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REPORT

NOVEMBER
2016



The Status and Importance of National Spatial Data Infrastructure: A Survey of WWF-UK Priority Countries

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Citation: *Chandler, G, and Schmitt, S.F. (2016) The Status and Importance of National Spatial Data Infrastructure: A Survey of WWF-UK Priority Countries. WWF-UK*

Front cover photo:

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Published in November 2016
by WWF-UK, Woking, UK

Acknowledgements:

The authors would like to thank the survey respondents and interviewees for sharing their insights. We would also like to thank Dr Paul Jepson, School of Geography, Oxford University for input into the initial conceptual work on a NSDI index and supervision as part of a MSc Dissertation Research for the MSC in Biodiversity and Conservation Management.

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WWF is one of the world's largest and most experienced independent conservation organizations, with over 5 million supporters and a global network active in more than 100 countries.

WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption.

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NATIONAL SPATIAL DATA INFRASTRUCTURE

The Status and Importance of National Spatial Data Infrastructure: A Survey of WWF-UK Priority Countries

Introduction

This report examines spatial data capacity and transparency within the WWF network and the WWF-UK priority countries. It provides recommendations to WWF, to the UK government and to priority country governments to improve their spatial data for environment and conservation efforts. It highlights the importance of a transparent, integrated and coordinated National Spatial Data Infrastructure to the achievement of the Sustainable Development Goals, and proposed an Index to assess countries on their capacity to deliver this.

Executive Summary

In working to protect some of our world's most important and sensitive biodiversity, effective and transparent spatial data for biodiversity conservation and land use planning is vital.

As increasing pressures are placed on land, and intrusive development projects are on the rise, land-use conflicts between communities, organisations, governments and companies are growing more common. The Sustainable Development Goals (SDGs), introduced in 2015, can only be successfully achieved if these conflicts are resolved in the best way possible for all involved parties.

A solution for preventing and resolving these land use conflicts is for organisations to encourage early engagement in these development projects. This is what a National Spatial Data Infrastructure (NSDI) can help to achieve. By mobilising a NSDI within a country, it is possible to solve these spatial data issues, such as availability and transparency, for all involved parties.

This report is an outline of what that solution might look like within the WWF network. It is a culmination of interviews and questionnaires from in-country spatial data users and experts within the eight countries that are considered 'priority countries' by WWF-UK. The results have been presented in country profiles. The research also gained an insight into the awareness of NSDIs and the use of NSDIs within these countries, as well as how these could be applied and improved.

The key findings of the report are:

- The wider lack of transparency of environmental spatial data within WWFs priority countries is a large issue for conservation work and often hinders WWF's efforts. Therefore, WWF should not miss the opportunity to be a vital voice in national transparency and data sharing discussions, especially those centred on the environment and natural resource use.
- GIS teams across the WWF network are very engaged and supportive of efforts to improve spatial data within their countries. WWF-Bhutan in particular is an excellent example of how WWF can support priority countries with their spatial data. However, a lot of the positive work seen is being done in colleague's spare time and more support may be needed.
- Collaboration and data sharing within the WWF network is relatively low. There is currently limited awareness across WWF network offices of who holds what data and, in solution, how they should be sharing data on an integrated and up-to-date platform.

This report recommends the following:

To WWF:

- WWF needs to tackle its own institutional constraints around spatial data sharing and access, as well as lobbying and assisting governments in improving theirs. This should be done through conducting an internal assessment of spatial data transparency within the WWF network to better understand where the identified barriers can be resolved.
- Spatial data should be central to, and a key evidence base for, conservation decision making, rather than just a supplementary piece of evidence.
- WWF should be asking the UK government to directly support and promote investment in the spatial data capacity of less developed countries, as well as establishing their own National Spatial Data Infrastructure as part of their commitment to the SDGs to "Leave no one behind".
- WWF should be engaging with governments in countries central to its operations on spatial data transparency. It also should be providing information on key environmental datasets and encouraging cross-ministerial data sharing by engaging with governments and any regional GIS/spatial data groups on spatial data and NSDI.

An NSDI Index:

In full, this report recognises that a method of assessing spatial data infrastructure at a national scale is greatly needed. A comprehensive and stakeholder-relevant index and scoring system to assess the NSDI of a country would allow investment and decision-making to be directed towards problematic areas of NSDI development. Additionally, it would promote collaboration and motivation between government departments and other stakeholders, improving their spatial data quality, management and availability. An appropriate NSDI would have long-term advantages for both development and environment agendas, vitally the SDGs require good supporting data infrastructure, making it a benefit for not only the parties involved but also the natural landscapes that WWF works to preserve.

Section 1: Introduction and Aims

1.a. The Importance of Spatial Data for Biodiversity Conservation

The coming years bring a range of goals, targets and challenges for environmental decision making. The Sustainable Development Goals (SDGs), launched in September 2015, require major environment and development action to be taken in the lead to 2030. Alongside this, The Convention on Biological Diversity Aichi Targets, the main global mechanism to protect biological diversity, come to an end in 2020. As a result, most countries have set environmental targets for 2020-2025.

For these targets to be effective and progressive, countries need to be equipped with the right information. The next decade will therefore be vital for the effective and transparent collection of environmental, developmental and biodiversity conservation data to support such ambitions. Measuring, monitoring, and providing evidence on progress across these three areas is required more than ever at a global, regional and national level.

