An Economic Case for the Use of Collaboratively-Developed Natural Capital Plans

About This Report

This report has been written for WWF-UK by Dr Sam Sinclair of Biodiversify Ltd. The opinions expressed in this publication are those of the author and do not necessarily reflect the views of WWF.

The report was commissioned to make an economic case to public and private decision makers, and their representative bodies, for the use of spatial plans agreed by multiple stakeholders as part of the process for setting environmental objectives at a local level. The plans are to be a means to achieving better value for money from expenditures to achieve 25 Year Environment Plan objectives, and to implement a new Environmental Land Management Scheme.

About WWF-UK

At WWF-UK, we're determined to change hearts and minds to make it politically, socially and economically unacceptable to degrade our planet's precious natural resources. We're tackling the underlying causes that are driving nature's decline – notably the food system and climate change. And we're fighting to ensure future generations have a world with thriving habitats and species.

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About Biodiversify

Biodiversify is a conservation consultancy which specialises in using scientific expertise to provide practical solutions to complex social and environmental problems.

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Executive Summary

Developing a replacement for the Common Agricultural Policy that will deliver the 10 goals of the 25 Year Environment Plan (25YEP) will be a complex challenge. Managing landscapes to deliver natural capital benefits to society, whilst respecting the broad range of stakeholder needs will require approaches that are both underpinned by evidence and capable of generating supporting social capital. We propose that drawing on the field of systematic conservation planning to develop regional natural capital plans for England would greatly facilitate this process. Such plans would allow for the analysis of ecological, social and economic data to identify the value of any given area in terms of natural capital benefits, as well as the potential opportunity costs associated with changing management practices. This could directly inform the use of public money to pay for public goods, playing a key role in ensuring that such efforts are cost effective.

Systematic conservation planning is the biogeographic-economic activity of identifying important areas for natural capital. A suite of software packages can be used to analyse spatial data to identify the areas that would most efficiently deliver targets. A broad range of data can be used, addressing not only ecological aspects but also social and economic considerations, meaning that the most socially acceptable, cost efficient solutions can be found. When paired with an inclusive social dialogue, this provides a structure through which a communal vision can be negotiated, and an evidence informed strategy can be developed. From a combination of the social and analytical processes, a proposed distribution of environmental goods and services can be derived. This proposed distribution can then be communicated back through the same dialogue to moderate it in light of stakeholder needs and local knowledge. This establishes a map of the relative values of land for producing environmental goods and services. This map of relative value can then be used to guide payment strategies. Because the approach is underpinned by a readily repeated analysis, the responses from land managers can be easily incorporated into successive iterations, allowing for priorities to be kept relevant as implementation evolves.

A systematic analysis of spatial data underpinned by a collaborative development process would readily mesh with existing consultation processes and could potentially play an important role in managing potentially complex stakeholder interactions. There is an extensive body of international practice which could be used to inform and guide development within an English context. Planning approaches have been used in South Africa to identify priority areas which optimally achieve national targets. These plans have a legal standing and feed directly into land use planning processes, ensuring that the regional contexts of decisions are properly considered. They have been used to develop online tools and sector specific guidelines which provide easy access to the information, reducing the burden of environmental mitigation on the private and public sectors. In Australia, an extensive stakeholder consultation process was used to resolve conflicts and develop of a multiuse zoning plan for the Great Barrier Reef. This has been in continuous operation since being gazetted by the Australian Parliament in 2003. In Canada, a marine plan for the coastal region of British Colombia was developed in 2015 through a collaboration between indigenous groups and provincial government. This plan combines both scientific data and traditional knowledge and is actively used to inform marine management.

Introduction

The 25 Year Environment Plan (25YEP) calls for ambitious, landscape level action that requires a coordinated response from a breadth of actors from all sectors of society. Achieving these ambitious goals will require an approach that is underpinned by science but that is fundamentally about cooperatively creating and delivering a shared vision. In a resource-constrained political context, the goals of the 25YEP must be delivered both efficiently and cost- effectively. In the event that the Common Agricultural Policy (CAP) is replaced by a system that seeks to use public money to pay for public goods, there will need to be an evidence-based framework underpinning disbursement to ensure that funds are spent effectively. In addition, the inherent complexity of the ten goals within the 25YEP requires significant planning and coordination if they are all to be achieved. The likelihood of effective implementation will also be greatly increased if stakeholders see the value of this process and work to facilitate it.

This challenge of achieving complex environmental goals through effective resource allocation embedded in a social process is exactly what systematic conservation planning (SCP) was designed to address. There is an extensive body of practice based on cutting-edge science from which to draw in order to deliver a robust, practical solution. This document will therefore make the case for using an SCP approach to underpin the implementation of the 25YEP and any financial disbursement system that might replace CAP.

To this end, the following sections are included:

1) An introduction to systematic conservation planning
2) An examination of the relevance of conservation planning to the 25YEP
3) An example of international best practice
4) Lessons for England from international best practice

The Need for Spatial Plans

The 25YEP presents an ambitious vision for England's natural capital. One of the key elements of this plan is its comprehensive suite of goals, many of which are inherently spatial, such as the expansion of wildlife areas and the development of a great northern forest. The characteristics of these goals also vary considerably, some require management of large landscape systems, such as flood defences, whilst others are more geographically flexible, such as reducing carbon emissions. Many areas managed for natural capital will play multiple roles, meaning that a holistic approach which takes advantage of complementarity to select areas that deliver multiple targets simultaneously will be key to maximising cost-effectiveness. Such an approach would also have the potential to coordinate the range of funding streams which feed into related environmental objectives, for example flood risk management plans, local nature partnership plans, biodiversity action plans, water company plans and catchment plans[1]. Understanding and quantifying where synergies occur is essential if the value of any given land parcel is to be determined, which in is in turn central to allocating cost. If a system to pay for the provision of environmental public goods, in lieu of a market, is to be cost-effective, a spatially explicit, evidence-based approach that identifies cost and value is essential.

