Healthy Cities Research Centre
University of the West of England

SOLUTIONS: ASSESSING LOCAL URBAN FORM

Hugh Barton

Paper for SOLUTIONS Symposium, 15 December 2004, Cambridge

Abstract
The purpose of this paper is to set out how the SOLUTIONS team intends to assess alternative neighbourhood design archetypes that are applied in each study area. The paper examines the criteria that could be used, and the practicality of measuring them. Then it briefly reviews the different approaches to assessing the significance of impacts and ascribing value. It adopts Sustainability Threshold Analysis (STA) as the preferred method, illustrating the way it will be used. It is noted that this approach has potential application in many situations other than SOLUTIONS.

Introduction

The problems facing the SOLUTIONS team at the local level are - perhaps surprisingly - quite novel, and require innovative research methods. At the strategic level there are well-tried theoretical and technical frameworks – in terms of broad urban form options (compact city, dispersal new settlements, corridors dispersed concentrations etc) and systematic methods of assessment (e.g. land use transport modelling). At the local level, by contrast, there are few recognised conventions. While neighbourhood form was studied extensively in the new town era (1950s and 60s) there has been little work since then. Current patterns of development are driven largely by market preferences and/or urban design fashions (Barton 2000, Chapter 1). There is no established contemporary classification of alternative forms. Neither is there any conventionally accepted method for the evaluation of local forms.

This gives a problematic but exciting edge to the SOLUTIONS local study. Not only are we trying to articulate local design options in a robust and useful way for the contemporary age (these are the subject of other papers), but we are devising an innovative framework for local design assessment. The first part of the paper examines the range of criteria that could be used. Selection involves quite a number of factors: criteria that represents different facets of sustainable development, that tie in with official lists of sustainability

indicators, are practical to measure, and discriminate usefully between neighbourhood designs. The list of eighteen chosen criteria will be subject to further discussion and debate within the team, following any feedback from colleagues at the December symposium.

The second part of the paper confronts the problem of how to reach an overall judgement. A distinctive feature of the SOLUTIONS programme is its attempt to look at settlements *holistically*. Many different kinds of criteria are involved. There are dangers in any attempt to reduce them all to a common denominator (e.g. money, or numerical weights) in order to add up and define the "winner". But at the same time it is necessary to make effective and illuminating comparisons between design options. The answer to this conundrum – Sustainability Threshold Analysis (STA) is one which has been piloted by the Environment Agency and used in project evaluation in south-west England.

Local Evaluation Criteria

The list of local evaluation criteria presented below is a contribution to on-going discussion rather than definitive. It is derived from a review of national guidance on land use and/or transport plans, especially *Local Quality of Life Counts* (DETR 2000). For a full list of official sources see Mitchell 2004 p.8. It also owes much to pilot work done for SOLUTIONS at UWE during 2004, and the experience of project appraisal in two independent projects undertaken by UWE for the South West Regional Development Agency and Clarks Shoes (Barton and Grant 2003, Barton and Grant 2004).

The UK Government identifies four broad goals for sustainable development: (a) social progress which recognises the needs of everyone; (b) effective protection of the environment; (c) prudent use of natural resources; (d) maintenance of high and stable levels of economic growth and employment. At the SOLUTIONS local level the emphasis is most strongly on the first two: "social progress" and "environmental protection". However, it also relates to the other two, and any particular criterion may affect more than one of the broad goals. For example, take a key criterion identified in official sources: transport economic efficiency. This can be measured in terms of minimising the overall costs faced by travellers (consumers, producers etc) i.e. less fuel used, shorter trips, less congested trips. Economic benefits are not the only ones to accrue from this: reduced travel cost also contributes to social progress, indeed social equity; reduced fuel use contributes to resource prudence; at the local level reduced congestion and/or trip length will also cut the environmental impact of motor traffic. So all four goals are promoted. Clearly all this will depend on exactly how transport economic efficiency is measured, but the point I am making is that in the context of sustainable development it is vitally important to be clear exactly what is being assessed, for what reason.