***“Everything that happens, happens somewhere”
(Unknown)***

Spatial data - more specifically, in this context, geospatial data - is one of the most important of these sources of information. Spatial data refers to any data that include specific location information, normally stored as coordinates and topology, which allows the data to be mapped¹. Biodiversity conservation is inherently spatial; within it we use spatial thinking to define priority areas and divide land cover into categories (e.g. WWF’s ecoregions approach²), track land and ocean use and habitat (e.g. dedicated fishing grounds), and locate and monitor species (e.g. Important Bird Areas³; Hotspots⁴).

As increasing pressures are placed on land and ocean use, it is vital for decision making to be spatially well-informed and integrated. But initial investigations concluded that stakeholders often fail to collaboratively use and share spatial data. Adding to decision making difficulties, results also found that vital datasets are frequently of poor accuracy, are not interoperable (meaning the ability of users to communicate, exchange and use data easily), or are out of date. Such issues can lead to conflicts between and within natural resource users and environmental protection initiatives, which often results in multiple overlaying concessions, ineffective natural resource management, and environmental degradation.

1 <http://unsdsn.org/wp-content/uploads/2015/04/Data-for-Development-Full-Report.pdf>

2 <http://www.worldwildlife.org/biomes>

3 <http://www.birdlife.org/worldwide/programmes/sites-habitats-ibas>

4 <http://www.conservation.org/How/Pages/Hotspots.aspx>

For decision making to be effective and well informed, this underpinning data needs to adhere to the following key principles:

- Accuracy: Data needs to be high quality and trustworthy;
- Transparency: To be transparent, all data should include supporting information on how and when it was collected;
- Openness: Data should be free to access and use;
- Interoperability: Data should be able to be easily shared and exchanged between users.

Environmental organisations responsible for decision making can be empowered by open, accurate, and exchangeable spatial. Critically, it can help them prevent and resolve land and ocean use conflicts by encouraging early engagement in ‘problematic’ development projects.

These principles listed above also can create geospatial data that are useful and accessible to all stakeholders. This means that it is possible to prevent land-use planning that is only beneficial to a limited few, rather than to the wider community, a scenario which often leads to deep land use conflicts and resource use injustices ⁵.

“The environment sector should, therefore, be investing in the strength of a country’s ability to transparently collect, manage, and share spatial data.”
(Author)

The research in this report investigated spatial data access, accuracy, and use, with a specific focus on the WWF-UK priority countries of: Brazil, Peru, Kenya, Tanzania, Bhutan, Nepal, India, and China (as well as the UK).

Through this process, the conceptual framework for the index in benchmarking and scoring countries on the development of their spatial data infrastructure has been further developed. Its details will be finalised through collaborative work between the University of Oxford and University of Leuven.

Section 2: Spatial Data Transparency and Conservation

2.a. Spatial Data and Conservation

Access to consistent spatial data has a range of benefits for conservation decision making, as well as profound implications for the quality of environment and development planning. It can reveal trends between different landscape relationships; it allows for spatially informed decision making; and it allows for land use trade-offs to be managed more effectively.

⁵ (FAO, 1999b).

One example of this is the recent work by WWF on World Heritage Sites⁶. Spatial data was used to determine that nearly 31% of these globally important areas for nature are overlapped by extractive concessions of various stages (such as mining and oil and gas). Such analysis can be the basis of effective advocacy and would not have been possible without being presented and analysed spatially.

The marine environment is a particular challenge for conservation because of its low visibility. As a result, it relies heavily on spatial data and mapping as well as environmental remote sensing technologies⁷ to provide evidence for marine protected areas and tracking industrial fisheries.

WWF has several existing spatial data-centred initiatives:

1. The WWF Global Observation and Biodiversity Platform (GLOBIL)⁸, launched in 2013, aims to unite, centralize, standardize, and visualize geospatial data from across the WWF network. It has the capacity to carry out mapping functions for different land-use scenarios, to resolve and understand conflict in areas such as the Amazon biome, and, as a monitoring interface, to track the progress toward ocean protection goals.
2. WWF-SIGHT⁹ is an early engagement spatial tool. It is hosted on GLOBIL and is a cloud based ArcGIS mapping application that integrates key development and environmental datasets. At the moment, the tool focuses on extractives and infrastructure. The aim for WWF-SIGHT is that it will allow rapid evaluation of the potential environmental and social conflicts of specific developments.

Alongside these direct benefits for environmental stakeholders, access to transparent and accurate spatial data can better equip governments, companies and investors in land use and investment decision making by:

- Strengthening the implementation of international environmental agreements, by empowering those responsible to identify ‘problematic’ development projects and engage early to resolve issues;
- Empowering national political and civil-society actors to more effectively engage with decisions relating to land-use and development planning;
- Providing a step toward investment institutions being able to better screen and assess risk of their investments in companies with spatially-located assets or projects;
- Giving corporations a steer on the level of environmental due-diligence required before embarking on a project with spatial component.¹⁰

⁶ http://www.wwf.org.uk/about_wwf/press_centre/?unewsid=7683

⁷ <http://noc.ac.uk/science-technology/research-groups/mg/seafloor-habitat-mapping/mapping-technology-techniques>

⁸ <http://www.int-arch-photogramm-remote-sens-spatial-inf-sci.net/XL-7-W3/511/2015/isprsarchives-XL-7-W3-511-2015.pdf>

⁹ http://assets.wwf.org.uk/downloads/2016_wwf_sight_mapping_platform_1.pdf

¹⁰ Chandler et al., 2016

Spatially directed tools and projects give conservation NGOs and stakeholders the ability to engage with business to find more sustainable investment solutions. Extractives, logging and industrial fishing industries are often significantly non-transparent in providing data on where, when, and how much activity is occurring. This leads to less effective conservation decisions and engagement with these sectors.