What Sets Systematic Conservation Planning Apart from Other Spatial Tools

There are a range of spatial tools currently available for informing environmental decisions in an English context. Notably however, many of these tools have significant shortcomings. They are frequently developed through non-collaborative processes to address very specific issues and as a result, are often siloed, non-strategic, overly prescriptive and lack accountability. Systematic conservation planning stands apart from other approaches because it rigorously applies computational methods to analyse complex social and biogeographic data to arrive at optimal solutions that are scientifically robust and transparent. Within an SCP process, goals are set at the beginning by identifying the desired

[1] Catchments if you can - making the most of England's annual catchment spending. (2016) Indepen

natural capital features and setting targets for each feature. Costs are then defined, often in the form of land value or opportunity costs to land owners. Indicators for both targets and costs are then selected and specialist software packages are used to conduct complementarity-based analyses which identify sets of sites that most optimally meet the targets, whilst minimising the costs. Because of the flexibility in the data that can be included, SCP is able to holistically consider a breadth of social, political, ecological and geographic considerations to provide a clear, spatially explicit strategy for cost-effectively achieving high level goals, in this instance those set out by the 25YEP. Over 30 years of implementation in a wide range of contexts has provided a considerable range of innovations. There are multiple scientific software packages available which draw on the literature to analyse complex data. The social process that surrounds the data analysis is highly developed and would readily build upon the extensive stakeholder engagement mechanisms already established.

A Brief Introduction to Systematic Conservation Planning

Purpose

The question of how to conserve natural capital effectively at a landscape scale, using limited resources efficiently and minimising social and economic impacts is a ubiquitous one. One of the main challenges is the complexity, as a large number of factors need to be considered across a large scale. The field of SCP has emerged to address this, defined by Kukkala and Moilanen (2013)[2] as the "biogeographic-economic activity of identifying important areas for biodiversity; where, when and how we might efficiently achieve conservation goals". Whilst originally developed by the conservation community, SCP can be readily applied to any spatial environmental problem, such as natural capital or flood defences.

Process

In practice SCP consists of two intertwined elements, the process is both social and technical. On the technical side, data is collated and analysed to find an optimal solution to the problem, and on the social side, key stakeholders must be empowered to play a central role in plan development. Cowling et al[3] (2003) reflected on the South African planning process and noted that the single most important lesson was to ensure "effective incorporation of implementation issues at all stages of the planning process". This is best achieved through meaningful stakeholder engagement; a recent global review[6] found that identifying and involving end users in plan development was the most important factor in determining whether a plan was implemented.

The process is ideally begun by convening a design team that represents as broad a spectrum of stakeholders as possible. This team then works to set clear quantitative targets and identify parameters for how they should be met. They then select the data and evidence that will be used to identify priority areas for conservation or natural capital. This data combines both features to be maximised, such as biodiversity, and elements to be minimised, such as potential losses in agricultural yield. This stage is critical as it allows stakeholders to ensure that their concerns are incorporated into the plan. For example, representatives of the farming community might play a key role in choosing the indicators of agricultural yield to ensure that they are accurate. This data is then analysed using specific software packages which identify where the targets can be most optimally met by changing management practices at the lowest cost to land managers[4]. This suggested solution can then be discussed with key stakeholders or community representatives to incorporate local knowledge, and deliver a plan that is grounded in science but still tailored to the needs of users.

[2] Core concepts of spatial prioritisation in systematic conservation planning, (2013), Kukkala and Moilanen, Biological reviews of the Cambridge Philosophical Society

[3] Introduction to systematic conservation planning in the Cape Floristic Region, (2003), Cowling and Pressey, Biological Conservation

[4] Systematic conservation planning, (2000), Margules and Pressey, Nature.

Application and advancement

Originally designed to inform protected area expansion in Australia, SCP is now used globally to address complex spatial problems. Whilst it is difficult to be sure how many plans have been developed, recent reviews suggest they number in the high hundreds if not thousands and growing exponentially[5]. A recent review[6] found that government bodies play a central role in developing 71% of plans, usually to guide the expansion of protected area networks or to incorporate biodiversity into government decision-making processes. There are multiple notable examples of effective practice internationally: in South Africa, Biodiversity Plans are used to inform land use planning decisions, from environmental impact assessment at the project level, to strategic development frameworks at the regional level; in the USA, State Wildlife Action Plans are used to coordinate conservation action and allocate government funding; finally, in Australia spatial conservation plans are being developed to establish and fund carbon farming projects. As the field of SCP has grown, there have been a number of advances. Multiple types of software have been designed, the development process has been increasingly refined, and reports from implementation have provided important insights.

Stakeholder consultation

The strongest message from practice has been the importance of the process of plan creation as a determinant of effectiveness. Plans which are developed through a collaborative process that engages stakeholders and end users are more effective at guiding action, resolving conflicts and influencing decision-makers. A recent global review found that identifying and collaborating with end users was the most important factor in predicting whether a conservation plan reached implementation[3].

