

Guidance to incorporating ecosystems services into Futures / Scenario Tools

1. What is this document about and who is it for?

The purpose of this guidance is to provide practitioners, consultants, researchers and decision-makers who are carrying out Futures work or who are involved in a Visioning or Scenarios process with practical advice on how to apply the tool effectively. This guidance has been produced as part of Work Packages 9 and 10 of the [UK National Ecosystem Assessment Follow-On](#) (UKNEA-FO) Programme. It should be read in combination with the General Guidance on the stages of the [EATME tree](#) which sets the wider context of the Ecosystem Approach and the range of existing / new ecosystem services proofed tools. Within the scope of the UK NEA-FO a [literature review](#) has also been undertaken which provides more information about the development, types and applications of [Futures tools](#) per se.

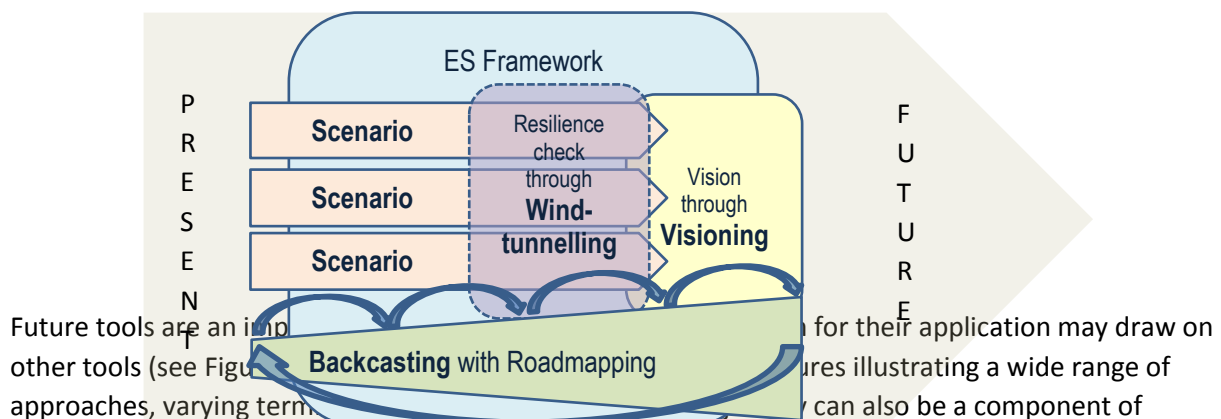
The guidance to hand combines insights and experience from several practitioners and researchers on how to integrate the ecosystem services (ES) framework into Future tools and how Future tools are part of or draw on other tools, including those which are specifically tailored towards ecosystem services or those which can be enhanced through meaningful adaptation. Other fundamental requirements, such as [the involvement of stakeholders and publics](#) form part of the overarching Ecosystem Approach, but are not the primary focus here.

2. What do we mean by ‘Futures tools’?

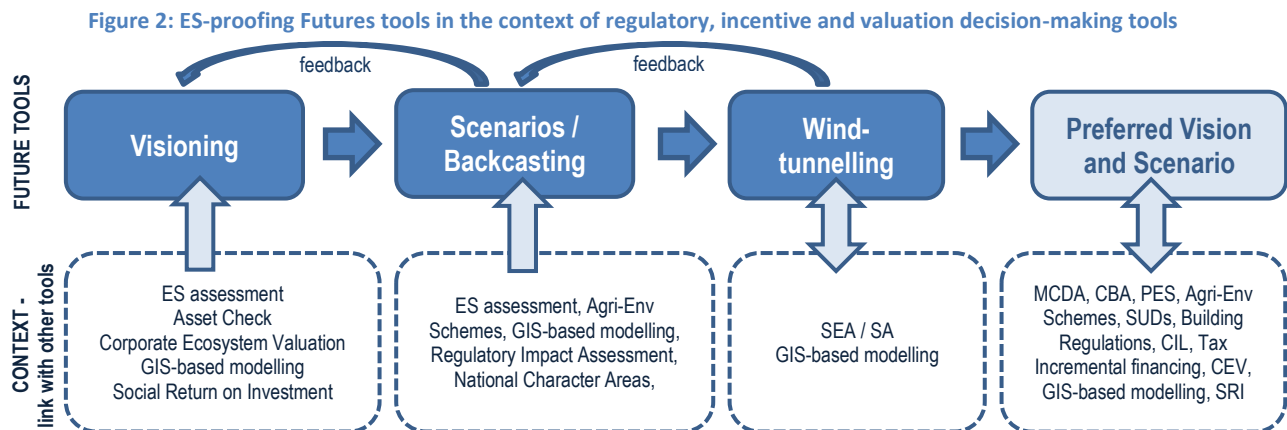
Several distinct tools are used within ‘Futures’ research and practice. A fundamental distinction can be made between some key Futures tools:

