

Sustainable Economic Growth Within Environmental Limits Volume 1: guidance for the East Midlands

A report prepared for *emda*

Land Use Consultants and GHK Consulting

30 September 2010

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SUSTAINABLE ECONOMIC GROWTH WITHIN ENVIRONMENTAL LIMITS

VOLUME I: GUIDANCE FOR THE EAST MIDLANDS

Prepared for the East Midlands Development Agency
by
Land Use Consultants
and GHK Consulting

30 September 2010



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PREFACE

AN APPROACH TO ESTABLISHING ENVIRONMENTAL LIMITS AT THE LOCAL LEVEL

“Humanity has the ability to make development sustainable – to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs. The concept of sustainable development does imply limits – not absolute limits but limitations imposed by the present state of technology and social organisation on environmental resources and by the ability of the biosphere to absorb the effects of human activities. But technology and social organisation can both be managed and improved to make way for a new era of economic growth”.

Our Common Future. The World Commission on Environment and Development (1987). Also known as ‘**The Brundtland Report**’ after the Commission’s chair, Gro Harlem Brundtland.

Current patterns of economic and social behaviour are environmentally unsustainable

1. There is widespread recognition that current patterns of economic development and social behaviour are environmentally unsustainable. Natural resources are being consumed more quickly than natural systems can replace them and as a result, stocks of natural capital are being run down. This means that current generations are compromising the ability of future generations to meet their own needs.
2. The need to ‘live within environmental limits’ is recognised by the Convention on Biological Diversity and is a guiding principle of the UK’s Sustainable Development Strategy.
3. The need to live within environmental limits applies globally, nationally and locally. There are international and national attempts to better manage natural capital, especially climate and biodiversity. At the local level the impacts of development on the environment have traditionally been managed through the use of specific environmental standards and regulations (often set internationally or nationally but implemented locally); and through the use of statutory local development plans.
4. The concept of limits can be applied to a wide range of environmental assets. As well as the more obvious examples of natural capital, such as water resources and biodiversity, the approach set out in this document can be applied to cultural heritage and landscape; there are often complex relationships between the different aspects of the environment that need to be understood.

Local environmental limits allow civil society to take clear responsibility for the environment

5. The new political agenda emphasises the importance of Civil Society¹. This requires local communities, led by local authorities, to take responsibility for the environment and for the impacts caused by economic and social activity. Civil Society, acting nationally and locally, reducing the reliance on standards set elsewhere, and taking a pro-active approach to challenging and better managing previously accepted trade-offs with the environment, can establish an environmentally sustainable economy and society.
6. To guide this action, stronger local advice is needed on the nature of environmental limits and on how to define and set them. Environmental limits can then be used to underpin new development plans, local standards and new voluntary action by businesses and households. There will always be international and national standards and targets, but setting environmental limits also requires local evidence of the environmental trade-offs arising from economic and social activity to judge the level at which to set the limit locally. Since the environment does not respect administrative boundaries, in many instances this will require a joined-up approach across a number of local authority areas to reflect how the environment functions in practice.

Setting environmental limits is complex and controversial

7. Understanding when the use of the environment becomes unsustainable is difficult – there are no alarm bells to alert people to unsustainable behaviour. Environmental limits provide the ‘alarm bells’ – if economic and social behaviour crosses agreed environmental limits, corrective actions can be taken. Better still, the alarm bells can warn of impending threats to environmental assets and prevent unsustainable losses. Monitoring needs to be linked to such alarm bells, so that actions are in place before limits are reached, helping to prevent irreversible damage occurring.
8. However, the lack of precise scientific information means that setting environmental limits is a matter of judgement - decision makers have to gauge where the continuing or planned loss of an environmental asset and the associated ecosystem services fails to be compensated by economic or social development. At the environmental limit it is judged that no amount of money can purchase the ecosystem services that would otherwise be lost. Such judgements clearly need to take into account not only the ecosystem services provided but also the economic and social implications of setting a limit.
9. It is not surprising that setting an environmental limit is not only complex but also controversial – the limit will prevent the loss of environmental assets that might otherwise have generated income and benefits to the community. This means that the local community, businesses and households have to be involved in the process of setting the limit.

¹ As expressed, for example, in Defra (July 2010) An invitation to shape the Nature of England. Discussion Paper

LUC and GHK have developed a tool for setting environmental limits that local communities and other stakeholders can use

10. The three-step approach is based on the participation of the local community and other interested stakeholders, such as statutory agencies and businesses. It enables them to debate the use of important national, regional and local environmental assets, and the potential economic and social implications of setting environmental limits. The approach also provides a tool that can usefully support and inform other assessment requirements, such as Sustainability Appraisal/Strategic Environmental Assessment, Habitats Regulations Assessment and Equality Impact Assessment/Health Impact Assessment.
11. **Step 1: Understanding environmental assets and services.** The discussion is informed by available information on the nature and distribution of the local environmental assets and the associated ecosystem services, and existing attempts to manage and control the use of the asset (such as existing standards).
12. **Step 2: The relationship between environmental assets/services and economic and social activity.** It is also informed by available evidence on the nature of environmental trade-offs with economic and social activity and the potential scale of impacts associated with an environmental limit. To help gauge where to set the limit, the approach examines different options for managing the trade-offs and the related impacts.
13. **Step 3: Negotiating and agreeing environmental limits.** The approach provides a structured method for local authorities to engage with relevant interests and to debate and advise on the use and setting of environmental limits.
14. The approach has been developed with the financial support of DEFRA and *emda* and advice from environmental and development bodies

GLOSSARY

AMR: Annual Monitoring Report – a report submitted to Government by a local planning authority measuring the effectiveness of spatial planning policies using national and local indicators.

AONB: Area of Outstanding Natural Beauty – a statutory designation for an area designed to conserve and enhance its natural beauty.

BAP: Biodiversity Action Plan - The UK BAP was published in 1994 in response to the UN Convention on Biological Diversity (CBD). It established a series of action plans for the UK's most threatened species and habitats, identified the factors contributing to their decline and prioritised the work that was needed to bring about improvements.

BaU: Business as Usual – a planning scenario that sets out the likely future evolution of events under existing plans and policies, providing a baseline against which to consider the likely impacts of policy interventions.

Ecosystem services: are the goods and services provided to society by environmental assets. For the purpose of this guidance, the term ecosystem services is considered to include a wide range of environmental services, including those provided by the historic environment.

Environmental assets: are the components of the region's natural physical and biological environment, including living organisms, soils/minerals, water and air. The sum of environmental assets comprise the stock of 'natural capital' used in the 'Four Capitals' model (see below). For the purposes of this guidance, the historic environment, although shaped by human activity, is also considered to be an environmental asset.

Environmental capacity: refers to the amount of development or other human-induced pressure which the stock of environmental assets can sustain over time without compromising their ecosystem functioning and provision of the related ecosystem services, either individually or cumulatively.

Environmental limit: is the level of consumption/use of an ecosystem service beyond which any further consumption/use would lead to an inability of the environmental asset(s) to sustain the delivery of an acceptable level of ecosystem services.

Environmental threshold: is the point at which a relatively small change in external conditions causes a rapid change in the environment – the system 'tips' from an acceptable level of environmental service delivery to an unacceptable one. When a threshold has been passed, the environment may no longer be able to return to its original state.

EqIA: Equality Impact Assessment - a tool for identifying the potential impact of a council's policies, services and functions on its residents and staff, with a view to promoting equality for all

Four Capital Model: an economists' model of sustainable development that categorises the assets required for human well-being into four types of 'capital' - manufactured (or man-made), natural (or environmental), human, and social.

GIS: Geographic Information System - any system that captures, stores, analyzes, manages, and presents data that are linked to location, allowing, for example, the creation of interactive maps.

HIA: Health Impact Assessment - any combination of procedures or methods by which a proposed policy or program may be judged as to the effects it may have on the health of a population.

HMA: Housing Market Area - Geographical area defined by household demand and preferences for housing which reflects the key functional linkages between places where people live and work.

LDF: Local Development Framework - a set of Local Development Documents (LDDs) prepared by a local planning authority that set out the spatial planning strategy for the area.

LFA: Low Flow Area – river stretch experiencing low flows during dry periods, with adverse effects for wildlife or other river uses.

HRA: Habitats Regulations Assessment – an assessment under the Habitats and Species Regulations 2010 of the likely impact of a plan or programme on the Natura 2000 network of European-designated biodiversity sites.

Millennium Ecosystem Assessment: international scientific appraisal of the world's ecosystems which developed a widely-accepted framework which groups ecosystem services into four categories – provisioning, regulating, cultural, and supporting.

PPS: Planning Policy Statement - a national statement of spatial planning policy to be followed by local planning authorities.

SA: Sustainability Appraisal – a process for appraising the social, environmental and economic effects of a plan which runs alongside the plan development process to help ensure that the final plan contributes to achieving sustainable development.

SEA: Strategic Environmental Assessment - a process of environmental assessment of certain plans and programmes which are likely to have significant effects on the environment, as required by the SEA Directive.

STW: Sewage Treatment Works.

WFD: Water Framework Directive – European legislation to conserve and enhance aquatic ecosystems and associated wetlands, promote the sustainable use of water, reduce pollution of water, and ensure progressive reduction of groundwater pollution.

1 Introduction

1.1 Planning Policy Statement 1: Delivering Sustainable Development states that:

“The Government is committed to protecting and enhancing the quality of the natural and historic environment, in both rural and urban areas. Planning policies should seek to protect and enhance the quality, character and amenity value of the countryside and urban areas as a whole. A high level of protection should be given to most valued townscapes and landscapes, wildlife habitats and natural resources.

Plan policies and planning decisions should be based on:

- *Up-to-date information on the environmental characteristics of the area.*
- *The potential impacts, positive and negative, on the environment of development proposals (whether direct, indirect, cumulative, long-term or short-term).*
- *Recognition of the limits of the environment to accept further development without irreversible damage.”*

1.2 This guidance was originally commissioned by emda to respond to the requirement for Regional Strategies to deliver ‘sustainable economic growth within environmental limits’. Although Regional Strategies have now been abolished, the principle remains at the heart of the ‘presumption in favour of sustainable development’.

1.3 The purpose of this guidance is to help all those with an interest in planning to gain a better understanding of what environmental limits mean, and to support a process of analysis and negotiation that can lead to the definition of limits for their area. This will support the delivery of environmentally sustainable economic and social development.

WHO IS THIS GUIDANCE FOR?

1.4 This guidance is primarily aimed at those with an interest in land use planning, environmental management, and economic and social policy. It can be applied at a range of scales from strategic to local and will often benefit from joint working across administrative boundaries where an integrated understanding and policy approach is required. The environment does not respect administrative boundaries so a joined-up approach is often essential for success.

1.5 The guidance will also be useful to others engaged in decision-making, or with an interest or stake in decisions, especially as a key component of the guidance is to support negotiation between different points of view. A particular focus of the guidance is the link between environmental limits and the economy, so it is hoped that the guidance will be useful to Local Enterprise Partnerships and those charged with preparing Local Economic Assessments.

1.6 This guidance is not just for those with a responsibility, or a concern, for the environment. It is also of great relevance to those with an interest in social policy and economic development and growth. Since a core component of the guidance is concerned with determining where environmental limits may

restrict economic development and growth, it is important that all interested parties – environmental, social and economic – become involved. Those who do not engage in the negotiations may find that their views are not heard, with the result that their interests are given less weight than those who did get involved.

HOW WAS THE GUIDANCE PREPARED?

- I.7 The guidance was prepared by Land Use Consultants and GHK Consulting to a brief prepared by *emda*. Its preparation was overseen by a Steering Group comprising representatives of:
- East Midlands Councils.
 - East Midlands Environment Link.
 - *emda*.
 - English Heritage.
 - Environment Agency.
 - Government Office for the East Midlands.
 - Natural England.
- I.8 The guidance was also tested in a workshop involving Steering Group members and representatives of other organisations. The help of all parties has proved invaluable in challenging early drafts, smoothing rough edges, and adding refinements.

HOW TO USE THE GUIDANCE

- I.9 The guidance describes a process to follow rather than a detailed prescription. It is structured as follows:
- **Section 2** sets out some terms and concepts. There is a great deal of terminology surrounding environmental limits that requires explanation. Reading this will help you to understand the rationale behind the guidance itself.
 - **Section 3** provides an introduction to the environmental limits method, which is summarised in a flow diagram in Figure 3.1.
 - **Section 4**, on scoping, describes what needs to be done before embarking on using the method.
 - **Sections 5 to 7** set out in detail the three steps which are at the heart of the environmental limits method, illustrated by an example based on water quality.
 - **Section 8** describes what is needed in the way of monitoring and evaluation in order to determine whether the outcomes are as anticipated, and what further action may be required.
- I.10 The rest of the guidance is provided in **Volume 2: ‘Useful Information’**. This is where more detail can be found on relevant research, environmental limits topics and environmental limits issues in the East Midlands.

2 Some terms and concepts

INTRODUCTION

- 2.1 The term 'environmental limits' is just one of several that are commonly used when trying to understand and explain the relationship between human activity and the environment. There are three main interlinked concepts behind the terms that are used:
- Firstly, the environment can be thought of as a resource upon which all human (and other) life depends.
 - Secondly, the quality of the environment – whether natural or man-made – can play a major role in human contentment and our overall sense of well-being.
 - Thirdly, that there are limits to the capacity of the environment to accommodate change beyond which the environment is unable to provide an acceptable level of the resources or qualities needed to support human survival and/or well-being.
- 2.2 Some of the most commonly used terms are defined in **Box 2.1**.

Box 2.1: Definitions

Environmental assets: are the components of the region's natural, physical and biological environment, including living organisms, soils/minerals, water and air. The sum of environmental assets comprise the stock of '**natural capital**' used in the 'Four Capitals' model (see below). For the purposes of this guidance, the historic environment, although shaped by human activity, is also considered to be an environmental asset.

Ecosystem services: are the goods and services provided to society by environmental assets. For the purpose of this guidance, the term ecosystem services is considered to include a wide range of environmental services, including those provided by the historic environment.

Environmental limit: is the level of consumption/use of an ecosystem service beyond which any further consumption/use would lead to an inability of the environmental asset(s) to sustain the delivery of an **acceptable** level of ecosystem services.

Environmental threshold: is the point at which a relatively small change in external conditions causes a rapid change in the environment – the system '*tips*' from an acceptable level of environmental service delivery to an unacceptable one. When a threshold has been passed, the environment may no longer be able to return to its original state.

Environmental capacity: refers to the amount of development or other human-induced pressure which the stock of environmental assets can sustain over time without compromising their ecosystem functioning and provision of the related ecosystem services, either individually or cumulatively.

- 2.3 There can be a tendency to think of the environment as static and finite. For some aspects of the environment this is true. We can work the minerals and use the fossils fuels that exist – once these are exhausted, they cannot be recreated. However, there are many aspects of the environment where we can influence its capacity to absorb human activity, through careful planning and design of development, reducing wastefulness, improving our management of the environmental resource or investing in the environment to increase the benefits and services that any given unit of the environment provides.