The selection of local criteria involves consideration of a number of factors:

- coverage of all relevant aspects of sustainable development
- the possibility of identifying indicators which act as a reasonable proxy for the achievement of an objective
- the practicality of measurement
- the ability of an indicator to usefully distinguish between different kinds of spatial form
- the need to avoid criteria which are so place-specific that they tell us nothing about the general case.

The local criteria set out below are divided into six sets: natural environmental capital; constructed environmental capital; movement; accessibility; feasibility and robustness. The first set is explored in some detail in order to illustrate some of the research issues involved. The other sets are examined quite briefly. The list is still under discussion by the SOLUTIONS team, and also awaits cross reference to other SUE programmes, particularly DISTILLATE.

Environmental Capital: Natural Resources

The scope of the agenda conventionally identified in EADP, SEA and SA (Environmental Appraisal of Development Plans, Strategic Environmental Assessment and Sustainability Appraisal) includes air quality, water, land and soils, energy, minerals/materials and biodiversity. *Air quality* will be assessed at the strategic level, as an output of the model. While clearly local spatial policy does affect air quality it is not going to be possible to quantify this in SOLUTIONS. Air quality will, though, be a factor in the assessment of urban design quality (see below).

Water impacts include use, supply, catchment, drainage and flood risk. The different spatial forms will not directly affect use, supply, catchment or insitu drainage – measures such as sustainable drainage systems (SUDS) can be pursued with any of the archetypes. However, form does impact on *flood risk*. The question is whether flood risk is a generic or a purely site-specific variable. Some theorists suggest that compact linear urban form combines particularly well with the preservation of linear parkways along water courses (Tjallingii 1995, Barton et al 1995) while by implication other forms do not. SOLUTIONS could reach some initial conclusions about this. Flood risk is in any case a highly topical issue, raised to prominence by recent flood events and the added threat from global warming, so it seems appropriate to include it as a criterion.

The issue of *land* is rather different. Official criteria focus on productive land lost to development (as a rather inadequate surrogate for soil conservation) and the brownfield v. greenfield debate. These are probably best dealt with at the strategic level because the main policy levers affecting them will come from

city-wide policies not neighbourhood-specific policies. However, it would be possible to assess the *efficiency* with which land is used, and this would affect the overall land-take. Since density varies between the archetypes, so the total greenfield and brownfield land-take for a given population will vary too.

Transport energy use is a central theme for SOLUTIONS and will be a predicted by the strategic models. The local analysis will not provide a quantitative energy use output, but several of the criteria to be discussed later in relation to transport efficiency will provide ordinal indicators of potential energy intensity. For example the length of local vehicular trips could, other things being equal, act as a crude proxy for intra-area transport energy use.

Other facets of the energy issue – embodied energy, heating, electricity generation etc – may well be affected by local urban form to some degree. For example the amount of embodied energy per unit is higher for lower density and very high density solutions than for medium densities. Equivalently the amount of construction materials needed varies with building type and infrastructure layout. So there is a prima-facia case for incorporating non-transport energy and materials in the study. However, the range of variables affecting energy and material use is considerable, and many of them are exogenous to the study (e.g. national energy policy and building regulations). The prime focus on transport therefore means putting these important criteria to one side.

Finally in the natural environmental capital set there is *biodiversity*. There is a question as to whether biodiversity is relevant to generic spatial forms, as opposed to site-specific conditions. Our proposal, nevertheless, is to include it in the list of criteria because of the great importance accorded wildlife in public and political debate, and the recognition that we are working with local partners.

Below is summary chart of proposed natural environment indicators:

Criteria	**Indicators**	**Assessment**	**Comments**
Water	Flood risk and groundwater vulnerability	Mapping analysis, Local plan and EA data	Generalisable?
Land	Efficiency of land use in terms of residents and employees	Estimates based on allocations and densities	Definitely a political issue – but is it about sustainability?
Biodiversity	SSSIs, nature reserves, woods, water courses, shelter belts	Mapping analysis – data form local plans and aerial photographs	Generalisable?

Environmental Capital: Constructed

The scope of the human-made environmental capital includes housing, commercial and other buildings, infrastructure provision, cultural heritage, landscape and townscape. The *stock of buildings* and the capacity of infrastructure will vary between archetypes, and this will be carefully noted. However, the variation will be in the context of city region strategies that provide for equal overall provision – so the level of local provision in itself is not a key factor. It may well, of course influence other variables, such as local service availability, which do directly affect quality of life and social inclusion.