- (i) **Foresight** exercises that explore possible future **Scenarios** along different trajectories (e.g. Defra’s Foresight studies);
- (ii) visioning desirable futures and then considering possible incremental steps towards achieving those states and outcomes (**Backcasting with Road-mapping**);
- (iii) testing plausible Scenarios against set goals (e.g. sustainability criteria) and/or likely and potential stresses or threats (**Wind-tunnelling**).

Figure 1: Futures tools and our suggested approach to ES proofing them



other tools that inform policies, land or programmes or support decision-making. For example, visioning and scoping alternative scenarios may provide insights to the scoping phase of a [Strategic Environmental Assessment](#); or a set of scenarios may be used to stimulate debate under a [Deliberative Monetary Evaluation](#) Exercise. Futures tools are particularly strong at the Ideas, Decision-making and Evaluation stages of policy and practice and can help provide links through use of a consistent framework and language.



3. Why include ecosystems services in Visioning / Scenarios?

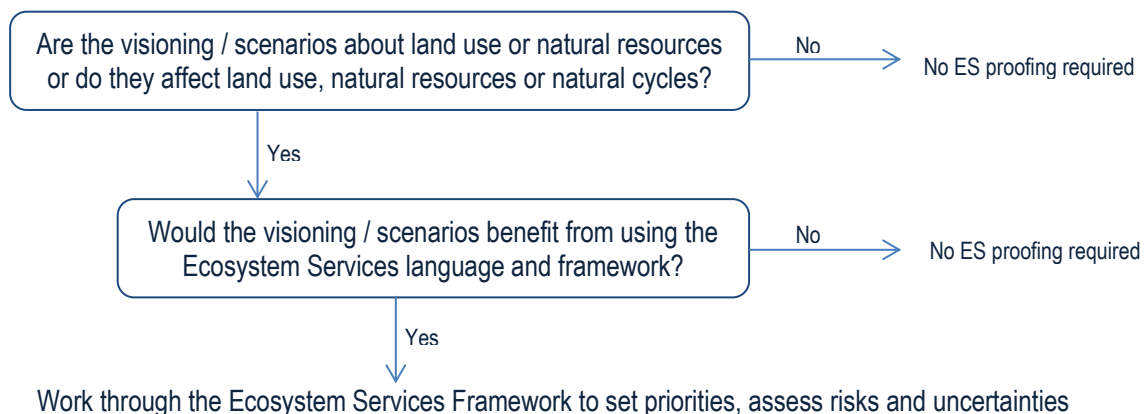
There are several reasons why anyone involved in Futures research and applications (e.g. researchers, consultants, stakeholders, decision-makers, citizens) should include ecosystem services explicitly in Visioning and Scenarios. This does not necessarily require additional steps or processes and can be easily integrated into existing Foresight and Visioning exercises.

- **Applying the ecosystem services framework is about resilience and risk reduction** – Ecological feedback processes may intensify human modifications of ecosystems. Using the ecosystem services framework in Futures tools allows us to consider how likely changes in the environment may impact on the provision of goods and services in the different plausible scenarios.
- **The ecosystem services framework facilitates integration and supports assessment of cumulative effects** – The range of ecosystem services are relevant across economic, social and environmental goals in visioning and associated scenarios. This integrative nature of the ecosystem services framework can be used to consider effects across sectors and scales to support identification of inter-relationships and cumulative effects.
- **Ecosystem services focus on processes and linkages rather than state(s)** – Considering the dynamic complexities of the environment is more effectively done through paying attention to processes, interactions and dependencies rather than describing a snapshot future state. Thus adopting an ecosystem services framework for futures work can help explore more realistically the future wellbeing and adaptive capacity of both the environment and society.
- **Ecosystem services capture the fundamental, desirable and interdependent benefits that society gains from nature** – Natural resources and the many benefits that natural cycles and the diverse functions, goods and services that ecosystems provide for the long term are of fundamental concern in Futures work.