The Potential for Systematic Conservation Planning to Increase Cost Effectiveness in the Delivery of the 25 Year Plan for the Environment

Ensuring a unifying vision

One of the main potential contributions would be unifying regional visions for England's natural capital. A well-designed SCP process would take advantage of existing consultation processes to tackle complex issues and produce a well-grounded, easily understood plan. By providing a vehicle for considering different types of evidence at a landscape level, this approach can ensure that spatial indicators of stakeholder needs are considered transparently, thus fostering the cooperation necessary to establish broad support.

The process of developing a multi-use zoning plan for the Great Barrier Reef is a good example of this. In response to increasing awareness that poor, disconnected governance was leading to environmental degradation, the Great Barrier Reef Marine Park Authority convened the development of an ecosystem-based plan through extensive public consultation to effectively manage the world heritage site, both for biodiversity and the needs of stakeholders. As the reef covers an area of 344,000 km2 and provides an estimated AU$6.9 billion annually to the Australian economy, its management directly affects many groups and communities[7]. During two-stage consultation process 31,690 written submissions were received and used to develop a zoning plan which was legally gazetted in 2004[7]. An executive director of the Great Barrier Reef Marine Park Authority highlighted the importance of effective consultation in delivering a plan that was effective, noting that it was essential that "everyone had to have ownership of it" if the process was to work[7].

One of the larger challenges in managing England's natural capital is that of how to achieve high level goals whilst addressing the needs of diverse stakeholder groups. Any approach should also ideally function through existing public consultation mechanisms. One of the strengths of SCP is that multiple forms of evidence through can be transparently analysed through a scientifically defensible, spatially explicit process. By providing a technical underpinning that is clear about how stakeholder input is considered, it can augment existing consultation processes, greatly facilitating the

[5] Research advances and gaps in marine planning: towards a global database in systematic conservation planning, (2018), Jorge et al, Biological Conservation.

[6] The use and usefulness of spatial conservation prioritization, (2018), Sinclair et al, Conservation Letters.

[7] Navigating the transition to ecosystem-based management of the Great Barrier Reef, Australia, (2008), Olsson et al, PNAS

development of a unifying vision for regional management of natural capital. Bottril et al (2012) [8] studied the benefits that emerged from SCP conducted by The Nature Conservancy, an NGO that had at the time developed over 100 plans across North, Central, and South America and the Asia-Pacific region. They found that the discursive process of developing and negotiating plans delivered a range of benefits, potentially the most important of these was a shared vision for the future. A well-negotiated, shared vision is a combination of a spatially explicit plan, and a mutual understanding of the needs and constraints of other stakeholders. Such a vision plays a key role in implementation because it provides a clear and defensible justification for actions over an implementation period. Where representatives from key stakeholder groups have co-developed and agreed upon a plan, this can also deter opposition or deviation. This in turn would play a key role in encouraging the contributions necessary to achieve the targets. This could take the form of increased participation on the part of land managers, more active private sector engagement or voluntary contributions. In addition, where major expansions of natural capital areas are intended, such as the 500,000 ha of additional wildlife habitat proposed by the 25YEP, a robust and defensible shared vision would be a useful tool in navigating social and political barriers.

Quantifying value

One of the headline goals of the 25YEP is to develop a strategy for nature. This will indicate how England will improve its natural capital by establishing more, higher quality, better connected habitats. One of the major challenges however is that there is no single fungible unit for biodiversity and the environment. Within an English context, the environmental value of a land parcel maybe defined by the contributions it makes towards the 10 targets of the 25 YEP. Challengingly however, a single area may contribute to multiple targets simultaneously. Additionally, some contributions are location independent and can be achieved at multiple sites, such as carbon storage, whilst others provide highly localised benefits which can only be delivered in a restricted selection of locations, such as contributions to community health. Further to this, the value of a site is also dependent on the areas already actively managed for nature, for example if targets for the protection of a threatened species or habitat have already been met, then further protection may be a lower priority. As a result, it is not possible to determine the contribution of a land parcel when it is considered in isolation, making its value unclear. One of the key benefits of a systematic plan would be to provide an up-to-date relative value for natural capital sites, as well as identifying the extent of geographical flexibility. Critically, this can be readily compared to a range of opportunity cost indicators, such as agricultural yield, thus providing a clear indication of the potential market price for a public good. The ability of a natural capital plan to increase cost effectiveness by providing a scientifically and economically informed valuation provides a significant advantage over *ad hoc* approaches.

Potentially one of the best examples of this approach working in practice is from the province of KwaZulu Natal in South Africa[9]. The government led systematic plans analyse a wide breadth of data to prioritise areas which collectively deliver national and international biodiversity conservation targets. These have been selected to have the lowest economic and social cost by considering factors such as proximity to human populations or roads. To guide management, the plans divide priority areas in to two categories: “mandatory”, those that contain natural capital which does not exist elsewhere and so must be conserved if targets are to be met, and “optimal”, areas that present the lowest cost solution to meeting targets. These categories are actively applied in land use decisions, for example during an environmental impact assessment process, developers must indicate how they have avoided priority areas, minimised their impacts, restored habitat degraded during the construction process, and in exceptional circumstances offset residual losses.