As a result, accurate and effective spatial data enables NGOs to enter into debates and negotiations through the use of well supported and visual evidence, meaning organisations such as WWF are able to compare and keep track of natural resource use. “When something is mapped it is very easy to see where things are going wrong”.¹¹

2.b. An introduction to National Spatial Data Infrastructures (NSDIs)

Spatial data is an important resource for many decision making functions. But to be used, collected, and managed effectively, and to uphold qualities of openness and transparency, it must be integrated into a National Spatial Data Infrastructure (NSDI) at a national level.

***“The role of National Spatial Data Infrastructures will become increasingly important. They can provide the means to organise and deliver core geographies for many national and global challenges including sustainable development. “
(UN-GGIM Future Trends)¹²”***

An effective NSDI emerges from a combination of technical, human, and legal components:

- The technical component consists of mapping standards, fundamental data sets (maps), and the functional requirements needed to access and exchange spatial data.
- The human component encapsulates the skills and education, as well as the political and policy support and leadership required to drive a NSDI to success.
- The legal component comprises of the quality of the legal and policy frameworks and capacity of government to implement them. This component crucially underpins the technical and human components; whilst a NSDI can operate on a voluntary basis, it becomes a force for effective integrated land-use planning and institutional reform when the system has a mandate in law.

¹¹ Source: Personal communication - Spatial data user from WWF-Kenya

¹² <http://ggim.un.org/docs/Future-trends.pdf>

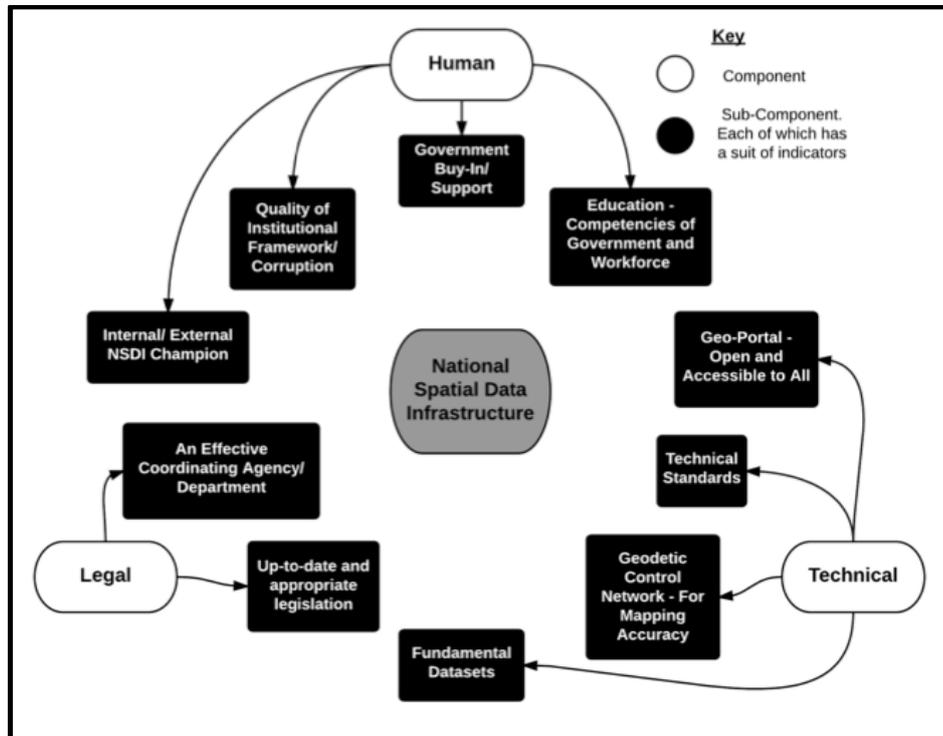


Figure 1: Schematic of the components of a National Spatial Data Infrastructure (Chandler, 2015)

A NSDI is a prerequisite for integrated land-use planning and coordination among sectors more generally. Put simply, it is a framework of technologies, policies, and institutional arrangements that facilitates and enables the creation, exchange, and use of geospatial data between sectors and other stakeholders¹³.

An NSDI provides countries with a way of reporting, storing and collecting spatial data. Through this system, the principles of transparency, openness, accuracy and interoperability can be promoted, and these mechanisms can be put in place for delivery.

Indonesia's One Map Initiative¹⁴ is an example where the establishment of an NSDI is directly connected to environmental motivations. Like many countries, Indonesia suffers from land use and land cover maps that are often conflicting. This has led to extensive overlapping concessions, which has made forest management difficult and hindered the implementation of the REDD+ initiative.

This started to change in 2007, where by Presidential Decree the country established laws and infrastructures to make its NSDI possible. An agency was established to create and maintain the NSDI, and to do so legal decrees and information sharing laws were established to increase the dissemination and sharing of data. Through this, the country has been establishing a 'One Map' through a series of base maps at a 1:50000 scale that will be used by all state ministries and stakeholders and which will be fully available on a free online portal. In assisting this, the agency established a national competence framework for establishing professional education, training and human resources.

¹³ <http://www.esri.com/library/bestpractices/spatial-data-infrastructure.pdf>

¹⁴ gim.un.org/knowledgebase/Attachment279.aspx?AttachmentType=1

The One Map Initiative is seen as a solution to help tackle Indonesia's land-use and deforestation challenges through increasing the openness, transparency, accuracy and interoperability of spatial data¹⁵.