THE RELATIONSHIP BETWEEN ENVIRONMENTAL LIMITS AND ECOSYSTEM SERVICES

- 2.4 The concept of services and benefits is integrally linked to environmental limits. There is a considerable amount of national and international research effort being spent on defining and understanding ecosystem services and it is likely that this term will feature more strongly in the future when planning for development and activity.
- 2.5 The Millennium Ecosystem Assessment developed a widely-accepted framework which groups ecosystem services into the four categories shown in **Figure 2.1**. The Millennium Ecosystem Assessment has been adopted in the international Convention on Biological Diversity to which the UK is a signatory.

Figure 2.1: The Millennium Ecosystem Assessment framework

Provisioning services	Regulating services	Cultural services
The products obtained from ecosystems such as food, fibre, fuel and water.	The benefits obtained from the regulation of ecosystem processes including carbon capture, air quality regulation, water regulation.	The non-material benefits that people obtain through spiritual enrichment, reflection, relaxation and aesthetic experiences.
Supporting services		
Services such as nutrient cycling, oxygen production and soil formation. These underpin the 'provision' of all the other service categories.		

- 2.6 Ecosystem services range from the essentials for life, including the provision of clean air and water, food and fuel, to things that improve our quality of life and well-being, such as recreation, beautiful landscapes and our cultural heritage. They also include natural processes, such as climate regulation and flood regulation, that we often take for granted – and as is becoming increasingly clear with climate change, society damages these natural processes at its peril. The varied nature of ecosystem services implies a hierarchy of benefits in which the delivery of services contributing directly or in a supporting role to human survival or physical health will be prioritised above cultural services which contribute to well-being.
- 2.7 We can also differentiate between the services provided by natural resource systems and the economic and social benefits that these services provide to society, as shown in **Figure 2.2**. An important feature of this cascade of

relationships is that whilst the biophysical properties of the environmental assets are fixed, the nature of the processes taking place within it can be altered by management activity and the associated services and to an even greater extent the benefits derived from those services will vary according to the nature of society and the particular circumstances of the people within that society.

Figure 2.2: The Cascade from Environmental Assets to Human Benefits Implicit in the Concept of Ecosystem Services (using woodland and services from woodland as an example)

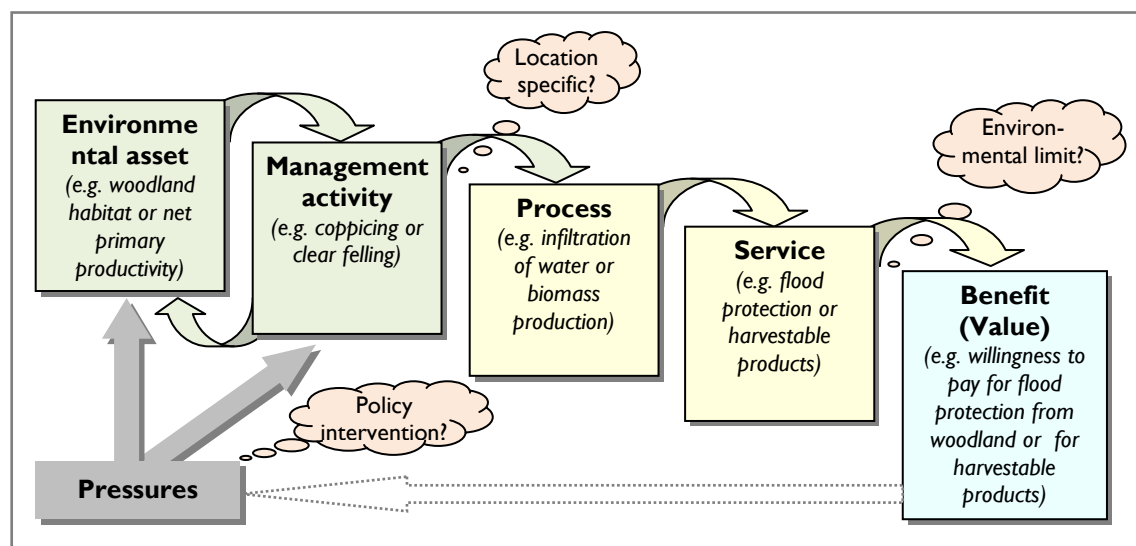


Figure adapted from Haines-Young and Potschin, 2008.²

UNDERSTANDING ENVIRONMENTAL LIMITS

- 2.8 ‘Living within environmental limits’ is recognised by the Convention on Biological Diversity as a core component of an ecosystem approach and is one of the guiding principles that underpins the UK’s Sustainable Development Strategy which describes it as:

“Respecting the limits of the planet’s environment, resources and biodiversity – to improve our environment and ensure that the natural resources needed for life are unimpaired and remain so for future generations.”

- 2.9 The World Commission on Environment and Development (the Brundtland Commission) in 1987 agreed that:

“at a minimum, sustainable development must not endanger the natural systems that support life on Earth: the atmosphere, the waters, the soils, and the living beings.”

- 2.10 The establishment of environmental limits needs to recognise the uncertainty and the potentially non-linear relationship between the pressure on the use of environmental assets and the provision of ecosystem services. **Figure 2.3** shows that this relationship may be linear (i.e. service delivery declines at a

² Haines-Young, R. and Potschin, M. (2008) England’s Terrestrial Ecosystem Services and the Rationale for an Ecosystem Approach. Full Technical Report. Defra Project Code NR0107.

uniform rate), it may be non-linear (the decline is faster at some levels of pressure than others) or it may change dramatically at a given threshold (the state of the service may suddenly collapse, having been ‘tipped’ into a radically different regime).

- 2.11 Such is the complexity of natural systems that responses that appear linear from a distance almost certainly involve non-linear or threshold relationships at a finer scale. Nevertheless, some environmental assets show a relatively linear response to pressures (such as the quality of ground water in chalk aquifers responding to pesticide applications) while others exhibit one or more threshold responses (climate models suggest this is the case for the climate regulation service supplied by natural resource systems).

Figure 2.3: Environmental Limits and Thresholds

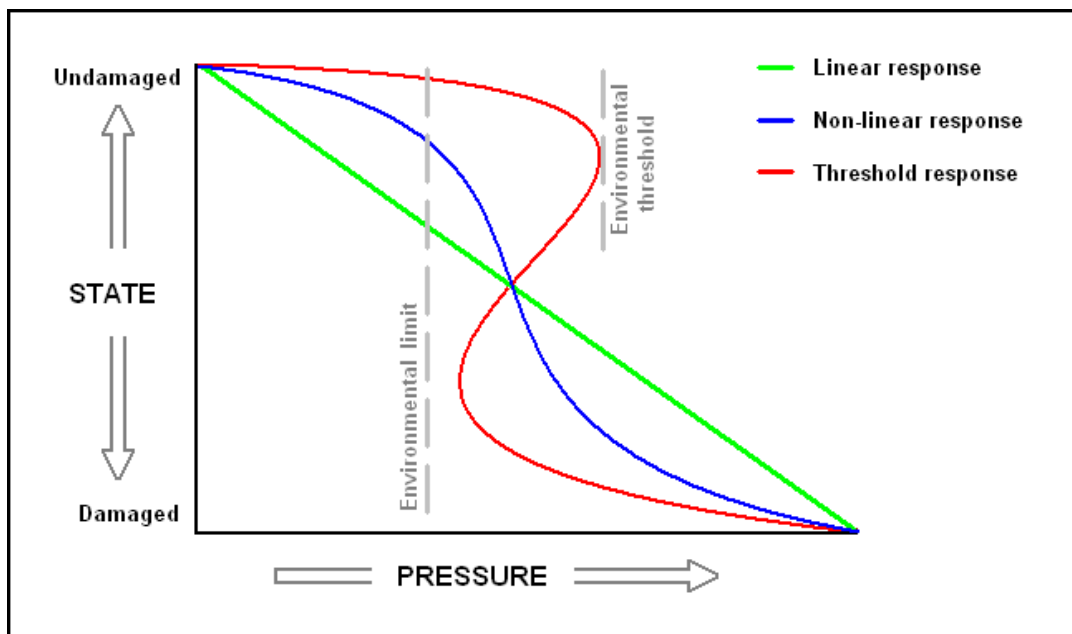


Figure adapted from Haines-Young et al, 2006.³

- 2.12 How environmental assets and services will respond to increased pressure is often difficult to predict. An asset that may have responded in a linear way until now may approach a threshold in future. The difficulty of predicting where thresholds lie means that it is often useful to apply a precautionary approach rather than assuming that it is acceptable to continue to pursue economic development right up to the point that it comes into contact with perceived environmental limits and thresholds since this would leave no room for uncertainty or error.

³ Haines-Young, R., Potschin, M. & Cheshire, D. (2006) Defining and Identifying Environmental Limits for Sustainable Development. A Scoping Study. Final Overview Report. Defra Project Code NR0102.

Box 2.2: The rationale for establishing an environmental limit

The rationale for establishing an environmental limit is that:

- the loss of the asset and associated services cannot be reversed nor (fully) compensated, or
- although the decline in the asset can be reversed there is a minimum requirement for that asset in order to provide an acceptable level of ecosystem services, which in turn means that further loss of the asset cannot be compensated.

Where the loss of natural capital and related services cannot be replaced or compensated through increases in other capital stocks (see the 'Four Capitals' model below), this will result in development that is unsustainable. The point at which this occurs is 'the limit'.

If this were not the case, and the environmental asset and related services could be replaced by spending money, then the decision on whether to continue to use environmental capacity would be a standard cost-benefit decision; do the benefits of using the environmental asset exceed the costs, including the cost of replacing the environmental asset, now or at some point in the future?

It is only the fact that the loss of environmental services cannot be replaced for a particular asset that renders standard cost-benefit analysis redundant, because no amount of money can compensate for the loss of the environmental asset and service. This is why the limit is so powerful – it says that no matter what the potential economic and social benefits might be from continuing to use the asset beyond the specified limit, these cannot be used to justify the further loss of the asset.

- 2.13 It may also be necessary to consider whether there is a need to make good past damage and restore ecosystem services that have been lost, damaged or eroded in the past. Two considerations are therefore important ingredients in determining where environmental limits should be set:
- What 'headroom' should be incorporated to provide the margin of safety required to guarantee to an acceptable level of confidence that environmental limits will not be breached?
 - What 'restorative action' is required to ensure progressively improving environmental conditions, particularly where environmental limits are already compromised.
- 2.14 In its purest sense, the most sustainable precautionary approach would be to pursue a policy direction and course of action that, over time, reduces the risk that environmental limits will be breached (e.g. building up of stocks of environmental assets). In practice, this is often not possible and trade-offs with the benefits and services provided by development may be necessary – the extent to which this is acceptable (taking into account who benefits and who loses out) will help to determine where the limits lie.

- 2.15 It should be noted that the ‘pressure’ placed on environmental assets may not always be linked to development or human induced at all, but can be entirely natural. These natural pressures can nevertheless be mitigated or exacerbated by human action. For example, the Earth’s climate is always changing and the physical and natural environment changes in response – the human-induced element relates to the speed and possibly direction of climate change. The coast of the East Midlands is naturally highly dynamic – this in turn is affected by direct human intervention, such as coastal development and investment in flood defences, and indirectly through sea level rises in response to human-induced climate change. Disease is common in natural systems – human alteration of natural systems (e.g. fragmentation, isolation, and reduced diversity and resilience of habitats as a result of built development, intensive agriculture, mono-culture forestry, and pollution) can make them more vulnerable to disease.

SCIENCE AND JUDGEMENTS

- 2.16 Predicting real-world responses to pressures on complex natural systems requires a high level of understanding of how these systems function. Imperfect knowledge is therefore often a constraint on the setting and measurement of environment limits and, as a consequence, limits are more often a policy construct that reflects the human benefits derived from ecosystem services.
- 2.17 The setting of environmental limits needs to be based on a sufficient scientific understanding of the environmental assets supplying (or supporting) the ecosystem service (including any threshold effects). Where this understanding is incomplete (as it will be in most cases) judgements are required on the public benefits derived from that service to come to a view on the acceptable risk to ecosystem services. The relative significance of the two types of evidence is likely to vary according to the nature of the service. Limits in respect of the water quality regulation service, for instance, are likely to rely more on the natural sciences whilst limits in respect of cultural services will draw more on an understanding of the values people attach to the services.

THE FOUR CAPITALS MODEL

- 2.18 We have established that the environment comprises a ‘stock’ of assets that provide life support systems and support economic activity. The stock of natural capital (environmental assets), whether regional or global, is in many instances finite. There are therefore physical limits to the use of the stock of such assets. If the services provided by the environmental asset are not threatened by current and planned levels of usage of the asset then it can continue to be used. This assumes that the relationship between the stock of the assets and the services provided is reasonably well understood.
- 2.19 If the services provided by the stock of environmental assets are threatened then economic growth relying on the continuing use of the asset becomes unsustainable or risks becoming unsustainable, depending on lags between changes in economic activity and changes in the stock of environmental assets. The stock of an environmental asset can therefore be understood in

terms of the amount of economic and social activity it can sustain, until limits are reached. It is important to note that the limit is not the disappearance of the asset but the point at which further use makes loss of the services it provides irreversible or otherwise unacceptable.

- 2.20 What is considered to be unacceptable may be based on scientific evidence of ecosystem failure. Where such evidence is contested or not available, then judgements will be required. These would need to include consideration of the extent of the remaining stock of the asset and its productivity; and the economic risks associated with a potentially premature limit to the use of the asset.
- 2.21 Inevitably these judgements will be contested and require negotiation, because of differing weights attached by different stakeholders to the costs and benefits resulting from a particular limit.
- 2.22 This conception has been formalised in the '**Four Capitals**' model of sustainable development⁴. This provides an operational definition of sustainable development as the provision of services and benefits that increase human well-being without causing a decline in capital stocks per capita. Capital stocks (assets) provide a flow of goods and services, which contribute to human well-being. More specifically, the four types of capital that sustain well-being have been defined as:
- **Manufactured (or man-made) capital**, broadly synonymous with built development and infrastructure.
 - **Natural (or environmental) capital** covering all forms of ecosystems and natural resources that provide services for social welfare.
 - **Human capital**, relating to the stock of human productivity potential of individual people based on their health, motivation, talents and skills.
 - **Social capital**, relating to the stocks of social trust, norms and formal and informal networks that people can draw upon to access resources, solve common problems and create social cohesion.
- 2.23 The capital stocks provide the capacity to meet human needs or increase quality of life, the 'development' part of sustainable development. Doing so sustainably requires that capital stocks per capita are maintained or increased over time.

THE NEED TO CONSIDER TRADE-OFFS

- 2.24 Inherent in planning and decision-making is the need to make choices. The most sustainable solutions are likely to be those that deliver benefits across all four capitals. For example, economic development or activity can provide an opportunity for environmental improvements, such as the creation of sustainable drainage systems rich in biodiversity as part of an overall development project, or investment in a new nature reserve might create

⁴ The Four Capitals model shares many similarities with Social Returns on Investment (SROI) methodologies. SROI is an analytic tool for measuring and accounting for a much broader concept of value. It incorporates social, environmental and economic costs and benefits into decision making, providing a fuller picture of how value is created or destroyed. (See <http://www.neweconomics.org/projects/social-return-investment>)

opportunities to enhance the visitor economy and local jobs. However, such 'win-wins' will not always be possible, and even where they are, there will always be differences in the extent to which each of the four capitals gains.