Informing land use decisions

A map that provides justified valuations of natural capital will likely have a range of potential applications. By indicating the public good provided by a natural area, there is the potential to inform decisions about land use. Historically, planning processes consider proposals and weigh a range of costs and benefits including those to society, the economy and the environment. Critics have however argued that they frequently undervalue the environment and natural capital benefits. Whilst there are multiple types of area currently identified as being of particular importance within an English context, they are often based on a small number of criteria, are not prioritised systematically and do not collectively deliver a comprehensive suite of targets. In other nations, robust systematic conservation plans which identify priority

[8] Evaluating Perceived Benefits of Ecoregional Assessments, (2012), Bottril et al, Conservation Biology
[9] http://bgis.sanbi.org/KZNSCP

areas for natural capital have been included as a standard component of land use decision making. In South Africa, natural capital plans (known as Biodiversity Spatial Plans) are incorporated into strategic development frameworks at the regional level, used to inform sector specific plans, and applied at a project level through environmental impact assessment. A study of the impact of Biodiversity Spatial Plans on government decision making processes found that they played a central role in the consideration of natural capital[10]. They were also found to be effective decision support tools which were routinely used to streamline the process and educate applicants. The plans also played an important role in identifying and communicating the value of these areas, which in turn informed decisions about these shared resources. If implemented in England, this could directly guide development, and allow environmental costs to be minimised, providing an overall benefit to society and the economy.

Achieving targets cost effectively

Many of the goals of the 25YEP are inherently synergistic as natural areas can play multiple roles simultaneously. For example, a wetland used as a natural flood defence may improve the health and safety of local communities, as well as providing important habitat for threatened bird species. Whilst it's possible to catalogue the characteristics of an individual site, without an understanding of its context within the region, it is not possible to understand its relative contribution to national targets. The central function of systematic conservation planning is to identify where such synergies occur and select a complementary portfolio of sites which collectively allow for targets to be achieved at the lowest cost. Given the complexity of such a task, implementation is more likely to be cost effective if decision makers are armed with a strategic, data-informed strategy, which can be rapidly updated to reflect ongoing developments.

Adapting to the future

One of the strengths of using an SCP approach is that new evidence can often be readily incorporated into calculations. For example, if technological advancement drives a change in land use or if new data becomes available, the plans can be updated to consider these novel effects. There are different ways this can be achieved, government agencies in KwaZulu Natal in South Africa maintain a "living database" which contains over 57 regularly updated data layers addressing a wide range of social and environmental characteristics[11]. When a development or action is proposed, this database can be consulted, instantly providing an up-to-date indication of potential environmental sensitivities and consequences, as well as the contextual importance of the land parcel in terms of natural capital contributions and regional targets[11]. Alternatively, this can be achieved through regular iterations of plans: conservation agencies in The Western Cape in South Africa develop novel SCP at 5-7 year intervals. Each iteration incorporates novel data as well as technical innovations and advances[12].

Managing voluntary contributions and funding from other sources

As the importance of natural capital is increasingly recognised, there is a growing scope for private entities to invest in the provision of ecosystem services that directly benefit them. A natural capital plan would guide the private sector by identifying where and how they could secure ecosystem services that would benefit their business. An example of this in practice is the Landscape Enterprise Networks (LENs) projects operating in Cumbria and East Anglia. Private sector partners, such as Tesco and Nestle, are increasingly aware that their commercial viability is dependent on a functional landscape. As such they have been motivated to invest in natural capital in their sourcing regions to increase landscape resilience, improve soil quality and reduce flood severity[13]. The outputs of a SCP process could be readily designed to provide an indication of the natural capital benefits received by the private sector. This in turn could be used to motivate and manage private sector investment in natural capital. In addition, the same tool could also guide the delivery of corporate social responsibility actions. For example, a private entity could use the plan to direct investment into priority areas that provide much needed benefits to local communities. This would then allow a clear link to be drawn between the private sector contribution and the services delivered to beneficiaries. The contributions of the private sector partners to regional and national targets could also be readily recognised and incorporated into the plan.

[10] The role of social factors in environmental decision making, (2018), Chapter 5, Sinclair
[11] Pers Comm Dr Boyd Escott, Manager of Biodiversity planning and spatial information
[12] Western Cape Biodiversity Framework (2014) and Western Cape Biodiversity Spatial Plan (2017)
[13] http://www.3keel.com/wp-content/uploads/2018/01/healthy-ecosystems-cumbria-lens.pdf

Ensuring local benefits

At the core of the 25YEP is a recognition of the important roles that wildlife areas can provide for the health and wellbeing of individuals and communities. Ensuring that these benefits are delivered requires an informed understanding of the interactions between people and their environments at the local scale. Whilst SCP was originally conceived as a means of guiding protected area expansion, it was rapidly adapted to balance trade-offs between high level targets and local needs. This has been approached from a technical perspective, a breadth of methods has been developed for including economic costs in the analysis[14]. It has also been tackled procedurally. There are many examples from practice for how to optimally structure processes so that they effectively mesh with existing consultation processes[15]. An example of this is the Marine Plan Partnership for the North Pacific Coast (MaPP). This comprehensive plan provides recommendations for marine management and informs decisions regarding the sustainable economic development and stewardship of British Columbia's coastal marine environment. Critically, MaPP has been developed through a collaboration between the Province of British Columbia and the First Nations peoples, the predominant indigenous population of Canada[16]. By using representatives from appropriate ministries and the 17 member First Nations, the plans combine the best available science with local and traditional knowledge whilst simultaneously acting as a driver of cohesion and collaboration.

