fuels in terms of continuation of shift to gas: resurgence of nuclear power with various risks and liabilities.
- **Transport supply options:** alternative balances of transport modes, given the realities of travel for work, leisure, personal business and freight. Policy options may centre on development of new infrastructure such as trams or new motorways: or on constraint measures such as parking policies or road pricing schemes. In the background, but basically driven at UK / EU levels are the expectations over time for vehicle energy efficiencies and emissions coefficients.
- **Housing / construction options:** this is an economic sector with potential for increased efficiency in energy, waste etc. It is also more significant in that performance then determines the pattern of demand from households for energy in buildings, and to some extent water and other utilities.
- **Housing / settlement planning options:** this is one of the key influences on transport demand and accessibility to employment and services (but not the only one).
- **Waste management options:** this is shown as a 'supply' of services, in that the pattern of waste management / disposal then determines environmental impacts further downstream (not all covered by REEIO). The options are driven by the expectations of the EU Directives on phasing out landfill, although the best practice alternative is yet to be determined.

Demand-side management

This theme focuses on the consumer side, and highlights the goal of reducing demand while raising quality of life – either through technology, regulation, market signals, the social economy, or public awareness. Just as anti-smoking campaigns have now become mainstream, it is quite realistic to plan for anti-consumption and anti-waste campaigns and shifts in behaviour by businesses and consumers. Over-arching this is the first theme of alternative development paths, where the regional strategy needs to look for 'win-win' solutions. For instance rather than plan for unlimited growth in road traffic, there may be a 'win-win' combination of more and better public transport, coupled with reducing overall travel demand through green travel plans.

Alternative scenarios

The example above shows how a realistic result may be generated with a combination of structural change, resource productivity, supply-side and demand-side assumptions. Such a combination is generally termed a '**scenario**' – a consistent and plausible account of future paths or conditions.

As above, a scenario may be formed as a combination of debate, narrative, images, visions, maps etc. The contribution of the REEIO tool is to provide a numerical summary for comparison, evaluation and benchmarking – i.e. the analytic part of the SEA / SA process.

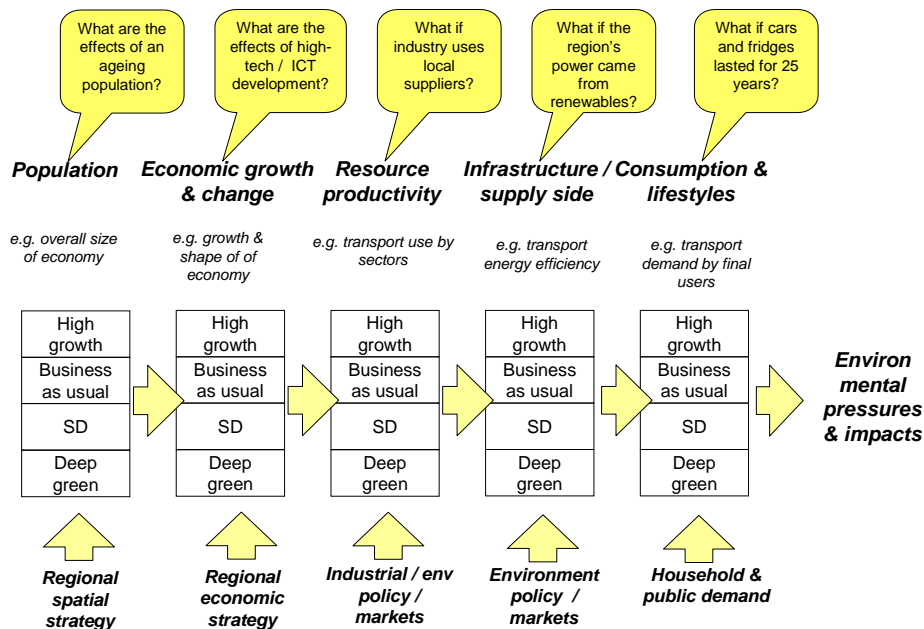
There are a small number of general scenario types, which may be combined in different ways to explore multiple combinations:

- A **'high-growth'** scenario can be characterized generally as unrestricted economic growth, material consumption and environmental pressure.
- The **baseline** or **default** 'business as usual' scenario is given in REEIO by the pre-set assumptions and economic growth / change projections built in to the settings for each region. These are designed as 'policy-off' with no further policy changes at the time of assembly: obviously this is not fixed over time, and may need updating from the time of the model development.
- A **'sustainable development'** scenario might combine this with political commitment, economic investment and consumer attitude change, so that quality of life and social welfare goes up independently of the economy, while environmental pressure reduces. As one variation on this a **'pale green'** scenario might explore an affluent future where technological improvements reduce environmental pressures to some extent.
- Going even further, a **'deep green'** scenario would envision a future of ecological protection as a top priority. It is useful to establish an alternative option beyond that of the SD scenario, so that the SD may appear as moderate and sensible.

Each of these scenarios might take different assumptions on population growth or decline, although these would not affect directly the environmental pressures per capita.