- **Ecosystem services are about a common language of why the environment matters** – Too often scenarios developed by experts do not make explicit what matters to people in the future. Using the ecosystem services framework highlights key benefits to support and improve human wellbeing, but also many of the internal processes in ecosystems that maintain their resilience and continued ability to produce these benefits. Considering implications for all interdependent ecosystem services thereby informs more tangible and valuable scenarios to support decision-making.
- **The ecosystem services framework is part of the policy landscape** – Much of the UK’s natural environment policy refers to or uses the concept of ecosystem services, and further policy development will be informed by the international agenda (such as the Convention on Biological Diversity) in which ecosystem services are a dominant theme. The relevance and plausibility of scenarios can be improved by adopting a similar ecosystem services lens and expressing actual/likely policy priorities to key ecosystem services and their land use implications.

Figure 3 is a simple decision-making tree to help assess whether or not to include ES in your Visioning and/or Scenarios exercise.

Figure 3: Decision-tree for including ES into Futures Visioning and Scenarios



4. Approaches to ES-proofing Futures tools

Since the creation and exploration of plausible **Scenarios** or **Visions** are a fundamental part to all, the guidance here is aimed at the whole family of [Futures tools](#). We recommend the use of the ecosystem services framework within specific futures tools, but importantly encourage their **use in combination** rather than stand alone to support decision-making (see Figure 1). For example, wind-tunnelling is viewed here as a quick and valuable test for any of the Futures work rather than a tool used in isolation.

ES-proofing of Future tools can occur by doing one or more of the following:

- **Use ES as the common framework and language.** Ecosystem services are used to frame and help describe vision(s) and scenarios. This way ecosystem services form a central focus and integral part of the visioning and scenario creation. The UK National Ecosystem Assessment scenarios are framed in this way.

- **Roadmap ES benefits and requirements.** Within a **backcasting** approach consider what specific measures are required to obtain/preserve the necessary quality and quantity of ecosystem services over time and in the long term, and the agreements between potentially conflicting demands upon them to ensure that overall ecosystem functioning is maintained.
- **Apply the ES framework to identify risks and uncertainties.** Ecosystem services are used as output/outcome variables to test the performance and resilience of a vision within a range of scenarios. This is effectively an ES-specific **wind-tunnelling**.

Ecosystem services affect everything. Therefore, the ecosystem services framework is just as relevant to technical and economic agendas and ‘non-environmental’ policy and decision-making realms as to more specific environmental domains.

5. Recommended process for ES-proofing Futures tools

This section provides more detailed guidance on how Futures tools can be ecosystem services proofed. Table 1 provides a list of questions to help you judge whether the use of the ecosystem services framework will be helpful and beneficial to improve process, outputs and outcomes of your specific project or challenge.

Table 1: Guiding questions for ES proofing Futures tools

Stages	Considerations to ES proof Futures tools	Supporting material
Visioning Scenarios Backcasting and Roadmapping	<ul style="list-style-type: none"> • <i>Can the ES framework help consider all interrelated dimensions of desirable or feasible future(s)?</i> • <i>Is the use of the ES ‘cascade’ (see Figure 4) useful in helping express the links between human activity and the continued provision of services by ecosystems?</i> • <i>Is the ES framework helpful in describing the interactions and interdependencies between different beneficiaries of ecosystems?</i> • <i>Would the ES framework help in the communication of desired/likely outcomes, risks and areas of uncertainty?</i> • <i>How relevant are certain ecosystem services to the vision / scenario / roadmap?</i> • <i>What are the priority ecosystem services (whilst ensuring that a focus on a few ecosystem services does not occur at the risk of unintended consequences for other ecosystem services)?</i> 	The UK National Ecosystem Assessment is the most prominent example of its application (chapter 25 developed the UK NEA Scenarios and discusses the development of storylines, and analyses the outcomes. See http://uknea.unep-wcmc.org/Resources/tabid/82/Default.aspx
Wind-tunnelling	<ul style="list-style-type: none"> • <i>Would your Futures work benefit from a rapid viability / performance assessment?</i> • <i>What is the impact of the scenario / roadmapping on ecosystem service quality and quantity?</i> 	