The inherently consultative SCP process provides the opportunity for bespoke products for different regions that recognise and reflect the variations and nuances in the needs of local communities. Within the English context pre-existing organisations such as local nature partnerships or local authorities could be invited to represent their constituents in plan development and execution. In addition, a well-designed natural capital plan could act as a vehicle for demonstrating how stakeholder needs had been recognised. In the Canadian example, the same organisations that contributed to plan development actively disseminated the outputs as part of a mainstreaming program with the aim of informing stakeholders about environmental management in their area, something which could be readily replicated in England.

Risk management

The process of creating a richer environment includes an inherent degree of uncertainty; restoration activities sometimes under deliver, weather conditions can affect pollutant run-off and species can unexpectedly decline. A natural capital plan could guide management of these risks if appropriately designed through the inclusion of relevant data sets and frameworks. Whilst a plan would identify geographical areas as priorities, it would also be possible to apply the mitigation hierarchy to suggest different types of actions across landscapes. The mitigation hierarchy is widely used to manage the environmental impacts of a broad spectrum of activities. It sequences different types of mitigation actions in order of decreasing environmental desirability and increasing risk. A recent study from The University of Oxford demonstrated how the hierarchy could be applied to proactively prioritise actions at a landscape level to facilitate risk management in a language already familiar to the private and public sectors[17]. This innovation could be easily incorporated into English natural capital plans.

Streamlining

One of the concerns most routinely raised by the private sector when managing their impacts on the environment is the challenging, complex nature of ecological considerations. An effectively communicated natural capital plan could help businesses understand potential environmental concerns at an early stage, streamlining existing processes. An in-depth review of the role of plans on the South African environmental impact assessment process found that plans were consulted in the vast majority of applications, usually in the early stages[18]. Consultants and developers reported that being able to rapidly identify environmental sensitivities facilitated project planning, helped with cost forecasting, and reduced the overall cost of environmental impact mitigation.

These benefits can potentially be achieved in England through effective plan design and delivery. Plans could provide detailed information about the specific sensitivities of wildlife areas, as well as guidance as to how and where impacts should be avoided or minimised. This reduced uncertainty would help actors predict costs, avoid delays and improve

[14] Integrating economic costs into conservation planning, (2006), Naidoo et al, Trends in Ecology and Evolution
[15] Let the locals lead, (2009), Smith et al, Nature
[16] http://mappocean.org/
[17] A Global Mitigation Hierarchy for Nature Conservation, (2018), Arlidge et al, Bioscience
[18] The role of social factors in environmental decision making, (2018), Chapter 5, Sinclair

impact mitigation, leading to better outcomes for both natural capital and the private sector. In South Africa this information is delivered through an easily accessible portal which allows developers and consultants to rapidly access both the plans and any relevant underpinning evidence[19]. The raw data, such as species occurrence records and landcover information, is also made available to inform mitigation efforts.

Issues with the evidence base

Whilst there is an extensive literature on the theory and practice of SCP, there is a lack of studies which compare the relative effectiveness of planned and *ad hoc* approaches[20]. There are multiple reasons for this deficit. Primarily, the organisations that lead complex land use planning processes rarely wish to invest in the extensive research required to scientifically measure the effectiveness of their approach. Should they wish to conduct such research, the variation between even neighbouring regions can make it a challenge to identify the control areas required to demonstrate causality.

While plans specify optimal outcomes, they are generally used to guide actions rather than dictate them. The challenges of implementation usually necessitate adaptation to changing contexts and even when goals are met, the final outcomes often differ from the original intentions. As such, measuring effectiveness by the extent of plan delivery can be misleading. Another option would be to measure the extent to which the desired goals are met, even if they are achieved through different means to those prescribed by the plan. In such cases the benefits of the SCP process might be realised through an improved ability to adapt, negotiate and act. Whilst such benefits have been broadly reported[7,6], it is rarely possible to disambiguate the specific effects of a plan from surrounding contexts, such as organisational effectiveness or unexpected opportunities.

It can also be very difficult to track cause and effect. In South Africa biodiversity plans identify areas with critical habitat. These areas are afforded a degree of protection within planning processes. A study of the impact of plans found that where a natural area was highlighted as a being important for biodiversity, developers were dissuaded from proposing environmentally impactful projects[10]. As these decisions were usually made confidentially, and thus not shared with government bodies, a significant proportion of the impact of plans was routinely undetected.

A Practical Example of International Best Practice

Whilst there is a wealth of international practice to draw from, South Africa represents the leading example of the application of spatial plans to support government decision-making processes. This nation has been using SCP for over thirty years to inform decision-making across a range of sectors, processes and levels. This extensive implementation has led to a wide range of practical advances which improve the effectiveness and relevance of plans, providing a strong example from which to draw. Initially proposed by academics, the approach was rapidly adopted by government bodies and NGOs who transformed SCP into a fundamental component of land use planning.

