MAPPING SPATIAL PRIORITIES

A PRIMER OUTLINING AN INTEGRATED SYSTEMATIC APPROACH TO SPATIAL ASSESSMENT, PRIORITIZATION AND PLANNING

Cover picture
Extract from an illustration by Michael Scott for WWF displaying the benefits of county spatial planning in Kenya.

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About the authors

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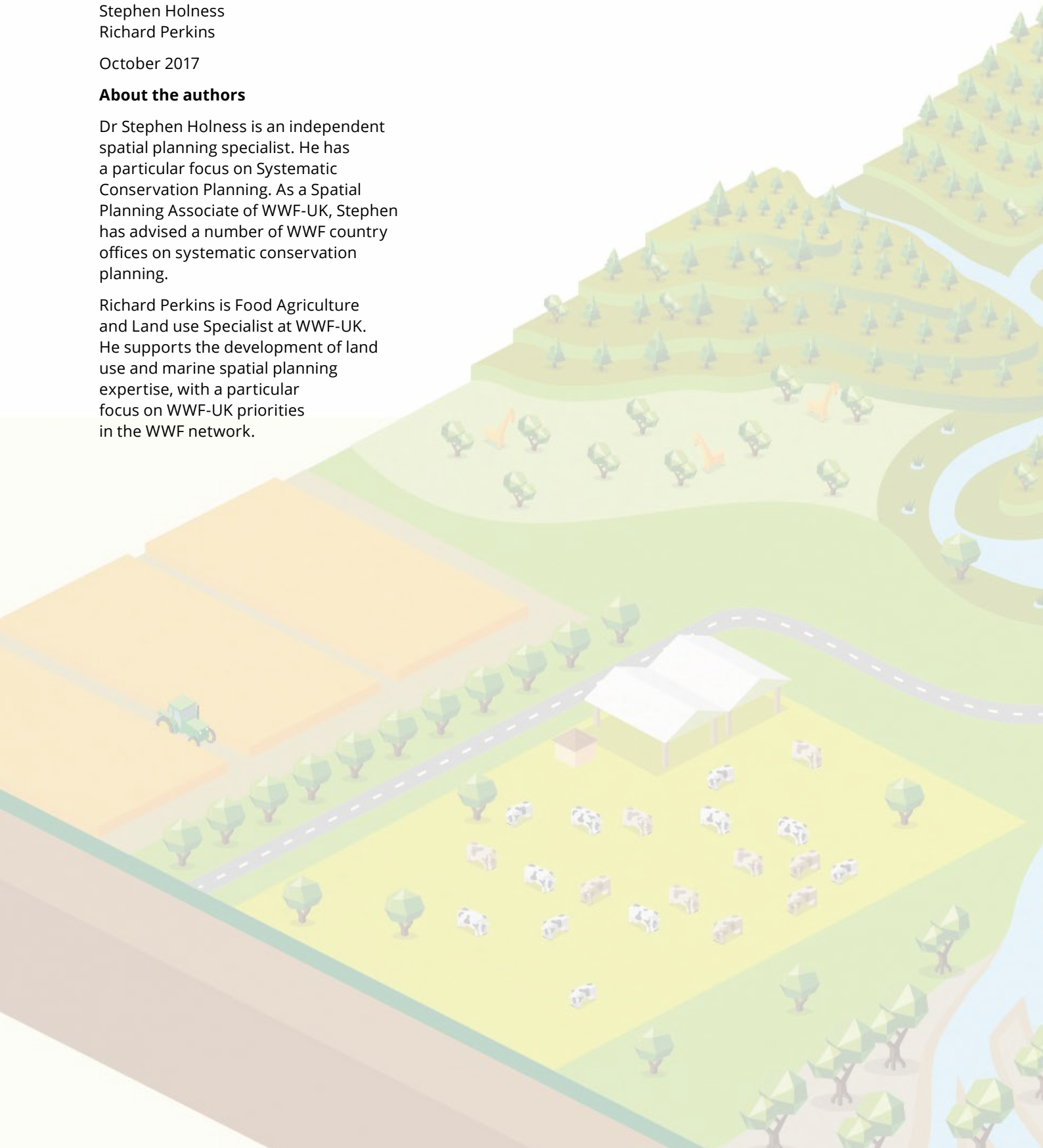
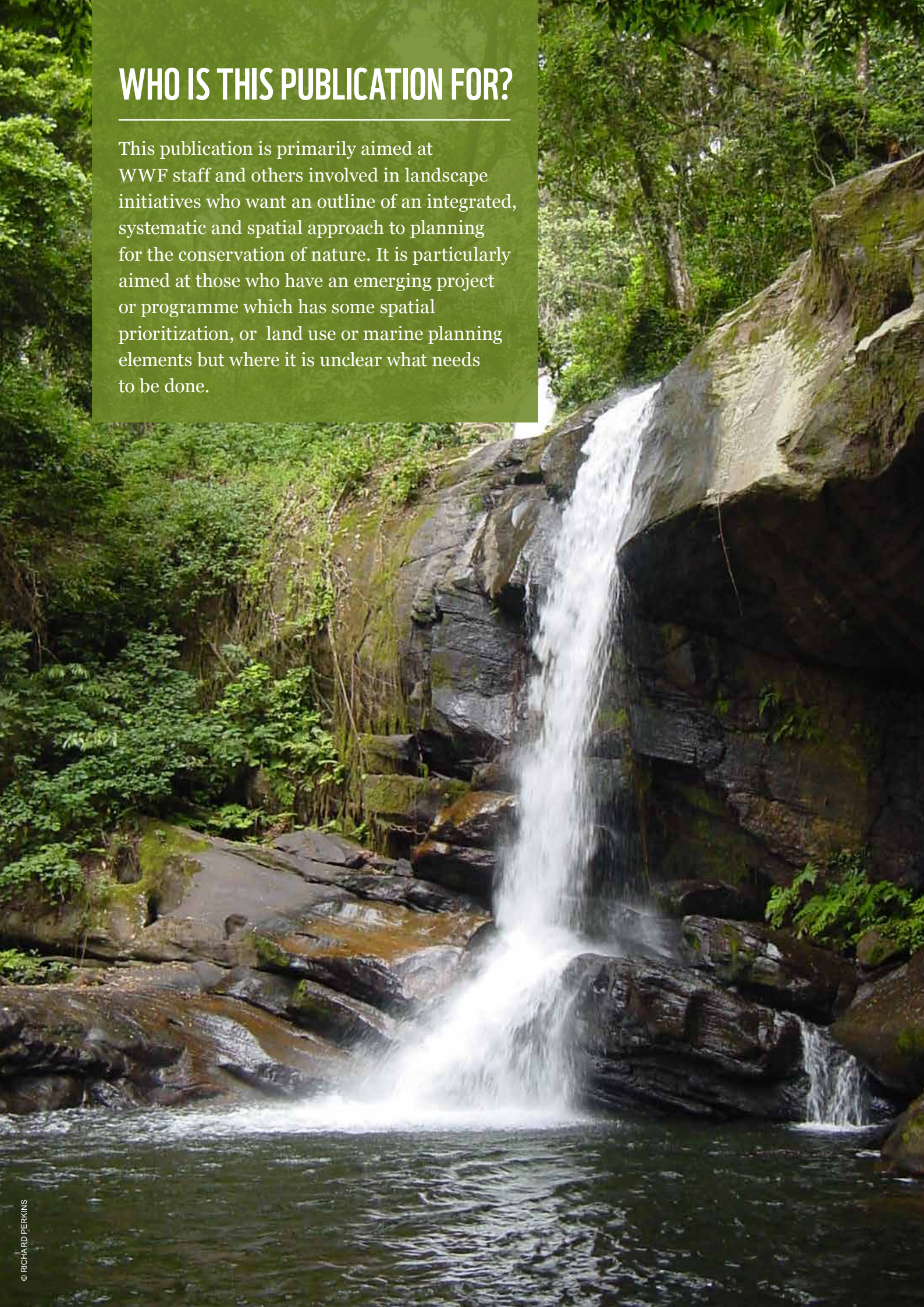


WHO IS THIS PUBLICATION FOR?

This publication is primarily aimed at WWF staff and others involved in landscape initiatives who want an outline of an integrated, systematic and spatial approach to planning for the conservation of nature. It is particularly aimed at those who have an emerging project or programme which has some spatial prioritization, or land use or marine planning elements but where it is unclear what needs to be done.