Despite the importance of NSDIs for Indonesia and countries across the world struggling with conflicting land use, there is no widely adopted or standardised method of benchmarking this infrastructure across countries. How can countries improve and develop their spatial data management infrastructure if they do not know where they currently stand, which components are doing well, and which components need resources directed towards them? Similarly, stakeholders using, conserving and investing in the environment need to know the spatial data situation of a country when operating with or within it, in order to be as effective as possible and to help the country improve.

In response to these challenges, this report offers a solution to this problem. The research presented in this report, and conceptualised in Chandler (2015) and Chandler *et al.*, (2016), examines ways in how to develop an index to benchmark NSDIs globally.

2.c. Spatial data and the Sustainable Development Goals - the need for a NSDI index

The Sustainable Development Goals express global economic, human welfare, and environmental sustainability ambitions. Meeting the SDGs will not only require trade-offs between the needs of economy, society, and the environment, but it will require that all sectors innovate to find synergies that will enhance all three.¹⁶ All three can only be achieved if countries have capacity for integrated land-use planning, and spatial data is an underpinning requirement of this capacity.

A key lesson that can be taken from the Millennium Development Goals is that a lack of reliable data can undermine governments' abilities to set goals, optimize investment decisions and measure progress.^{14,17} Therefore a requirement of the SDGs is the development of indicators and there is a global call that many of these will have a spatial connection.

“If you look at the Sustainable Development Goals... all of them deal with information and all of that information has some relationship to where those events or where those activities are happening on the Earth. In order to make the Sustainable Development Goals really meaningful, they have to know where these events are happening.”¹⁸

Spatial data underpins a number of national statistics (Figure 2) and complements many other traditional data systems. More than two thirds of the SDG indicators can and should be visualised spatially, especially at the sub-national scale¹⁹, because it can help decision-makers visualize and

¹⁵ Mulyani, M. (2014) Chapter 5, Phd Thesis, Oxford University School of Geography and the environment.

¹⁶ Chandler et al., (2016)

¹⁷ <http://unsdsn.org/wp-content/uploads/2015/04/Data-For-Development-An-Action-Plan-July-2015.pdf>

¹⁸ <http://www.un.org/apps/news/story.asp?NewsID=51608#.V4C6v7grLb1>

¹⁹ <http://unsdsn.org/wp-content/uploads/2015/04/Data-for-Development-Full-Report.pdf>

understand data such as the visual overlay of multiple data sets. These can reveal relationships, patterns and trends that may not otherwise be perceived.²⁰

Geospatial data is especially valuable when used to visually track progress over time, which all of the SDG indicators, and especially those using spatial evidence bases, will need to do.²¹ Location-specific information gives insight into the distribution of needs and on how to optimise development investments and planning²². Links can also be made between potentially detrimental trends (such as in health or wealth) and spatial features such as roads and proximity to water resources or green spaces, helping to form a fuller picture from which more targeted decisions can be made.

The importance of spatial data to the SDGs is recognised across the UN. The UN-GGIM has been established to set the agenda for the development of global geospatial information and promote its use to address key global challenges.

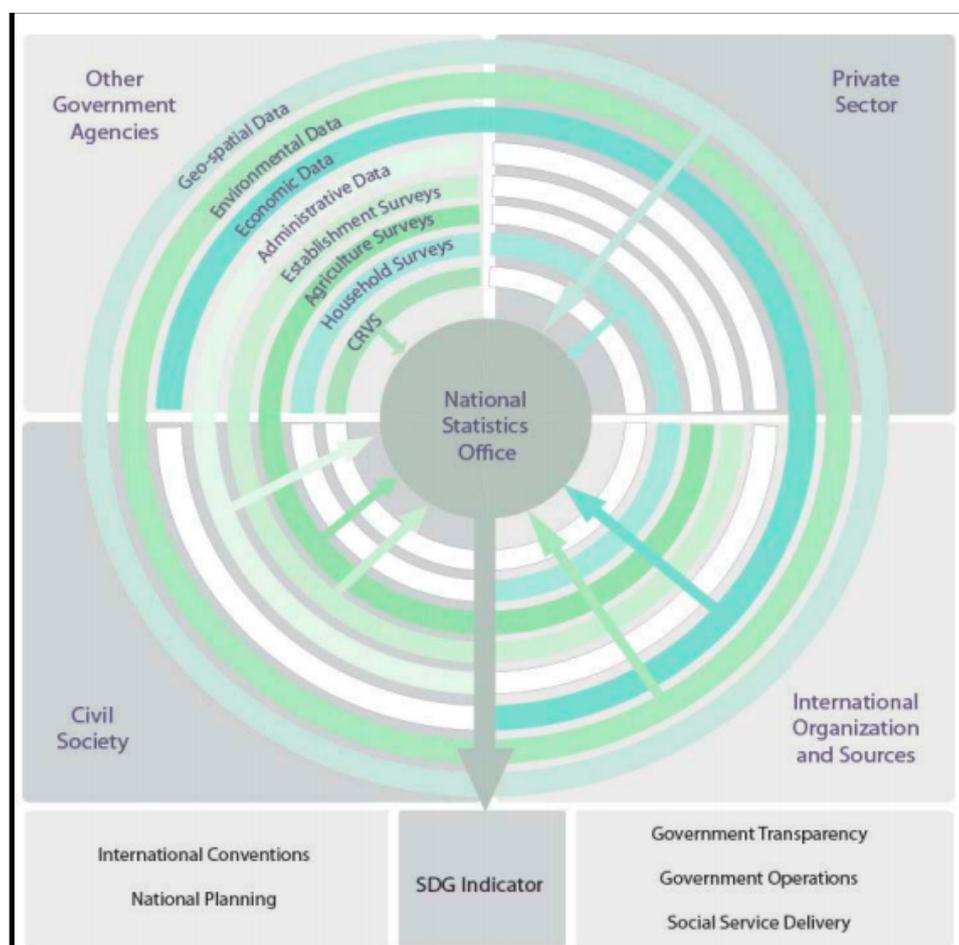


Figure 2: Spatial data can be seen as an encompassing data-type that underpins the SDG indicators²²

