MASTERS THESIS

Integrating ecosystem services into regional and local policies: the case of the River Blackwater estuary in Ireland.

by

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PREFACE

The concept of *ecosystem services* was something I had not heard of until I began my Masters. Yet, I have, like everyone else, indulged in the services provided by our ecosystem daily. Admittedly, initially the concept confused me, and I was left questioning what exactly these services were, where were they, who used them and why were they important. Like trying to remember back to a time before you could read or write however, once you start learning about something it seems difficult to imagine a time when you did not know about your new found knowledge. You imagine everyone knows what you know, which is not true. This becomes obvious when you start to communicate with stakeholders and lay people, which became apparent during the thesis.

With my growing interest in the topic I wanted to hear arguments for and against the concept which I included in my thesis, as I felt that nobody should blindly believe what is being put in front of them without some healthy confrontation.

The Delta Lady project looks to incorporate the concept of ecosystem services into regional policy in numerous delta regions, which has been achieved in the case of the Southern RSES in Ireland. However, how the concept is incorporated and translated into policy is of the utmost importance. I found that different people interpreted one concept in different ways and although this might not be a surprise to some was a surprise to me. Like a game of Chinese whispers, how a concept is changed and reshaped as it passes among people of different disciplines really shone a light on the importance of communication for me.

This thesis brought with it a steep learning curve for myself and it put me in touch with some incredible people. I would like to extend my utmost gratitude to my first supervisor Dr. Maia Lordkipanidze for answering the numerous questions I had (sometimes multiple times) and for always being happy to speak to me throughout the thesis period. A special thanks to my external supervisor, Dr. Timothy O'Higgins from University College Cork, for his invaluable input and encouraging words throughout, and whose work and advice acted a source of genuine inspiration. I would also like to thank John Lalor, Senior Executive Planner from Cork County Council, for taking the time to speak to me and whose input was of vital importance. I am also very grateful to my second supervisor, Dr. Kris Lulofs, whose feedback and direction early on was both insightful and steering. I am also appreciative for all of the representatives from the Delta Lady RSG and all of the remembers of the public, who filled out the surveys which made this thesis possible. Lastly, I would like to thank my friends, my family, all my peers and lecturers that I met through the MEEM programme, and the curiosity that dwells within the human psyche of which all had an influence on the writing of this thesis, during a very strange time (COVID-19).

I hope that the method that was used to write this thesis is deemed valuable and can be used to better this world in some small way. I hope you enjoy my findings.

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ABSTRACT

This thesis outlines a method to allow for the incorporation of ecosystem services (ESs) in to policy applied to the case of the River Blackwater Estuary, Co. Cork. The concept of ESs have become mainstreamed into many countries policies worldwide. However, it has only recently become integrated into the Regional Spatial and Economic Strategy by the Southern Regional Assembly and has yet to be recognised on a local scale. This thesis aims to make local policy recommendations which lead to the enhanced delivery of the ESs which are found in the area. This is achieved by (1) identifying what ESs exist in the Blackwater estuary, and three proposed development sites (PDS). (2) examining the good practices (GPs) and the relevant policy documents in the locality to determine how they currently relate to ESs. (3) Using theories from academic literaure related decision making and policy arrangements. The primary data source on the ESs supplied to the area was acquired through: a site visit, through local reports on identified good practices, policy documentation from regional, county, and local scales and information gathered from the interview and surveys that were conducted. Cork County Council acted as the sole *key-actor*, with the other actors being the RSG and the public. An analysis of survey and interview data formed what is referred to as *stakeholder prioritisation*. Confronting stakeholder prioritisation with the identified policy opportunities then lead to the recommendation to include “Ecosystem services” as a core concept in the Cork County Development Plan 2022; and of the PDS, the Claycastle site was chosen to be the area in which development should first take place based on its potential to develop ESs.

Key words: ecosystem services, policy recommendations, stakeholder prioritisation, stakeholder participation, good practices.