The typical range of scenario types with alternative policy options is show in the diagram below, with examples and questions at each stage:

Fig 1: developing policy options



Summary of spatial strategy themes

This table shows the broad themes and objectives in a 'typical' regional spatial strategy, and the linkages to footprint analysis through REAP & REEIO. (based on the NWDA RSS)

Policy objectives	Policy options	REAP input types	REAP influence	REEIO input types	REEIO influence
SPATIAL STRATEGY & ENVIRONMENT SECTORS					
Housing development	Accelerate HH energy efficiency?	HH energy intensity	Strong	HH energy demand	Strong
	Promote low-impact construction?	Material EF factor	Strong	Construction productivity	Strong
	Planning for low-impact travel?	Transport eff.	Marginal	Trans demand	Marginal
	Build new or rehab existing housing?	Hsg stock turnover	Strong	-	-
	Upgrade HH appliances / fittings?	Appliance stock-flow	Strong	HH energy demand	Marginal
	Footprint neutral housing policy?	Comparative analysis	Strong	-	-
Other development	Accelerate building energy efficiency?	Blg energy intensity	Strong	Other energy demand	Strong
	Promote low-impact construction?	Material EF factor	Strong	Construction prod	n.d.
	Location for low-impact travel?	Transport eff.	Marginal	Trans demand Other energy demand	Marginal
Urban regeneration	Accelerate building energy efficiency?			Construction prod	Strong
	Promote low-impact construction?			Trans demand	Strong
	Location for low-impact travel?			Trans demand	Marginal
Transport strategy	Transport demand side management?			Trans demand	Strong
	Promote low impact transport modes?			Trans eff	Strong
	Expand / constrain road traffic?			Trans demand	Strong
	Expand / constrain air travel?			Trans demand	Strong
Waste management	Accelerate waste minimization?			Waste eff	Strong
	Promote recycling economy?			Waste supply	Strong
	Re-cycle construction / agricultural waste?			Waste demand	Strong
Energy / climate strategy	Accelerate demand side management?			Energy demand	Strong
	Invest in energy supply efficiency?			Energy supply	Strong
	Invest in renewable energy sources?				Strong

Policy objectives	Policy options	REAP input types	REAP influence	REEIO input types	REEIO influence
Water strategy.	Promote water demand management?			Energy supply Water demand	Strong

Summary of economic strategy themes

This table shows the broad themes and objectives in a 'typical' regional economic strategy, and the linkages to footprint analysis through REAP & REEIO. (based on the NWDA RES)

Policy objectives	Policy options	REAP input types	REAP influence	REEIO input types	REEIO influence
ECONOMIC STRATEGY					
1 business clusters	Focus on hi-tech or low-impact sectors? Focus on branch plant or indigenous development?	Ec growth / change Social change / lifestyle	Marginal	Ec growth / change	Marginal Marginal
2 competitiveness & productivity	Accelerated environmental improvements? Increase import fractions?	Resource productivity of sectors	Marginal	Sectoral prod. Trade balance	Strong Marginal
3 regional knowledge base	Hi-tech industry for low-impact development? Accelerated environmental improvements?	-	-	Ec growth / change Sectoral prod.	Marginal Marginal
4 urban renaissance	New construction or rehabilitation? Invest in energy efficiency?	Construction prod Hh energy demand	Strong (localized)	Construction prod Hh energy demand	Strong (localized)
5 rural renaissance	Reduce farming impacts? Reduce rural commuting & travel? Improve water balance?	Food chain issues Transport demand	Strong Marginal	Agri prod Tran demand Water eff	Strong Marginal Marginal
6 economic inclusion	ILM for recycling & resource management? Social enterprise to replace service sectors?	-	-	Supply side Demand side	Marginal Marginal
7 labour market	Upgrade labour occupations / skills? Import commuting labour?	-	-	Labour balance	Marginal Marginal
8 transport & infrastructure	Invest in energy supply efficiency? Invest in renewable energy			Energy supply side Trans mode	Strong Strong Strong

Policy objectives	Policy options	REAP input types	REAP influence	REEIO input types	REEIO influence
	sources? Transport demand side management? Promote low impact transport modes? Expand / constrain road traffic? Expand / constrain air travel?			eff. Trans demand side	Strong Strong Strong
9 employment sites	Promote inward / indigenous industry?			Ec growth / change	Marginal
10 image & visitors	Promote mass tourism / eco-tourism?			Tourism prod	Marginal

3.6 Comparison of modelling tools

The table below is a summary of the 2 modeling approaches discussed here. It should provide some starting guidance as to which tool is best suited to which application.

	Economy-environment	Material flow
	REWARD	REAP
Model approach	Based on production	Based on consumption
Main focus	Environmental impact within the region of economic activity, including exports (excludes travel abroad).	Environmental impact locally / globally of consumption within the region, including imports (excludes commuters)
Spatial level	England region / Wales	UK National, regional and LA level
Time frame	10-15 years	25-50 years
Methodology	a) Regional economic scenario: b) env pressures are calculated from activity in 49 sectors.	Key environmental pressures: material consumption, ecological footprint, GHG emissions
Scope of model	a) 49 x 49 economic IO table with employment data: b) energy, emissions, waste, water, in ~ 50 categories	a) Direct / indirect material consumption b) eco-footprint & GHG c) activity model d) business-environment benchmarks
Limitations	No direct account of material flow or global impacts	No direct account of economic processes or transfers
Main applications	SEA analysis on economic strategies & programmes	SEA / EIA analysis of policy scenarios, sectoral strategies etc
Main users	Environment Agency, Regional Development Agencies etc	Local authorities, RDAs & other regional bodies, business associations, householders, researchers
Main orientation	Policy-technical orientated	Communications & education orientated
General output	specific quantitative output for policy analysts	visualising tool aimed at public relations and campaigns.
Funding	Partnership of EA with RDAs and NAW.	Biffaward Landfill Tax Credit Scheme, plus other 10% funders.
Availability	CD access to regional subscriber organizations only. Available late 2004	CD Available to the general public early 2006 at low cost. Web access through linked regional projects e.g. Eco-Region NW