GLNP natural capital report

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Contents

Glossary of terms

Asset	At its most basic level this can refer to mineral, soil or flora and fauna, though is often used to refer to a collection of these things which work together to provide one or more ecosystem services.
Biomass	Biomass refers to cultivated crops, grass, wild fish and wild produce. It does not include farmed fish or cattle as they are currently perceived as a product (ONS, 2017). For the purpose of this report timber and peat extraction have been counted separately in figures where possible.
Ecosystem service	Also referred to simply as service. Services are derived from the habitat and benefit society and the economy.
Habitat	Refers to any one of the eight broad habitat types described by the National Ecosystem Assessment.
Multiplier	For the purpose of this report it is the figure by which national accounts were multiplied to work out asset values. This has been used as a simplified method of working out the potential asset values derived from Greater Lincolnshire services.
Net present value	A system for converting the service flow value into an asset value.
Service asset value	The value of a service provided by the natural environment (ecosystem services) based on the perceived period of time over which it will continue in the future. It often takes into account predicted changes in flow and monetary values. It makes up a component of an asset's overall value, which takes into account all services which flow from it.
Service flow	The physical flow of an ecosystem service. In layman's terms, how much there is, for example the tonnage of pollutants removed by woodland.
Service flow value	Backward looking annual monetary benefit of an ecosystem service to society.

1. Introduction

An understanding of natural capital is becoming increasingly important and quickly superseding the single value approach of ecosystem services. The need to understand natural capital has been further highlighted by its inclusion in the Government's 25 year environment plan. While in its infancy and though it divides opinion, to ignore natural capital risks the potential for the Greater Lincolnshire Nature Partnership (GLNP) to be left behind/lose influence in certain parts of the sector.

1.1 What is natural capital?

Natural capital is defined, by the Natural Capital Committee, as "…*those elements of the natural environment which provide valuable goods and services to people, such as the stock of forests, water, land, minerals and oceans*".

Natural capital has four basic categories (habitats, air, land and water) and consists of the environmental assets, such as minerals, soils and flora and fauna. These assets enable the ecosystem to function and, in turn, provide services which hold benefits for people and society. A focus on protecting the assets, over the services they result in, is considered to be a more sustainable approach for protecting nature as it considers the habitat as a whole rather than focusing on the parts that provide the services. As such, using assets has the potential to maximise the broad societal benefits of the natural environment while promoting the conservation of a functioning habitat.

1.2 Report aims

This report presents the eight GLNP workstreams in the context of their impact or contribution to natural capital using case studies. This highlights the relevance of the GLNP's work to Greater Lincolnshire's natural capital and provides a base on which to build any future natural capital strategies.

It is not intended to be a natural capital account for Greater Lincolnshire or to place a definitive monetary value on the work that the GLNP does. Given enough time there would be the potential for developing a minimum natural capital account for Greater Lincolnshire, however due to the varied nature of the work the GLNP does, it would be unreliable to place a single figure on the GLNP's economic impact on those accounts.

2. Methods

The following section briefly introduces the methods used in natural capital accounting as suggested by the Office of National Statistics (2017). It then covers the methods used to develop the case

studies presented in this report and also the simple calculations used to create an indicative valuation of some of Greater Lincolnshire's natural capital assets.

2.1 Natural capital accounting methods

It is important to note that there is currently no definitive method for valuing natural capital and the service flows which derive from it, though there are recurring themes across methodologies. The Office for National Statistics accepts that on many occasions a method for valuing service flows will have to be developed by those conducting the accounting, stating that any methods should be transparent. Most of the figures used in this project are either directly from or derived from UK natural capital accounts conducted by the Office of National Statistics (ONS) (2017: 2018); however it is worth being aware that the ONS describe the status of the methods used as 'experimental'. Monetary accounts should also be considered as minimum or partial accounts as the values given are simply for the service flows that can currently be valued. Many service values cannot be quantified yet are still benefitting the economy and society. Therefore any final summed figure is only a partial representation.

2.1.1 Service flow value

The keystone of natural capital's worth is the accumulative value of the services that society derives from it. These are measured using a variety of methods that also vary in their reliability[1]. The ONS (2017) suggests that all systems developed for measuring value must be transparent and intuitive. The list below describes different valuation techniques, used for annual service flows in natural capital accounting:

Market based methods:

- **Market prices** of goods or services (includes all added value and input including human) e.g. the price of timber
- **Resource rent** refers to the value derived from the asset itself. E.g. the income raised by selling timber less any costs such as tax, labour and other operating costs. (The calculation involves taking into account GDP and 10 year government bond yield)
- **Production function** attempts to evaluate an ecosystem service, usually regulating services, by evaluating its contribution to marketable goods or services e.g. the value of healthy peatland filtering water to water companies.