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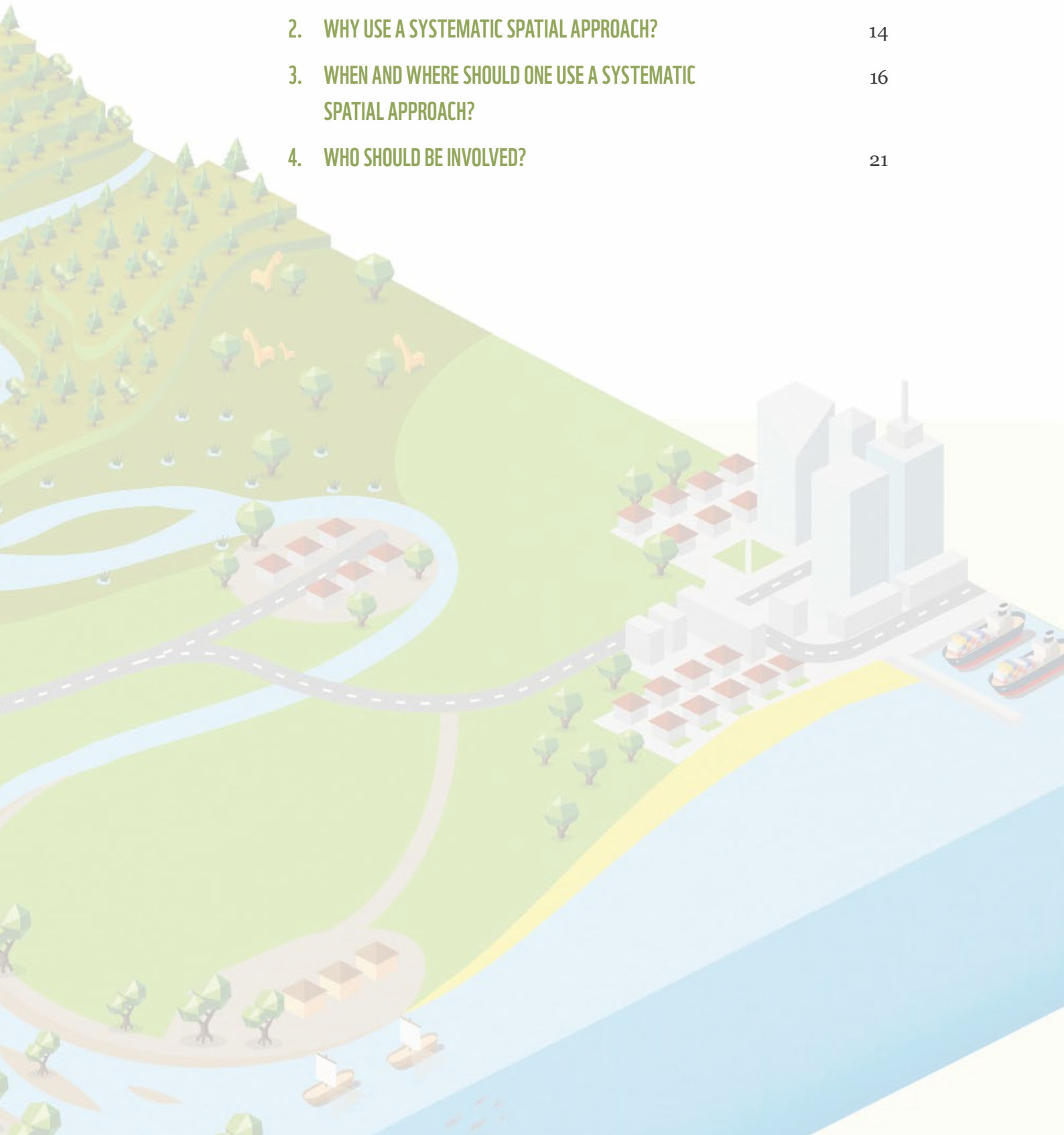


EXECUTIVE SUMMARY

This document outlines an integrated systematic approach to spatial assessment, prioritization and planning

1. WHAT IS A SYSTEMATIC SPATIAL APPROACH TO MAKING DECISIONS ON THE USE OF LAND AND WATER?

A systematic spatial approach built on the principles of Systematic Conservation Planning (SCP) can broadly be divided into three components, namely:

i. **Spatial Assessment** identifies relevant natural features and then evaluates the status (condition, threat and protection) of all the features in a class of natural features across a region (e.g. seasonally flooded wetlands in East Africa). It provides information on issues such as rates of loss, a Red List status for ecosystems, and protection levels or gap analyses for a Protected Area network.

ii. **Spatial Prioritization.** In addition to the previous operations carried out during Spatial Assessment, Spatial Prioritization takes this information and identifies the most important and sensitive areas, which require urgent interventions, and examines how we should safeguard them. In addition to the distribution, condition and status of natural features (carried out under spatial assessment), this process often involves an analysis of the opportunities and limitations at sites for conservation actions, examines the spatial configuration of sites, may include social and economic data, and may involve stakeholders. It often requires the use of sophisticated prioritization software such as Marxan.

iii. **Spatial Planning** is a formally mandated process within a jurisdiction that builds on the above processes, adding in public, governance and zoning elements to agree on and specify an allocation of human activities that achieves ecological, economic, and social objectives. It is generally called Land-Use Planning in a terrestrial environment and Marine Spatial Planning (MSP) in marine and coastal areas.

2. WHY USE A SYSTEMATIC SPATIAL APPROACH?

The benefits of a defensible and spatially explicit approach, that uses robust evidence to assess the state of natural features and helps decide on priority areas for action, are: it fits in closely with the WWF land use principles and can help towards achieving Sustainable Development Goals; it can form the basis of robust "Go, No-Go" assessments; it supports the rational application of offsetting; it can integrate ecosystem, species and ecosystem service requirements; it supports the scoping of environmental priority issues and areas against clear and defendable criteria; and it avoids bias. The approach works particularly well in landscapes and seascapes where there are multiple legitimate resource users as it demonstrates that the environment sector is not laying claim to an interest over the whole area but rather is attempting to achieve its objectives efficiently, using the smallest possible area and avoiding conflict where possible.

3. WHEN AND WHERE SHOULD ONE UNDERTAKE A SYSTEMATIC SPATIAL APPROACH?

Spatial Assessments, Spatial Prioritization and Spatial Planning can be undertaken for a variety of purposes, areas and at a variety of scales. The approaches are relevant across marine, freshwater and terrestrial systems. The links to WWF's Project and Programme Management System (PPMS) planning process are that the systematic approach sets clear targets, identifies spatial priorities and evaluates threats to these priorities. Hence it lends itself to effective project planning and monitoring and evaluation. It provides a context for asking questions about effectiveness, location of projects, and is a very useful backbone for monitoring and evaluation.

4. WHO SHOULD BE INVOLVED?

All processes are invariably improved by being appropriately inclusive and engaging stakeholders. There should be effective stakeholder participation, respect for human rights, and equitable and transparent benefit sharing. There is value in co-producing data, gaining stakeholder endorsement, and engaging in stakeholder processes to identifying alignments between social, economic and ecological issues.

1. WHAT IS A SYSTEMATIC SPATIAL APPROACH?

A systematic spatial approach to integrating economic, social and ecological issues into decision making on the use of land and water can broadly be divided into three components, namely **Spatial Assessment**, **Spatial Prioritization** and **Spatial Planning**.

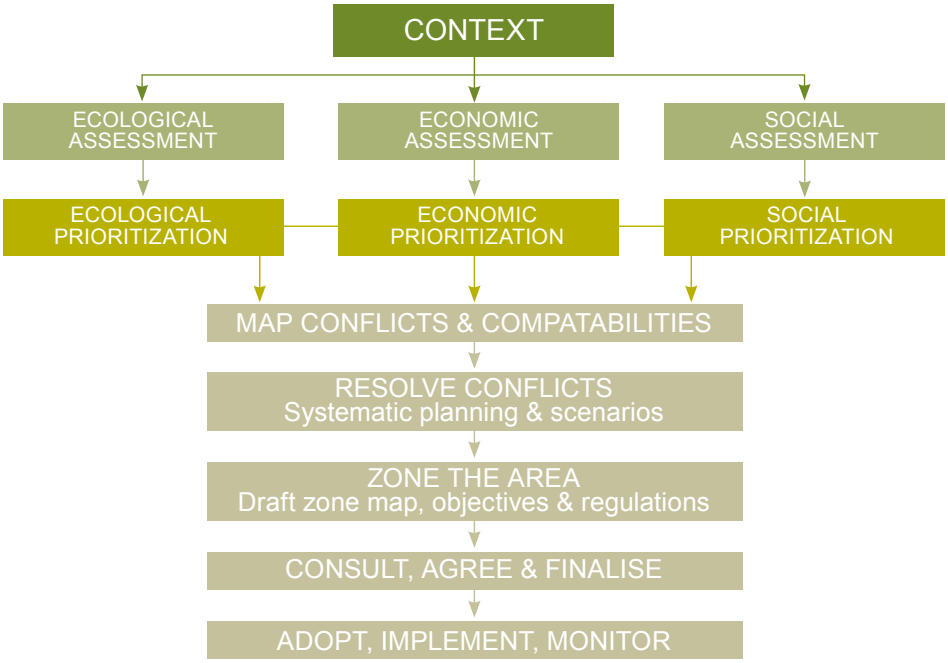


Figure 1: Simplified flow diagram showing a typical project workflow for a project that goes through a spatial assessment, prioritization and spatial planning process. Earlier stages (e.g. assessments and prioritization) do not have to lead to a formal spatial planning process, but it is problematic to attempt a spatial planning process without the earlier building blocks.

There are many different valid and useful methods for undertaking **Spatial Assessments, Spatial Prioritization** and **Spatial Planning**. This document sets out some core elements that go into a systematic spatial approach to decision making, but it is beyond the scope of this document to provide detailed technical guidance on methods[1].

A systematic spatial approach is based on the methods of **Systematic Conservation Planning (SCP)**, which is a scientific method for identifying spatial priorities, emphasising the need to sufficiently represent all aspects of biodiversity (including setting quantitative targets for critical habitats, ecological processes, ecosystem services and species), and to secure the ecological processes that allow them to persist over time.

We use ecological features and other data (e.g. landcover, social and economic data) to identify a set of priority areas that meets targets for ecological features in the smallest possible area, considers aspects such as connectivity in the landscape, and where possible avoids conflict with other sectors and land-uses. The approach has been successfully applied by WWF in Brazil, South Africa, Colombia, Russia, Indonesia, and Malaysia; and in marine, freshwater and terrestrial contexts.

Spatial Assessments, **Spatial Prioritization** and **Spatial Planning** can be undertaken separately (especially **Spatial Assessments** and **Spatial Prioritization** can stand alone) but overall there is a logical progression through these three components (Figure 1).

1. In the future hyper-linked versions of this document, links to supporting technical information on each section will be included. Links will also be provided to existing relevant WWF resource documents such as specific guidance for planning in river systems. This aims to provide more access to more detail (without putting too much into this primer), provide more technical guidance on the processes, and also to remind users that this is not a new initiative, but rather one that builds on ongoing systematic spatial planning in WWF.

All systematic spatial approaches should be built on a robust understanding of the **context** within which they are being undertaken. Otherwise, there is a risk that the wrong issues will be assessed, stakeholders will be missed (e.g. local community structures that are involved with resource decisions), and effort wasted either by making the process more complicated than necessary or through missing key elements that undermine the usefulness of the work.

It is important to consider integrating all WWF concerns for an area and not to look at individual thematic issues, e.g. freshwater and tigers, in isolation. We need to develop a clear picture of what we as an organization want and need from the overall process, and understand the visions and aspirations of stakeholders. Stakeholders can play an important role in helping us fully understand the context within which we are undertaking a systematic spatial approach. Ideally, we would undertake a robust stakeholder process to identify the key values which drive the spatial planning process, and clarify the principles which should be applied when making land use decisions.