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LIST OF ABBREVIATIONS

CICES - Common International Classification for Ecosystem Services

CSO – Central Statistics Office

DCE – Discreet Choice Experiment

EIA – Environmental Impact Assessment

EPA – Environmental Protection Agency

ESs – Ecosystem Services

EU – European Union

GI – Green Infrastructure

GP – Good Practices

HP – Hedonistic Pricing

MA – Millennium Ecosystem Assessment

NCP – Nature's Contribution to People

NHA – Natural Heritage Area

NHP – Non-Hedonistic Pricing

NPF – National Planning Framework

NPWS – National Parks and Wildlife Service

OSI – Ordnance Survey Ireland

PDS – Proposed Development Sites

PES – Payment for Ecosystem Services

pNHA – Proposed Natural Heritage Area

RPO – Regional Policy Objective

RSES - Regional Spatial and Economic Strategy

RSG – Regional Stakeholder Group

SAC – Special Areas of Conservation

SEA – Strategic Environmental Assessment

SECAD – South and East Cork Area Development

SPA -Special Protected Area

SRA – Southern Regional Assembly

TEEB – The Economics of Ecosystems and Biodiversity

TEV - Total Economic Value

UCC – University College Cork

WFD – Water Framework Directive

WTP – Willingness to Pay

WWTP – Wastewater Treatment Plant

YSEDG – Youghal Socio-Economic Development Group

1. Introduction

1.1 Background

Deltas and estuaries are often desirable locations to live and work with 500 million people worldwide living in delta environments and 22 of the 32 largest cities in the world located on estuaries (Nicholls et al., 2018; NOAA, 2019). These areas host a plethora of unique plant and animal life and provide services that fosters human well-being (NOAA, 2019). The term *ecosystem services* (ESs) is used to denote the benefits humans gain from ecosystems and the more interest in the topic, the more apparent the interlinkages between humans and the rest of nature become (Nicholls et al., 2018).

Many projects have been established to incorporate this concept of ESs into policies, especially since its popularisation in the Millennium Ecosystem Assessment (MA, 2005). This thesis is being conducted in conjunction with the Delta Lady project. University of Twente is a lead partner of the project, while Cork County Council and University College Cork are the Irish partners. The aim of Delta Lady is to improve the regional policy instruments, in six delta or estuarine regions from six different countries in Europe, that aims to boost the regional economy by fostering the capabilities and nourishing the use of ecosystem services in river deltas. The focus of this thesis is on one of these regions, the River Blackwater estuary. The estuary (51°97′N, 7°84′W) creates a natural boundary between counties Cork and Waterford, with Youghal, County Cork (population approximately 8,000 people) sitting on its west bank. The estuary is highly valued for its natural heritage being both a Special Area of Conservation (SAC) and a Special Protected Area (SPA) (*Figure 1*). Delta Lady seeks to inform planners involved policy formulation in deltaic and estuarine regions through cross-regional learning and cooperation and encourage relevant stakeholders to get involved in policy development, with an aim to improve governance[1].

The River Blackwater catchment, spanning an area of 3307.5km^2, is located in the south-west of the Republic of Ireland. The estuary is shallow, with an average depth of 4.2 m, and is classified as mesotidal (tidal range of 3.6m). In terms of salinity it is categorised as oligohaline, between 0 – 0.5% salinity, all year-around and generally well-mixed, however stratification has been observed in the mid-estuarine region (O'Boyle et al., 2017). The land throughout the catchment is primarily used for agriculture with the dairy industry being the primary economic activity (O'Higgins, 2020). Three sites adjacent the town, namely, the Slob Bank, the Claycastle site and the Ballyvergan Marsh, have been identified as areas to develop good

[1] More information on Delta Lady can be found at: https://www.interregeurope.eu/deltalady/

practices for the delivery of ESs provided by the estuary and are referred to as the proposed development sites (PDS) in this thesis.