The South African application of systematic conservation planning

The state of South Africa's environment and biodiversity is reviewed in the National Biodiversity Assessment, conducted every 5-8 years. This assessment is then used to develop the National Biodiversity Strategic Action Plan (NBSAP) which sets out the strategy for fulfilling commitments under the Convention for Biological Diversity. This document identifies conservation features, details their sensitivities and then sets rigorous, scientifically-informed targets for their conservation. Based on these robust targets, the document then identifies the challenges faced, and prioritises actions across the country, highlighting areas where efforts should be focused. These targets are then operationalised by

[19] https://bit.ly/2SN7Hdi

[20] Absence of evidence for the conservation outcomes of systematic conservation planning around the globe: a systematic map, (2018), McIntosh et al, Environmental Evidence

provincial level plans, as illustrated in Figure 1 [21]. Developed using an SCP approach, these plans identify priority areas for conservation action and quantify the provincial contribution to national targets. Multiple categories of priority area are identified, each with different values, contributions and management needs (See table 1). These in turn speak to different elements of policy and legislation and guide integration of the plans into a breadth of land use planning processes. At the regional level they are a standard component of multiple planning processes including industrial development zones and strategic development frameworks (such as the Western Cape SDF[22]). They are also routinely considered at the project level through environmental impact assessments and environmental management frameworks as well as being translated to guide specific sectors such as mining and natural resource extraction (Such as the mining and biodiversity guidelines[23]). This integration into decision-making processes is facilitated by a standardised approach; the language, presentation and design protocol are prescribed by nationally gazetted guidelines.

Over thirty years, conservation plans have transitioned from an academic concept into a fundamental component of land use planning in South Africa. The widescale application of the plans to decision making has ensured that biodiversity is routinely considered during land use planning. An extensive study of the environmental impact assessment process found that because the value of a conservation area can now be much more clearly defined, it is far easier to consider the consequences of development and balance challenging trade-off decisions[24]. It is also a considerable success to have a tool which is capable of working at different scales. For example, the same map has been used to inform both the establishment of small-scale orchards, and the expansion of a national road network. As with many adaptable tools, the plans have continuously evolved over successive iterations, developing wider relevance, utility and functionality. As they have been increasingly mainstreamed, they have expanded in usage, allowing them to provide improved support for decision-makers and to provide coordination and guidance to the conservation sector.

A practical tool

The accessibility of the South African plans is key to their effectiveness. A website hosted by SANBI provides a suite of tools which allow users to download data, read reports and interact with design maps[25]. As well as informing land managers, these tools have been specifically designed to be readily applied by the environmental consultants who guide developers through legislative processes[26]. This careful tailoring to the needs of end users has helped increase uptake and made the tools a standard component of environmental impact mitigation efforts[19]. In addition to the spatial tools, the plans contain guidelines for regions or sectors which can be used to directly inform management practices, such as pesticide use, waste management or water extraction.

[21] Pence, G.Q.K. 2017. Western Cape Biodiversity Spatial Plan files. (geospatial dataset). Stellenbosch: CapeNature.
[22] https://www.westerncape.gov.za/eadp/files/atoms/files/psdf_report.pdf
[23] http://biodiversityadvisor.sanbi.org/industry-and-conservation/conservation-and-mining/understand-2/mining-and-biodiversity-guideline/
[24] The role of social factors in environmental decision making, (2018), Chapter 5, Sinclair
[25] http://bgis.sanbi.org/
[26] Systematic conservation planning products for land-use planning: Interpretation for implementation, (2005), Pierce et al, Conservation Biology