Cultural Heritage refers most obviously to conservation areas and listed buildings; *landscape* to areas of landscape value, qualitatively defined; and *townscape* to the aesthetic quality of the public realm in built-up areas, also qualitatively defined. All three feature in guidance on SEA/SA. Stakeholder views on what, locally, is valued will be important, but will need careful reporting to maintain comparability across case study areas.

As with natural capital there is an issue about the degree to which *general* lessons can be drawn about the merits and characteristics of different local designs in terms of constructed capital from looking at specific places. The research will illuminate that question. But meanwhile it is important to represent local stakeholders' concerns for their own heritage and townscape.

Criteria	Indicators	Assessment	Comments
Cultural Heritage	CAs; listed buildings; ancient monuments; special landscape areas; other locally defined features or green areas	Mapping from local plans; stakeholder views	May nor be generalisable Should Green Belts be included?
Townscape	Urban design quality	Expert assessment; stakeholder views	May not be generalised; More relevant to establish baseline

Movement, or Transport Efficiency

SOLUTIONS is centrally about the relationship between land use and transport. The strategic LUT model is the main means by which travel behaviour and transport system efficiency are assessed. At the local level prediction is not possible. It is still uncertain whether the models can differentiate at all between local design archetypes. Estimates may have to await the micro-simulation model. Below are suggested local criteria:

Possible Criteria	Indicators	Assessment	Comments
Walking and cycling	Modal share of trips by residents	Model and/or WP12 surveys	Proxy for physical fitness
Public transport	Proportion of population within 400m of a "good" p.t. service	Route design and map analysis (GIS)	Assesses social inclusion as well as the availability of non-car transport
Car use	Modal share of trips by residents	Model?	Proxy for level of car dependence and transport energy use/emissions
Car trip length	Average distance of car trips within the study area	Mapping analysis (GIS)	Proxy for local transport energy use/emissions and other environmental impacts.

Accessibility

Local accessibility assessment will differentiate clearly between different local designs, and should provide good generalizable conclusions. However, application of the archetypes to study areas will not be at the level of detail necessary to determine the future location of many of the smaller facilities, including surgeries, primary schools and allotments, which would in practice only be defined at a later stage. So the indicators below concern the more important spatial structuring elements.

Note that accessibility is primarily a social inclusion criteria – assessing the degree to which people have (or are likely to have) local access to facilities. But it also had implications for the proportion of walking/cycling trips. WP12 on accessibility and social inclusion will provide empirical data which could allow estimates to be made.

Criteria	Indicators	Assessment	Comments
Local jobs	Job ratio	Estimates based on allocations	Social inclusion, and energy/emissions agenda
Local Centres	Proportion of population within 400m and 800 metre pedsheds	Mapping analysis (GIS)	As above possibly health benefits (WP12?)
Open Space	Proportion of population within 400m & 800m of major greenspace	Mapping analysis (GIS)	As above, and possible health benefits

Feasibility

While all the previous criteria are measures of quality they rely on the assumption that implementation of the local design archetype can occur effectively. That might well not be the case if the design is distorted, if the market is sluggish, or if public sensibilities are offended.

Criteria	Indicators	Assessment	Comments
Design Feasibility	How fully is the archetype realised?	Expert assessment and specific design exercises	Partial realisation is likely to be the rule.
Market Feasibility	Would market and institutional investors be motivated?	Stakeholder workshop (plus model outputs and expert assessment)	Business, retail and housing elements
Public Acceptability	Would the public and local politicians accept?	Stakeholder workshop	Views can change!

Robustness

Robustness is the degree to which a plan (archetype) can be successfully implemented and continue to operate efficiently even when the situation it was designed for changes. The approach here is to link robustness (a) to alternative general scenarios and (b) to alternative strategic and local forms.