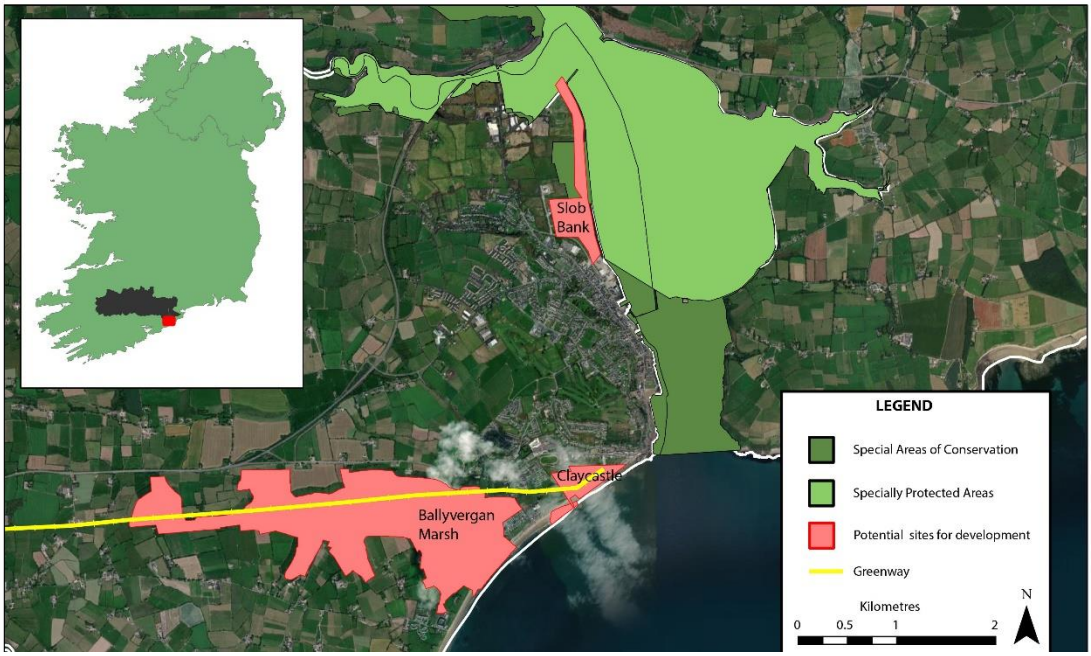


Figure 1 *River Blackwater estuary and the PDS. SAC, SPA, pNHA and Midleton-Youghal Greenway route indicated.*

Given the growing interest in ESs among researchers and policymakers alike (Braat and de Groot, 2012), this thesis seeks to forward the assist researchers and policy makers by implementing a method to assess how ESs could be incorporated into local policy plans.

1.2 Problem Statement

Despite indications that delta and estuarine environments are rich in the supply of ESs (Costanza et al., 1997; Barbier et al., 2011), a lack of focus on ESs in policy (especially those with no direct market value) is major reason for the decline of ecosystems and ESs worldwide (Russel, Jordan and Turnpenny, 2016; Barbier et al., 2011). In the case of the River Blackwater estuary, the concept of ESs has been incorporated into the Regional Spatial and Economic Strategy (RSES) (SRA, 2019), however there is still a lack of integration of the concept at the local scale (see Cork County Council (2017b); see Youghal Town Council (2009a)). The absence of academic theory and management practices relating to ESs in the River Blackwater estuary and the PDS indicates that there is an opportunity to establish an effective method of studying and valuing the services the local people derive from these areas.

1.3 Research Objective

The objective of this research is to make recommendations for the incorporation of ESs into regional/local policy arrangements by accessing the development possibilities of the three PDS adjacent to the River Blackwater estuary. This is achieved by finding synergies between

(1) opportunities observed in current policy plans and good practices, related to the delivery of ESs, with (2) stakeholder prioritisation.

1.4 Research Questions

Q1. What is the best opportunity to formulate new local policy arrangements that incorporate ecosystem services?

Q1.1 What ecosystem services are found in the River Blackwater estuary and PDS?

Q1.2 What are the good practices in place and how do they relate to ESs?

Q1.3 What opportunities for policy arrangements, that could support ESs, can be identified?

Q1.4 Which ESs found in the River Blackwater estuary and on the PDS are important to stakeholders? Why are these important?