Revealed preference methods:

- **Hedonic pricing** extracts marketable values where a service is an attribute of the value of a marketable good. E.g. the difference in house prices on a leafy and non-leafy street
- **Avertive behaviour** is the value placed by consumers on a service by buying replacement products when service is not met. E.g. the price of bottled water when tap water is undrinkable
- **Recreational value** is the willingness to pay. E.g. the price paid for car parking or entrance fees

[1] More technically: Existing or deduced exchange values are used for marketable goods. Welfare values are used for non-marketable goods or services

Cost based methods:

- **Damage costs avoided** refers to costs saved because services provided by natural capital prevented damage or pollution. E.g. reduced water filtration costs for water companies through healthy peatland.
- **Replacement cost** refers to the cost that would be required to fulfil a job currently being done by the natural environment, such as the cost of a sea defence wall in the absence of saltmarsh.

Stated preference methods:

- Based on contingent valuation and choice experiments. This method is not very robust, but is useful where a value is needed but there are no other ways of determining a value. For example how much people state they would pay for 'wanting nature to be there' and 'saving it for future generations'.

Each technique used should be broken down and explained within any set of natural capital accounts, including reporting on both service flows and monetary values. Where possible as many services should be assessed using the same technique for comparability.

2.1.2 Asset values

Once the service flows have been valued these figures are then used to create a value for the assets they flow from. For example the value of water filtration by healthy soil is a service flow to water companies that can be used to create a value for the soil asset (although the value of all measured service flows linked to the asset (soil in this example) should be taken into account). This is usually done on a broad habitat basis or as a minimum, values should be consistent with habitat accounts[2].

Unlike service flow values, asset values look forward and predict the cumulative worth of all the services annually. The System of Environmental Economic Accounts (SEEA) recommends the use of a **net present value** (NPV) approach which takes into account:

- The predicted future flow of values, including any projected degradation, for example the value of water filtration by soil declines as soil becomes degraded as the water is not as clean. Where degradation or improvement is not known or cannot be measured a constant service flow value is used.
- The asset's lifespan. Renewable services, which do not deplete the resource from which they are derived, are assigned a 100 year lifespan[3]. Values for non-renewables, such as peat extraction, are assigned the number of years the resource is predicted to last, where this is unknown the values are capped at 25 years[4].
- A discount rate, which is used to predict the expected fall in the service flow value. Standard economics expects the values (not flows) to decline over time and a rate is used to calculate this. The ONS and Defra use the rate set out in the HM Treasury Greenbook (2003). It should be noted that issues have been raised concerning the appropriateness of the discounting methods

[2] Asset accounts of a habitat type

[3] Previously lifespans were set to 50 years based on timber rotation trends.

[4] 25 years is the current standard however this can vary depending on the author and age of the accounts.

used (Ramsey formula) to ecosystem accounting but there is currently no other standard and widely accepted methodology.

The total values of these services are then collated to create an asset value for the habitat from which the service flow originates. In line with ONS advice, area accounts (such as a parish or even county) should then be based on these underlying broad habitat accounts.

2.2 Case study methods

Eight case studies have been compiled to highlight the impact that the work of the GLNP has on natural capital. They are based on existing UK figures, though where they were available Greater Lincolnshire figures have been included. The following list illustrates the process of developing the case studies:

- Research into natural capital and how different ecosystem services related to different broad habitat types, in line with NEA Ecosystem trends as presented in the Natural Choice white paper (Defra 2011).
- Meeting held with GLNP workstream leads to discuss and agree the services and broad habitat types impacted by each.
- A table was created for each workstream utilising a traffic light system to show interactions with service flows, as shown in Figure 1 below:

Figure 1 Key for case study tables

- From these tables a brief summary of how and why the workstreams interacted with natural capital was developed, to be included in the case studies.
- Existing figures for natural capital values were then researched and collated before being attributed to relevant workstreams.
- The case studies were then written up including the impact summary and a list of values to which the workstream contributes.