- 2.25 It is important, therefore, to identify potentially significant trade-offs between types of capital from development, where development increases some forms of capital but leads to a decline in others. Because there are limits to the extent to which one type of capital can be used to substitute for a different type of capital these trade-offs can lead to a decline in the overall stock of capital and unsustainable development. Assessing the nature of trade-offs from development is therefore necessary in order to determine what is and is not going to be acceptable. Where trade-offs are identified, the aim should always be, in the first instance, to think of alternative ways that such trade-offs might be avoided; and where they cannot be avoided, how the significance of trade-offs can be reduced, for example through mitigation and and/or compensation.

Box 2.3: Trade-offs do not automatically mean the environment loses out

In the past there has been a presumption, often supported by evidence, that the environment has suffered most in the pursuit of economic development – sometimes coined as 'the economy only has to win one battle to make progress, whereas the environment has to win every war just to stand still'. But it should not be presumed that a trade-off means that it will be natural capital that declines. Indeed, it may be because environmental limits have been identified, that economic development that might otherwise have taken place is precluded from happening (with consequent loss of the potential to increase manufactured capital).

Natural capital should always be given due weight when considering trade-offs but it is equally important to consider the social and economic consequences of not pursuing economic development. For example, the impact on social capital of not delivering much needed homes may well be of greater importance than maintaining natural capital, particularly to those households and families most affected who are often the most vulnerable members of society. In many situations, the key will be to deliver the housing and at the same time improve local environmental quality as part of the development package.

- 2.26 The use of one type of capital to increase another type of capital (a trade-off) occurs constantly, everywhere; and is usually associated with a net increase in capital stocks. However, over long periods of time, these trade-offs have tended to reduce the total stock of natural capital and the provision of ecosystem services. This does not need to be the case (see **Box 2.3**).
- 2.27 Investment in environmental assets as a contribution to maintaining minimum levels of ecosystem services, or enhancing existing services even where these are above some minimum acceptable level has tended to be inadequately recognised in investment decisions for a variety of reasons, including:

- Externalities (e.g. costs of environmental damage not borne by those causing it).
- The difficulty of monetising some environmental benefits.
- The long time taken for the consequences of lack of investment to become apparent.
- The often long payback period (which can be well in excess of political and funding cycles) coupled with difficulty in calculating returns on investment.
- The difficulties of comparing returns on investment in the environment, compared to investment in other capitals (especially manufactured capital).

2.28 Where degradation of an environmental asset is such that the level of ecosystem service delivery is approaching (or has already passed) a critical threshold further depletion of natural capital is not sustainable, regardless of the scale of short term economic or social returns it may provide. In other words, the normal and multiple uses of one capital to produce other capitals (trade-offs) become environmentally unsustainable because the production of other capitals from the use of environmental assets cannot provide a set of services that can compensate for the loss of ecosystem services; other forms of capital cannot substitute the loss of natural capital, and declining capital stocks result.

2.29 It is possible, however, to increase environmental capacity and restore ecosystem services by restoring a degraded environmental asset where the loss or change is reversible. Such investment has the effect of lowering the environmental limit. It is also possible to work more productively within the existing environmental capacity provided by environmental assets by identifying alternative, less damaging forms of development, and thus changing the nature of the trade-offs. This has the effect of delaying the time at which the limit is reached.

2.30 In some cases, it is the risk that the loss of environmental assets is irreversible (or only partly capable of compensation) that provides the rationale for environmental limits, such as the loss of ancient woodland. In other cases, a decline in the stock of an environmental asset can be reversed, but it is the loss of ecosystem service that is the critical factor, and that requires a *de minimis* level of the environmental asset.

2.31 From the discussion above, it is apparent that in order to determine whether a particular policy approach to development is environmentally sustainable and to understand the merits of allocating resources to one form of development relative to another, it is vital that policymakers identify where acceptable environmental limits exist and that they fully understand the economic, social and environmental effects of alternative policy approaches. The Four Capitals model, trade-off analysis and other elements of this guidance are tools to support decision makers in these tasks.

3 Introducing the environmental limits method

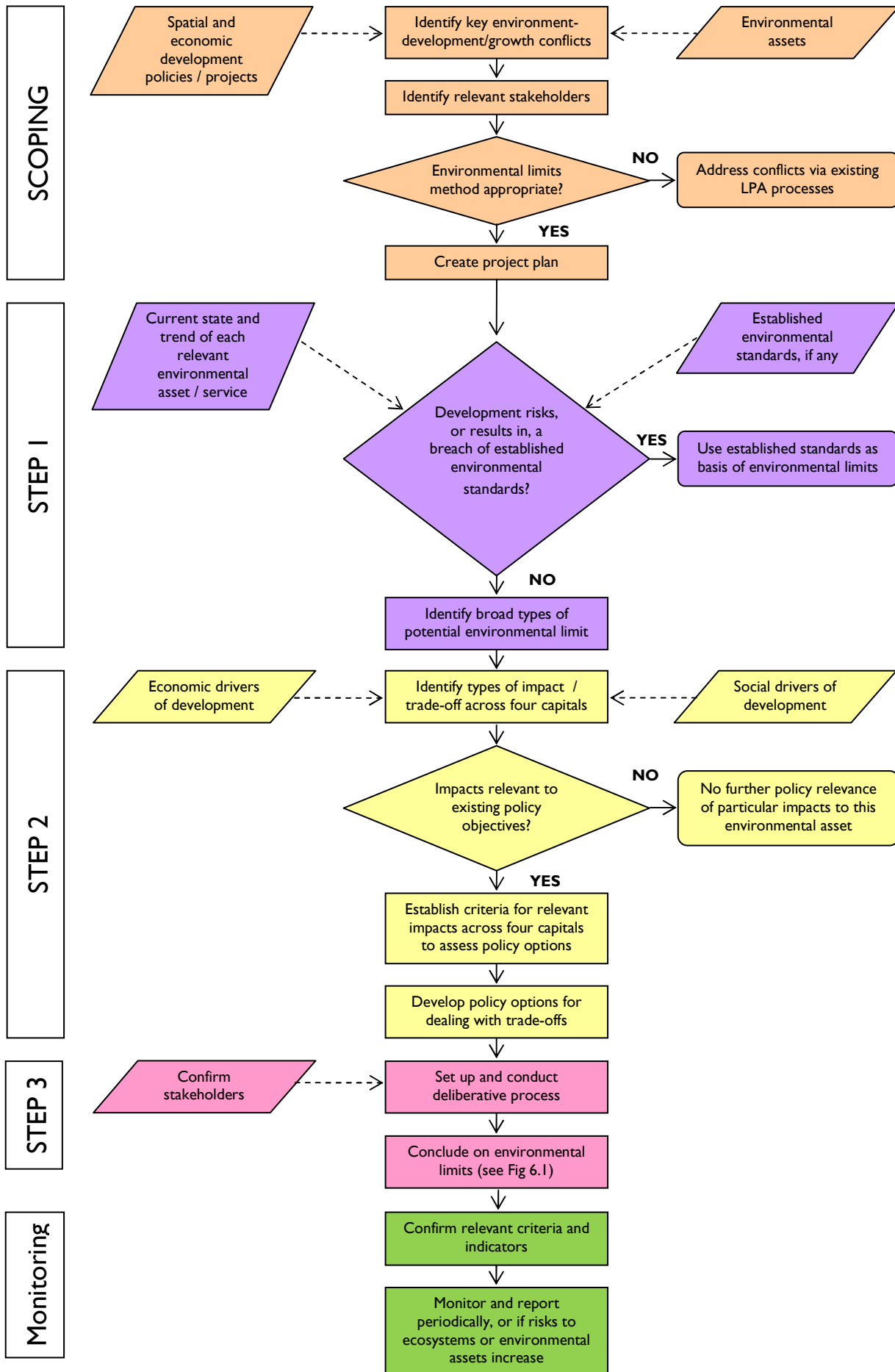
INTRODUCTION TO THE METHOD

- 3.1 This guidance is targeted at local policy makers and is intended to help resolve difficult issues relating to the balance of development and environmental protection, especially at the level of Local Development Frameworks (LDFs) and in preparing sub-regional or regional proposals for strategic development projects.
- 3.2 The approach to establishing environmental limits is based on evidence gathering, analysis, and importantly stakeholder discussion and negotiation. The choice of relevant stakeholders is therefore critical to the success of the process, but will depend on the particular development and environmental issues involved – the stakeholders are those with an interest in the ‘limit’, either because of their role or responsibilities, or because of the effects (whether positive or negative) that the setting of a limit might have on furthering their interests.

THE METHOD: AN OVERVIEW

- 3.3 The method for applying environmental limits in the East Midlands comprises three core steps, starting with gathering evidence, through to analysis, and finally to determining environmental limits (see **Figure 3.1**). Before applying the method, its relevance and relevant parameters need to be established (scoping). Once the exercise is complete, the outcomes will need to be kept under review (monitoring and evaluation):
- **Scoping:** Setting out in broad terms the relevant issues and identifying the relevant stakeholder community in order to confirm the relevance of the approach.
 - **Step 1:** Reviewing the environmental asset(s) and ecosystem services.
 - **Step 2:** Identifying the relationship between economic and social development and threats to environmental assets.
 - **Step 3:** Assessing and agreeing environmental limits.
 - **Monitoring and evaluation:** Monitoring trends and periodically evaluating whether the limit needs to be revised.

Figure 3.1: The 3-step method for establishing environmental limits



- 3.4 The method can be applied in two ways:
- On an **environmental topic** basis – to determine the extent to which a specific aspect of the environment may be nearing environmental limits – this may be particularly relevant to those environmental topics that require a strategic approach (e.g. carbon emissions which have a global context; water supply which needs to be considered in terms of water resource management zones).
 - On a **geographical** basis – to understand how a suite of environmental limits might apply to a particular location, suitable at varying scales of analysis, for example at a sub-regional, local authority, settlement or neighbourhood level.
- 3.5 If there is a known issue with respect to the environment, then it can sometimes be useful to focus on this environmental topic in order to make best use of research effort, time and resources.
- 3.6 In many instances there are close links between environmental topics, which will require an understanding of the relationship between them. For example, landscape, the historic environment, soils and biodiversity are closely linked.
- 3.7 The environment does not respect administrative boundaries, and therefore there will sometimes be a need for a collaborative effort between local authorities to produce meaningful outcomes.
- 3.8 Sections 4-6 of the guidance set out in detail the three step approach.

LINKS WITH OTHER APPRAISAL AND ASSESSMENT REQUIREMENTS

- 3.9 The environmental limits method is a tool to help local policy makers come to decisions about where environmental limits should be set when determining where, how much, what type and in what form development should take place.
- 3.10 It has strong links with other appraisal and assessment requirements that are required by legislation and/or policy, and will be useful in providing information, analysis and an audit trail to populate these other legal requirements, which include:
- Strategic Environmental Assessment
 - Sustainability Appraisal.
 - Habitats Regulations Assessment.
 - Equality Impact Assessment.
 - Health Impact Assessment.

Strategic Environmental Assessment/Sustainability Appraisal

- 3.11 Strategic Environmental Assessment (SEA) is a requirement for a wide range of plans and programmes prepared by public bodies and statutory undertakers (e.g. utilities companies) in accordance with the Environmental Assessment of Plans and Programmes Regulations 2004. Sustainability

Appraisal (SA) is a requirement under the Planning and Compulsory Purchase Act 2004 for Local Development Documents (LDDs).

- 3.12 SEA (which focuses on environmental impacts) is often absorbed within SA (which also takes into account social and economic impacts). For LDDs, the Government advises that SEA should be incorporated into SA.
- 3.13 Schedule 2 of the SEA Regulations requires that the likely significant effects on the environment of a plan or programme should be reported, including short, medium and long-term effects, permanent and temporary effects, positive and negative effects, and secondary, cumulative and synergistic effects, on issues such as:
- Biodiversity.
 - Population.
 - Human health.
 - Fauna.
 - Flora.
 - Soil.
 - Water.
 - Air.
 - Climatic factors.
 - Material assets.
 - Cultural heritage, including architectural and archaeological heritage.
 - Landscape.
 - The inter-relationship between the issues above.
- 3.14 In order to determine what constitutes a 'significant effect', Schedule 1 of the Regulations sets out a series of criteria, which include the characteristics of the effects and of the area likely to be affected, including the value and vulnerability of the area likely to be affected due to (amongst other factors) exceeded environmental quality standards or limit values.
- 3.15 The SEA Regulations also require the consideration of the likely effects on the environment of 'reasonable alternatives' to the plan or programme, and also to ensure that consultation bodies and the public consultees are given 'an effective opportunity to express their opinion'.
- 3.16 Whilst not fulfilling all the statutory requirements of the SEA Regulations, the environmental limits method can play an important role in contributing to and informing those elements described above.

Habitats Regulations Assessment

- 3.17 Regulation 5(55) of The Conservation (Natural Habitats, &c.) (Amendment) Regulations 2007 requires that a plan-making authority must consider whether their land-use plan (which includes all LDDs) is likely to have a significant effect on the Natura 2000 network of European protected sites. If any significant effect is not directly connected with or necessary to the

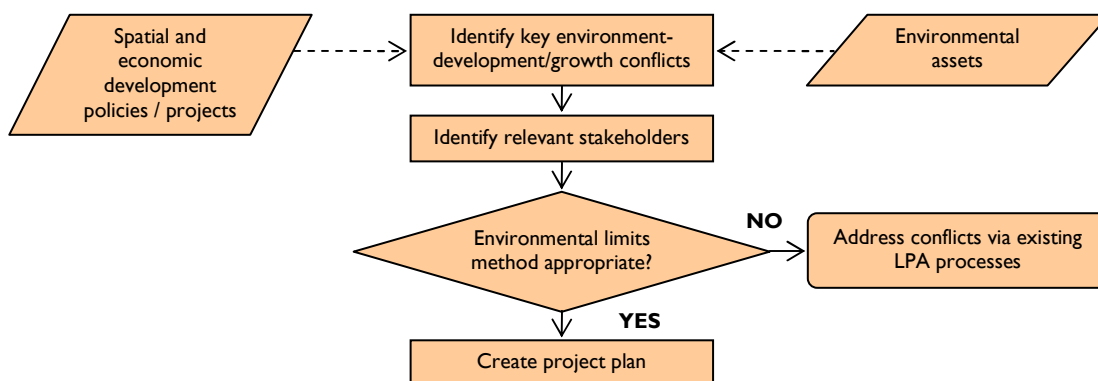
management of the site, an appropriate assessment must be made of the implications for the site in view of that site's conservation objectives, undertaking any necessary consultation.

- 3.18 The process by which the impacts of a plan or programme are assessed against the conservation objectives of a European site is known as Habitats Regulations Assessment (HRA). The HRA determines whether there will be any likely significant effects on any European site and, if so, whether these effects will result in an adverse effect on its integrity.
- 3.19 In the UK, Government advice is that European Sites should be interpreted as including Special Areas of Conservation (under the Habitats Directive, 92/43/EEC) Special Protection Areas (under the Birds Directive, 79/409/EEC), and Ramsar sites (under the Ramsar Convention, to which the UK is a signatory).
- 3.20 Given the strict protection afforded to such sites, they form an important consideration in the environmental limits method.