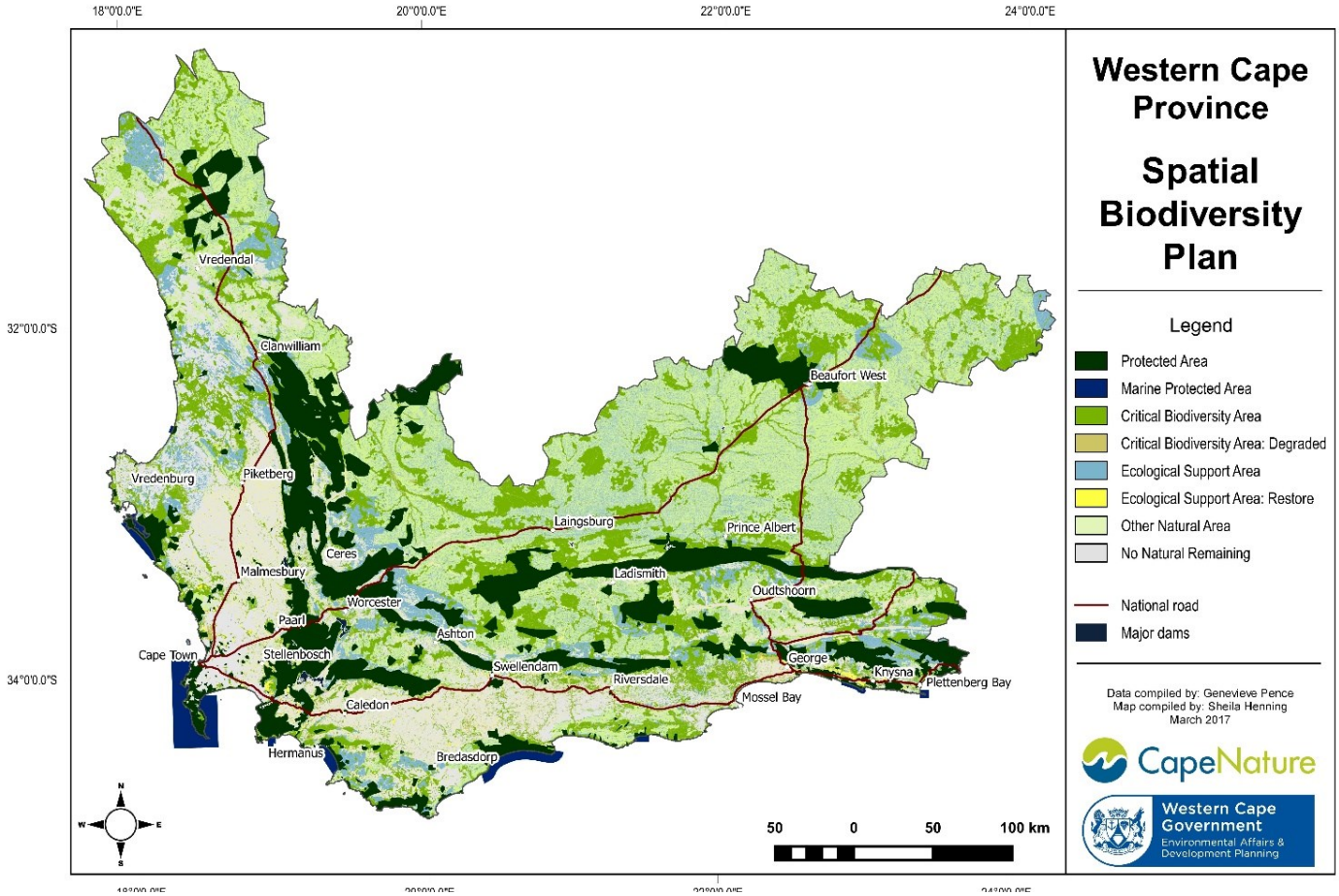

Figure 1 The Spatial Biodiversity Plan for the Western Cape. This map is the end product of an extensive government led prioritisation process. It identifies the areas where conservation action would most cost effectively deliver provincial environmental targets. It is designed according to strict protocols and as such is an obligatory component in many different land use planning processes.

MAP CATEGORY	DEFINITION	DESIRED MANAGEMENT OBJECTIVE
Protected Area	Areas that are proclaimed as protected areas under national or provincial legislation.	Must be kept in a natural state, with a management plan focused on maintaining or improving the state of biodiversity.
Critical Biodiversity Area 1	Areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure.	Maintain in a natural or near-natural state, with no further loss of habitat. Degraded areas should be rehabilitated. Only low-impact, land-uses are appropriate.
Critical Biodiversity Area 2	Areas in a degraded or secondary condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes.	Maintain in a functional natural or near-natural state, with no further loss of habitat. These areas should be rehabilitated.
Ecological Support Area	Areas that that play an important role in supporting the functioning of PAs or CBAs, and are vital for delivering ecosystem services.	Maintain in a functional, near-natural state. Some habitat loss is acceptable, provided the underlying ecological functioning is not compromised.
Ecological Support Area 2	Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of PAs or CBAs, and are vital for delivering ecosystem services.	Restore and/or manage to minimize impact on ecological infrastructure functioning; especially soil and water-related services.
ONA: Natural to Near-Natural	Areas that have not been identified as a priority in the current systematic biodiversity plan, but retain most of their natural character and perform a range of biodiversity and ecological infrastructure functions.	Minimize habitat and species loss and ensure ecosystem functionality through strategic landscape planning. Offers flexibility in permissible land-uses, but some authorisation may still be required for high-impact land-uses.
No Natural Remaining	Areas modified by human activity, are no longer natural, and do not contribute to biodiversity targets.	Manage in a biodiversity-sensitive manner, aiming to maximise ecological functionality.

Table 1. The different categories mapped in Figure 1, their roles and associated management guidelines.

Lessons for England from International Best Practice

Drawing on international models

If a natural capital plan were to be developed for regions of England, components of a suitable model might be drawn international examples of best practice. By taking advantage of the considerable resources already invested in existing examples of implementation, an effective suite of tools could be produced at a relatively low cost. There is also an extensive body of scientific literature that addresses technical elements of SCP including design, process and presentation. Reviews of the scientific literature have identified over 1659 peer reviewed articles and over 645 conservation plans[1,3]. There are however several key lessons from international implementation which could directly inform the development of natural capital plans in a UK or English context.

The importance of supportive legislation

The national environmental management of biodiversity act (NEMBA) of 2004 founded the South African National Biodiversity Institute (SANBI) to convene the necessary experts and develop a community of practice[27]. It also provided the legislative mandate for incorporating the plans into land use planning processes. This has been further augmented by guidelines gazetted by the Department for Environmental Affairs which stipulate how plans should be designed and presented in order to ensure their seamless integration into other government processes. There is currently widespread debate about an upcoming Environment Bill in the UK. If a spatial plan is to be adopted as part of the strategy, then it may be desirable to draw inspiration from the South African example, and provide plans with a statutory underpinning that would catalyse action and resources, and ensure transparency and accountability in decision-making and consultation processes.

Developing a diverse community of practice

One of the key roles played by SANBI has been to convene and support a community of practice through regular events, curation of data and development of standards. This has in turn facilitated rapid innovation, advancement and implementation[28]. One of the main strengths of this community is its diversity. It comprises of a wide range of scientists, government officials, NGOs, private sector partners and planning specialists. A variety of inclusive meetings are held to facilitate participation. This has allowed different types of stakeholder to engage directly with the planning community, helping them understand and contribute to the mechanics of plan creation. This has both improved the plans and fostered cross-sector support [29].