2.3 Method for example Greater Lincolnshire accounts

As an example a simple assessment of natural capital was undertaken for a limited number of habitats and service types within Greater Lincolnshire. These included:

- Woodland (as the asset), including the following services:

    - Flood management
    - Climate change mitigation
    - Recreational value
    - Air pollution
- Farmland (as the asset), including the following service:
    - Air pollution
- Vegetated freshwater habitats (not including open water) (as the asset), including the following service:
    - Air pollution

The following process was used:

- Determine the unit value of the service – this is a simple calculation of the service flow value divided by the service flow. For example, say the total value of UK woodlands for removing air pollution is £2million so this is divided by the amount of woodland in the UK say 100 hectares. So the unit value is £20,000 per hectare[5]. Alternatively already published unit value figures can be used where they are available.
- Create the service flow value for your area – the unit value simply needs to be multiplied by the amount of habitat in Greater Lincolnshire to give a Greater Lincolnshire service flow value. For example £20,000 per hectare is the unit value of air pollution removed by woodland, multiplied by 10hectares of woodland in Greater Lincolnshire. So the service flow value is £200,000 for this service that woodland provides.
- Calculate the service asset value – This uses a multiplier to change the annual service flow value into a total all time value[6]. This can be done using existing multipliers or created by dividing the asset values in the national accounts by the service flow values. For example if the service flow value is £200,000 this is an annual figure and must use a multiplier to determine the total value for the future. This could be £200,000 multiplied by 15 years, so the service asset value is £3million.
- Create a minimum asset value – add together all the different service asset values (if available) to create a minimum asset value in Greater Lincolnshire. For example if the air pollution service asset value is £3million in Greater Lincolnshire this needs to be added to the values for flood management, climate change mitigation and recreation. However it is still only a minimum value as services such as timber and biodiversity have not been valued.

N.b. These methods are simplistic in nature, utilising UK wide habitat figures and relating them to the area of habitat recorded in Greater Lincolnshire. They are intended only to offer an idea of Greater Lincolnshire's potential wealth of natural capital and therefore the need to invest in a full, more in depth set of accounts. While similar techniques could potentially be used for other habitats and services in Greater Lincolnshire, it is suggested that further development of natural capital accounts should take a more in depth approach.

[5] Fictitious figures used for clarity!
[6] Or more technically a Net Present Value

3. Case studies

The partial estimate for the value of UK natural capital assets was £761 billion in 2015 (Office of National Statistics, 2018). The following case studies were developed to give an indication of how the work of the GLNP fits into this figure. Due to the nature of the GLNP's projects it is not currently possible to attribute a specific monetary value to the work it does. The case studies, which can be found on the GLNP website, will highlight where workstreams improve the value of natural capital, preserve existing value or in some cases, in the interest of transparency, have the potential of degrading it.

4. Examples of Greater Lincolnshire natural capital

The table below shows a simple set of accounts to highlight the value of Greater Lincolnshire natural capital stocks.

Greater Lincolnshire example accounts						
Habitat	Area	Service	Flow (£)	Asset (£)	Multiplier	Notes
Woodland	8139.934	Flood	40,699.67	1,220,990.10	30	
		Climate	3,483,891.75	130,238,944	37	
		Recreation	5,697,953.80	170,938,614	30	
		Air Pollution	1,953,584.16	55,351,551.20	28.333	
		Total	**11,176,129.38**	**357,750,099.30**		
Enclosed Farmland	366513.6	Air Pollution	5,136,187.88	145,523,611.20	28.333	
Wetland	526.329	Air Pollution	7512.19	212,842.84	28.333	Does not include floodplain grazing marsh, marsh or open water

5. Project limitations

5.1 Natural capital

There are a number of potential limitations with natural capital in general:

- It cannot take into account the intrinsic value of nature.
- UK accounts are not complete, not all habitats have been subject to accounting and for those that have not all services have been valued. All accounts are partial or minimum values.

- The benefits of ecosystem services are heavily reliant on location (Bolt and Ausden, 2018). Where the benefits are not felt the value is diminished. For example the value of trees for water quality services is heavily reliant on the location of trees within catchment areas.
- Like any other economic system natural capital is linked to demand. The value of natural capital can be affected by changes in demand. As such changes in value are not always linked to degradation or enhancement of assets, but could be due to increased need. Such as higher levels of air pollution increasing the value of trees regarding their ability to perform pollution removal, while a reduction of pollutants would reduce the value of trees in this respect regardless of their potential to fulfil the service.
- The effectiveness of a natural capital approach as a way to highlight the importance of conserving the natural environment can be hindered by society and economy continuing to undervalue their dependence (Belt and Blake, 2015). Embedding natural capital into the mainstream financial system could overcome this, though it would be difficult due to the lack of marketable values.
- There will often be trade-offs when managing for natural capital, managing for one service flow may negatively impact on another (Bolt and Ausden, 2018).
- The system of natural capital valuation is complicated by the lack of a unified evidence base explaining the processes that allow natural capital to provide ecosystem services (Smith *et al.*, 2017). There is a need for more discussion and sharing of potential accounting techniques and methods, including greater transparency in reports of where figures are from. As such natural capital values can vary dramatically according to the evidence and methods used.
- Valuing natural capital often has to be conducted on a site by site, organisation by organisation basis. This also means that there is no accepted standard, resulting in inconsistencies between sites, inability to make comparisons and difficulties in communication. It also leads to the duplication of effort by different organisations evaluating sites for natural capital potential. This could lead to the value of natural capital being poorly defined, which can undermine any arguments for conservation.