20 <http://deliver2030.org/?p=6864>

21 http://blogs.ei.columbia.edu/2015/05/08/sdg_geospatial_data2015/

22 <http://unsdsn.org/wp-content/uploads/2015/04/Data-for-Development-Full-Report.pdf>

The need for a national spatial data infrastructure to form accurate and effective spatial data is therefore more important than ever. The United Nations Sustainable Development Solutions Network (UNSDSN) reports that, while national statistical services have become centralized institutions, the responsibility for geospatial data remains fragmented. The same report states that spatial data infrastructure allows for coordinated but still decentralized data management across government agencies, a platform critical for multi sector data monitoring for the SDGs.²⁴

Deployment of a NSDI index would support the realisation of the SDG goals in relation to the following²³:

- Building accountable and inclusive institutions (SDG 16);
- Reducing the opportunities for corruption (SDG 16.5);
- By focusing on a nation's capacity to conduct integrated spatial and land-use planning, the NSDI Index directly addresses the references in SDGs 11a and 11.3. These outline the need for sustainable human settlement planning and for generating positive economic, social, and environmental links between urban, peri-urban, and rural areas through strengthening national and regional development planning;
- Building resilient infrastructure (SDG 9) and ending hunger through food security and sustainable agriculture (SDG 2), linking back to the need for coordinated and efficient spatial planning.

To allow for improvement, there is a need for a comparative measure to benchmark countries on their NSDI. An index is considered to be an effective way of communicating complex systems and situations into a measurable and consistent format. Indexes display data in a way that is communicable to policymakers and citizens, and can be used to assess the progress of a country, region, or organisation towards a goal. Well-known examples include the Human Development Index (World Bank) and the Corruption Perceptions Index (Transparency International).

Ultimately, the scoring that the index provides would allow investment and decision making to be directed towards problematic areas. It also advocates collaboration and motivation between government departments and other stakeholders to improve their spatial data quality, management, and availability.

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Chandler et al., 2016

Section 3: Methods Overview

The methods and the outputs of this study have been twofold. Firstly, a questionnaire and interviews were used to examine spatial transparency within and for WWF-UK and across its network. Secondly, the index scorecard was further developed and refined, and then sent separately to the spatial data contacts in the priority countries as a means of ranking. These two sets of results have fed into the country profiles, with the first set being from the questionnaire which adds context and supporting information to accompany the index score table which is added at the end of each profile.

3.a. Questionnaire and Interview Methods

The aim of the survey was to investigate spatial transparency benefits and issues across the WWF-UK priority countries with the purpose of better informing WWF's policy and advocacy needs in these countries based on the survey results. Therefore, the questions were developed around the themes of data use, access, accuracy and transparency.

They were distributed firstly to spatial data users/teams within the WWF-UK priority countries, and secondly to a wider network of spatial data professionals which included NGOs, private companies and international organisations from the countries listed below.

The following results and country profiles were obtained from interviews and questionnaires sent to spatial data professionals and users within NGOs, government ministries, and private organisations:

- Brazil - good survey response
- Peru - average/poor survey response
- Kenya - good survey response
- Tanzania - good survey response
- India - average survey response
- China - poor survey response
- Nepal - average survey response
- Bhutan - good survey response
- UK - poor survey response but excellent index input

The

questionnaires were detailed and quite technically specific, so response rates were preferred to be of high quality rather than high quantity. They were also aimed to be representative of other spatial data stakeholders, such as government ministries and private companies as well as WWF offices.

The results have been presented in the country profiles, and split into sector where survey responses allowed. These vary between countries depending on the number of responses received per sector. For all countries a response from the WWF office was received.

3.b. The Index

A draft index and feasibility/need assessment was conducted prior to this development work being undertaken. The second aim of this project was to pilot test the initial index on the WWF-UK priority countries. Indicators were selected through rigorous research into existing studies on NSDI, including work by Vandenbroucke *et al.*, (2011)²⁴ on the EU INSPIRE State of Play (EU NSDI) and leading research such as that of Cromptvoets *et al.*, (2008).²⁵

The index at time of writing is currently being improved through a process of expert review and further research, involving academic collaboration with Dr Paul Jepson, from the Conservation Governance Lab, Oxford University, and Dr Joep Cromptvoets, from the Public Governance Institute, KU Leuven. Advice, support and endorsement was further obtained from David Lovell, President of the GSDI Association (as of December 2016). It will be tested at an expert workshop at the GSDI 15th World Conference in Taipei, Taiwan in December 2016.