Criteria	Indicators	Assessment	Comments
Sensitivity	How well does it survive different societal scenarios?	Team debate	Strategic options would be assessed in the same way

Adaptability: strategic	How consistent is it with different broad strategies?	Compatibility Matrix	This presumes adaptability is a benefit
Adaptability: local	How far can the medium term designs mutate successfully into other archetypes in the long run?	Compatibility Matrix	As above

Sustainability Appraisal

Assessment of the relative merits of alternative spatial frameworks necessarily involves consideration of many different social, economic and environmental impacts. The question is: how to reach a logically defensible overall judgement? Following the principles developed in Environmental Impact Analysis (EIA) and plan-making processes (such as Development Potential Analysis) there are eight distinct stages of assessment:-

1. Identifying the *criteria* against which the project or plan is to be assessed. E.g. sustainable water management.
2. Selecting an *indicator* (ideally measurable) in relation to each criteria which pinpoints the most relevant aspect and can act as proxy for the broader issue E.g. the degree of flood risk.
3. Measuring the *magnitude* of impact. E.g. in the case of flood risk mapping the areas with different levels of risk.
4. Assessing the *significance* or seriousness of the impacts – e.g. ascribing relative weightings or values to the various indicators
5. Assessing *indirect* and *cumulative* effects: water management, for example, is closely linked to issues to biodiversity, recreation, soil fertility and the aesthetic heritage of an area.
6. Assessing the *interactions* with related policies plans and projects. E.g. in the case of SOLUTIONS – the compatibility of local and strategic designs.
7. Assessing the degree to which *mitigation* of undesirable impacts is possible. E.g. in relation to flood risk, can alternative flood storage capacity be created.
8. Reaching an overall judgement about the quality of the proposal or plan.

Not all these stages are necessarily present in every assessment., Many EIAs, for example, fail to examine indirect, cumulative or interactive impacts in any depth at all (Morris and Therival 1995, and recent personal study). The complexity of multi-criteria assessment, combining sets of criteria which relate

to very different human aspirations, means no one method has established any degree of hegemony in practice. There are ordinal, reductive, weighting and directional systems. *Ordinal* is the most basic, essentially involving the simple ranking of alternative schemes, thereby avoiding the need for precise measurement but still giving clear messages to decision-makers. The most well-known *reductive* method is Cost-benefit analysis (CBA), where all criteria are expresses in common terms, i.e. financial, thus allowing systematic summation and comparisons to be made. *Weighting* systems also allow systematic summation and comparison, ascribing relative values to the criteria without using common units, and is particularly adapted to stakeholder involvement in deciding what is valued most. *Directional* systems are very widely used in plan appraisal (Environmental Appraisal of development plans (1993) and sustainability appraisal on the official 2004 UK model); they apply a "moving towards" or "moving away" or "not sure" judgement to the impact of each policy on each criteria (this may be expressed as a "traffic light" system).

Clearly the choice of method is dependant partly on context: the resources available, the main outcomes needed. The ordinal and directional approaches do not require analysts to measure impacts precisely, instead relying on "professional judgement", and are thus relatively quick to undertake. They also risk superficiality and lack of transparency. My own analysis of many plan approvals undertaken for or by local authorities is that they get lost in tick-box processes, and avoid the main issues, which are often about cumulative impacts not individual policy impacts.

Reductive and weighting schemes, with careful measurement where necessary, are much more tempting for SOLUTIONS. The strategic LUTM is using a kind of reductive approach in-as-much as it bases forecasts on rational economic behaviour and many (though by no means all) of its criteria are economic. Modelling, with its strength in assessing overall patterns (i.e. cumulative and interactive impacts) is not an option at the local level.

One project assessment method gaining widespread credence in the UK is the Building Research Establishment Environmental Assessment Method (BREEAM). It covers many of the relevant sustainability criteria and adopts a weighting scheme. Is so doing it is following in a long tradition of techniques – Nathaniel Litchfield's' Planning Balance Sheet, Hill's Goals Achievement Matrix - and other more contemporary processes such as the Comprehensive Project Appraisal advocated by the Royal Institution of Chartered Surveyors (RPA 2000).

These weighting schemes do have the advantage of approachability – stakeholders can become deeply engaged in the arguments about what criteria are most important. They also deliver an overall "answer" at the end. But they suffer from a fundamental logical fallacy, which means they are not appropriate for research. The attempt to reduce all criteria to a common means of exchange

(whether money or weights) belies the uniqueness of each criterion. High quality urban design quality, for example, is not in any sense "equivalent" to safety from flood. It is not valid to substitute flood risk for beauty. Both aspects need to be valued in themselves.