It is useful to scope the key spatial issues which need to be dealt with, identify the key risks and get an idea of the priority issues. We also need to make decisions about planning areas i.e. what area we are planning for, how we are going to deal with data gaps, how we are facilitating real stakeholder participation where appropriate, and make decisions about our methods.

The key characteristics of **Spatial Assessments**, **Spatial Prioritization** and **Spatial Planning** are shown in Table 1 and then examined in more detail in the following sections.

It is important to recognize that, in addition to systematic spatial approaches, there are many useful and valid methods, techniques and tools to help identify spatial priorities. These can be used separately or in combination with a systematic approach e.g. to build input data on an issue such as ecosystem services. Landscape modelling tools such as InVEST[2] are widely used to identify high priority regions for ecosystem service delivery. Where one does not require an efficient solution, spatial multivariate assessments can be used to prioritize areas based on particular characteristics. For example, WWF's RACER[3] project used a resilience mapping multivariate approach to identify areas of conservation importance in the Arctic based on their likely resilience to climate change impacts. Criteria and threshold based mapping approaches are widely used for delineation of Important Bird Areas and other Key Biodiversity Areas[4].

Table 1: The key characteristics of the different components of a systematic spatial approach.

SPATIAL ASSESSMENT	SPATIAL PRIORITIZATION	SPATIAL PLANNING
• Identifies and maps the relevant natural features across a region. • Evaluates the status of all of the natural features in a class across a region e.g. arid grasslands. • Evaluates condition, threat and protection e.g. evaluations of rates of loss, a Red List for ecosystems, a gap analysis for a Protected Area network.	• Identifies which areas are most important for conservation actions. • Can take into account social and economic opportunities and constraints for implementating conservation actions. • The prioritization includes identification of which areas require our most urgent interventions, and includes issues of which areas the most important and sensitive. • Can be integrated (e.g. ecosystems, species and services) or specific (e.g. priorities for tigers). • Examples include Protected Area expansion plans, prioritising areas for securing water services.	• Builds on spatial assessment and priorisation, adding in public participation, governance and zoning elements. • Land Use Planning (LUP) and Marine Spatial Planning (MSP) are mandated public processes of analysing and allocating the distribution of human activities to achieve ecological, economic, and social objectives, usually specified through a political process. • These processes are by definition multi-sectoral.

2. www.naturalcapitalproject.org/invest/ 3. http://wwf.panda.org/what_we_do/where_we_work/arctic/what_we_do/climate/racer/ 4. http://www.keybiodiversityareas.org

WHAT IS SPATIAL ASSESSMENT?

Spatial Assessment examines the current state of natural features in a region. It identifies and maps the relevant natural features across a region, and evaluates the status of all the natural features in a class[5] across a region. This generally includes evaluations of ecological condition (how close to their original state each of the features in a class are), threat (the proportion of the original extent of class of feature that has been lost/remains) and protection (the proportion of the remaining features in a class that are in Protected Areas.

Spatial assessments generally focus on two issues:

1. Which natural features are relevant to our exercise and where are they?

Initial steps in a spatial assessment require the identification and mapping of relevant natural features.

We need to have a clear and logical register of the natural features which we are including in our assessment. The process of deciding what goes into the inventory needs to be systematic to avoid being driven only by our specific interests, biases and available data (e.g. there may be important river and wetland types, and aquatic species, in our area which we may miss if we only consider terrestrial issues). A single species focussed programme may need to also incorporate broader ecosystem issues.

Ideally, we should include **ecosystems**, relevant **species** (e.g. Red-Listed threatened species and socially important species) and areas important for **ecological processes** and **ecosystem service supply** (Figure 2). The more strongly these features are linked to human benefits the more likely it is that the assessment will have traction with stakeholders.

Once we know which natural features we are going to include, we then need to map them. Ideally, we need to map their original, as well as their current, extent as this allows us to determine what has been lost.

2. What is the status of each class of relevant natural features in the region?

We now need to systematically evaluate the status of the natural features in a class across a region. An assessment generally examines condition, threat and protection.

A systematic assessment requires that we set targets for **how much to keep in an intact condition** or include in **Protected Areas**. Without targets, we cannot identify which losses or gaps are most serious (e.g. if we have a target of 1 000ha of a specific wetland ecosystem type and only a 1 000ha remains, then any loss is disastrous; but if we have a target of 1 000ha and 2 000ha remain then we may be able to accept some loss). Targets are often set as a % of the original extent of the feature (e.g. 30 % of the original full extent of North Caribbean shallow muddy bottomed ecosystems). For species, targets are often set as a percentage of distribution or are based on specific ecological requirements (e.g. required home range for at least 20 breeding pairs of a key threatened species).

Once we have set targets, we then map the current condition and remaining extent of natural features[6]. This can often be done simply in a terrestrial environment where we can develop these maps from landcover data, but is more difficult in marine and freshwater

5. Forests of a particular type (e.g. Oak Forests in the United Kingdom) would be a class of natural feature that is made up of discrete individual forested areas. 6. The actual mapping of remaining extent and condition is often done during the initial steps of a project.

CONDITION

environments where we may need to develop proxy measures for condition.

What is the status of these relevant natural features across our land and seascape?

By status we mean what is the **condition** of these features (by which we mean how degraded are they in their ecological state and how much remains in an intact or functioning state – Figure 3 below); what is the **protection level** of natural features (by which we mean to what degree are features in a class sited within a Protected Area – Figure 4 on p10); and what is the **threat status** of natural features (by which we mean how much of each natural feature remains in an intact or functioning state in comparison with the targets derived from their original extent – Figure 5 on p10). The evaluation of these three elements gives us a robust and quantitative picture of which features in our landscape have suffered the most degradation or loss, which ones are insufficiently secured by our current protected area network and which are under most threat.

For a very basic assessment process, it is likely that we will focus on developing headline indicators of threat status and protection level for ecosystems. For a more comprehensive assessment, we will also examine a broader range of natural features (e.g. areas important for ecological processes and ecosystem service supply). These assessments have been successfully applied across terrestrial, freshwater (river and wetland) and marine ecosystems.

Finally, the assessment process should identify the most **important drivers and pressures** on key natural features, particularly those features that are threatened and important for people. It should also examine whether there are changes in these pressures and drivers.

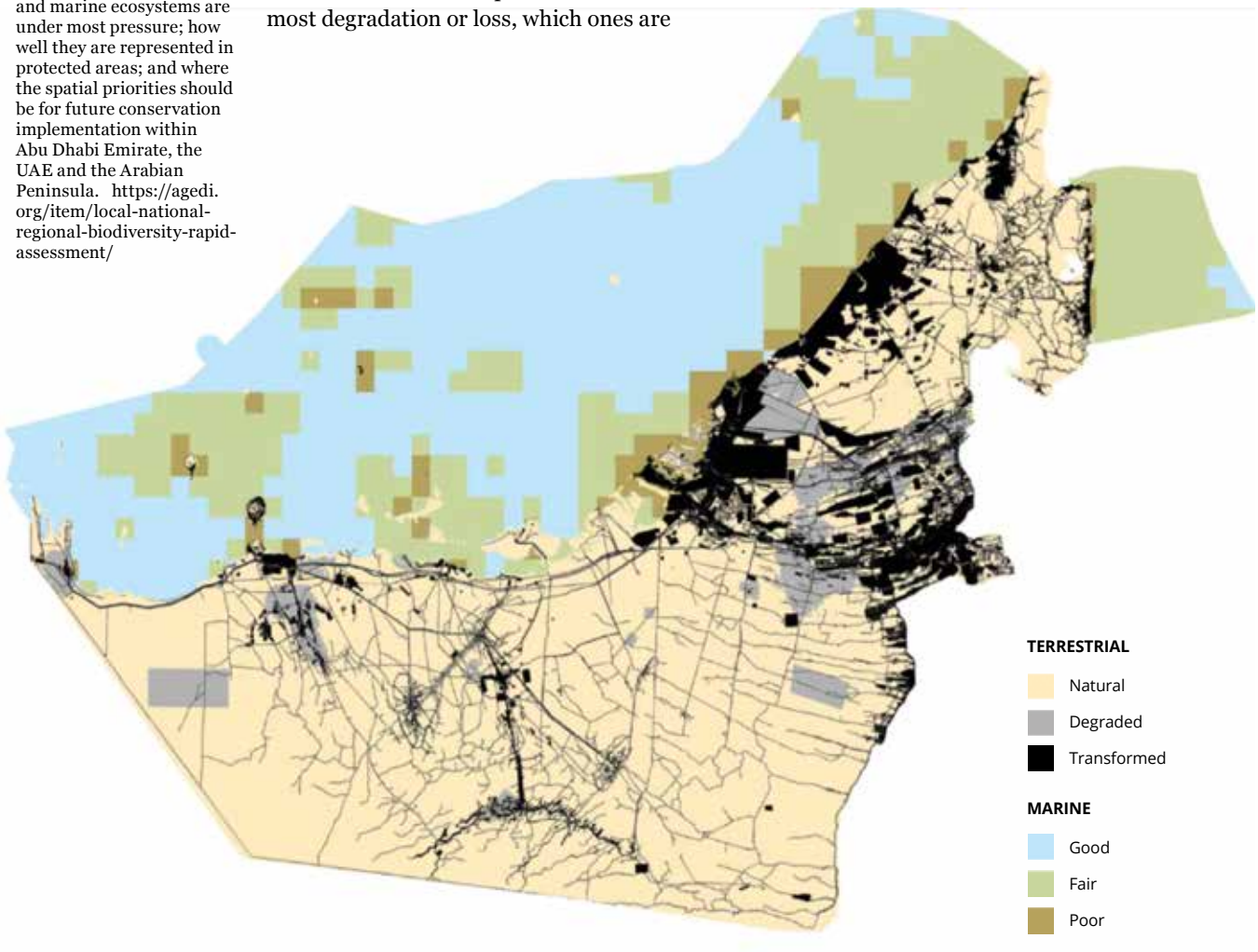
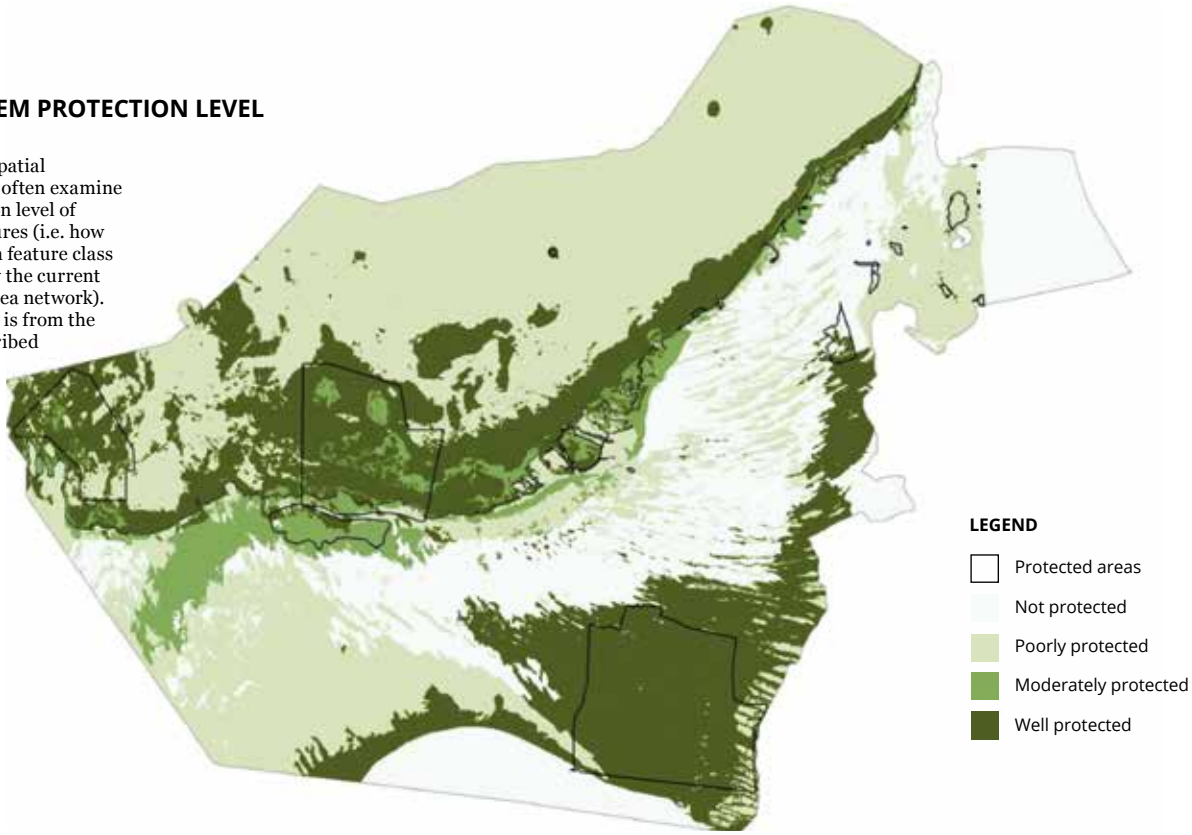