If applied with an Ecosystem Approach mindset, using the ecosystem services framework will go beyond a change in language and affect the way a challenge is defined, approached and tackled. So while in some cases, especially if you are already in the middle of an exercise, the ecosystem services proofing may be an addition to an existing approach, you may find it triggering changes and feedback loops that can help future-proof your approach more generally (see Figure 2).

Generally, we recommend a process that starts with Visioning and a Backcasting approach that develops a step-by step Roadmapping over time to achieve the desired future conditions, where the

resulting plausible Scenario(s) are then tested for resilience as illustrated in Figures 1 and 2. However, the guidance can also be used more selectively for the ecosystem services proofing of a particular stage or Futures method. Important is that the ES proofing enables more explicit attention to the links between human activity and ecosystem services provision, essentially considering plausible cause-effect or impact pathways to inform decision-making.

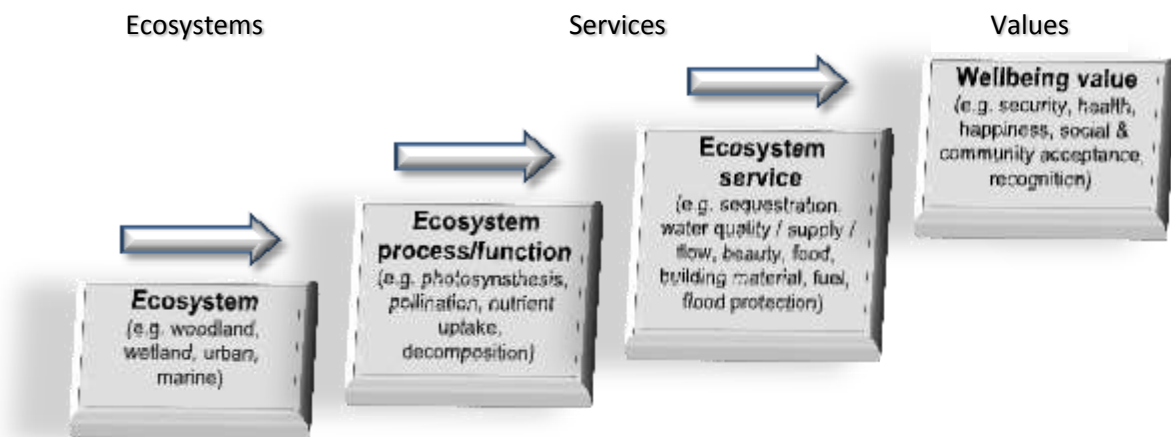


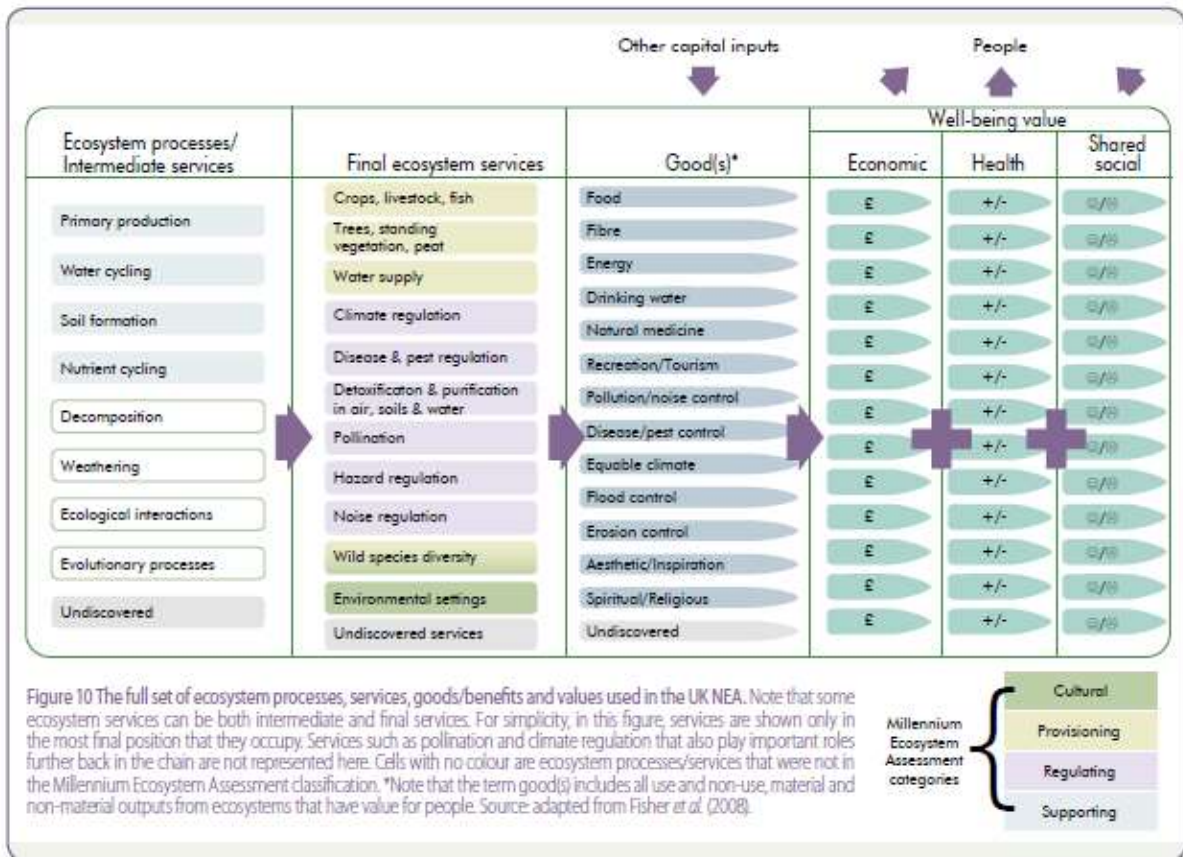
Figure 4: The ecosystems-services-value cascade (after Roy Haynes-Young and others)

5.1 Visioning

[Visioning](#) may draw on a range of techniques; they can be informally constructed through conversations, or formally in workshops. Producing a Vision can act as the starting point for [Backcasting](#) and other [Futures tools](#) or can be used as a valuable exercise in its own right.