The occasional crassness of weighting schemes was driven home to me (and a government planning inspector) recently at a Local Public Inquiry in the East Midlands. The study on which the Local Plan allocations were partially based involved comparing the sustainability of possible development sites. In this multi-criteria analysis top weights were ascribed to factors such as brownfields and flooding, with weights carefully negotiated (in the abstract) by stakeholders. One site which came out as very high priority for development was an old airfield nine miles from the main town. It scored well because it *was* brownfield and was *not* liable to flooding. The study recognised, in its commentary, that no-one actually considered the site sustainable (despite the systematic analysis) because of its isolation and lack of facilities. Nevertheless the local authority permitted development.

The point is that many factors, at the extreme, become very important. There is a "bottom-line" of acceptability. In this case the site was so far from main settlements that that in itself should have been sufficient to deter the authority from permitting development. As it was they were going against the bottom line in government planning advice (PPG3) which prioritises in-town sites over edge-of-town, over out-of-town. What the advice does is to stipulate *thresholds* of acceptability.

Such thresholds hark back to "threshold analysis" in the 1960s, where settlement development potential was related to spare capacity in infrastructure. A critical threshold was reached if major investment (in roads, sewage, schools etc) was needed to provide for any extra population. The concept also links to that of "carrying capacity": an ecosystem can maintain its life-support capabilities with a certain amount of disturbance, pollution or invasion, but once past a particular threshold its carrying capacity will reduce, collapse or change.

One advantage of a threshold approach is that it directly relates the level and seriousness of impact to importance, and at the same it identifies where action is needed to mitigate impacts. In other words it neatly ties together stages three, four and seven of the SA process. By comparison a weighting system may pass over very serious impacts simply because that aspect or criteria has been given a low overall weighting, and it does not focus attention where it is needed. The threshold approach for analysing sustainable development has been recently taken up by the Environment Agency. The EA, concerned about flood risk and unsustainable patterns of development, originally commissioned the creation of a

technique to work out the "carrying capacity of catchments". Barbara Carroll, who led the research, takes up the story:

> "The research team comprised environmental and planning practitioners and researchers from Enfusion and the University of the West of England (UWE). An initial feasibility study (Carroll et al for the Environment Agency, 2000) identified the most appropriate approach for the Agency to take with regard to environmental capacity. Methods and experience were reviewed and an approach was developed. This built upon earlier work by UWE (Barton et al, 1995) which followed the criteria-based approach as used in the Strategic Environmental Assessment SEA) of plans and programmes and aimed to help with location choices for proposed development. This work has recently been updates to embrace sustainability and the neighbourhood approach to planning (Barton et al, 2002).
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> The approach proposed for the Environment Agency was a sequential process set within the framework of environmental objectives and appropriate environmental boundaries. Relevant environmental issues (criteria) are scoped and thresholds are which an environmental impact occurs are identified together with a score. The Spectrum Score ranges through five categories from red (absolute constraint to development) to blue (development encouraged because it will resolve an existing environmental problem). For the orange and yellow categories with predicted impacts on the environment, management options may be identified in order to offer choices for mitigating impacts and thus increasing environmental capacity.
>
> It has been agreed that the method should be compatible with existing techniques in both spatial planning and environmental management. SEA methodologies have tended to develop into Sustainability Appraisal (SA) methods in the UK where an SA is now required of each development plan. The sequential approach is also compatible with traditional planning techniques of constraints mapping and recent government guidance regarding urban capacity and the re-use of brownfield land in accordance with Planning Policy Guidance Note: 3 Housing (DETR, 2000).
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> The proposed approach was tested through workshops and the method further refined through seminars and discussions. Pilot schemes were organised in different parts of the country including both coastal and inland locations to reflect differences on environmental characteristics and sensitivities, as well as testing at different levels of administration and planning: regional, sub regional (country) and local (district). The pilot studies were carried out during 2000-1 and were designed to test the impacts of additional proposed housing which is the greatest development

pressure currently in the UK. The method was used to test the relative risk of environmental impacts from land options available for housing allocations in order to assist with decision-making. An additional pilot study was carried out to investigate the application of the method to a single development site. This also presented the opportunity to consider the approach from the developer's viewpoint and consider whether the approach could also inform the form of development (as well as location)."