Equality Impact Assessment/Health Impact Assessment

- 3.21 Equality Impact Assessment (EqIA) and Health Impact Assessment (HIA) are closely related. Local authorities are required, under the Race Equality Scheme, Gender Equality Scheme, and Disability Equality Duty, to consider the impacts of their policies on certain groups, in order that no discrimination should occur on the grounds of:
- Age.
 - Sexuality.
 - Faith or belief.
 - Race.
 - Ethnicity.
 - Disability.
 - Gender.
- 3.22 HIA ('human health' also needs to be covered in SEA/SA) specifically focuses on health issues, and the determinants of health, such as poverty, unemployment, poor housing, crime, poor educational achievement, the quality of local environments, etc.
- 3.23 Equalities and health issues are important factors in the 'social capital' component of the Four Capitals Model. The environmental limits method can be used to address such issues when negotiating environmental limits and potential trade-offs.

4 Initial scoping



Purpose

The key term during Initial Scoping is **'relevance'**: to set out in broad terms the relevant issues and to identify the relevant stakeholder community; and then to confirm the relevance of the approach.

- 4.1 Local policy makers will rarely be starting with a blank sheet. From evidence gathering in the preparation of LDFs, annual monitoring reports, and consultations and representations from stakeholders, most local policy makers will have a pretty good idea of where the 'crunch points' are when it comes to deciding what environmental limits to development are likely to need more detailed examination.

Who to involve in the Initial Scoping

- 4.2 The Initial Scoping stage should therefore be a rapid exercise. It should not be used to gather new information, but should draw on existing knowledge, experience and expertise to decide what issues are most likely to need addressing, who will need to be involved, and whether this 'environmental limits' method is the most appropriate approach to resolving the issue. This may most usefully be done by having a short 'brainstorm' meeting involving officers with different but relevant remits, which could also include outside information holders such as the Environment Agency, English Heritage and Natural England, for example where there are potential gaps in knowledge. Alternatively, it may be quicker and easier to make personal contact with such bodies to establish an initial view.

Tasks in Initial Scoping

- 4.3 The first task in Initial Scoping is to define the specific development pressures and environmental assets that are the focus of interest and for which an environmental limit is required in order to frame subsequent development choices.

Strategic questions

1. What development policies and projects are giving rise to possible concerns for the environment?
2. What features of the environment are likely to be affected (directly and indirectly) by development?

- 4.4 Next, the planning context and geographic scope for environmental limits need to be defined.

Strategic questions

1. What is the planning context for the development and the application of the environmental limit?
2. What is the likely geographic scope of the environmental limit (local area within a local planning authority, the whole local planning authority, sub-regional level, including cross-regional boundaries)?

- 4.5 The relevant stakeholder community then needs to be defined.

Strategic questions

1. What is the relevant constituency of interest and the range of stakeholder groups that should be involved, given the answers to the above questions?
2. Are there established representative bodies – statutory or non-statutory – reflecting the range of stakeholders, or are there additional stakeholders who have no representative voice but whose views must be heard?
3. Will they all participate, and is there a collective willingness to discuss and negotiate the establishment of an environmental limit that will frame current and future development proposals?

- 4.6 Interest in being involved is most likely to come from environmental bodies, both statutory and voluntary, and special interest groups. However, for the discussions and negotiations to be meaningful, other stakeholders with an interest – including the development industry and other businesses – will need to be identified and encouraged to become involved. One way of achieving this will be to make clear that if their voice is not heard, then their interests are likely to be given less weight in the negotiations, to the potential detriment of the businesses and organisations concerned.

- 4.7 Where there is doubt as to the composition of the stakeholder group, the advice is to have too broad and diverse a group than one that is too narrow in scope such that issues that come up are unable to be fully debated. Obviously this requires an initial scoping of the likely range of topics and issues, generated by the development issue.

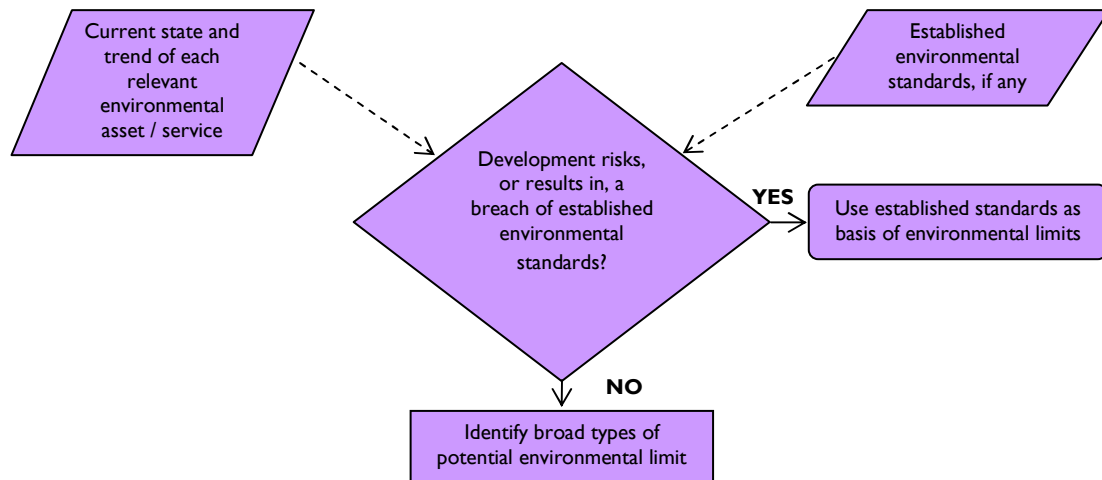
- 4.8 Finally, the approach needs to be confirmed as the one that is most suited to resolving the issue in question.

Strategic questions

1. Is it worth adopting the approach or should the issue be left to the existing development plans and decision-making process of the local planning authority?
2. Are the resources available to use the approach in order to achieve meaningful outcomes?

- 4.9 Should the Initial Scoping exercise result in a decision that the environmental limits method should be used, a project plan should be produced. This should set out the various stages of work, reporting lines and responsibilities, who needs to be involved at what stage (both internal to the local planning authority and external stakeholders and data holders), key contacts, estimated timelines and resourcing, and risk assessment should things not go according to plan. The project plan should also describe how the approach will be used in the consultation process, how it will assist with the development of choices and options to inform policy or plan preparation, and how it will feed into other assessment procedures such as SA/SEA.
- 4.10 You will then be in a position to move to the environmental limits method proper.

5 Step 1: Review of the environmental asset(s) and ecosystem services



Purpose

To understand the nature of the environmental asset(s) and related services:

- Define the types of asset for which a limit is sought, and the related geographic scope taking into account direct and indirect impacts of development.
- Assess the ecosystem services and related indicators.
- Map assets/services across the study area.

Strategic questions

1. What are the environmental assets and their related services and benefits that are particularly relevant to the assessment?
2. What are the trends in the stock of the asset and levels of ecosystem services?
3. Are there any relevant links with services and benefits provided by other environmental assets?
4. What should be considered to be the minimum acceptable level of provision of ecosystem services, and hence the required environmental limit, on the basis of established environmental objectives and existing scientific information?
5. Do the identified trends suggest that this level is likely to be reached or has already been exceeded?

IDENTIFYING RELEVANT ENVIRONMENTAL ASSETS, SERVICES AND BENEFITS

What are the environmental assets and their related services and benefits that are particularly relevant to the assessment?

- 5.1 From the Initial Scoping, a good idea should have been established of the environmental assets that are likely to be affected by the policies or projects under consideration.
- 5.2 It may not be necessary to identify all environmental assets – just those that are likely to be affected. For example, if water resources are not an issue in the area, and therefore unlikely to be a critical factor in the decision-making process, then there is little point in including them in the assessment.
- 5.3 A useful starting point is to map the environmental assets that are likely to be relevant to the assessment. Many local authorities already have comprehensive Geographical Information Systems (GIS) for this purpose, and there is also a wide range of digitally mapped datasets available at the national level, or through statutory agencies such as the Environment Agency. Sometimes licence agreements will need to be signed to use these data sources.
- 5.4 Examples of mapped environmental assets for Housing Market Areas (HMAs) in the East Midlands are provided in **Volume 2**.
- 5.5 Mapped data will not cover all aspects of the environment that may be relevant to the assessment. For example, designated assets – Areas of Outstanding Natural Beauty, Sites of Special Scientific Interest, Scheduled Monuments, etc – are readily available. However, environmental character and quality are often not easily available, or have not been mapped, particularly at the local level. Landscape character assessments and historic landscape characterisation (e.g. Lincoln Townscape Assessment) can be useful in describing the character of different character areas and the pressures on them. These are value-free assessments, but can be utilised for sensitivity studies to help inform development options.
- 5.6 Where information is not available, this needs to be noted and considered for further study where relevant.
- 5.7 The East Midlands is fortunate in having a number of detailed studies of aspects of the environment. For example, the environment and natural resources section of the East Midlands Regional Economic Strategy evidence base provides a comprehensive analysis of the state and trends in the environment⁵, the public benefits mapping tool provides a useful indicator of where investment in the environment is likely to deliver greatest benefits⁶, and a detailed regional landscape character assessment is also available⁷.
- 5.8 With the demise of regional planning, sub-regional approaches will become more important. For example, Derbyshire County Council has developed a

⁵ http://www.emda.org.uk/research/documents/eb2010/CHAPTER_7_Environment_FINAL.pdf

⁶ http://www.riverneneregionalpark.org/images/PDF_Files/Green_Infrastructure_Network/Links/GIMASTERI_13.pdf

⁷ http://www.naturalengland.org.uk/regions/east_midlands/ourwork/characterassessment.aspx

methodology for identifying 'Areas of Multiple Environmental Sensitivity' (AMES) based on the county landscape character assessment, historic landscape character, historic environment records, and biodiversity datasets.

- 5.9 Once relevant environmental assets have been identified and mapped, the services and benefits they provide need to be established. It may be useful to use the Millennium Ecosystem Assessment categorisation of benefits and services – provisioning, regulating, cultural, supporting – to differentiate why the asset is important.
- 5.10 To assist in this process, **Volume 2** provides some basic information on a range of environmental topics. A preliminary analysis of the environmental limits which may be of greatest concern in each HMA of the East Midlands is provided in **Volume 2**.

Box 5.1: Environmental topics useful information

Included in Volume 2 is information that will prove useful when considering environmental limits. The environmental topics are:

- Air.
- Climate.
- Flood risk.
- Water quality.
- Water resources.
- Soils, agriculture and woodland.
- Habitats and species.
- Historic environment.
- Landscape.

For each topic, the following information is provided:

- Why it is important.
- Relationship with economic development.
- Standards and targets.
- Indicators and data sources.

What are the trends in the stock of the asset and levels of ecosystem services?

- 5.11 Where possible, trend information should be sought in relation to the environmental assets identified as being relevant, and their related services and benefits. For example:
- Is water quality getting better or worse?
 - Is tranquillity (a key component of landscape character) being eroded or being maintained?

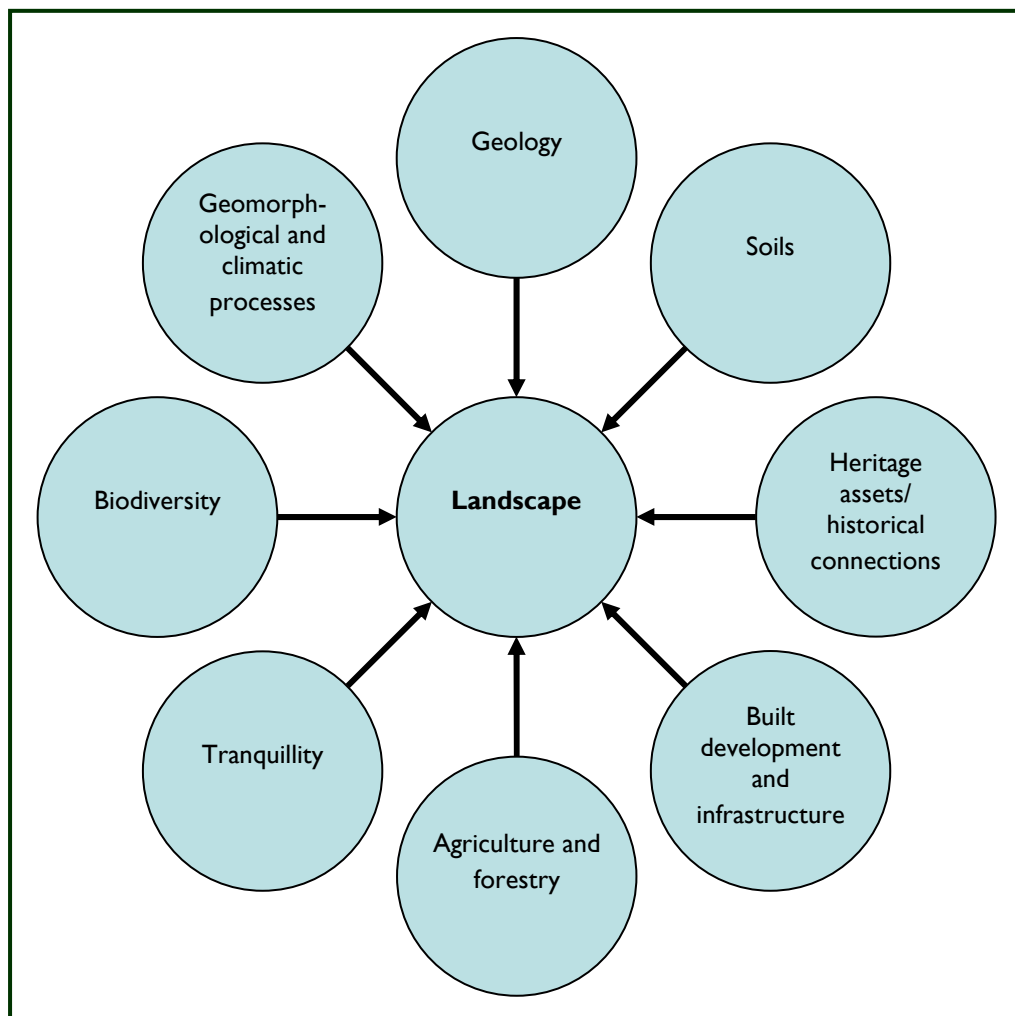
- Are carbon emissions increasing or reducing?

5.12 Trend information will be important in deciding, later on in the assessment, whether limits could be compromised in the future, even if they are not now.

Are there any relevant links with services and benefits provided by other environmental assets?

5.13 The final part of the assessment of assets, services and trends is to identify linkages between them. For example, landscape character reflects the coming together of a whole range of environmental assets, including geology, soils, the water environment, biodiversity, heritage, and built development (see **Figure 5.1**). Similarly, some heritage assets provide habitats contributing to biodiversity, and some species rich meadows are dependent upon seasonal flooding.