This tool **enables organisations or groups of people to develop ideas about what they would like the future to be like and set out their aspirations for an area**. Visioning exercises are often area-focused and **consider natural resources and land use changes**; here both quantity and quality counts. In such cases, the ecosystem services framework (see Figure 5) is likely to add structure and comparability to visioning exercises and should be considered as **a common language and framing** of needs, desires and benefits – be it in their ‘raw’ state or as part of a production process. Trying to unpack specific aspects for parts of the vision can be a helpful exercise where the ecosystem services framework may be useful in bringing out **(inter)dependencies, trade-offs and multiple benefits**. As part of your Visioning exercise you may find it useful to construct your own ES framework adding sub-categories as relevant.

Figure 5: The ecosystems-services-framework as used in UK National Ecosystem Assessment
(Source: UK NEA 2011, Table 10, p.15)



Any vision should be **positive, inspiring and credible** – setting a vision for London as a rainforest for instance is simply not credible, regardless of how much the people of London might want it. Visioning can be ‘unconstrained’ and aspirational or framed by addressing a set of desirable principles which can provide a basis for Backcasting to address strategic challenges and overcome short-term constraints (see section 7, particularly Everard et al. 2009)

How easy are ecosystem services incorporated into my Visioning exercise?

Getting people together to vision around a preferred mix and emphasis of ecosystem services would be **easy to do** and can act as a **valuable learning process** about the ES framework linking up different socio-economic sectors and constituencies of people. This may be done in very general terms or be informed by evidence from the use of other tools such as [Ecosystem Services Assessment](#), [Asset Checks](#), [Corporate Ecosystem Valuation](#), GIS-based modelling and/or Social Return on Investment.