The feedback from the pilot studies was very positive, not only from many EA staff but from local authority participants. It was recognised that one value of the threshold approach is that it encourages the search for maximum sustainability across the whole gamut of concern. Decisions are not about economic viability *versus* social justice *versus* environmental capital, but about integrated solutions that achieve all three as much as possible. (Barton 2002).

The approach was subsequently adapted (under the name the Spectrum Approach) for two major project sustainability appraisals in Somerset. The first of these was for the South West Regional Development Agency: the redevelopment of the Morlands site in Glastonbury – the biggest industrial renewal site in the County. The second, for Clarks Shoes, involves the regeneration of an old industrial site in the centre of Street for housing – and is still ongoing (Dec 2004). The technique has been used both as a scoping process, to identify key issues, and as an evaluative framework which allows the involvement of a wide range of stakeholders. The final sustainability appraisal of the Morlands project drew systematically on the more detailed technical reports (including the EIA) and provided a rigorous overview which was submitted to the local authority with the planning application (Barton and Grant 2003).

The lessons from these exercises was that the threshold/spectrum approach was systematic, effective and transparent. A wide variety of stakeholders were successfully engaged in agreeing the appraisal framework and negotiating (through a Delphi exercise) the grading of the development proposals in relation to sustainability criteria. Technical judgements slotted into place and were seen in balanced perspective. The "objectivity" of the process was respected by all involved.

Sustainability Threshold Analysis (STA)

STA attempt to be:

- comprehensive with respect to major sustainability issues
- value-explicit, but without weighting values/criteria
- clearly discriminating between different issues and levels of impacts
- amenable to qualitative and quantitative measurement
- simple to understand and manage
- useful to decision-makers

- transparent, motivating and a learning process

The heart of STA is an assessment framework or matrix which combines the sustainability criteria with a scale of development acceptability from very poor to very good. The term 'spectrum' comes from the colour coding of degrees of acceptability: an extended *traffic light* system which goes from red (development is unacceptable), via orange and yellow to green (acceptable) and on to blue (where development would be positively beneficial). The extension of the grading into the positive (or exemplary) allows high quality to be represented, and identifies the sustainability development potential or "pull" factors to be expressed as well as the constraints or "push" factors. The distinction between yellow and orange has also proved very helpful – *yellow* being a relatively minor issue while *orange* presents real difficulties.

- BLUE: an *excellent* sustainability level:– the sustainability criterion is fully satisfied. For example, in relation to *water* you might expect autonomy of supply and treatment, with insitu drainage and flood risk effectively managed.
- GREEN: a *good* sustainability level:- the criterion is generally well satisfied, at least to the level we would currently consider best practice. For example in relation to water there would be demand management, rain water and/or recycled grey water for low grade uses, sustainable drainage systems and effective flood risk management, but not full water autonomy.
- YELLOW: a *negotiable* level:- There are significant areas of unsustainable or questionable practice which could (at least in theory) be overcome by practicable means. In the water example it might be the absence of any strategy for sustainable drainage – which could be achieved straightforwardly.
- ORANGE: a highly *problematic* level:- the criterion is not likely to be satisfactorily fulfilled without major reassessment, a change in the basic development assumptions, or action in a related (but independent) decision area. In the case of water the assessment might be *orange* if development was proposed in an area of water shortage without appropriate demand management, rain-water collection and grey water recycling – unconventional and expensive measures.
- RED: an *unacceptable* level – the criteria cannot be satisfied. This might apply, for example, where development is proposed in a major flood plain.

The assessment framework for SOLUTIONS local study needs to provide consistency across all the case studies. It cannot be changed for each area. Unlike the examples of its use in Somerset, therefore, there will not be an opportunity for local stakeholders to be involved in agreeing the framework. But it does need to be agreed within the research team. A meeting to do this is arranged for January 2005. Meanwhile an illustrative framework is shown on the next page.