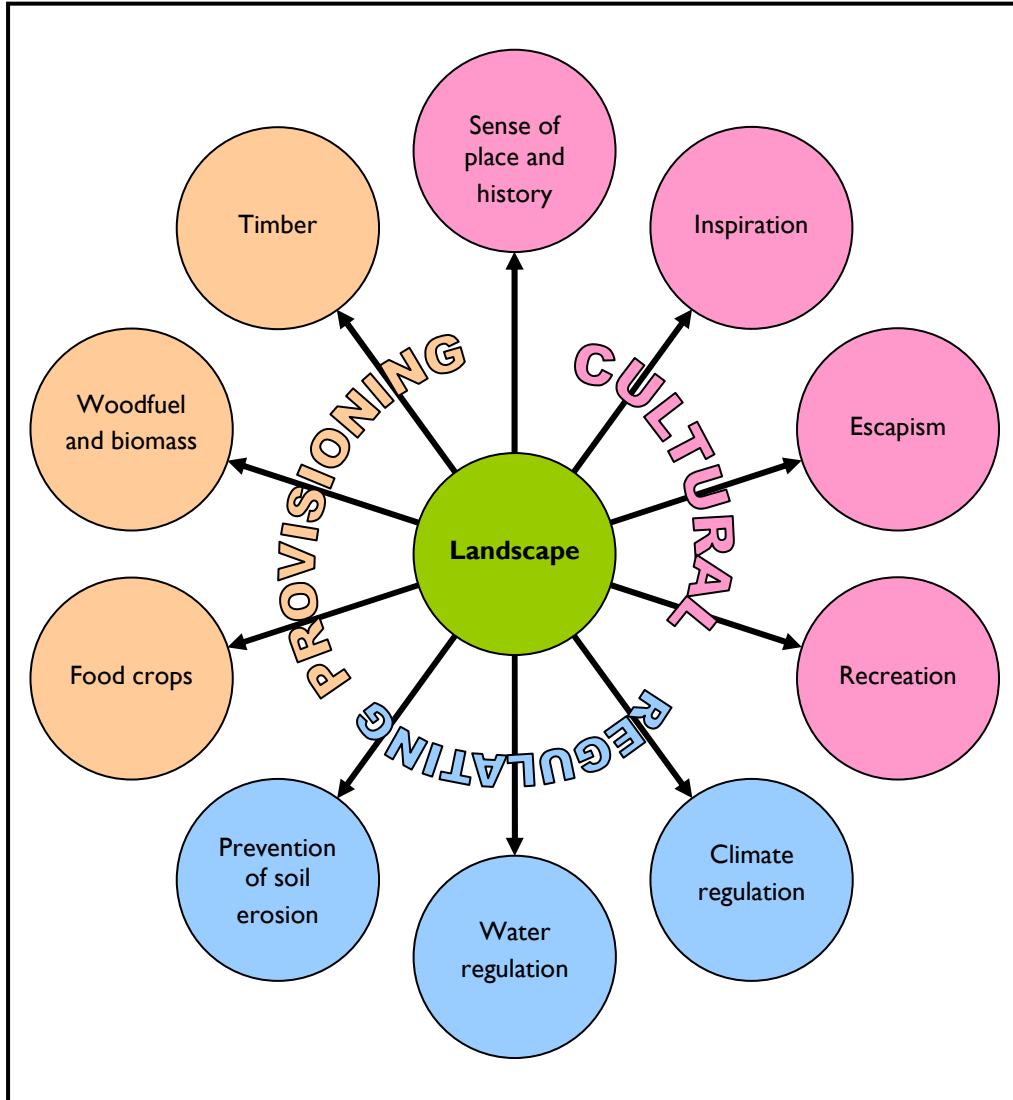
Figure 5.1: Understanding linkages between environmental assets using landscape as an example



5.14 Linkages are important because of the need to take into account indirect or ‘knock-on’ effects of decisions. The loss of an ancient woodland to development, will have knock-on effects for landscape, biodiversity, archaeology, and even potentially air quality and carbon sinks. This is the

whole concept behind ecosystem services – that the environment is a ‘system’ where an impact on one component can have quite unintended effects elsewhere if not thought through carefully. A single environmental asset may provide for a stream of services and benefits (see **Figure 5.2**).

Figure 5.2: Examples of ecosystem services provided by landscape



TYPES OF ENVIRONMENTAL LIMIT

What should be considered to be the minimum acceptable level of provision of ecosystem services and hence the required limit on the basis of established environmental objectives/existing scientific information?

- 5.15 The principle behind the environmental limits method is that many environmental limits need to be determined through discussion and negotiation. Often there is some form of standard in relation to development (such as building regulations or design standards) or some means of control over the type, scale and/or location of economic and social development.

- 5.16 In many instances, the negotiations will have already taken place at an international and national level and limits set down, which can only be compromised in exceptional circumstances. For example, there are standards in relation to water quality, air quality, and internationally designated biodiversity sites. To breach such standards often requires special dispensation.
- 5.17 Even where an environmental standard exists that represents a limit, as with water quality, there will still be a need for further policy decisions to interpret and respect the environmental standard.

Worked Example: Water Quality – Establishing Limit Types

What type of environmental limit should be considered (e.g. standards, location control on development)?

Water quality is regulated under the Water Framework Directive (WFD). There is therefore already an established set of standards that are relevant in establishing an environmental limit. The WFD requires that **there should be no further deterioration in water quality in water bodies**. Note that quality is measured using a number of indicators and that the reference point is the quality recently assessed under the WFD. It does not refer to quality levels at any point in the past. The extent that water quality and associated ecosystems have deteriorated against some reference point in the past would not be taken into account. To reverse any historical trend of declining quality would require a separate policy option.

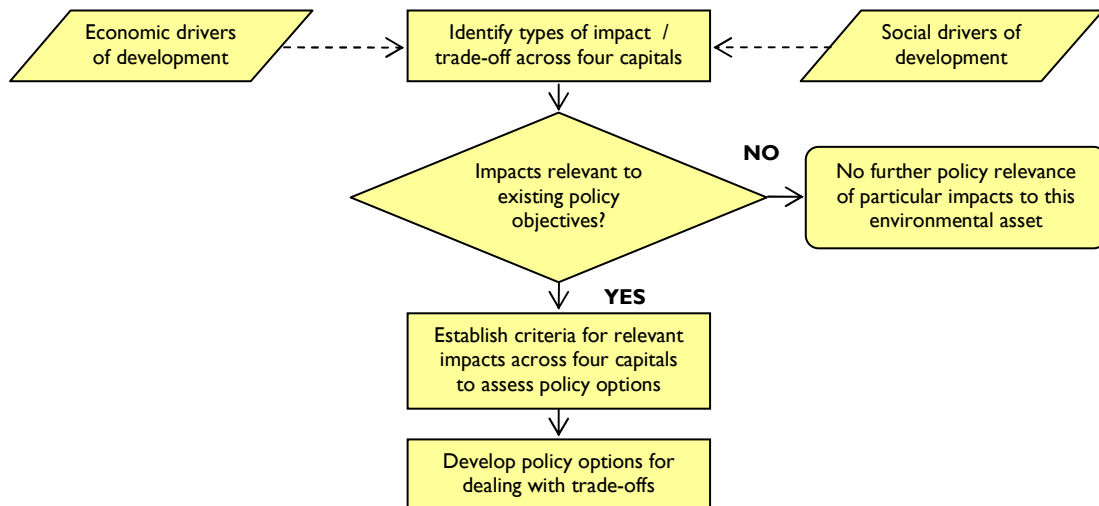
This limit in turn has implications for managing development. For example it may be more sustainable to limit development in certain locations to avoid the costs and environmental impacts of higher treatment levels. But of course this may have further knock-on effects on the range of capitals (depending on where the development is redirected).

- 5.18 In other instances, targets have been set, although these are not always backed up by legislation. Examples include Biodiversity Action Plan targets, carbon reduction targets (which are set down in law for the UK as a whole but not for individual local authorities). Some local authorities may have set their own targets to complement those that apply at an international or national level.
- 5.19 All of the above are important factors that need to be taken into account in determining environmental limits. Examples are given for each of the environmental topics in **Volume 2**.
- 5.20 In many instances, however, standards or targets will not have been set for an environmental asset/service at the local level even though international or national targets exist. In these cases, limits will generally need to be based on negotiation, and judgements following the steps described below.

Are the identified trends suggesting this level is being reached or already exceeded?

- 5.21 Having established, where possible, potential environmental limits, the spatial and trend based data needs to be analysed to determine whether there is a risk that limits could be in danger of being breached.
- 5.22 Where there are established targets and standards, and monitoring information, this will be relatively easy to determine. For other environmental assets and services, a risk based approach may need to be adopted. For example:
- Declines in populations of farmland and woodland birds may indicate that habitats are under threat of loss or decline.
 - Time-series tranquillity mapping may show that the essential qualities of some rural landscapes are being eroded.
 - Increases in the numbers of historic assets listed in heritage at risk registers may be indicative of an incremental loss or damage to cultural heritage.
 - An increase in the number of designated Air Quality Management Zones is likely to suggest that pollution from traffic is getting worse.
 - The number of drought orders (or hosepipe bans) may suggest that the water supply-deficit balance is nearing critical a point.
- 5.23 Where there are a number of indicators pointing in the same negative direction in a particular location, this could well be indicative of widespread environmental stress and the potential breaching of critical thresholds.
- 5.24 Step 2 seeks to examine the relationship between economic and social development and potential breaching of environmental thresholds.

6 Step 2: The relationship between economic and social development and threats to an environmental asset



Purpose

To understand the nature of development that threatens the asset and to scope out the relevant issues that need to be considered in establishing the limit:

- Review major development objectives, policies and potential threats.
- Define potentially significant trade-offs between development and protection of environmental assets as the basis of assessment criteria.
- Consider ways (policy options) in which the trade-offs might be avoided or mitigated.

Strategic questions

1. What are the economic and social drivers that affect the environmental asset and what are the indicative TYPES of benefits and costs of these drivers across each of the four capitals?
2. What are the potential trade-offs and are there locations where these are particularly relevant?
3. What are the impacts, relevant policy objectives and hence assessment criteria for each of the four capitals in order to determine what is acceptable or unacceptable with respect to the identified trade-offs?
4. What policy options are there for dealing with the trade-offs, including investment in natural capital?

GENERAL APPROACH

- 6.1 The approach to this step is intended to identify:
- The nature of trade-offs, defined in terms of the broad types of costs and benefits across the four capitals, that give rise to concerns over the current/future loss of the specified environmental asset (e.g. water quality, water supply, biodiversity).
 - The relevant criteria for assessing the establishment of an environmental limit, based on the identified types of impact.
 - The types of policy responses that might be considered to avoid, manage and reduce the scale of losses associated with the trade-off.

ESTABLISHING THE NATURE OF TRADE-OFFS

- 6.2 The threat to natural capital (and to policy objectives concerned with its protection and enhancement), and hence the potential requirement for an environmental limit stems from various forms of economic and social development. Economic and social development is undertaken to meet the needs and requirements of society. These are reflected in public policy objectives (for example in relation to employment, housing and social cohesion) that seek to ensure that development takes place to meet these needs and requirements.
- 6.3 This step seeks to identify, in the context of a concern for a particular environmental asset, the related drivers of economic and social development and their impacts on the four capitals including natural capital. These impacts then become the relevant issues to examine when seeking to establish an environmental limit for the particular environmental asset and the services and benefits that it provides. Identified impacts should be checked for their relevance to the negotiation, by ensuring that there are policy objectives establishing the desired outcome. Examples might include:
- If an urban extension is needed to meet housing need and to deliver employment land, what services and benefits provided by potential greenfield sites might be lost or damaged (e.g. landscape, biodiversity, recreation, agricultural land, etc.), and who would be affected?
 - If a new science park is proposed on a brownfield site in an urban area, what and who is likely to be affected during both construction and operation, whether positively or negatively – such as local businesses and construction companies, transport providers, neighbouring communities, local heritage assets and unique species associated with the brownfield site?
 - If an impact of development is an effect on freshwater fish stocks and hence on angling, is change in the type/frequency of angling of policy interest?
- 6.4 The intention is **NOT** to quantify these impacts at this stage, but to establish the **TYPE OF IMPACTS**, whether they are **RELEVANT** to policy objectives and the particular economic and social **ACTORS** affected.

6.5 **Figure 6.1** illustrates at a very broad brush level the range of drivers associated with population and household growth and the indicative types of impact across the four capitals. When considering development, in many instances the drivers and related impacts for manufactured, human and social capital are likely to be similar to those described in Figure 6.1. The challenge is to determine what is and what is not acceptable with respect to the outcomes that result.

Figure 6.1: General Description of Drivers of Economic and Social Development and Related Impacts

Green = benefits; **Red** = costs **Bold italics** = environmental assets/resources that could be subject to environmental limits negotiations

Impacts of:	On objectives for increasing stocks of capitals:			
	Manufactured capital	Human capital	Social capital	Natural capital
Driver: Population growth and household formation Resulting in: New housing development	Increase in housing stock	Accommodation for population with their skills and talents	Improve social cohesion by meeting housing needs	Consumes natural resources during both construction (<i>water, minerals, land, energy</i>) and operation (<i>water, energy</i>). Can lead to loss of <i>habitats, heritage assets, landscape</i> and <i>visual impacts</i> , pollution to <i>air</i> and <i>water</i> . Generates <i>waste</i>
		Health and well-being during construction	Some forms of housing exacerbate social exclusion	Replacement housing can be more <i>energy</i> efficient New housing can provide new <i>habitats</i> if well designed Can restore contaminated/ degraded <i>land</i>
Driver: Population growth and increased consumption, increases in productivity Resulting in: Increased economic output and development	Increase in business space and its productive capacity to deliver goods and services	Creation of jobs Possible skills development Improved health and well-being	Employment growth can support social cohesion, with reduced levels of inequality, crime etc.	Consumes natural resources during both construction (<i>water, minerals, land, energy</i>) and operation (<i>water, energy</i>). Can lead to loss of <i>habitats, heritage assets, landscape</i> and <i>visual impacts</i> , pollution to <i>air</i> and <i>water</i> . Generates <i>waste</i>
		Health and well-being during construction	Historically, job creation has not benefited those who need it most – inequality has increased	New economic development can provide new <i>habitats</i> if well designed. Can restore contaminated/ degraded <i>land</i>
Driver: Population growth and household formation; renewal of urban fabric Resulting in: Increased provision of social infrastructure	New, expanded or improved social infrastructure (e.g. schools, colleges, hospitals, healthcare, local authority service provision, places of worship, entertainment, etc.)	Creation of jobs Skills development Improved health and well-being	Social infrastructure supports social cohesion and helps to meet the needs of all but especially the most vulnerable	Consumes natural resources during both construction (<i>water, minerals, land, energy</i>) and operation (<i>water, energy</i>). Can lead to loss of <i>habitats, heritage assets, landscape</i> and <i>visual impacts</i> , pollution to <i>air</i> and <i>water</i> . Generates <i>waste</i>
		Health and well-being during construction		Replacement infrastructure can be more <i>energy</i> efficient New social infrastructure can provide new <i>habitats</i> if well designed. Can restore contaminated/ degraded <i>land</i>
Driver: Population growth and increased economic activity Resulting in: Demand for new and improved utilities and transport infrastructure	New, expanded or upgraded transport, energy, water supply and treatment, waste management infrastructure	Assured access to basic needs (e.g. water, heat and light) Improved personal mobility	Improved public transport provision can meet current unmet needs	Consumes natural resources during both construction (<i>water, minerals, land, energy</i>) and operation (<i>water, energy</i>). Can lead to loss/fragmentation of <i>habitats, heritage assets, landscape</i> and <i>visual impacts</i> , pollution to <i>air</i> and <i>water</i> .
		Health and well-being during construction Possible impacts on health from increased traffic (noise, air quality)	Can lead to severance of communities	Can encourage a switch to renewable <i>energy</i> off-setting <i>carbon emissions</i> Improved public transport services can offset <i>carbon emissions</i> , improve <i>air quality</i> Reduces environmental impacts from <i>waste</i>

NB: In the long-term climate change can also be expected to be a driver of regional development, affecting the costs and locations of development

- 6.6 When examining a specific type of natural capital, the type of impacts will be much more specific (see **Figure 6.2** as an example with respect to water quality). Note that there will need to be some discussion and review to scope out the types of impacts among the relevant stakeholders. This is because as well as considering the types of development pressures that might impact on the environmental asset (water quality in Figure 6.2), the possible range of impacts from attempts to maintain and manage the environmental asset must also be taken into account.