Benefits / additionality of ecosystem services in Visioning

Current visioning exercises tend to be expert-led. Yet, they have the potential to **include a broad range of people**. Such participatory visioning exercises around a **preferred mix of ecosystem services** may reveal overlooked or side-lined values relating to the benefits that people receive from nature. It may also **bring out significantly under-appreciated constraints, risks and opportunities**. Both visioning and the ecosystem services framework work well at a range of scales; therefore visioning is capable of using and connecting ecosystem services from a local to global context. This multi-scalar property of the ES framework can add strength to a Visioning by **zooming in and out from the chosen area and explicitly considering inter-scalar connections and dependencies**. For

example water supply can be assessed at the national and international scale as part of the hydrological cycle (regulatory service), at the landscape scale as a source of fish (provisioning service) or feature that defines the landscape character (cultural service), and at the field scale as a vital ingredient for growing food (supporting/provisioning service), and at the microscale as removing pollutants from foliage, roads etc. and particle pathway which then can get cleaned (regulating service). Using the ES framework demonstrates and highlights the interdependencies and intricate connections of socio-ecological systems, thus increasing capacity for systems thinking.

5.2 Backcasting and Scenarios

A range of futures are developed into a set of credible Scenarios. The steps described under Visioning only get us to the stage of having a 'better' vision; it still needs to be made real. Progress to realising the vision can be helped through [Backcasting](#) which is **a systematic approach to identifying necessary conditions that must be met for the vision to be achieved** (see also the [ecosystem proofed guidance on scenarios](#)).

Backcasting starts from the date of the vision (e.g. 2060) and, for instance, looks at what needs to be in place in 2050, 2040, 2030 and 2020 for the vision to be realised. With an idea of the necessary conditions to be achieved, then **forward-looking planning, through Roadmapping, can be undertaken to work out what steps are needed to move forward from one time-step to another** – e.g. what needs to be done in the period 2013 to 2020 to meet the necessary conditions for 2020 that had been identified through the Backcasting exercise. Backcasting can help form preferred outcomes that are not only more sustainable but also pinpoint barriers and bottlenecks where conflicts need to be overcome ([see section 7, particularly Robinson et al. 2011](#)).

The strategic futures approach thus tries to bring the focus to **what can be done now and in the near-term with a view towards achieving a longer-term vision**, paying attention to the sorts of issues and surprises that unpredictable futures might throw up on that journey. So we set a course for a destination but make sure we have a range of navigation aids that help us to see hazards to navigation on the way and allow us adjust the course en route; potentially even changing our final destination if needs be.

How to integrate ecosystem services thinking into Scenarios, Backcasting or Roadmapping?

Essentially, any Scenario, Backcasting or Roadmapping exercises for a specific place will consider the natural environment. The ES framework can **aid the description of outcomes in scenarios and the interactions and interdependencies between different beneficiaries of ecosystems**. Thereby, the ecosystem-based approach helps **identify actions of mutual benefit and highlight issues that may require agreements to ensure the sustainable management and sharing of ecosystem resources**.

EXAMPLE: Everard et al. (2009) have been the closest to using back-casting in relation to ecosystems in their work on an integrated catchment value systems model. By starting from the 'end-goal' perspective, Everard and colleagues found they could help break down sustainable development actions into 'bite-sized chunks' that enable 'ownership' by the community and therefore is more likely to be sustained into the long-term. Back-casting enabled them to identify the diverse communities within a catchment working together through, for example, a Catchment Management

Agency, Water User Association or other (South African) stakeholder model, to identify services required, the ecosystem functions supplying these services, the ecosystems depending on these services, and therefore the catchment characteristics which were needed to meet all needs.

Clearly, the further into the future one looks, the more uncertain the future becomes and hence the value of 'planning' in any rigorous form deteriorates. Thus when looking over long timescales, Roadmapping has greatest value where it focuses on near and medium-term actions and where it sets out bifurcation or break-points at which alternative pathways may be required. Human reliance on fundamental ecosystem services and the benefits received from associated ecosystem services may thus prove **particularly helpful for considering the longer-term future**, providing specific reference points and grounding that use the same language and framework as for near and medium-term considerations. However, Scenarios do not automatically address all services and the considered range and complexity would depend on how 'holistic' or 'focused' the exercise has to be.