5.2 Report methods

5.2.1 Case study

- Data was collected from a range of sources produced at different stages of a constantly developing set of principles. Where possible figures were used from ONS publications and were from comparable dates, geographical areas and techniques.
- Livestock and aquaculture are no longer included by ONS as they are considered to be products not services (ONS, 2018) creating some disparity between sets of accounting depending on when they were compiled.
- Due to the incomplete nature of UK natural capital accounts, some figures have been sourced from scoping studies.

5.2.1 Example accounts

- Though available, figures for the impact of woodland on water quality were not included as these are only relevant where woodland is in appropriate areas. This is something that should be included in an in-depth set of accounts.
- Greater Lincolnshire asset values were calculated by multiplying service flow values by the same multiplier utilised in ONS calculations of national accounts. This was to take into account the **net present value** of the service, however in further accounting these should be developed specifically for Greater Lincolnshire accounts using guidelines set out in Principles of Natural Capital accounting (2017) and HM Treasury's The Green Book (2003).
- The methods to give example accounts for Lincolnshire habitats are based on averaged UK figures; this makes the assumption that the demand for each ecosystem service is the same as the national average demand. For example the assumption is that air pollution levels in Greater Lincolnshire are the same as UK average levels and there is no process for adjusting values to take into account variations.

6. Next steps

This report and the enclosed case studies highlight the work that the GLNP does in a natural capital context, however acknowledging this is just the first step. Further consideration will be needed to help maintain the GLNP's relevance and improve its ability to inform and support in a sector which is increasingly turning to natural capital as a way to convince the wider population of nature's importance.

The following is a list of potential opportunities for moving forward with natural capital:

- Natural capital asset mapping of Greater Lincolnshire
- Development of a Greater Lincolnshire set of natural capital accounts
- A review of natural capital methods and processes
- Address discrepancies and weaknesses while supporting strengths within natural capital evaluation methods
- Be an active voice in the development of local and national natural capital plans

7. Summary

- **Natural capital is becoming increasingly important within the conservation sector.**
- **This report and the associated case studies have been developed to address the topic of natural capital and highlight the part the GLNP plays within Greater Lincolnshire.**
- **The eight case studies produced show that the GLNP workstreams have an impact on the natural capital of Greater Lincolnshire; however the actual monetary contribution cannot currently be quantified.**

- **The simple example accounts presented in this report are for limited habitats and services, but suggest that there is a need for the compiling of a more in depth and robust set of Greater Lincolnshire natural capital accounts.**
- **A number of limitations within natural capital have been identified. It is clear that there is a need for communication and transparency in the development of a definitive accounting process.**

Appendix 1: Processes to create example Greater Lincolnshire accounts

Woodland

- Per hectare values of woodland calculated and presented in a report by the Woodland Trust were multiplied by the area of habitat recorded in Greater Lincolnshire to create a local value[7].

Farmland and air pollution[8]

- The service value of UK farmland pollution removal was divided by the service flow of UK farmland pollution removal to get a monetary value for each tonne of pollution removed.
- The service flow of UK farmland pollution removal was then divided by the area of UK farmland recorded to get a per hectare figure for removal.
- These two figures were then multiplied to calculate a per hectare value for farmland pollution removal.
- The per hectare value was then multiplied by the area of farmland in Greater Lincolnshire to create a minimum account of the area farmland asset (based only on air pollution removal).

Freshwater habitats and air pollution[8]

- For freshwater the same method as for farmland was used
    - For purposes of UK habitat freshwater refers only to vegetated wetlands, such as fen marsh and swamp and bog, it does not include open water habitats.
    - Freshwater habitats in Greater Lincolnshire included are lowland fen, lowland raised bog, reedbeds, swamp, marginal and inundation (floodplain grazing marsh and marsh were not included as their figures also referred to grassland and coastal grazing marsh, though it can be assumed that they would add value to area's natural capital).

Notes on methods

- These are estimates using standardised unit figures, quality, sub category and location of habitats could result in a variation of service benefit.
- For simplicity the service asset value to the habitat was calculated by applying a multiplier to the service flow. This multiplier was developed by **dividing** national asset values of a service by their annual flow value. **In a full accounting of natural capital it would be necessary to develop asset values by applying NPV approach to Greater Lincolnshire specific annual service flows.**

[7] The report was undertaken by Europe Economics (2017) for the Woodland Trust

[8] Figures from 'Developing Estimates for the Valuation of Air Pollution Removal in Ecosystem Accounts, ONS 2017'

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