Developing tools that facilitate mainstreaming

Broad uptake of novel tools requires an active outreach strategy. In addition to the already consultative process, a suite of approaches has been adopted to achieve this in South Africa. The Biodiversity Geographical Information System website[30] allows anyone to access the plans directly. An interactive, in-browser tool delivers detailed ecological information about species and ecosystems for any location at the click of a button. This is designed to allow any member of the public to rapidly understand the environmental sensitivities which they may need to consider when planning activities. This website also provides reports which give detailed guidance for impact mitigation as well as the raw data, which is often used by environmental consultants. The Australian state of Queensland has also developed a comparable tool to support their Land Restoration Fund, a carbon farming initiative which seeks to address the causes of climate change by funding the management of areas for natural capital[31]. Critically, these online resources provide services directly useful to the professional activities of a range of public and private sector actors. To encourage active uptake, staff from South African conservation agencies have also held “Road Shows” at the municipal level (comparable to local authorities in the UK). These events target local government, civil society and environmental professionals with the aim of educating them about the rational, design, purpose and usage of the plans. As well as teaching participants how to apply these tools to their professional activities, these events provide feedback essential to improving future iterations.

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[27] https://www.environment.gov.za/sites/default/files/legislations/nema_amendment_act10.pdf

[28] Designing Systematic Conservation Assessments that Promote Effective Implementation: Best Practice from South Africa, (2006), Knight et al, Conservation Biology

[29] http://biodiversityadvisor.sanbi.org/participation/biodiversity-information-management-forum/biodiversity-planning-forum/

[30] http://bgis.sanbi.org/

[31] https://www.qld.gov.au/environment/climate/climate-change/land-restoration-fund

Creating opportunities to link with legislative and policy processes

Systematic conservation planning is extremely flexible, it has been applied across the world to address a wide range of challenges. This flexibility arises from its potential to provide bespoke solutions to suit the context. In South Africa, plans have been tailored to directly link with existing policies and take advantage of political opportunities. Possibly the best example of this is the use of natural areas to address the worsening water crisis. Wildlife areas that support the nation's water system, such as wetlands, are identified on the plans as ecological support areas, which in turn promotes their retention and management in land use management processes. Additionally, this is used to leverage public money for alien species eradication under the "Working for Water" initiative, a scheme which provides low skill employment in return for public service[32]. The English context has its own specific social, political and legislative opportunities, for example, there is appetite for net environmental gain, increased connectivity and improved resilience. Effective planning for regions of England should leverage these desires and clearly indicate how they can be achieved efficiently, cost-effectively and reliably. Additionally, there are already a breadth of locations identified as conservation priorities, incorporating these into the plan would increase its perceived strength.

Balance standardisation with innovation

Effective environmental management requires an adaptable, evolving response. A conscious effort must be made to maintain consistency across a nation in order to increase accessibility, whilst still allowing for regional plans to innovate and address local needs. In The USA, each state develops a State Wildlife Action Plan[33] (SWAP) which indicates how they will conserve threatened species. The SWAPs must address eight specific elements identified by congress, follow best practice guidelines and undergo a review process, but beyond that, state agencies have considerable agency to tailor the plans to their contexts. In South Africa, a national lexicon[34] has been produced and specific guidelines have been gazetted which specify a breadth of design components, such as colour and types of category. This is intended to ensure that any plan is immediately familiar to any reader. Natural capital plans will be more effective in England if these lessons can be applied to identify where to standardise, and where to allow flexibility.

[32] https://www.environment.gov.za/projectsprogrammes/wfw

[33] https://www.fishwildlife.org/afwa-informs/state-wildlife-action-plans

[34] http://biodiversityadvisor.sanbi.org/planning-and-assessment/lexicon-of-biodiversity-planning-in-south-africa/

Conclusion

Implementing the 25 Year Environment Plan will ultimately require a flexible, informed approach. Potentially the most central challenge will be accurately assessing the value of natural capital and determining a cost that is both fair for land managers and provides public goods cost effectively. The bold scope of the 25YEP means that a complementarity-based approach that seeks to coordinate the delivery of complementary targets at each location and recognises this in ascribed values will likely be key to achieving cost-efficiency.

If public consultation is not managed sensitively, there is a risk that the methods for ascribing values could be perceived as "black box" and poorly understood. This could in turn lead to issues during public consultation and implementation. One of the strengths of SCP is its potential to resolve decision making conflicts in practice by providing a transparent underpinning, informed by data, that allows stakeholders to communally understand the consequences of their decisions. This can be used to foster regionally shared visions which leverage social capital to streamline implementation.

Systematic plans are also an inherently adaptable approach. They are frequently found to have unexpected benefits or used to support a range of other initiatives. There is international precedent for their incorporation into land use decision making processes, both at project and regional levels. They have also been used to manage private contributions to biodiversity objectives as well as directing compensation for impacts through approaches such as biodiversity offsetting. Ultimately the approach provides the underpinning required to deliver bespoke, scientifically-supported solutions for understanding and managing natural capital at the landscape level. In the largest global review of systematic conservation planning, it was noted that the approach "is not an exact science, but a dialogue that software tools can effectively mediate."[35].

[35] The use and usefulness of spatial conservation prioritization, (2018), Sinclair et al, Conservation Letters