Worked Example: Water Quality – Analysis of drivers/impacts

What are the economic and social drivers that affect the environmental asset and what are the indicative TYPES of benefits and costs of these drivers across each of the four capitals?

The general drivers of development apply to water quality; with their associated costs and benefits. The principal driver is population and household growth, which all other things being equal will increase the flow of effluent requiring sewage treatment. However, because the dilution effect will be smaller given the higher volume of discharge from sewage treatment works (STWs) a higher standard of treatment will also be needed.

Expansion in agricultural activity or changes in practice that give rise to increased point discharges or diffuse run-off can also have adverse impacts on water quality.

The impacts on water quality and water treatment requirements, depends crucially on the location of new or modified development. Housing development in locations where STWs discharge to low flow rivers will have a greater cost impact. (Note: STWs can treat to whatever is the required quality, but higher standards of treatment incur increases in per unit costs as well as creating other impacts including increased carbon emissions from higher levels of energy use.) Future agricultural activity is likely to continue in the same locations, but changes in practices and intensity of activity could have positive or negative impacts on water quality. The diffuse nature of much agricultural pollution makes it difficult to establish the contribution of agricultural activity to any given impact.

Because the impacts on water quality are mitigated in part by the capacity of the water body to dilute effluents, development that increases abstraction of water and contributes to a reduced dilution effect, should also be considered. These drivers relate in large part to the need for abstraction to supply drinking water and for agricultural uses. Note that due to reductions in use by industry, overall levels of abstraction are falling. There are also linkages to drought and flood management in so far as they have implications for managing abstraction. This linkage suggests that a separation of water quality from water quantity in defining environmental assets may not be appropriate.

- 6.7 Having identified the economic and social drivers and their likely (relevant) impacts across the four capitals, the next task is to identify where there are potential trade-offs between them:
- Potential trade-offs will arise where there is a mixture of red and green cells across a row in the impact assessment matrix (Figure 6.1).
 - Where there are just green cells across a row, then positive outcomes are likely to result across all four capitals – there will be no need for trade-offs – in other words, this is a ‘win-win’ scenario.
 - Should the unlikely situation arise where there are only red cells in a row across all four capitals, then no positive benefits are likely to arise. This could conceivably occur through, for example, uncontrolled population growth, in which case a national level response would be required.
- 6.8 Having identified potential trade-offs, those stakeholders affected need to be established as their views will be needed to determine what is acceptable or unacceptable – i.e. where the limits should be drawn.

Worked Example: Water Quality – Trade-off Analysis

What are the potential trade-offs and are there locations where these are particularly evident?

The trade-offs arise from expansions in population and housing development especially, as well as changes in the practice and intensity of agricultural activity. These trade-offs are more likely to be located in rural areas where low flow rivers are more prevalent and where the proportionate increase in population may be greater. Agricultural activity will also be more significant in rural areas.

Attempts to manage water quality are therefore likely to generate the following TYPES of social and economic trade-off:

- Meeting development needs (e.g. job creation, housing provision, amenities), probably in Low Flow Areas (LFAs), and especially rural areas, where development may need to be controlled.
- Investment in the operation of STWs and related financial costs, energy use and emissions.
- Controls on the agricultural sector to the extent that it generates water pollution.
- Changes in the abstraction of water in different locations and related impacts.

Key ACTORS therefore comprise:

- Local authorities.
- Local communities (esp. in rural areas).
- Developers.
- Water industry.
- Agricultural sector.

Figure 6.2: Drivers of Economic and Social Development and Related Impacts: Costs and Benefits of Ensuring Water Quality

Green = benefits; **Red** = costs **Bold italics** = environmental assets/resources that could be subject to environmental limits negotiations

Impacts of:	On objectives for increasing stocks of capitals:			
	Manufactured capital	Human capital	Social capital	Natural capital
Driver: Population growth and household formation Resulting in: New housing development	Increase in housing stock, by HMA / water catchment, except where costs of maintaining water quality are considered too high	Accommodation for population with their skills and talents	Support social cohesion by meeting housing needs Potential to invest in development of communities	Increased population & households generate demand for increased treatment capacity, which may impact on river flow Measures to control development in low flow areas (LFA) may increase travel and related emissions
	Possible controls on development in certain catchments with low river flow – low flow areas (LFAs), mainly situated in rural areas	Possible limits to expansion of human capital in certain (mainly rural) locations	Possible limits on further development of some communities. Some housing needs may not be met	Replacement housing can be more water efficient Measures to control development in low flow areas (LFA) may reduce travel and related emissions
Driver: Population growth and increased consumption, increases in productivity Resulting in: Increased economic output and development	Increase in business space and its productive capacity to deliver goods and services	Creation of jobs Skills development, esp in agriculture.	Employment growth can support social cohesion, with reduced levels of inequality, crime etc.	Increased activity will generate demand for increased treatment capacity, which may impact on river flow . Measures to control development in LFA may increase travel and related emissions
	Possible impacts from possible controls on economic activity (esp. agric) where costs of maintaining water quality are considered too high Possible impacts from limits on abstraction in LFA	Possible restrictions on economic activity may impact on employment levels, esp. in rural areas	Possible impacts on social cohesion in farming / rural communities from possible controls on certain agricultural practices	New economic development can provide opportunities for more efficient water use
Driver: Population growth and household formation; renewal of urban fabric Resulting in: Increased provision of social infrastructure	New, expanded or improved social infrastructure (e.g. schools, colleges, hospitals, healthcare, local authority service provision, places of worship, entertainment, etc.)	Creation of jobs Skills development Improved health and well-being	Social infrastructure supports social cohesion and helps to meet the needs of all but especially the most vulnerable.	Consumes resources during construction (water, minerals, land, energy) and operation (water, energy)
		Health and well-being during construction	May have added benefit in the case where development is redirected from rural to existing urban areas	Replacement infrastructure can be more water efficient New social infrastructure can provide new habitats if well designed, linked to catchment management

Impacts of:	On objectives for increasing stocks of capitals:			
	Manufactured capital	Human capital	Social capital	Natural capital
Driver: Population growth and increased economic activity Resulting in: Demand for new and improved water infrastructure	New, expanded or upgraded water supply and treatment infrastructure	Assured access to basic water related needs Health benefits from improved water quality	Improved water quality / amenity	Consumes resources during construction (water, minerals, land, energy) and operation (water, energy) May increase demand for transport infrastructure depending on development limits
	Possible impacts on costs from possible pass through of higher treatment costs to producers and consumers	Minor risks during construction	Possible impacts on income equality from possible pass through of higher treatment costs to households	New infrastructure is more energy efficient – with possibly some scope to better utilise renewable energy

NB: In the long-term climate change can also be expected to be a driver of development, affecting the costs and locations of development

ESTABLISHING THE ASSESSMENT CRITERIA

- 6.9 The TYPES of impact on the four capitals should form the basis of the criteria to be used in the subsequent assessment to determine the nature of the environmental limit. This step is simply to ensure an explicit scoping of the types of impact as the criteria, across the four capitals, for subsequent assessment.
- 6.10 The types of impact should have been defined in relation to policy objectives (e.g. for water quality and water resources, development objectives such as new housing, and agricultural activity) to ensure their relevance to the decision-making process. These policy objectives will typically be set out in:
- Government policy, such as Planning Policy Statements (PPSs), for example with respect to economic development (PPS4) and carbon emissions (PPSI supplement on climate change).
 - Local authority strategies such as Sustainable Community Strategies and Local Enterprise Partnership strategies.
 - Local Development Framework/Documents – the stated policy objectives that set out what the local authority aims to achieve through the planning system in order to achieve the vision for its area.
- 6.11 Another useful reference point will be the scoping work undertaken for the Sustainability Appraisals of LDDs, especially the SA Framework of objectives and criteria.
- 6.12 It is the local policy objectives, as they relate to the four capitals, that provide the justification for considering particular types of impact related to the prospective environmental limit. Unless there is some objective for say agricultural development or for say employment then possible impacts on the agricultural sector of an environmental limit would not be considered relevant to the assessment of environmental limits. There is therefore likely to be some iteration between scoping out the types of impacts and checking they are covered by national or local policies.
- 6.13 The types of impacts identified at this point form the basis of the deliberation process and the assessment of options that might manage the trade-offs between development and the environmental asset. For example, if one or more options for managing the environmental asset are likely to impact on the agricultural sector, then ‘impacts on the agricultural sector’ must be one of the criteria to be considered in deliberating how and at what level to set the environmental limit. In this way the TYPES of impacts, as long as they are policy relevant, and organised into each of the four capitals, form the assessment criteria to be used in Step 3.

Worked Example: Water Quality – Establishing Assessment Criteria

What are the impacts, relevant policy objectives and hence assessment criteria for each of the four capitals to determine what is acceptable or unacceptable with respect to the identified trade-offs?

The relevant policy objectives for each of the four capitals in this context are, in general, implied by the existing and explicitly stated development objectives that apply to the area for which limits are being negotiated. For example, the trade-offs identified in Figure 6.2 suggest a range of policy relevant CRITERIA related to each of the four capitals that can be used to assess the scale of trade-offs:

Manufactured:

- Costs of water treatment.
- Delivery of housing development in relation to identified housing need.
- Type of agricultural activity.
- Change in transport services as a result of changes in location/scale of development proposals designed to mitigate impacts on water quality.

Human:

- Scale and speed of population growth.
- Effect on employment.
- Health effects associated with changes in water quality.
- Leisure effects associated with potential changes in the amenity value of water bodies.

Social:

- Communities (likely to be mainly rural) affected by development proposals that impact water quality.
- Communities affected by changes in agricultural activity.
- Communities affected by potential changes in the amenity value of water bodies.
- Social consequences of the pass-through of higher costs associated with higher treatment (higher water bills).

Natural:

- Water quality and quantity (historically and current).
- Ecosystems and habitats affected by changes in water quality.
- Landscapes and carbon emissions as a result of changes in development designed to mitigate impacts on water quality.
- Energy and resource costs of water treatment / benefits of water treatment using natural capital.

- 6.14 So taking the example of water quality above, options to manage water quality would be assessed against criteria that included:
- The impacts on the costs of water treatment.
 - The potential for population and housing growth.
 - Aquatic ecosystems.
- 6.15 This in turn requires that the impacts are, where possible quantified, which requires the selection of indicators to represent the assessment criteria. Where quantification is not possible, subjective measures/indicators will be required. **Table 6.1** illustrates the possible use of indicators in the case of water quality.

Table 6.1: Possible Assessment Criteria and Related Indicators for Determining Water Quality Related Limits

Four capitals	Assessment Criteria	Possible Indicators
Manufactured capital	Costs of water treatment	Unit operating costs of STWs
	Housing development	Number of dwellings planned/completed
	Agricultural activity	Output of agricultural goods & services
	Transport	Passenger kilometres by car
Human capital	Population growth	Number of households
	Health effects	Incidence of water related illness
	Amenity benefits	Cost of local fishing licences
Social capital	Social cohesion	Share of affordable housing in housing stock
		Unemployment rates in rural areas
		Visitor numbers
		Households on low incomes
Natural capital	Water quality	Indicators specified by the WFD
	Aquatic ecosystems	Fish stocks
	Landscape	Assessed landscape character
	Energy use	Carbon emissions

- 6.16 In practice there may need to be some discussion to confirm the detailed specification of the assessment criteria and associated indicators. In some cases, because the impacts are complex, more than one indicator may be needed. For example the effects on rural communities may need to be reflected in a number of different attributes, such as:

- Ability to meet housing need – net additional homes planned versus household growth.
 - Retention of essential community services – viability of local post office, primary school, pub, bus services, etc.
 - Vitality – proportion of working age population working within the boundaries of the rural settlement in which they live.
- 6.17 Such attributes may not always have obvious linkages to water quality issues, but if a control on the amount of development is an option in order to meet water quality standards, this could have a knock-on effect on rural settlements vitality and viability.

IDENTIFYING POLICY OPTIONS

- 6.18 The negotiation of environmental limits depends on the range of options that can be identified to manage the impacts from development, including the options for mitigating and managing the environmental impact. The assessment of these options provides the basis for determining the significance of impacts (depending on the indicators chosen) and the inter-linkages between impacts and informs the significance of trade-offs and hence the negotiation of environmental limits.
- 6.19 The identification of options should be guided by the following good practice:
- **Select a manageable number of options** – no more than 4 or 5. Additional or hybrid options can always be defined as the negotiation proceeds; indeed the revision and amalgamation of options would be expected.
 - **Select options that seek to manage the trade-offs** (e.g. the balance of development in rural areas) rather than ones which would just lead to a polarised debate (e.g. an option to stop development in rural areas).
 - **Ensure a ‘business as usual’ (BaU) option**, to allow an appreciation of what might happen in the absence of changes in planned development or environmental management policies, allowing current trends to continue. It is assumed that these planned changes give rise to concerns over an aspect of natural capital, hence the need for negotiation. The assessment of BaU should essentially define the nature of the problem and the risks to natural capital.
 - **Consider whether there is a possible ‘win-win’ option** that might deliver development objectives and reduce the risks to the natural capital of BaU – if not it will be a test of the negotiation process to see if such an option can be developed.

Worked Example: Policy Options for Managing Development to Ensure Water Quality Limits are Respected

What policy options are there for dealing with the trade-offs?

Business as Usual (BaU): Planned changes in current levels of population and households; Planned changes in practice and intensity of agricultural activity. Continue to manage water quality in line with River Basin Management Plans (and Catchment Plans when completed).

[Note: These Plans contain a wide range of possible interventions the selection of which will be subject to appraisal and consultation. An important assumption in their preparation is the expected future changes in population and economic activity – as such there will already be significant appraisal and policy choice to manage the environmental limit.]

Water Treatment Option: Expand treatment volumes and increase treatment standards, where STWs are located on rivers with sufficient flow. Additional STWs as required by development trends if river flows allow.

Water Treatment & Abstraction Option: Where STWs are located on rivers with inadequate flow, some action may also be possible in relation to abstraction to enable the expansion of treatment. This would take into consideration related risks of floods and droughts and management responses.

Development Planning Option: There are risks that the costs and environmental impacts of expanded treatment (including carbon emissions from higher energy use) may be too high in certain locations, depending on the scale of growth. The option seeks to restrict development in these locations and redirect it elsewhere. In the case where agricultural activity is a key factor, the option would seek to encourage changes in agricultural practices.