The draft index is presented in the scorecard, within which each sub-component of the NSDI structure identified in Figure 1 is reliably scored against a suite of robust and meaningful indicators that are assembled to form the Index. These cover the human, legal, and technical components that a NSDI needs in order to be effective. There is a standardised scale across indicators, such as a one to five score, with qualifying descriptions for each. The aim is that by having clear descriptions across scales for each indicator, this will clarify what is needed to strengthen a NSDI and therefore achieve a higher index ranking. The index will be sent to a select group of spatial data infrastructure experts in each of the pilot countries to score and return and verified by an independent expert. The index design will be completed in early 2017, with scores for each of the priority countries in this study, and the score-card will be inserted into an updated version of the report.

Section 4: Results

4.a. Positive results - WWF network

The research has demonstrated that the spatial data situation varies between countries and often between organisations within those countries. WWF offices are, in general, well-supported technically and with well-trained teams/individuals. Yet, improvements in software and technical updates, and the need for more training and trained individuals were often quoted to be important. These improvements are not specifically targeted to one office and instead should be assessed across the network.

²⁴ Vandenbroucke, D., Cromptvoets, J. and Jenssen, K. (2011) INSPIRE and NSDI State of Play: D1.1 - Report on the Methodology, K.U.Leuven Spatial Applications Division, Research and Development.

²⁵ Cromptvoets, J., Rajabifard, A., van Loenen and Delgado Fernandez, T (eds.) (2008) A Multi-view framework to assess SDIs, Space for Geo Information (RGI), Wageningen University and Centre for SDIs and Land Administration, Department of Geomatics, The University of Melbourne, Available: http://www.csdila.unimelb.edu.au/publication/books/mvfasi/MVF_assessment_SDI.pdf

GIS teams across the WWF network are very engaged and supportive and are willing to collaborate and expand to improve the use of spatial data within the organisation. They are an important asset and are champions for better data use and NSDI establishment.

WWF Nepal is a good example, where a well-established GIS team provides training and support to another GIS team within the WWF network. This kind of support can help to foster relationships, improve data sharing, and makes collaborative ventures more likely. WWF Bhutan is a second example of a highly engaged WWF office, providing a strong example of how WWF can play a central role to promoting data exchange and collaboration, within and outside of the organisation, by setting up and taking an active role in such groups. Bhutan's GIS team shows that WWF can act as a champion for data transparency because the organisation is widely recognised and its reputation carries weight, meaning that the country offices are in an influential position in establishing better in-country spatial data capacities.

4.b. Improvements needed – WWF network

The awareness of the huge importance of spatial data across environmental NGOs outside of their spatial data departments is relatively low; as a result, awareness about NSDIs and their potential benefits is also limited. This suggests that the potential application of NSDIs, in developing countries especially, is poorly advertised, promoted and utilised.

For example, WWF Cameroon raised the issue that the government there are currently working on an integrated land use plan, and that conversations are taking place between stakeholders on data sharing, platforms, and even geo-portals, without the acknowledgement of these fitting into an NSDI as a functioning system. WWF Cameroon have stated that the land use planning process is less effective without an NSDI and the work presented in this report would help them to frame their support for data transparency and galvanize momentum to champion NSDIs in Cameroon.

Teams and government departments are much stretched, meaning that data sharing and putting the results of data into useable formats falls behind other more important demands. GIS teams within the network do not have national or even organisational capacity building for spatial data included in their time allocation. Instead, much of the positive work done towards GIS takes place in people's spare time and driven by their passion. There is a missed opportunity here to make WWF's voice heard in national transparency and data sharing discussions, and perhaps an internal push is needed in the priority places to engage country teams in government data discussions.

It had been raised across the course of the research by influential spatial data professionals that there is a need for intra-organisational reflection on sharing and transparency within the WWF network. There is also the need for investment and network wide support for NSDI which could be championed by GLOBIL and applied via spatial decision making tools such as WWF-Sight.

Siloed working – the practice of working within certain departments and sectors without sharing information with others within the same organisation or sector - is very apparent. This occurs both within the WWF network and across environmental stakeholders. For example, there is currently limited capacity across WWF network offices to share data on an integrated and up-to-date platform. Most data users stated collaboration and data sharing to be one of the most important areas for improvement. WWF Bhutan is an example where data sharing is a large part of the NGO

and organisational culture. This has caught the attention of government and prompted appropriate legislation and assistance to be put in place to help.

Lack of data transparency within organisations external from WWF is a prominent problem for the WWF network when internal users are trying to access and share data. Often WWF data users cannot obtain data from other organisations because of highly regulated data use and the reluctance of companies to share data due to competition, especially within mining and infrastructure sectors. Each transparency barrier carries its own issues for conservation and land use planning.

There are several examples of this taking place. One example was given by Brazil whereby lack of data transparency can be used to hide detrimental progress in curbing deforestation in the Brazilian Savanna. In China the WWF office (within certain parameters) cannot manipulate certain datasets independently of a regulatory body, which can significantly slow the process and prevent controversial but often crucial analysis from taking place. Within the East African study area, low transparency and data sharing has led to extensive duplication of datasets, which are scattered between ministries, meaning data use can be time consuming and expensive.

This study has demonstrated that transparency is a large issue in the countries which WWF is operating in. For improvements to be made it is important for the organisation to work with governments and data users to find solutions specific to each country, and to use clear advocacy if such collaborative efforts are unsuccessful.

4.c. Further insights

Across the countries included in this report, another key barrier to better data transparency, alongside siloed approaches to working, is political will. If there is no political support for NSDI, efforts often fall flat. For example, some countries such as Indonesia have been very ambitious with their spatial data infrastructure, but this motivation was driven at a presidential level which allowed for a government-wide coordinated approach and meaning better resources were made available.