Figure 3: The development of maps of current condition or remaining extent of natural features is a key task in the spatial assessment process. This example from the United Arab Emirates was developed by Stephen Holness as part of a local, national and regional Biodiversity Rapid Assessment project undertaken by AGEDI (Abu Dhabi Global Environmental Data Initiative) where the approach outlined in this document was implemented to identify which terrestrial and marine ecosystems are under most pressure; how well they are represented in protected areas; and where the spatial priorities should be for future conservation implementation within Abu Dhabi Emirate, the UAE and the Arabian Peninsula. https://agedi.org/item/local-national-regional-biodiversity-rapid-assessment/

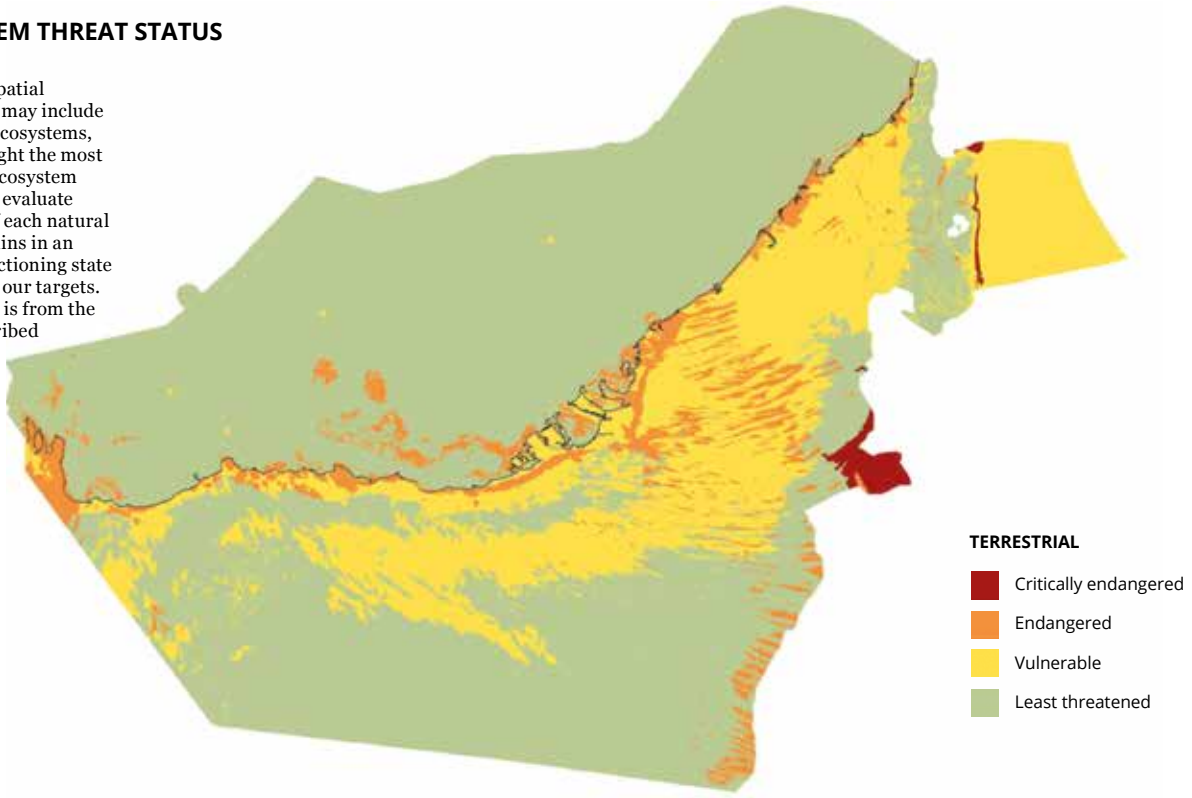
ECOSYSTEM PROTECTION LEVEL

Figure 4: Spatial assessments often examine the protection level of natural features (i.e. how much of each feature class is secured by the current Protected Area network). The example is from the project described in figure 3.



ECOSYSTEM THREAT STATUS

Figure 5: Spatial assessments may include Red lists of ecosystems, which highlight the most threatened ecosystem types. These evaluate how much of each natural feature remains in an intact or functioning state compared to our targets. The example is from the project described in figure 3.



WHAT IS SPATIAL PRIORITIZATION?

Spatial Prioritization identifies which areas are most important for conservation actions. The Spatial Prioritization identifies the most important and sensitive areas which require our most urgent interventions. Spatial Prioritization asks: **Of our most important and sensitive classes of feature (identified through spatial assessment), which require urgent interventions and how should we act to safeguard them?** In addition to the distribution, condition and status of natural features (carried out under Spatial Assessment), this process often involves an analysis of the opportunities and limitations at sites for implementing conservation actions, may include social and economic data, and may involve stakeholders.

Some key Spatial Prioritization issues:

- Spatial Prioritization can be integrated or can be done for a specific class of feature (e.g. prioritising for securing water supply or a specific endangered species), for a specific issue (e.g. evaluating ecological issues to identify priority areas to focussing forest conservation efforts), or it can incorporate the requirements of other sectors (e.g. also including economic and social requirements to identify the natural features which are most important for supporting services such as the provision of water to people). Prioritization can be used for several different purposes such as guiding land-use planning processes (e.g. which areas should be zoned for conservation rather than development?), identifying areas for expanding the protected area network, or identifying the best areas for rehabilitating degraded ecosystems to improve ecosystem services delivery.
- Spatial Prioritization may consider opportunities for conservation. This could examine where a conservation outcome could be achieved compatibly with the requirements of other sectors (e.g. also meeting the needs of traditional peoples whose land use was compatible with environmental outcomes) or where there were factors which supported a conservation outcome (e.g. existing protected area expansion activities).
- Spatial Prioritization can take limitations on conservation actions into account. It often examines where there are factors which make a desired conservation outcome less likely. These constraints could include areas of impact from industry or areas which have been designated for other sectors e.g. an industrial development zone.
- As WWF, we are likely to be (1) focussing on the ecological component (including the delivery of ecosystem services), (2) including the dependencies of other sectors on ecosystem services, and (3) considering the opportunities for alignment and limitations posed by the requirements of other sectors on achieving our objectives.

At its most basic level, an initial spatial prioritization can be obtained by overlaying the results of the spatial assessment and a map showing ecological condition, to identify key intact natural features. However, this approach will result in a selection that is spatially inefficient and does not consider conflict avoidance or alignment with other sectors.

Ideally, one needs to take into account the spatial flexibility of each sector (i.e. some sites are critical to a sector and no choice exists, while other parts of the configuration of sites may be flexible), the natural capital dependencies of each sector (e.g. a water tower may be critical to a downstream industry), building on alignments of interests (e.g. traditional fisheries compatible with ecological values), while as far as possible avoiding loss of areas of intrinsic interest to a sector (e.g. if ecological targets can be met elsewhere, it would be best to avoid industry development zones).

Areas in best ecological condition are preferentially selected to meet the ecological targets, though some processes may also target areas for rehabilitation.

Typically, a Spatial Prioritization process would require **both the inputs of stakeholders and the use of advanced specialised software** (e.g. Marxan[7]) that uses algorithms to consider a range of different options for achieving objectives. Methods for Prioritization can vary widely, depending on GIS capability, data, the purpose and the context.