Natural Treatment Option: (see below)

- 6.20 It should be remembered that whilst options should be guided by the trade-offs identified, a key principle of sustainable development is to reduce the need for trade-offs occurring in the first place. Therefore, options should always be sought where positive benefits arise across the four capitals, and that negative impacts – whether on natural capital or other forms of capital – are reduced to a minimum or acceptable level.
- 6.21 This will sometimes require innovative thinking – placing less reliance on reducing negative impacts and instead seeing whether there are alternative, more imaginative options that can help to secure policy objectives across all four capitals – the ‘win-win’ scenario. An example with respect to water quality is provided below.

Worked Example – Searching for the ‘Win-Win’ Option for Water Quality

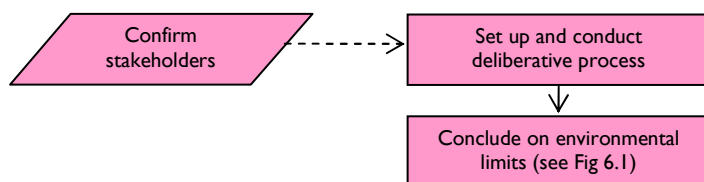
A ‘win-win’ option for water quality would be an option that is at least pollution neutral and would preferably improve the situation in areas where the WFD target is not being met. Such an approach would promote water quality improvement in targeted areas to allow development that would otherwise make the situation worse or perpetuate current harm (i.e. using development to secure improvements to water quality).

This may mean looking for less obvious solutions, using ecosystem services thinking. For example, gravel pits could be used to ‘clean’ effluent in a co-ordinated ‘whole river’ approach. Diverting parts of rivers, such as the Trent, into gravel pits along their length could help water quality significantly and at the same time diversify the flood plain (and benefit fisheries, landscape, biodiversity, flood management, etc). By slowing the speed at which water drains away, natural processes can begin to do their ‘cleaning’ work – bringing natural systems to bear rather than hard engineering solutions.

Such an approach could include some sort of water quality improvement levy, such as is being used in the South West on some SAC rivers and estuaries already (on one river this is currently £200 per house). Lower water bills from improved efficiency could compensate.

Source: Natural England. Pers comm

7 Step 3: A deliberative approach to assessing and agreeing environmental limits



Purpose

To establish a deliberative process for negotiating the establishment of an environmental limit:

- Confirm the deliberative process (stakeholders, chair, meeting formats, etc).
- Confirm the assessment criteria and related evidence.
- Confirm the policy options that can best achieve the different objectives.
- Assess the impacts of options and implications for environmental limits.
- Conclude on the preferred approach to setting the environmental limit.
- Conclude on the environmental limits to be adopted.

Strategic questions

1. Which stakeholders are likely to have different views about what is acceptable or unacceptable and which should be included in the deliberation process?
2. Is the range of costs and benefits identified in Step 2 fully reflected in the assessment criteria – do additional criteria need to be added?
3. Is the range of options adequate and sufficiently well developed to allow assessment?
4. What are the IMPACTS of each of the policy options on the selected criteria – do these provide a clear picture of the benefits and costs of the option on each of the four capitals; are these impacts acceptable to all stakeholders?
5. Do additional or modified options need to be examined?
6. Can the basis of an acceptable limit be agreed across the stakeholders? Does this require certain conditions (e.g. the limit should last for a certain period, and then be reviewed/revised)?

GENERAL APPROACH

- 7.1 The approach to this Step is intended to be a deliberative approach, where stakeholders negotiate the establishment of environmental limits by assessing the impacts of different options designed to balance the benefits from development with the benefits of maintaining or enhancing ecosystem services.
- 7.2 Except where international or national limits have been set, the choice and establishment of environmental limits is the final responsibility of local authorities (alone or in agreement with neighbouring authorities depending on the nature of the environmental asset being considered). It is therefore assumed that the deliberative approach will be chaired and managed by the local authority.
- 7.3 The assessment of options will identify the scale of the major trade-offs and allow an understanding of the relative benefits from setting different environmental limits.
- 7.4 The approach comprises two parts:
- Part A: Setting-up the deliberative process.
 - Part B: Conducting the deliberative process and concluding on the establishment of environmental limits.

Part A: Setting-up the deliberative process

- 7.5 The deliberative process, chaired by the local authority, is based on the assessment of options by stakeholders to understand the scale of impacts from development and the use of environmental limits. Step 2 should have provided the basic requirements:
- The identification of the relevant stakeholders given the nature of the issues involved.
 - The identification of relevant assessment criteria that reflect the key issues involved across the four capitals.
 - The identification of relevant options.
- 7.6 The first three strategic questions correspond to these three requirements.
- Which stakeholders are likely to have different views about what is acceptable or unacceptable and which should be included in the deliberation process?***
- 7.7 The negotiation process needs to be inclusive of all interested parties in order to conclude an effective environmental limit. This should include all relevant stakeholders irrespective of whether they are opposed to or strongly in favour of an environmental limit. The only requirement for participation is that they negotiate in good faith, respect the views and evidence as presented and abide by the conclusions reached. Of course a stakeholder can disassociate themselves from the process or conclusions at any time, but in so doing must also recognise that the other parties are free to continue to negotiate and conclude on the environmental limit.

- 7.8 To ensure that the process is inclusive, but also manageable, the number of different stakeholders should be limited where possible. This may mean some pre-negotiation to organise the representation of different parties. However, such pre-negotiation should not seek to pre-empt or 'manage' the views to be expressed. If the process does not reflect the range of views it is unlikely to be seen as a credible process, and the conclusions may be challenged as a legitimate basis for the environmental limit.

Is the range of costs and benefits identified in Step 2 fully reflected in the assessment criteria - do additional criteria need to be added?

- 7.9 The assessment of options is intended to demonstrate the scale of potential impacts, across the four capitals, from different approaches to the establishment of the environmental limit. The criteria have therefore to relate to the critical issues associated with establishing the environmental limit. Step 2 should have identified these issues in a systematic manner, and the relevant indicators to be used as the basis of the related evidence.
- 7.10 To ensure that the deliberative process is not obstructed by evidence on key issues it will be important to confirm with the stakeholders that the relevant range of issues are covered and that the choice of indicators provides a reasonable coverage of these issues. It may be that in some cases there is a general appreciation that some critical evidence is missing and should be collected first. However, it must be recognised that the evidence base will always be imperfect and there will always be gaps and ambiguities in the available information. If there was not, it is unlikely that there would be a need for the negotiation.
- 7.11 It is for the deliberative process to decide on whether the evidence allows key trade-offs to be fully appreciated. Where there are doubts on key evidence, it may be that provisional conclusions can still be reached subject to further investigations. However, there should be some awareness that the call for further evidence may be a delaying tactic for some stakeholders. In such circumstances it will be for the local authority, as chair, to determine whether a precautionary principle should be applied, and to propose establishing a stricter environmental limit pending further research.

Is the range of options adequate and sufficiently well developed to allow assessment?

- 7.12 The establishment of the environmental limit is expected to derive from an understanding of how the environmental impacts of development can be managed. The different ways in which the impacts can be managed are reflected in different options. These options are not themselves intended to be designed on a continuum of weak to strong environmental management. Rather they are intended to demonstrate the likely impacts across the four capitals from adopting different approaches to the establishment of environmental limits, as the basis for deciding on the nature and level of the environmental limit.
- 7.13 It is therefore important that there is an adequate range of options, which allows an adequate basis for understanding the implications for establishing an environmental limit and allows an understanding of the significance of trade-offs associated with any given limit.

- 7.14 Step 2 should have identified a range of options, but it will be important to verify with stakeholders that there are not other options that should be included, recognising the potential for the deliberative process itself to generate new or revised options as the process continues.

Part B: Conducting the deliberative process and concluding on the establishment of environmental limits

- 7.15 The final part of the approach is to conduct the impact assessment of options and to identify the scale of trade-offs associated with different approaches and any given limit. The deliberation should consider:

What are the IMPACTS of each of the policy options on the selected criteria – do these provide a clear picture of the benefits and costs of the option on each of the four capitals; are these impacts acceptable to stakeholders?

Do additional or modified options need to be examined?

Can the basis of an acceptable limit be agreed across the stakeholders? Does this require certain conditions (e.g. the limit should last for a certain period, and then be reviewed/revised)?

- 7.16 It is expected that the process of assessment will be conducted through discussion, chaired by the local authority and perhaps supported by an experienced facilitator. A facilitator would help to ensure the debate proceeds in a logical and transparent manner, and to ensure that the debate does not simply become a polarised and unproductive ‘development versus environment’ discussion.
- 7.17 Depending on the complexity and strength of opposing evidence the deliberative process may need several sessions to discuss and decide on the scale of impacts and the implications for the establishment of the environmental limits. Some breaks to collect or to represent certain information or advice may be agreed. Additional or revised options may be tabled and discussed.
- 7.18 The appraisal of options against criteria (multi-criteria analysis) is in itself a well used and developed approach to the identification of preferred solutions to difficult policy issues (see **Figure 7.1**). This shows the anticipated outcomes for the water quality example, where possible in quantified terms. Where this is not possible descriptive text is used, whilst seeking to avoid subjectivity and value judgements. Different stakeholders are likely to have different views about the extent to which each of the impacts is desired, acceptable or unacceptable, but this does not alter the underlying evidence-led basis to the analysis against the criteria.
- 7.19 This means in turn that the judgements expressed in the completion of the appraisal of what is desired, acceptable or unacceptable will, in the first instance differ (potentially very substantially) between the different stakeholders. It is the purpose of the deliberative process to understand the positions of each stakeholder group and their reasons for reaching judgement on particular criteria for a given option. A key feature in the use of multi-criteria analysis in this context is that it is undertaken directly by the

stakeholders affected by the outcomes and not by a small group of officers/consultants.

7.20 With respect to the water quality example:

- The water industry may wish to pursue the ‘water treatment’ option because it is low risk, will meet WFD standards, and investment will be met by higher water bills.
- The agricultural sector may be split between those who are willing to pursue those options that include Environmental Stewardship as part of the overall policy approach, but at the risk of reduced yields, and those who are keen to reduce their environmental impact and accept grant funding available.
- Those members of the local community who are in urgent need of housing are more likely to favour the ‘water treatment and abstraction option’ or the ‘natural treatment option’ despite higher water bills. These are also likely to be favoured by housing developers.
- Some members of the community located close to potential development locations are more likely to favour the low development options – ‘business as usual’ or the ‘development planning options’.
- The environmental voluntary bodies are likely to support the ‘natural treatment option’ because of the ecological benefits, despite the higher costs.
- The local planning authority is unlikely to want to pursue the ‘development planning option’ because of the social and economic risks involved of not meeting development needs.

7.21 The differences between stakeholders on what is an acceptable or unacceptable impact should be the focus of the deliberation; the aim is to try and identify an option where the impacts across all the four capitals are acceptable to all stakeholders. If this is not possible, it may be that further evidence on the impacts might lead to a change in the judgements reached; alternatively a redesign of options could be tested to see if a measure of consensus can be reached.

7.22 In the event that no consensus can be reached by the deliberative process, the chair will need to conclude on whether the outstanding disagreements are such as to prevent the establishment of a limit, or the nature of the limit, and whether additional research should be commissioned.

Figure 7.1: Worked Example – Assessment of Options for Managing Water Quality vs. Agreed Criteria/Indicators

Policy option	Manufactured capital	Human capital	Social capital	Natural capital
Business as usual option	<p>Costs of water treatment: No additional investment costs over those already planned.</p> <p>Housing development: Continue to develop 300 dwellings per annum housing in line with planned delivery targets, but with no guidance relating to water quality issues.</p> <p>Agricultural activity: Little change.</p> <p>Transport: Continued growth in passenger kilometres at 2% per annum resulting in £5m road investment.</p>	<p>Population growth: Could accommodate household growth of 10% over plan period (50% of requirement under household projections). Significant number of households potentially displaced to other local authority areas.</p> <p>Health: Limited risk of ill-health from bathing.</p> <p>Amenity benefits: None of note.</p>	<p>Social cohesion: 50% of affordable housing need not met. Water bills as planned.</p>	<p>Water quality: Potential failure of WFD standards.</p> <p>Aquatic ecosystems: Loss of key indicator fish species and overall fish species and aquatic invertebrate diversity.</p> <p>Landscape: Continued incremental erosion of landscape character from urban fringe development and road infrastructure.</p> <p>Energy use: Carbon emissions associated with housing and transport to increase by 5% over plan period.</p>
Water treatment option	<p>Costs of water treatment: Increase of 25% in investment required to bring STWs to higher standards and to increase capacity.</p> <p>Housing development: Will allow for 400 dwellings per annum in locations where river flows permit and STWs upgraded. Restrictions to development of 50 dwellings per annum in low flow areas.</p> <p>Agricultural activity: Little change.</p> <p>Transport: Growth in passenger kilometres would rise by 3% per annum due to</p>	<p>Population growth: Could accommodate population growth of 15% over plan period (meeting 75% requirement under household projections). A small number of households potentially displaced to other local authority areas.</p> <p>Health: Reduced risk of ill-health from bathing over BaU.</p> <p>Amenity benefits: None of note.</p>	<p>Social cohesion: 28% of affordable housing need not met. Water bills increase by 7%.</p>	<p>Water quality: Compliance with WFD standards.</p> <p>Aquatic ecosystems: No change.</p> <p>Landscape: Slightly increased erosion from BaU of landscape character from urban fringe development and road infrastructure.</p> <p>Energy use: Carbon emissions associated with housing and transport to increase by 8% over plan period and for STWs by 5%.</p>

Policy option	Manufactured capital	Human capital	Social capital	Natural capital
	increased housing growth, which would require increased road investment over baseline of £8m.			
Water treatment and abstraction option	<p>Costs of water treatment: Increase of 35% in investment required to bring STWs to higher standards and to increase capacity, plus transfer of some flows to low flow rivers to enable increase in capacity/standards of STWs on low flow rivers.</p> <p>Housing development: Will allow for 450 dwellings per annum in locations where river flows permit and STWs upgraded. Low flow areas could increase to 150 dwellings per annum.</p> <p>Agricultural activity: Little change.</p> <p>Transport: Growth in passenger kilometres would rise to 4% per annum due to increased housing growth which would require increased road investment over baseline of £10m.</p>	<p>Population growth: Could accommodate population growth of 20% over plan period (meeting 100% requirement under household projections). No displacement of households to other local authority areas.</p> <p>Health: Very limited risk of ill-health from bathing.</p> <p>Amenity benefits: Some additional recreational opportunities in low flow areas (e.g. fishing).</p>	<p>Social cohesion: 20% of affordable housing need not met. Water bills increase by 10%.</p>	<p>Water quality: Compliance with WFD standards.</p> <p>Aquatic ecosystems: Some risk to fish and aquatic species diversity from transferring water from one river system to another.</p> <p>Landscape: Slightly increased erosion from BaU of landscape character from urban fringe development, village development, road infrastructure, and expansion of STWs in low flow areas.</p> <p>Energy use: Carbon emissions associated with housing and transport to increase by 10% over plan period and for STWs and water transfer by 10%.</p>
Development planning option	<p>Costs of water treatment: No additional investment costs over those already planned.</p> <p>Housing development:</p>	<p>Population growth: Could accommodate population growth of 3% over plan period (meeting 17% requirement</p>	<p>Social cohesion: 75% of affordable housing need not met. Water bills as planned.</p>	<p>Water quality: Compliance with WFD standards.</p> <p>Aquatic ecosystems: No change, although noticeable</p>