Potential / *Criteria*	RED Development IMPOSSIBLE	ORANGE Development PROBLEMATIC	YELLOW Development CONDITIONAL	GREEN Development OK	BLUE Development PRIORITY
1. Physical Development Potential		Contaminated land, buildings awkward to repair, steep slopes	Derelict land and buildings requiring treatment and/or rehabilitation		Previously developed land and vacant buildings capable of easy reuse
2. Market Development Potential	Land-locked site with no access possible	Zero/low value site, lacking appeal or potential; owner unwilling to sell	Marketable site/buildings depending on conditions and costs imposed	Likely to be viable irrespective of conditions or S106 costs	High value sought-after location
3. Infrastructure Capacity		Major threshold breached: shift in investment priorities required	Contribution needed to school/sewage treatment/roads/station etc.	No particular thresholds are breached	Spare capacity in local schools, p.t. services, road system, sewage treatment
4. Pedestrian Accessibility to Key Local Facilities	No facilities within 800m	Few facilities available within 800m	Legal agreement could fill key gaps in facilities	Most facilities within 800m	Choice of facilities available, most within 400m
5. Public Transport Accessibility to Jobs/Centres	No regular public transport services accessible or planned	Only poor services accessible or planned	Poor services capable of improvement	Good quality services within 400m	Excellent quality services within 300m
6. Energy Use and Carbon-fixing	Very exposed sites	Shelter belts, woodland, coppices	North-facing slopes, tree-replacement conditions		Gentle South-facing slopes, spare CHP/CH capacity
7. Water	Areas liable to flood every 30 years or more	Marginal flood areas: high ground water vulnerability	Areas of medium ground water vulnerability	Supply, treatment, drainage OK; no flood risk	
8. Land, soils and local food production	Unstable land, areas prone to coastal erosion	Allotments, market gardens, organic farmland	High quality soils; impact on farmland		Contaminated land
9. Biodiversity	SSSis and other national designations	Locally defined valued habitats and wildlife corridors	Locally valued but common habitats, trees and hedgerows	No threat to assets	Potential to create new habitats in degraded areas
10. Air Quality and Noise	Areas prone to unacceptable level of pollution	Source of pollution capable of correction – but who will pay?	Migratable noise levels		
11. Open Space Value or Impact	Valued and well-used public open-space (POS)	Common-land, valued public access land	Inadequate local open space, contribution needed	Ample supply of accessible open space locally	
12. Aesthetic and Cultural Heritage	Listed buildings; vulnerable landscapes of great value	Specific areas of valued landscape or great archaeological value	Conservation areas, AONBs, National Parks		Ugly or monotonous environment needing improvement

A Sustainability Threshold Assessment (STA) Framework

This is an illustrated example taken from Barton et al (2003). The criteria and thresholds for SOLUTIONS are likely to be different.

The STA framework will be used in several ways:

- to assess the current situation (the baseline) and current proposals
- to screen out local design archetypes which do not score well at an early stage of the analysis of any particular study area
- to provide the agenda for the main assessment of alternative archetypes in a study area and a means of systematically comparing their performance
- in that context, to shape the analysis of feasibility and acceptability undertaken in the main stakeholders' workshop
- to allow consistent conclusions to be drawn about the comparative qualities of the archetypes across all the case study areas.

Conclusion

This paper has explored the range of criteria that could be used to assess the relative merits of the local design archetypes in the SOLUTIONS project. It has argued that the diversity of criteria compromises the validity of some of the common ways of handling multi-criteria assessment, and in particular that conventional weighting systems are seriously flawed because they fail to take proper account of the comparative severity of impacts. The technique proposed for SOLUTIONS is based on thresholds of positive and negative impact. It has been piloted elsewhere with success.

Towards the end of the research it will be appropriate to review the effectiveness of STA as research and practice tool. Our expectation at this stage is that STA will prove an effective aid to decision-making and feature in the practice guide which is the culmination of the research programme. It is already clear that, in various guises, STA is useful in the systematic multi-criteria assessment of projects and plans. It avoids the logical pitfalls of many other techniques. It is user-friendly and decision-oriented. To my mind it has the potential to provide a consistent analytical link between a number of different levels of planning practice. SOLUTIONS will show how far it is effective for future-oriented research.

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