7. http://Marxan.net/

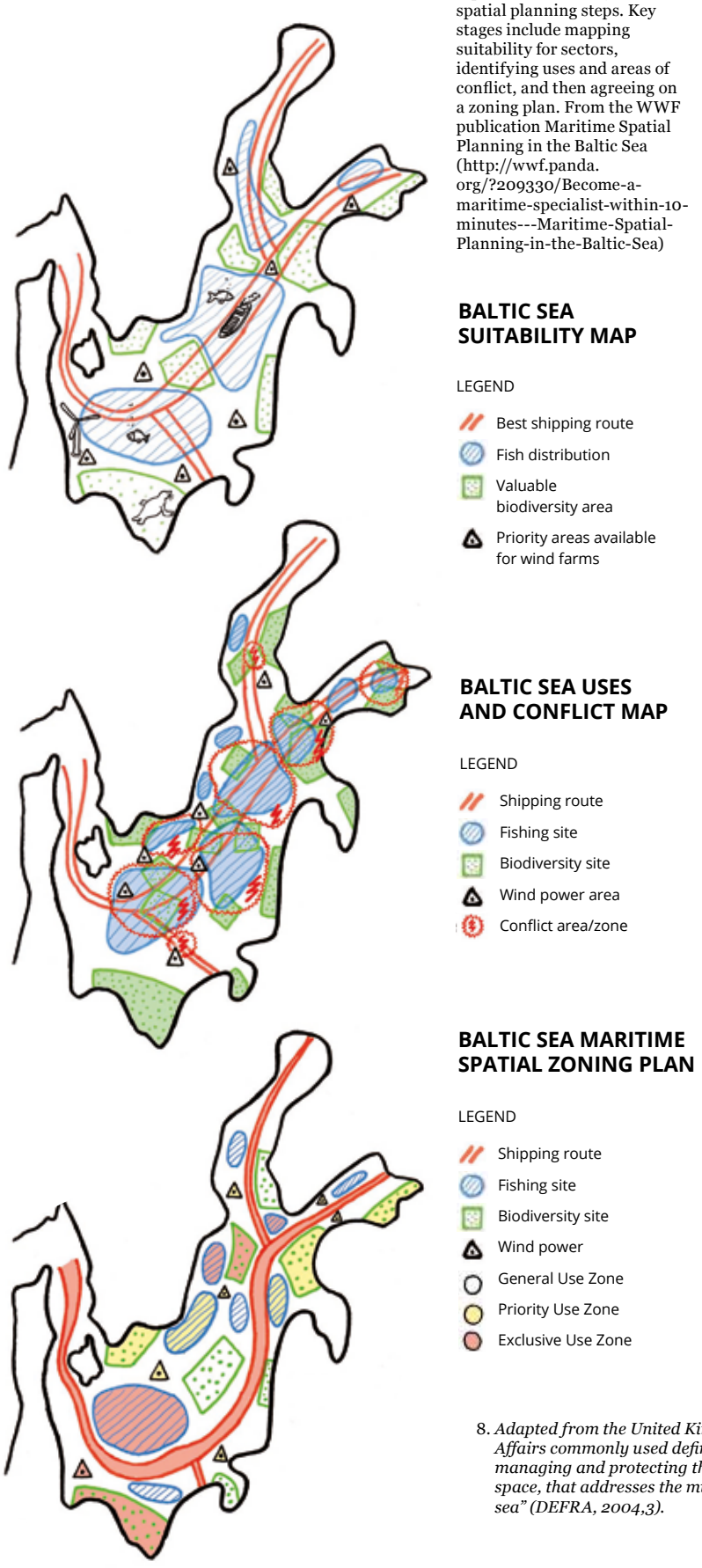


Figure 6: Diagrammatic representation of key marine spatial planning steps. Key stages include mapping suitability for sectors, identifying uses and areas of conflict, and then agreeing on a zoning plan. From the WWF publication Maritime Spatial Planning in the Baltic Sea (http://wwf.panda.org/?209330/Become-a-maritime-specialist-within-10-minutes---Maritime-Spatial-Planning-in-the-Baltic-Sea)

WHAT IS SPATIAL PLANNING?

Land Use Planning (LUP) and **Marine Spatial Planning (MSP)** build on Spatial Assessments and Spatial Prioritization, adding in public participation, governance and zoning elements. These processes are by definition multi-sectoral, and hence each sector will need to undertake at least some Spatial Assessment and Spatial Prioritization in order to allow sectors to define their spatial asks and for spatial planners to identify conflicts and compatibilities (Figure 6 shows a diagrammatic representation of key MSP steps). It is likely that WWF would only be involved in certain components of a Spatial Planning process.

LUP and MSP are mandated public processes of analysing and allocating the spatial and temporal distribution of human activities to achieve ecological, economic, and social objectives, usually specified through a political process. Essentially, spatial planning enables integrated, forward-looking and consistent decision-making on the use of the land and sea for regulating, managing and protecting the environment, including through allocation of space, that addresses multiple, cumulative, and potentially conflicting uses[8].

Once one has undertaken the Spatial Prioritization tasks for each of the sectors (i.e. economic, social and ecological), the next steps are to:

- **Map conflicts and compatibilities:** This stage spatially identifies the compatibilities and conflicts of different sectors using an interactive process with stakeholders and based on sound mapping and analysis.
- **Resolve conflicts:** A variety of methods can be used to help resolve spatial conflicts. Systematic planning techniques and use of scenarios to understand consequences and trade-offs are helpful.
- **Zone the area:** An initial zoning with a limited number of clearly defined use zones should be delineated and mapped. A desired state, objectives, and regulations on acceptable and unacceptable land uses and activities would be developed for each zone.

8. *Adapted from the United Kingdom's Department of Environment, Food and Rural Affairs commonly used definition: "strategic, forward-looking planning for regulating, managing and protecting the marine environment, including through allocation of space, that addresses the multiple, cumulative, and potentially conflicting uses of the sea" (DEFRA, 2004,3).*

Figure 7: Example of stages used in the land use planning process for the development of Kenyan County Spatial Development Plans. WWF Kenya supported the development of a planning process as well as land use plans for four key Kenyan counties.

- **Consult, agree and finalize:** Draft plans with regulations for the zones need to be discussed and agreed with stakeholders.
- **Adopt, implement, monitor:** The plan then needs to be formally approved, after which it should be implemented, and then processes for monitoring implementation and compliance should be established.

Effective spatial planning needs to be:

- **Multi-objective** – Spatial planning should balance ecological, social and economic objectives. It cannot be undertaken by a single sector on behalf of other sectors.
- **Inclusive of stakeholders** – Spatial plans need to be agreed on by stakeholders to ensure implementation. The process requires good data and robust analyses, but is primarily a public and political process that is built on robust stakeholder participation.
- **Spatially focused** – The jurisdiction to be managed must be clearly defined and outcomes are spatially specific (outcomes that you can mark on a map, or which pertain to particular areas marked on a map, usually zones with allowed uses and any management rules for that zone).
- **Integrated** – The planning process should address the interrelationships and interdependence of each component, including natural processes, activities, and institutions.
- **Binding** – It results in a clear agreed and binding spatial plan for a jurisdiction: objectives, outcomes and regulations on acceptable and unacceptable activities and uses are determined for zones in a land or seascape.

2. WHY USE A SYSTEMATIC SPATIAL APPROACH?

Spatial assessment and spatial prioritization, as parts of a systematic spatial approach, can help identify relevant natural features, set appropriate targets for how much of each feature is required, provide a clear picture of the status of natural capital assets across the land and seascape, help identify priority areas for action, support the monitoring of progress towards targets, and communicate key issues.

A SYSTEMATIC SPATIAL APPROACH CAN TOTALLY TURN AROUND THE WAY ONE LOOKS AT THE OVERALL SET OF ENVIRONMENTAL PROBLEMS AND WHERE ONE BEST FOCUSES EFFORT

This evidence is particularly important when engaging with other sectors during land use and marine planning processes because it reinforces the argument that the environment sector proposals are justified.

The spatial assessment element in the process informs us where the most important natural features in a landscape are. This enables us to plan to safeguard these. A reliance on robust evidence in the systematic spatial approach allows other parties to have greater confidence that the zones and guidelines that the environment sector are proposing have a sound rational basis. This increases the likelihood that other sectors will take environment sector proposals seriously. A spatially explicit approach (i.e. with clearly defined priorities which are shown on good quality maps at an appropriate scale) makes it clear that the environment sector has limited asks and is not trying to claim interest over the entire territory.

The systematic spatial approach fits in closely with the **WWF land use principles** and the **Sustainable Development Goals**. Spatial assessments can form the basis of robust **"Go, No-Go"** approaches, support rational application of **offsetting**, and allow for **scoping of environmental priority issues and areas** against clear and defendable criteria. Some key benefits of a systematic spatial approach are:

- **All relevant natural features are included in an unbiased manner in a systematic approach.** Existing conservation efforts are often biased towards well-known regions; areas that we are familiar and comfortable working in; areas with charismatic species; or, the objectives of individuals, groups, or organizations. The systematic approach includes all terrestrial, freshwater and marine ecosystems and species. Each ecosystem or species is treated objectively, and is not given undue preference based on skewed or subjective information. A particularly important issue is the move from what has often in the past been a terrestrial-only or a single species focussed process, through to one which incorporates freshwater and marine ecosystems and more explicitly deals with areas delivering ecosystem services (e.g. key water towers).
- **A systematic approach allows for robust monitoring and evaluation.** The approach sets targets for relevant natural features in terms of how much of each feature needs to be maintained in good or functional condition, and how much needs to be effectively protected. The fact that we ask how much of each feature is enough gives confidence to other sectors that we have limited and reasonable ambitions for the planning process. Progress in the implementation of conservation actions can be robustly and transparently evaluated against these targets.
- **The targets used in a systematic approach allow for effective integration of multiple objectives.** Targets allow us to work more effectively in a landscape context where we cannot pursue a maximization of ecological benefits alone. This is particularly important if we are applying a landscape approach which seeks "to provide tools

IT CAN CLEAR OUT THE FOG OF TEN THOUSAND PROBLEMS ALL OVER THE PLACE

and concepts for allocating and managing land to achieve social, economic, and environmental objectives in areas where agriculture, mining, and other productive land uses compete with environmental and biodiversity goals[9]."