Policy option	Manufactured capital	Human capital	Social capital	Natural capital
	<p>Reduce development to 100 dwellings per annum housing in line with planned delivery targets, restricted to locations with STW capacity, and nil in low flow areas.</p> <p>Agricultural activity: Encourage take-up of Environmental Stewardship initiatives in low flow areas, although could reduce crop yields by 5%.</p> <p>Transport: Increased growth in passenger kilometres at 7% per annum due to increased commuting from displaced households – investment similar to BaU.</p>	<p>under household projections). Greatest potential displacement of households to other local authority areas.</p> <p>Health: Same risk of ill-health from bathing as BaU.</p> <p>Amenity benefits: None of note.</p>		<p>improvement in fish species and aquatic invertebrates anticipated from Environmental Stewardship take-up.</p> <p>Landscape: Slightly reduced erosion from BaU of landscape character from urban fringe development, and road infrastructure. Strengthening of landscape character in Environmental Stewardship areas.</p> <p>Energy use: Carbon emissions associated with housing expected to be below BaU but from transport above BaU due to need for increased commuting - net increase of 10% over plan period.</p>
Natural treatment option	<p>Costs of water treatment: Increase of 20% in investment required to bring STWs to higher standards and to increase capacity, including low flow areas. Additional cost (equivalent to 20% on planned STW investment) to redirect flows via gravel pits. 40% increase in costs in total over baseline.</p> <p>Housing development: Will allow for 450 dwellings per annum in locations where river</p>	<p>Population growth: Could accommodate population growth of 16% over plan period (meeting 80% requirement under household projections). No displacement of households to other local authority areas.</p> <p>Health: Increased risk of ill health from illicit bathing in gravel pits.</p> <p>Amenity benefits: Significant new leisure opportunities from opening up gravel pits to recreation as part of water</p>	<p>Social cohesion: 25% of affordable housing need not met. Water bills increase by 12%.</p>	<p>Water quality: Compliance with WFD standards.</p> <p>Aquatic ecosystems: Fish species and aquatic invertebrates diversity anticipated to increase significantly in main rivers, low flow rivers and gravel pits. Good potential for otter re-introduction.</p> <p>Landscape: Mixed impacts - slightly increased erosion from BaU of landscape character from urban fringe development,</p>

Policy option	Manufactured capital	Human capital	Social capital	Natural capital
	<p>flows permit and STWs upgraded. Low flow areas could increase to 25 dwellings per annum.</p> <p>Agricultural activity: Encourage take-up of Environmental Stewardship initiatives in both high and low flow areas, which could reduce crop yields by 10%.</p> <p>Transport: Growth in passenger kilometres would rise to 3.5% per annum due to increased housing growth which would require increased road investment over baseline of £8m.</p>	<p>quality proposals (fishing, sailing, bird watching).</p>		<p>village development, road infrastructure, but enhancements to gravel pits, riverine environments, and on farms subject to Environmental Stewardship.</p> <p>Energy use: Carbon emissions associated with housing and transport to increase by 9% over plan period, and for STWs by 3%.</p>

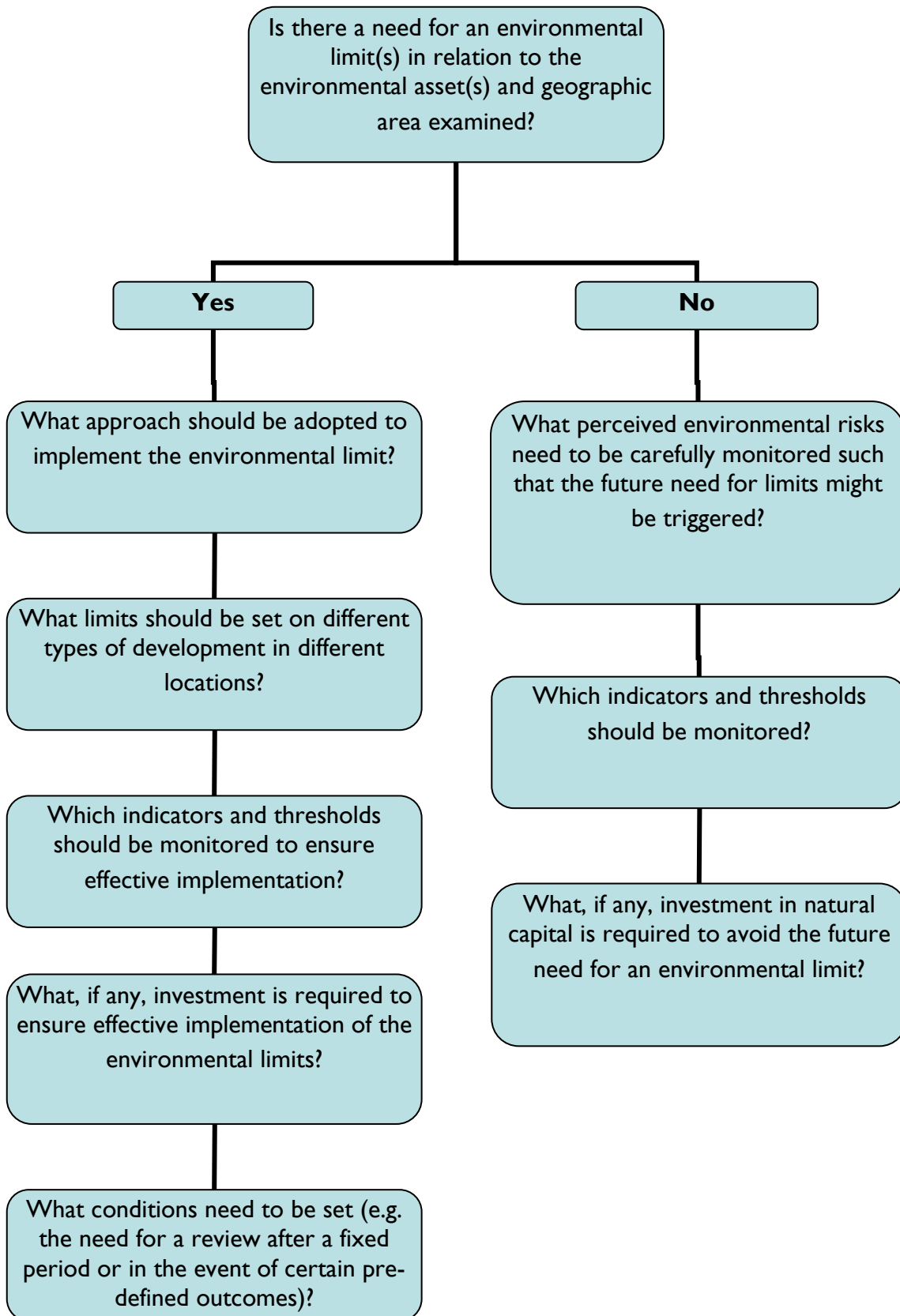
- 7.23 The deliberative process should conclude by identifying the general consensus (recognising there may be those stakeholders who dissent from the general view) on the preferred policy option (which may be some hybrid of those initially defined). The preferred option should indicate whether a limit is required and if so the nature of the limit; it should consider the questions set out in **Figure 7.2**.
- 7.24 The preferred option and the underlying impact assessment should indicate the perceived risk and threat to the environmental asset and related ecosystem services and the acceptable trade-offs in managing the risk. The option may indicate a willingness of stakeholders to countenance further erosion of the asset because the impacts on other criteria of preventing further erosion are unacceptable. Conversely, the option may indicate that the concern over the continuing loss of the environmental asset is such as to outweigh consequent impacts on all other criteria.
- 7.25 If it is decided that **an environmental limit DOES need to be set** with respect to the environmental asset(s) and the benefits and services it provides, then there will be a need to agree how to implement the limit. This will be achieved by adoption of the option (or hybrid option) that achieves greatest acceptance from those involved in the negotiations.
- 7.26 It is likely that the preferred option will indicate one or more of the following: (i) a restriction on the amount of development that would otherwise occur in specified locations, (ii) different types, form and design of development, (iii) using development as a mechanism for generating investment in the environmental asset(s). In the latter case, development may be used to secure the benefits and services to an acceptable level – without this, the development (scale, location, type, and form) would be unacceptable. For example:
- Development is already tightly controlled in environmentally sensitive areas such as Areas of Outstanding Natural Beauty (AONBs), National Parks, flood risk areas – limits are already being applied.
 - Development that is designed to be ‘in keeping’ with local character is more likely to be acceptable, particularly to local communities, than a development that is incongruous with local character – here, implementation of the limit concerns not how much development takes place but rather the form that it takes.
 - Development that meets a pressing social or economic need, such as a rail freight interchange that will create several hundred jobs in an area of high unemployment. All other things being equal, this is likely to attract less stringent environmental limits than areas where there is full employment and a buoyant economy.
 - Development that will consume large amounts of energy is likely to be more acceptable if investment is made in securing a high proportion of renewable energy supply.
 - Development that would otherwise place excessive pressure on water supplies would be more likely to be acceptable if it incorporates high

levels of water efficiency in its design, and provides funds for retrofitting water efficiency in existing development to achieve water neutrality.

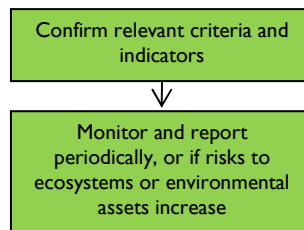
- Greenfield development on agricultural land would be more likely to be acceptable if it were accompanied by space for local food growing (e.g. allotments), the creation of biodiverse sustainable drainage systems that also provide a venue for informal recreation, plus woodland planting.

- 7.27 Unless there are specific technical issues or standards that cannot be met, then limits can often be managed through the development planning process.
- 7.28 If it is decided that **an environmental limit DOES NOT need to be set**, then this does not mean that there is no need to be concerned. It is far better to take a proactive and precautionary approach that sets down a course of action to avoid the need for environmental limits having to be set in the future.
- 7.29 Monitoring is crucial in this regard, particularly of trends over time, and early investment (e.g. in environmental infrastructure or in biodiversity enhancement) may help to reduce the likelihood of limits being breached and hence the need for even greater investment further down the line when problems begin to emerge. For example, this was one of the key conclusions of the Stern review on the economics of climate change (October 2006), which found that the impact on the global economy, environment and society would be greater in the long-term if investment in reducing carbon emissions were to be delayed in the short-term.

Figure 7.2: Concluding on Environmental Limits



8 Monitoring and evaluation



Purpose

To monitor trends relevant to the indicator (using the criteria previously used) and periodically evaluate whether the limit needs to be revised

- Confirm relevant indicators based on previously selected criteria.
- Establish data collection.
- Review trends and the need for any revisions to policy direction or environmental limits.

Strategic questions

1. Are the trends indicating changes in the scale or nature of costs and benefits from development that were not anticipated in the deliberation process?
2. Is the level of ecosystem services provided becoming unacceptable?
3. Is there merit in relaxing the environmental limit to allow more development?
4. Do these signify a need to reconvene the deliberation process?

GENERAL APPROACH

- 8.1 Once a decision has been made of the preferred policy approach in relation to an environmental limit, this will be reflected in the relevant planning document, such as a LDD.
- 8.2 Monitoring forms an important component of the development plan process, most notably through the Annual Monitoring Report (AMR). Monitoring of 'significant effects' is also a requirement of the SEA Regulations.
- 8.3 The purpose of monitoring is to determine whether the outcomes anticipated as a result of a plan or policy are arising through delivery and, if not, whether any adjustment to the plan or policy is required.
- 8.4 With respect to environmental limits, where outcomes are not as anticipated, this may require an amendment to the plan or policy or a review of the limit itself to determine whether it is appropriate. It may also be necessary to

review limits where new or more reliable science or evidence becomes available.

- 8.5 Although monitoring and indicators included in an AMR will be linked specifically to policy implementation, the indicators chosen for the purposes of environmental limits will need to relate specifically to the limit and/or those aspects of development that impact on the limit, using the criteria developed in Step 2 of the process.

Are the trends indicating changes in the scale or nature of costs and benefits from development that were not anticipated in the deliberation process?

- 8.6 The delivery of development will have impacts across the four capitals that should have been predicted through the earlier deliberation on the setting of environmental limits. There will always be some positive impacts (benefits) predicted (otherwise the development should not have been permitted), but there may also have been some negative impacts (costs) that were predicted, but which were not seen as being sufficient to outweigh the benefits.
- 8.7 Therefore, all significant costs and benefits that were predicted at the time of plan preparation should be monitored during implementation of the plan and during the delivery and operation of development. Indicators should be measured in relation to:
- The baseline situation.
 - Direction of travel (time series analysis).
 - In relation to any standards or limits that have been set or negotiated.

Is the level of ecosystem services provided becoming unacceptable?

- 8.8 With respect to environmental limits, the critical issue to bear in mind when monitoring is whether the costs and benefits of development on an ecosystem service(s) are acceptable or not.
- 8.9 For example, where monitoring indicates that environmental standards or negotiated environmental limits have been breached, or could be breached in the future having analysed trends, then this is likely to require corrective action. For those environmental assets and ecosystem services where there are no prescribed standards or targets – such as landscape – overall trends in contextual indicators may suggest that development is having an impact more significant than was anticipated at the time of the original policy option negotiations. Although development with planning consent will be able to proceed, it will be important to ensure that all conditions and planning obligations are being adhered to. Negotiations and decisions on future development (and development plan policies) may result in more stringent requirements in order to compensate.

Is there merit in relaxing the environmental limit to allow more development?

- 8.10 In certain instances, the need for development may increase over time – for example, to respond to population and household growth, or to encourage

new or additional economic activity, in order to deliver human and social capital benefits.

- 8.11 Certain limits, in particular those that are not linked to standards or targets, will have been based on judgements of what is and is not acceptable given development needs at a particular point in time. Where these needs change, views upon what is and is not acceptable may change.
- 8.12 For example, even those who were vehemently opposed to development in their settlement because it would lead to the loss of greenfield land may become more disposed to accept such development when it becomes clear that local people, including members of their own family or those of friends, cannot afford to buy homes locally, or that there are not enough homes to meet need.
- 8.13 The quality of the development, and the impact that it has on local services and infrastructure, and the wider benefits that development will bring, will often be deciding factors in influencing what is and is not acceptable to different stakeholders.
- 8.14 It is important to appreciate, therefore, that environmental limits are not set in stone. Even those that have prescribed standards and targets may change over time, given better understanding of the science behind them, and political priorities.

Do these signify a need to reconvene the deliberation process?

- 8.15 In response to the findings of monitoring, and changing circumstances over time, there may come a point where stakeholders need to reconvene in order to determine where limits should lie. In any event, LDDs will be subject to regular review, and each time a review takes place, new challenges are being dealt with, and the plan being considered is rolled forward to cover additional years' development and growth.
- 8.16 Whenever a review of an LDD takes place, consideration should be given to the need to reconvene the deliberation process to determine where limits should be drawn and which policy options perform best. If monitoring suggests there are urgent issues that challenge the previous decisions made through the deliberative process, then a decision on whether to reconvene may need to happen more rapidly than the normal plan review cycle.

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30th September 2010

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