Specific steps to incorporating ecosystem services in Scenarios, Backcasting and Roadmapping

In terms of incorporating Ecosystem Services into Backcasting and Scenarios, very similar consideration and guidance apply as listed under Visioning above. The key questions are:

1. What are the priority ecosystem services for each Scenario and/or the stages in the Backcasting and Roadmapping?
2. Which (key) services does each Scenario and/or Backcasting / Roadmapping stage use?
3. Which (key) services are impacted upon in each Scenario and/or Backcasting / Roadmapping stage?

Current examples of explicit use of the ES framework within Futures work are limited. A range of work under the banner of 'Foresight' has been used in predicting changes to natural landscapes, taking into account a variety of factors. In the context of fisheries management for instance, the FAO (2012) claim that foresight tools, including elements of scenario building, enabled the construction of the Ecosystem Approach for Fisheries (EAF); aiding with clarifying uncertainties with regards to fisheries. The UK government has used foresight in a variety of contexts, from anticipating issues with food supply, to climate change and future landscapes. The former involves predicting the needs of the rising population and the food security which comes along with this. For any of those topics the ES framework provides an integrated systems-based approach and offers specific relevant ES services to be used.

Scenarios as a meta-tool

It is important to remember that the Scenario tools discussed here tend to work as a meta-tool in that **a wide range of other tools can operate within Futures work**, in a nested fashion, and also that **Scenarios can play an important part in other tools** (see Figure 2). For example, scenarios may draw on the [national](#) or an area-specific [ecosystem services assessment](#) to help characterise different land use impacts or draw on information from [National Character Areas](#). Scenarios may include key existing or new regulatory or incentive tools such as agri-environmental schemes, [biodiversity offsets](#) or [Payment for Ecosystem Services](#) which implicitly or explicitly consider/target specific ecosystem services. The effects of different priorities and policy mechanisms can then be assessed using for example [Regulatory Impact Assessment](#) and 'mapped out' across different

scenarios, for example drawing on GIS-based modelling tools. Investment in appropriate facilitation may help to improve the quality and formulation of produced Scenarios.

5.3 Wind-tunnelling

Wind-tunnelling assesses how well the elements of a Vision or Roadmap might perform against a range of anticipated pressures or selected criteria (as expressed in the Scenarios). The assessment may go beyond more obvious pressures and also consider potential threats and ‘wild cards’ which are events that are difficult to foresee or unlikely but would have a dramatic impact (e.g. civil conflict or war; major environmental change such as change in ocean currents; or catastrophes such as the outbreak of new pandemic diseases affecting humans, trees or food crops). The Vision and/or Roadmaps can also be **tested against criteria set out in a Sustainability Appraisal** to assess the extent to which they achieve the principles of sustainable development. The outcomes of the Wind-tunnelling and Sustainability Appraisal can be used to **adjust a preferred Vision or Roadmap and to increase its credibility and robustness** in a range of credible futures.

The ecosystem services framework can help in the rapid assessment of the implications of scenarios through quick ‘wind-tunnel’ assessments. These **test the viability of development and tool options**, paying attention to the **distribution of their benefits and costs to different sectors of society** and the **integrity of underlying ecosystems**. One of the benefits of using scenarios is that they are in themselves ways of capturing and treating complexities in a systems-thinking approach. This means that not just the expected range, quantity and quality of *individual ecosystem services* but also the health and performance of the *overall system* require attention in the wind-tunnelling exercise. This process flags up risks, opportunities and uncertainties but also, importantly, it highlights dependencies and conditionalities that describe in more nuanced detail how the vision may perform within the scenarios. As a result, scenario annotation may be qualified by statements such as ‘yes, but...’ or ‘no, unless...’ and some flesh put on ‘it depends’. This helps **make assumptions clear and explicit** and thus open to challenge and revision.

Specific steps to incorporating ecosystem services in Wind-tunnelling

ES-proofing can occur through testing a ‘conventional’ Vision / Scenario / Roadmap against the delivery of specific ecosystem services and their maintained capacity and quality over time, including considerations of the overall integrity and resilience of ecosystems producing or maintaining those services. Here the ecosystem framework then effectively acts as a set of criteria against which to test the Vision / Scenario / Roadmap. If the ES framework is already integrated into a Vision / Scenario / Roadmap, then the use of wild cards, risks, and/or sustainability appraisal criteria may be appropriate.