- **The methods used in a systematic spatial approach are pragmatic and flexible.** A systematic spatial assessment approach is flexible enough to be applied in a wide variety of environments and is achievable even when data and resources are limited. A basic procedure can be applied relatively simply and quickly when necessary, but can also be used as a starting point for ongoing improvements that will yield increasingly comprehensive and accurate outputs.
- **Efficiency, conflict avoidance and alignment with compatible activities.** A key aspect which differentiates a systematic approach from many other methods, is that the systematic approach attempts to meet targets in a way that is most **efficient**, avoids unnecessary conflict, and increases **alignment with compatible activities**. This improves the likelihood of achieving a satisfactory environmental outcome and of a solution that is agreeable to all parties because the environment sector is leaving more land or sea for other users to achieve their goals.
- **Climate change and support of ecological processes.** Systematic approaches have a strong emphasis on ensuring persistence of the key natural features that support the delivery of ecosystem services, e.g. through identifying priority catchments that are required to deliver water. The approach is well suited to the identification of **priority areas for both avoiding loss of natural features** and for **rehabilitation of natural features (e.g. species, ecosystems and areas delivering ecosystem services)** in support of climate change adaptation and mitigation efforts.
- **Resolution of spatial conflict**. Land use and marine spatial planning processes consider the cumulative effect of industries on land and seascapes, seek to make industries more ecologically sustainable and proactively minimize conflicts between sectors and industries attempting to utilise the same area or resource.
- **Spatial governance**. Spatial planning processes bring together multiple users of land and seascapes - e.g. agriculture, energy, industry, fisheries, mining, government, conservation and tourism – to make informed and coordinated decisions about how to use resources sustainably. The approach requires robust stakeholder participation, reasonable consensus and political agreement.
- **Agreed zoning and land use plan**. When they are appropriately applied, land and marine spatial planning processes result in binding spatial plans that generally include a clear spatial zoning, with clear descriptions of allowable and non-allowable activities in each zone. All parties are then more likely to adhere to the resulting plan. When all parties adhere, important natural features and key natural capital assets are more robustly secured.

9. Sayer, J., Sunderland, T., Ghazoul, J., Pfund, J.L., Sheil, D., Meijaard, E., Venter, M., Boedhihartono, A.K., Day, M., Garcia, C. and van Oosten, C., 2013. Ten principles for a landscape approach to reconciling agriculture, conservation, and other competing land uses. Proceedings of the national academy of sciences, 110(21), pp.8349-8356.

3. WHEN AND WHERE SHOULD ONE USE A SYSTEMATIC SPATIAL APPROACH?

A SYSTEMATIC SPATIAL APPROACH CAN BE USEFUL UNDER A RANGE OF CONDITIONS:

First, the systematic spatial approach can be used to develop a broad spatial picture of ecological priority areas for any landscape where one is working.

It is always useful to know the location and status of natural features, and it is helpful to have a clear evidence-basis for the relative importance of different parts of the landscape and the ecosystem services delivered. Spatial assessments can provide much of this picture, though rapid integrated spatial prioritization improves the strength and usefulness as it allows robust incorporation of ecosystem service elements, and can improve alignment with social and economic requirements and limits.

Prioritization further allows for efficiency and avoidance of conflict with social and economic requirements where these are incompatible with the ecological values. Even basic spatial assessments and spatial prioritizations can contribute effectively to project and programme design.

The approach can:

- Support the identification of an **integrated set of high priority areas** to guide WWF's **landscape programmes** to ensure that WWF is working in optimal areas, has a clear spatial focus and to ensure that different activities fit together and contribute to an optimal overall picture.
- Provide a **scoping of potential problem areas**. This allows us to focus on priority areas and issues. It provides a robust evidence basis to allow us to prioritize interventions.
- Allow us to highlight **where more detailed spatial prioritization** is required. Often, it is not necessary or appropriate to engage in detailed spatial prioritization processes across very large areas, but rather to resolve competing requirements in a particular locality.
- Support the **broad scale identification of priorities for specific activities** e.g. identification of key ecological infrastructure to guide conservation investments, identification of key priorities for protection of forest for REDD, identification of key areas for rehabilitation and restoration projects.
- **Provide an evidence basis for advocacy campaigns**. A robust evidence base, and particularly high-quality mapping, can provide the content for strong and effective advocacy campaigns.
- Provide the basis for **effective project planning**, as well as monitoring and evaluation. A systematic spatial approach fits in well with WWF's Project and Programme Management System (See Figure 8).

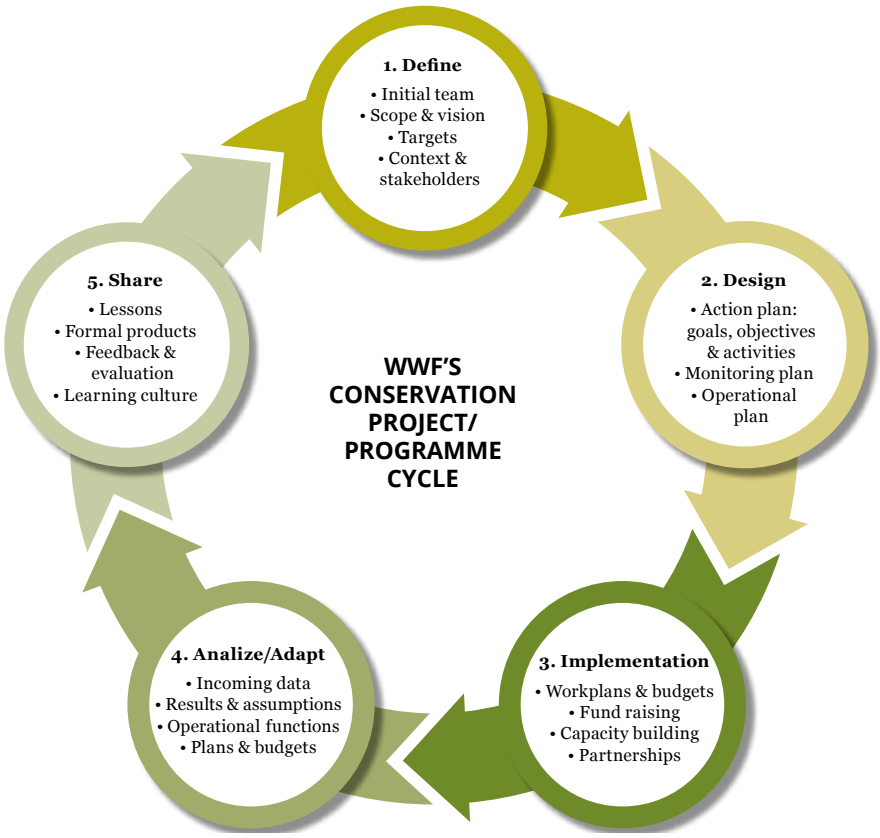


Figure 8: A systematic approach is very compatible with WWF's Project and Programme cycle.

The systematic approach sets clear targets, identifies spatial priorities and evaluates threats to these priorities. Hence it lends itself to effective project planning and monitoring and evaluation. It provides a context for asking questions about effectiveness, location of projects, and is a very useful backbone for monitoring and evaluation.

Second, the systematic spatial approach can help one to develop a more detailed set of spatial priorities. Once one has an initial broad picture of spatial priorities it is often useful to develop a more detailed spatial prioritization at a local level, or to incorporate additional elements (e.g. stronger ecosystem service valuation). A two-stage approach allows one to identify key issues and make a rational assessment of areas of greatest potential improvement, identify key missing data or stakeholders. Importantly, a staged approach can also allow one to decide that there is a sufficiently clear picture and that there is no need or benefit in doing more.

More detailed systematic assessments and Spatial Prioritization processes can be aimed at:

- Identifying **high priority areas** to guide **WWF's overall landscape programme** to ensure it is working in optimal areas, has a clear spatial focus and to ensure that different parts of the landscape initiative fit together and contribute to an optimal overall picture.
- Identification of high priority or value environmental areas to feed into a **sector based intervention** (e.g. organized agriculture, mining, urban expansion, sugar, protected areas). This sort of process would involve the identification of priority areas in a process undertaken in partnership with that sector and building these into best practice guidelines and/or a decision support tool for that sector (e.g. to guide large scale sugar companies away from highly sensitive environments). These could focus on an issue (e.g. ecological infrastructure, biodiversity priorities, forest restoration, carbon).
- Identification of high priority environmental areas to feed into a very specific issue (e.g. a major set of **infrastructure projects** such as dams, rail or new roads) or to guide particular parts of the overall activity (e.g. identification of key ecological infrastructure to guide conservation investments, identification of key priorities for protection of forest for REDD, identification of key areas for rehabilitation or restoration, or identification of areas with High Conservation Values (HCV)).

Third, a systematic spatial approach can enable WWF to **engage appropriately with land and marine planning processes**. Spatial planning processes have significant potential to help solve difficult resource allocation problems. However, as spatial planning processes are political processes which intrinsically require formal mandates to secure agreed land use outcomes, there are limited circumstances under which WWF could effectively undertake its own land use planning process. Nevertheless, it can advocate for these processes and then contribute to them.

WWF contributions could include either **formal involvement in the planning process** to help identify priority areas for inclusion into spatial planning processes, or doing this independently to **support advocacy**. Whatever WWF's role is in a spatial planning process it is always better for the organization to know which parts of the landscape are most important and have a robust evidence basis for the identification of these. This can serve as a robust starting point for negotiation, and a basis for evaluating whether the alternatives selected are acceptable to WWF.