Inconsistent funding is also particularly detrimental to consistent government support of a NSDI. Funding for NSDIs in developing countries is often supplemented by external sources, such as development aid or grants, which come with short term or bulk financing characteristics. But establishing an NSDI needs long term and sustainable funding, and should be a consistent process of improvement. At present, especially in East Africa and developing nations, inconsistent and sporadic funding leaves NSDI development vulnerable to inconsistent donor subsidies while governments divert funding to other ‘more pressing’ issues of development. As a result, progress in the establishment and improvement of NSDIs can be slow; this may lead to low motivation within ministries in supporting it, and private investors withdrawing support due to lack of tangible results.²⁷

The interviews conducted in the preliminary work²⁶ for this report revealed that the way a NSDI situates itself to government can greatly affect its acceptance and development. This shows a need for governments to make the connection between mapping and investing in mapping, and their national development plan. Often government do not consider the processes needed for effective

²⁶ Chandler (2015)

land-use planning, just the end result they are aiming for; this was shown in the earlier example of Cameroon where discussions were taking place but without the understanding of the structure an NSDI provides as an underpinning need.²⁷

To justify investment, discussion needs to come from a need based and problem solving agenda, which can prove its use from the outset and demonstrate end results. If proven valuable to national development plans, the NSDI could also surpass the lack of government support from fear of transparent data. One organisation interviewed in East Africa is attempting to raise the profile of NSDIs through demonstrating to the government what can be achieved with accurate and transparent maps, and how this can save them time, money and resources, while boosting their development agenda.

Across the surveys that were conducted, several spatial data experts, especially in Brazil and India, stated that the trend for 'smart cities' would improve the use of NSDI and investment in its improvement. A smart city is an urban development agenda which aims to use information technologies in a coordinated, high tech, integrated way to manage a city's 'assets', such as transport, water and waste control, emergency services etc.^{28 29 30}

Implementing a smart city infrastructure optimally requires open, accurate, transparent and integrated spatial data, all of the qualities that an NSDI provides. As a result, it is thought that this demand will trigger interest and improvement in NSDIs, as smart cities demonstrate to governments the direct link between a development issue and spatial data management as a solution. There is great potential if the same problem solving attitude can be applied to natural resource management and the environment, but more needs to be done to demonstrate this in a current and relevant way.

Another potential for NSDIs is that many developing countries have an advantage due to the lack of legacy systems and technologies which restrict change. This will enable them to leapfrog some developed countries. Because of this there is an opportunity to establish positive principles early on, something which WWF offices in Nepal and Bhutan have demonstrated.

Section 5: Moving forward - Recommendations

5.a. Recommendations to WWF

This study has demonstrated that spatial transparency issues are unique to each priority place. In some countries WWF is actively involved and engaged with creating solutions to solve spatial data issues nationally, and in others teams are so stretched they do not have the time and resources to do the same.

²⁷ Personal communication (2015)

²⁸ <https://www.theguardian.com/public-leaders-network/2015/aug/06/10-steps-to-building-a-smart-city>

²⁹ <http://www.smart-cities.eu/?cid=1&ver=4>

³⁰ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/246019/bis-13-1209-smart-cities-background-paper-digital.pdf

In light of this WWF needs to tackle its own institutional constraints around spatial data sharing and access, as well as lobbying and assisting governments to improve theirs. A way that this can be improved is to make spatial data central to and a key evidence base for conservation decision making, rather than a supplementary piece of evidence. For example, rather than supporting work by offering a map of where it is happening, spatial analysis can be used to look at the trends and threats to biodiversity in an area, and decision making can be based on spatially underpinned evidence.

5.b. Recommendations from WWF to the UK government

Governments globally will continue to play an important role in enforcing spatial transparency principles and in improving national spatial datasets, and should be a source of high quality spatial data. However, some countries may require support or motivation to do so.

This is the case with the UK government, which is in a position to gather and provide data through DFID, international policy, and the Ordnance Survey. Through DFID the UK government has a commitment to helping less developed countries achieve the SDGs and ensuring that “no-one is left behind”. Building spatial data capacity is vital to helping countries collect data for, and report on the SDG indicators, as well as the other direct benefits mentioned in this report. The UK

This report recommends that WWF develop an organisational policy on the following aspects:

- Make datasets that are important to the environment available to the public, and participate in country data initiatives;
- Share datasets and collaborate openly with other environmental stakeholders;
- Engage with data discussions and groups in priority countries (as seen in WWF-Bhutan);
- Use the network more effectively to share and exchange experiences and advice;
- Share datasets within the WWF network, making sure they are accessible and available for use, and specifically in this case provide secure funding and governance of GLOBIL and spatial decision making tools such as WWF-SIGHT;
- Spatial data leadership - recognise the importance of spatial data to conservation decision making, policy advocacy and early engagement with governments, companies and investors and ensure that it supports project work where appropriate to the best of its ability;
- Engage with stakeholders (especially governments) who have the resources to improve spatial data management in priority places and governments, and advocate for spatial data transparency and openness;
- Conduct an internal assessment on spatial data transparency within the WWF network itself.

government is also in the Global Partnerships for Sustainable Development Data³¹ group as a champion and has pledged “an additional £6 million for PARIS21 to enable the Partnership to play an enhanced role in helping developing countries to strengthen their national statistical systems in a rapidly changing environment.”