In terms of incorporating Ecosystem Services into Wind-tunnelling exercises, the following key questions should be asked:

1. How does each wind-tunnelling assessment (e.g. likely pressures, wild card) impact on the range, quantity, quality and continued provision of the ecosystem services identified in your Vision / Scenarios / Roadmap?

2. Based on the rapid assessment(s), which ecosystem services are most vulnerable and why? What are the expected primary, secondary, ... effects? How does vulnerability of an ecosystem service map against its criticality for the Vision / Scenario / Roadmap?
3. Based on the rapid assessment(s), what opportunities does each scenario imply? Do these opportunities relate to specific ecosystem services or require a specific mix of ecosystem services and policies or management practices? What are the expected primary, secondary, ... impacts? Which Vision / Scenario / Roadmap provides most opportunities and/or is most adaptable?
4. How does the Wind-tunnelling affect the set goals and proposed tools or strategies?
5. What adjustments or fundamental changes could/should be made to improve specific aspects (or ecosystem benefits) as well as the overall resilience of your Vision / Scenario / Roadmap in response to the identified problems and risks?
6. How adaptable is your Vision / Scenario / Roadmap? Can changes be easily made in light of unforeseen events? Further helpful questions here are: How reliant is your Vision / Scenario / Roadmap on a few key products or processes? How easily can multiple paths and options be maintained to potentially act as a buffer?
7. What critical uncertainties remain?

6. What to watch out for – need for good tools and good craftsmen

Using an ecosystem services lens does not automatically produce good work or better answers. We thus highlight the need for adopting Ecosystem Approach thinking rather than just mechanically applying ecosystem services language and categories like a tick-box exercise. A particular challenging area is how to capture and adequately reflect the 'moral imperative' aspects of conservation and environmental management. Just adding in passing a reference to 'intrinsic value' is unsatisfactory. Working with the overlapping benefits and complexities of different ecosystems...

7. Resources and Links

Publications on Futures tools that uses / address ecosystem services

Bohensky, E.L., Reyers, B. and Van Jaarsveld, A.S. (2006) Future ecosystem services in a Southern African river basin: a scenario planning approach to uncertainty. *Conservation Biology*, **20**(4): 1051-1061.

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Haynes-Young R. et al. (2011) The UK NEA Scenarios: Development of storylines and analysis of outcomes. Chapter 25 in: *The UK National Ecosystem Assessment Technical Report*. Cambridge: UNEP-WCMC.

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Robinson, J., Burch, S., Talwar, S., O'Shea, M., & Walsh, M. (2011). Envisioning sustainability: Recent progress in the use of participatory backcasting approaches for sustainability research. <i>Technological Forecasting and Social Change</i> , <i>78(5)</i> , 756-768.
Sutherland, W. J., M. Clout, I. M., Côté, P. Daszak, M. H. Depledge, L. Fellman, E. Fleishman, R. Garthwaite, D. W. Gibbons, J. De Lurio, A. J. Impey, F. Lickorish, D. Lindenmayer, J. Madgwick, C. Margerison, T. Maynard, L. S. Peck, J. Pretty, S. V. Prior, K. H. Redford, J. P. W. Scharlemann, M. Spalding, and A. R. Watkinson. 2010. A horizon scan of global conservation issues for 2010. <i>Trends in Ecology and Evolution</i> 25(1) :1-7. http://dx.doi.org/10.1016/j.tree.2009.10.003
Thrush, S.F., Hewitt, J.E., Dayton, P.K., Coco, G., Lohrer, A.M., Norkko, A., Norkko, J. and Chiantore, M. (2009) Forecasting the limits of resilience: integrating empirical research with theory. <i>Proceedings of the Royal Society B: Biological Sciences</i> 276(1671) : 3209-3217.
Wilkinson, A. and Mangalagiu, D. (2011) Learning with Futures to realise progress towards sustainability: The WBCSD Vision 2050 Initiative, <i>Futures</i> , <i>44(4)</i> : 372-384.

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- UK National Ecosystem Assessment (UK NEA) (2011) *The UK National Ecosystem Assessment: Synthesis of the Key Findings*. Cambridge: UNEP-WCMC.