SPATIAL ASSESSMENTS, SPATIAL PRIORITIZATION AND SPATIAL PLANNING CAN BE UNDERTAKEN FOR A VARIETY OF AREAS AND AT A VARIETY OF SCALES:

- **Spatial Assessments**. Systematic spatial assessments are generally best done across sufficiently broad areas (e.g. nationally or across a state or province) to provide a clear picture of relative importance of different natural capital assets, or natural features. National level assessments of priority natural capital assets are common. Gap analyses of protection of ecosystems and species are often also undertaken nationally. Figure 9 shows an example of an assessment of highest value water source areas undertaken at a country scale.
- **Spatial Prioritization** can occur at a variety of scales and for a range of different areas. Figure 10 illustrates a prioritization that was undertaken within a single fairly small catchment, for water related ecological services Figure 11 shows a prioritisation for the whole Amazon Basin.

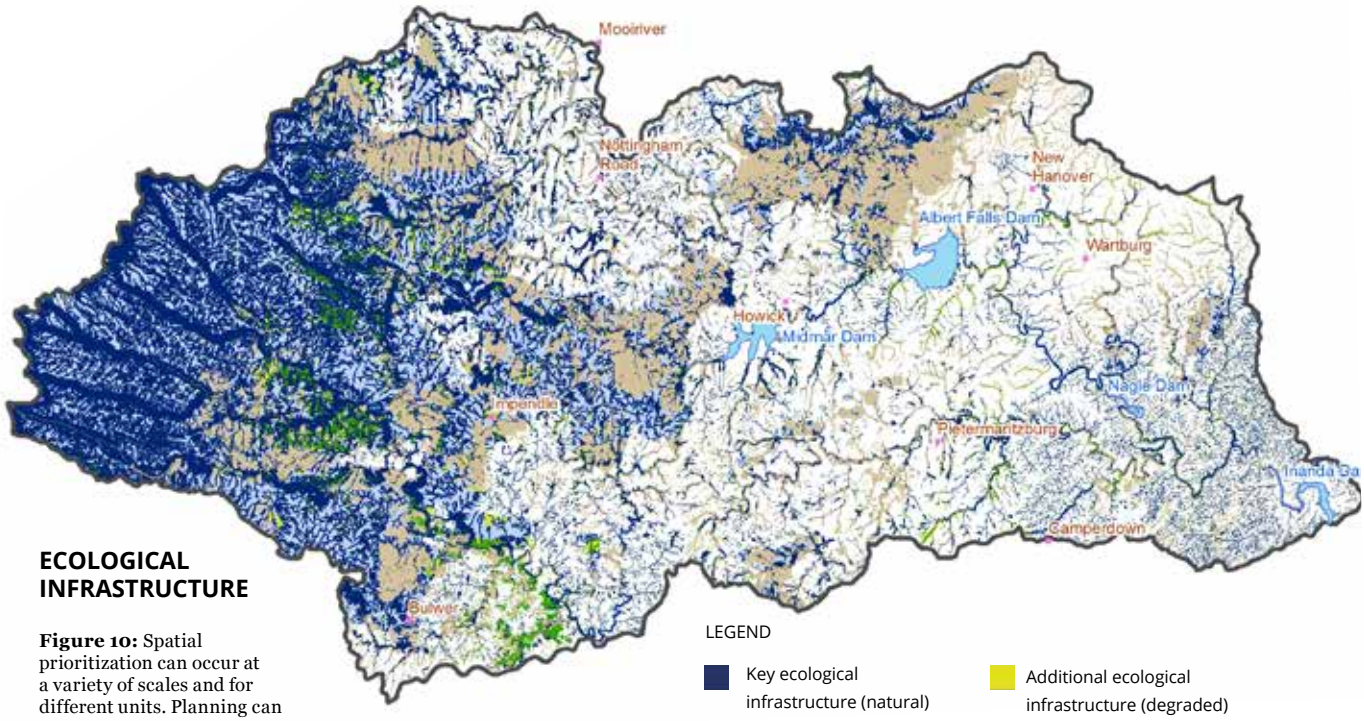
SOUTH AFRICAS WATER SOURCE AREAS

Figure 9: Systematic spatial assessments provide valuable information on the relative importance of different natural assets. They are therefore often undertaken at a national or provincial/ state level rather than at a local level to allow the big picture to be obtained about the relative value of different places and features. Source: Defining South Africa's Water Source Areas, 2013, WWF-World Wide Fund For Nature , Cape Town, South Africa. www.wwf.org.za/media_room/publications/?9321/Defining-South-Africas-Water-Source-Areas

If one is aiming to use the results of a spatial prioritization for **interactions within a jurisdiction** (e.g. to influence impact assessments and land use decisions by a state, province, county, district, department or municipality) to influence decision making, it is extremely important that the results are relevant for that administrative unit.

- **Spatial Planning** always takes place within a jurisdiction or political region as the outputs need to be secured via formal legal and political processes. For Marine Spatial Planning the area can be very large, while for terrestrial areas the planning is typically for smaller areas such as a county, district or municipality (Figure 12).

A systematic spatial approach is most beneficial in areas with diverse natural assets (especially mega-diverse countries and regions), where there is rapid development, where there are significant competing interests but reasonable areas of natural and semi-natural habitat remain, and where there are limited resources available for conservation that must be focused on the most urgent priorities. In regions where there is no choice, a systematic approach remains useful and valid, but may add little additional value to other planning and assessment processes.



ECOLOGICAL INFRASTRUCTURE

Figure 10: Spatial prioritization can occur at a variety of scales and for different units. Planning can be done within a catchment (such as in the example given here for Water Related Ecological Infrastructure for the Umgeni Catchment in South Africa, WWF-SA).

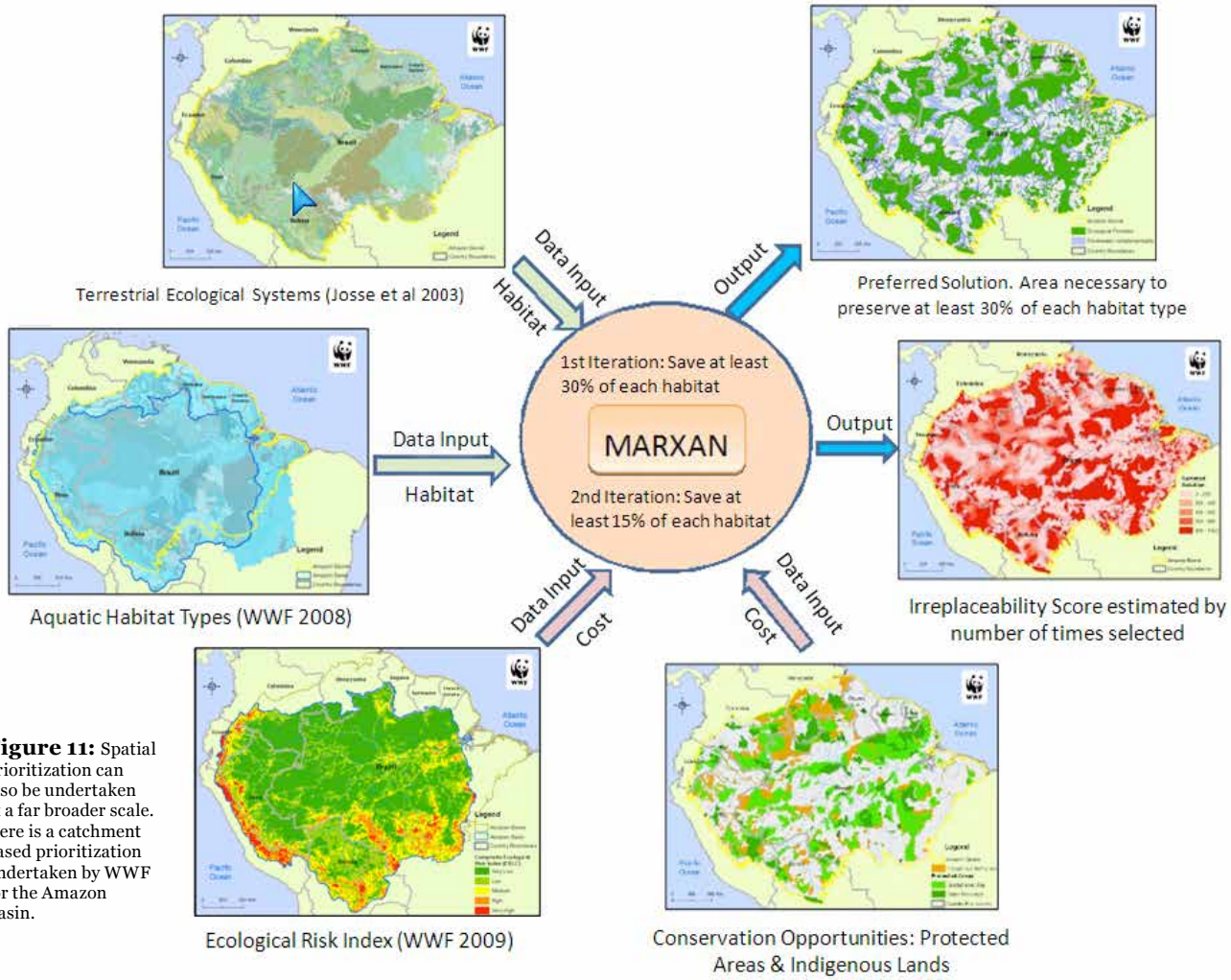
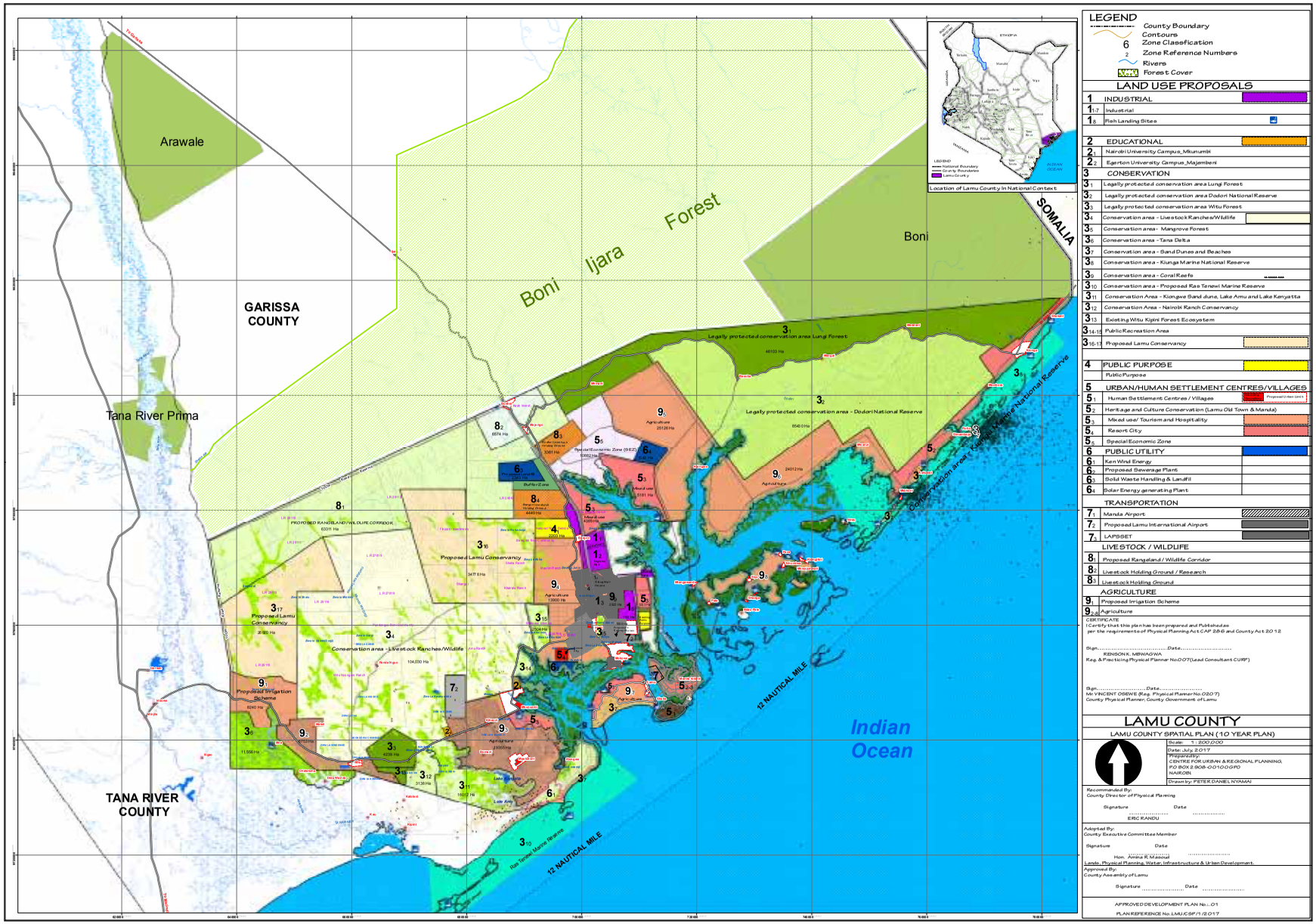