“Delivering the statistics to monitor the progress of the SDGs will require NSOs to work together with the geospatial community to identify and

WWF-UK should be recommending the UK government to address the following:

WWF-UK should be recommending the UK government to address the following:

- To directly support and promote investment in less developed countries spatial data capacity (specially through the development of an NSDI) to assist them with reporting on the SDGs;
- Encourage the use of Open Data Principles³² when approaching UK government data, and lead by example within the UK;
- Be involved in actively establishing and using global standards and global initiatives for spatial and statistical data, such as through the UN-GGIM;
- Pioneer on laws and policies around open data and spatial data transparency;
- Fulfil the mandate of the EC INSPIRE directive³³, a European regional NSDI initiative;
- Encourage contributions to the World Bank trust fund for statistical capacity³⁴;
- Push the UK Government to honour commitments in the World Data Forum 2016, a platform established to increase cooperation on data for sustainable development³⁵;
- Finally, governments need to recognise the importance of the data held by organisations and to support them appropriately. Certain global datasets, in particular for biodiversity, are currently maintained by institutions, such as the IUCN (e.g. red list of species) and UNEP-WCMC (e.g. the World Database on Protected Areas), with no secure funding. These data sets should be viewed as a “global good” as although governments themselves do not hold this data, many organisations and decisions depend upon this data. It is essential that these funding constraints are recognised and addressed in the interest of better environmental decision making and in recognition of the need for open data access.

develop requirements for spatial statistics within and across Member States.”
(UN-GGIM)³⁶

³¹ <http://www.data4sdgs.org/champions/>

³² <http://www.opengovguide.com/standards-and-guidance/the-10-principles-for-open-data/>

³³ <http://inspire.ec.europa.eu/>

³⁴ <http://www.worldbank.org/en/data/statistical-capacity-building/trust-fund-for-statistical-capacity-building>

³⁵ <http://thewitnessstar.blogspot.co.uk/2015/10/un-to-hold-inaugural-world-data-forum.html>

³⁶ http://ggim.un.org/docs/UN-GGIM-Future-trends_Second%20edition.pdf

5.c. Recommendations WWF should be making to Governments in Priority Countries

“Governments remain in a unique position to consider the requirements for geospatial information for society as a whole, and will continue to play a key role in providing a reliable, trusted and maintained geospatial information base.”³⁷

Political will was identified as a key barrier to spatial data transparency and NSDI improvement. Governments need to see this foundational geospatial information for its ‘value’, not for where it has come from or who owns it. Geospatial information needs to be treated as an essential component in decision-making processes, not solely as a commodity that can be sold³⁷. WWF is in a position where it can work to promote and inform to change these attitudes.

Recommendations that should be made across regional WWF offices to their respective governments are:

- Improving the efficiency of resource allocation (using the NSDI index proposed above) to developing their NSDI, or increasing it;
- Bettering the coordination across government and opening the datasets related to the SDGs³⁸;
- Promoting spatial data transparency at a regional and international level;
- Lobby for and provide ideas on secure funding for global environmental and social spatial data bases (e.g. WDPA; IUCN Red list);
- Take note and invest in making use of more ‘big data’ technique based solutions as they are rapidly becoming available. This means using the large amounts of data and data collecting technology to more effectively answer conservation questions; for example, using sensors and tracking data to establish animal home ranges to better inform conservation management.

Section 6: The index moving forward

By benchmarking the state of NSDIs globally, the index can reveal countries where development investments carry risks relating to poor performance and negative environmental and social impacts. A NSDI index would enable governments to benchmark the state of NSDIs and set investment goals to strengthen their spatial planning institutions, and thereby improve their NSDI ranking. International finance institutions and multi and bilateral donors could support this by integrating a NSDI ranking as conditionality of their loans and grant aid and investing in their

³⁷ <http://ggim.un.org/docs/Future-trends.pdf>

³⁸ <http://unsdsn.org/wp-content/uploads/2015/04/Data-for-Development-Full-Report.pdf>

development. The index has significant benefits to offer countries data transparency, management and openness, alongside assisting improvements in NSDIs and drawing policy attention to the crucial role of NSDIs in achieving the SDGs.

Additionally to this, there is a potential to include marine datasets in the assessment, something which should be emphasised moving forward. Developments in deep sea mining, overfishing, and pollution continue to happen at devastating rates, and governments continue to try to rectify this and set targets on marine protected areas and fisheries and pollution policies. The index could be tailored to apply to the regional fisheries management organisations, as transparency and accuracy of data are, arguably, larger issues in the marine environment. This is something that the UN-GGIM should take into account when developing their ‘fundamental datasets’ to ensure the marine environment is represented³⁹.

Next steps

The aim is to apply the index globally and to obtain a score for each country. It is a strong possibility that this could be led by GSDI with WWF as a potential partner. The profile of the index should then also be raised by the work currently being done by the GSDI, UN-GGIM and Ordnance Survey (UK). It is hoped these groups will endorse and support the use of the index and its role within the spatial data infrastructure improvement. This work will be presented at the GSDI world conference in November 2016, and a workshop will be run to test the index and explore next steps.

The rollout of a NDSI index has the potential to mobilise a collection of donors, investors, and NGOs, to pressure governments to modernise their NSDIs. This would strengthen capacity and demand for integrated land-use planning, with potentially profound long-term benefits for investment, innovation, people, and the environment.⁴⁰

³⁹ <http://un-ggim-europe.org/content/un-ggim-europe-kicks-work-global-fundamental-geospatial-data-themes>

⁴⁰ Chandler et al., (2016)

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To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.
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