Figure 11: Spatial prioritization can also be undertaken at a far broader scale. Here is a catchment based prioritization undertaken by WWF for the Amazon Basin.



LEGEND

- County Boundary
- Contours
- 6 Zone Classification
- 2 Zone Reference Numbers
- Rivers
- Forest Cover

LAND USE PROPOSALS

1	INDUSTRIAL
1_{1-7}	Industrial
1_8	Fish Landing Sites
2	EDUCATIONAL
2_1	Nairobi University Campus_Mkunumbi
2_2	Egerton University Campus_Majembeni
3	CONSERVATION
3_1	Legally protected conservation area Lungi Forest
3_2	Legally protected conservation area Dodori National Reserve
3_3	Legally protected conservation area Witu Forest
3_4	Conservation area - Livestock Ranches/Wildlife
3_5	Conservation area - Mangrove Forest
3_6	Conservation area - Tana Delta
3_7	Conservation area - Sand Dunes and Beaches
3_8	Conservation area - Kiunga Marine National Reserve
3_9	Conservation area - Coral Reefs
3_{10}	Conservation area - Proposed Ras Tenewi Marine Reserve
3_{11}	Conservation Area - Kiongwe Sand dune, Lake Amu and Lake Kenyatta
3_{12}	Conservation Area - Nairobi Ranch Conservancy
3_{13}	Existing Witu Kipini Forest Ecosystem
3_{14-16}	Public Recreation Area
3_{16-17}	Proposed Lamu Conservancy
4	PUBLIC PURPOSE
	Public Purpose
5	URBAN/HUMAN SETTLEMENT CENTRES/VILLAGES
5_1	Human Settlement Centres / Villages
5_2	Heritage and Culture Conservation (Lamu Old Town & Manda)
5_3	Mixed use/ Tourism and Hospitality
5_4	Resort City
5_5	Special Economic Zone
6	PUBLIC UTILITY
6_1	Ken Wind Energy
6_2	Proposed Sewerage Plant
6_3	Solid Waste Handling & Landfill
6_4	Solar Energy generating Plant
	TRANSPORTATION
7_1	Manda Airport
7_2	Proposed Lamu International Airport
7_3	LAPSSET
	LIVESTOCK / WILDLIFE
8_1	Proposed Rangeland / Wildlife Corridor
8_2	Livestock Holding Ground / Research
8_3	Livestock Holding Ground
	AGRICULTURE
9_1	Proposed Irrigation Scheme
9_{2-9}	Agriculture

CERTIFICATE
I Certify that this plan has been prepared and Published as per the requirements of Physical Planning Act CAP 286 and County Act 2012

Sign.....Date.....
KENSON K. MBWAGHA
Reg. & Practicing Physical Planner No.0077(Lead Consultant CURP)

Sign.....Date.....
Mr VINCENT OSEWE (Reg. Physical Planner No.0207)
County Physical Planner, County Government of Lamu

LAMU COUNTY

LAMU COUNTY SPATIAL PLAN (10 YEAR PLAN)

Scale: 1 : 200,000
Date: July 2017
Prepared by:
CENTRE FOR URBAN & REGIONAL PLANNING,
P.O BOX 2 808-0100 GPO
NAIROBI
Drawn by: PETER DANIEL NYAMAI

Recommended By:
County Director of Physical Planning
Signature Date
ERIC KANDU

Adopted By:
County Executive Committee Member
Signature Date
Hon. Amina K Mwaoud
Lands, Physical Planning, Water, Infrastructure & Urban Development.

Approved By:
County Assembly of Lamu
Signature Date

APPROVED DEVELOPMENT PLAN No...01
PLAN REFERENCE No. LMU/CSP/1/2017

WWF KENYA
TOGETHER FOR NATURE

LAMU COUNTY SPATIAL PLAN

Figure 12: Lamu County published this map of zones and permitted uses and regulations for each zone as part of the Lamu County Spatial Plan. The WWF-Kenya spatial planning team, with the support of WWF-UK, worked with the Kenyan Ministry of Lands and Physical Planning, Lamu County officials and local consultants to support the development of a plan which met development objectives while securing key biodiversity assets such as mangroves, corals and forests.

4. WHO SHOULD BE INVOLVED?

Spatial Assessments, **Spatial Prioritization** and **Spatial Planning** can have varying levels of participation by stakeholders, but all processes are generally improved by being appropriately inclusive and engaging stakeholders.

Whatever the situation, it is always critical to have safeguards[10] in place to ensure that the stakeholders can effectively participate (particularly the poor and the vulnerable), that human rights are respected and protected, and that equitable and transparent benefit sharing among all stakeholders is ensured. This is **particularly important in formal Spatial Planning processes** where decisions are made that can impact on use rights and even tenure. Specific roles for stakeholders can include:

- Stakeholder participation in co-production of analysis and data. Participatory mapping exercises with different stakeholders can help identify what and where their concerns are, and identify the most important issues and resource conflict areas. Stakeholder interactions can allow key issues to be highlighted and direct data gathering, collation and analysis. This is particularly important where local communities utilize the environment directly, and have (or should have) use or tenure rights.

A participative approach can assist in the **identification of key resources** (e.g. participative mapping of high priority fishing areas by local subsistence fishers so that this could be accommodated for in MPA planning), **can help fill gaps in data** (e.g. local hunters or citizen science groups may have a good understanding of the areas of the landscape that are most diverse or important for a key species and can contribute to mapping), can allow for the **appropriate incorporation of human issues** in planning processes (e.g. traditional grazing management systems in Kenya, or the protection of sacred sites or areas of cultural importance such as initiation sites), and can help identify **key ecosystem service dependencies** (e.g. the identification of water source areas and most important risks such as flooding). Effective participation can also ensure that there is robust protection of rights (e.g. access to open rangeland for traditional pastoral livelihoods, and areas where indigenous people have tenure rights).

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Figure 13: Effective stakeholder participation is necessary to validate results and ensure buy-in to planning processes. Stakeholders can also play a valuable role in identifying keys issues, concerns and resource conflict areas. They can highlight key issues and direct data gathering, collation and analysis. This photo shows stakeholders contributing to the Narok County planning process in Kenya.

10. Note that in many cases this may just be a quick and informal process that specifies that the assessment has no potential social impact.

Figure 14: Traditional use and tenure issues need to be built into spatial planning processes. Safeguards need to be in place to ensure that human rights are respected and protected, and that equitable and transparent benefit sharing among all stakeholders is ensured.

- **Stakeholders participation and validation of results**. Gaining stakeholder endorsement of systematic assessment processes and outcomes is **essential for the uptake of the results**. It is beneficial to be inclusive from an early stage. However, it must also be understood that certain aspects of assessment and Prioritization are more appropriate to certain stakeholder groups, and not all stakeholders need to be involved in every aspect throughout the entire process. For spatial assessments, it may be appropriate to involve only a smaller group of core stakeholders, while for spatial prioritization, broader stakeholder involvement usually becomes more important. **For formal land use and marine spatial planning, robust stakeholder participation is critical**. Stakeholder involvement should be strategic and well-structured to avoid unproductive interactions. Figure 13 shows an example of stakeholders validating spatial results from a Kenyan County planning process.
- **Stakeholder can help identify alignments between social and ecological issues**. Often there are strong alignments between traditional land management practices (See Figure 14) and the retention of key natural assets. For example, indigenous territories in the Amazon and elsewhere often have the lowest deforestation levels and are in practice better secured for ecological values than other forms of protection. Stakeholder involvement can help identify these synergies.

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