Q1.5 What are the synergies between stakeholder prioritisation and policy opportunities?

Q2. Which of the three PDS is recommended for ESs development/enhancement?

1.5 Thesis Overview

In Chapter 2 the literature review is provided. The first section outlines the development of the concept of ESs; considers related concepts, namely, supply-demand, scale, and good practices; and is then followed by criticisms of the concept of ESs. The second section discusses theories related to ESs integration into policy. The final section then, looks at the Blackwater estuary and the PDS, describes the GPs that exist in the area, as well as the policy plans from a regional to local level that encompass the Blackwater estuary area.

Chapter 3 introduces the research design, which outlines the method used to complete the thesis. The contents of this chapter are guided by the approach recommended in Verschuren and Doorewaard (2010). The methods of data analysis and a summary of the method used to answer the research questions are also included.

Chapter 4 and Chapter 5 outline the results and the analysis of results, respectively. Section 4.1 illustrate the results of Q1.1 with the full table of results displayed *Table 4* and *Table 5*. Section 4.2.2 and section 5.1 answer Q1.2. This was achieved by consulting experts, a document review, a site visit, and information gathered in the interview which was conducted. Section 4.2.1 and section 5.1 answer Q1.3. This was answered by examining relevant policy documentation and identifying existing policy instruments that could be used to indicate where the concept of ESs is alluded to, either explicitly or implicitly. Section 4.3 and section 5.2

answer Q1.4. Survey questionnaires and an interview were conducted to attain the necessary information on stakeholders. Section 5.3 answers Q1.5 by examining the synergies between the policy document analysis and stakeholder consultation. By answering the sub questions, Q1 was answered. Using what is learned from answering Q1, Q2 is considered throughout Chapters 4 and 5, with the results being delivered in the final chapters, Chapter 6, Conclusions and Chapter 7, Recommendations.

2. Literature Review

This chapter introduces concepts with associated models and theories that are used to answer the research questions and achieve the research objective. The first section explores ESs as a concept, its development and related concepts, namely, supply-demand, scale and GPs. The second section investigates the theories on decision-making and policy instruments related to ESs. Finally, the last section outlines the nature of the River Blackwater estuary and the PDS and examines policy plans and GPs relevant to the local area.

2.1 Ecosystem Services

2.1.1 The Concept

The term “ecosystem” was coined in Tansley (1935) to denote the importance of the integration of the biotic whole and its physical environment as a cardinal unit in ecology. The establishment and acceptance of this term was fundamental to developing an approach that would value this system or systems, depending on the spatial and temporal scale used to observe.

To quantify the value that these ecosystems provided, a new common language was needed to bridge the gap between ecological sciences and contemporary economics. This gave rise to the concept of “ecosystem services” which was popularised by the Millennium Ecosystem Assessment (MA) (Costanza et al., 2017; Verburg, Selnes and Verweij, 2016). The MA define ESs as “the benefits humans derive from nature” and its usage facilitates the collaboration and cooperation between scientists, decision-makers, professionals, and other stakeholders (Schröter et al., 2014). The language of economics is monetary, therefore these ESs would need to be quantified to place an economic value on them. Total economic value (TEV) is defined as “the sum total of use and non-use values associated with a resource or an aspect of the environment” (de Groot et al., 2010). Attempts at quantifying the TEV of ESs is complex. This is due to the three main factors. First, the language of ecology is not monetary. Second, the MA defined three sub-classes of ESs, which are underpinned by biophysical structures and/or processes (de Groot et al., 2010), termed “supporting services”. These three sub-classes are provisioning services, such as ecosystem enabling the production of food, water, fuel and other materials; regulating services, such as, climate regulation, flood regulation, water purification and carbon sequestration; and cultural services, such as an ecosystems aesthetic, educational and spiritual functions. Aside from the market price placed on the provisioning services, as they have a cost, the process of quantifying benefits is not as straightforward. Hence, all-encompassing economic valuations for these services and their TEV is difficult to obtain (MA, 2005). Thirdly, the idea of “joint production” is where multiple ESs acting together may provide benefits that discrete ESs would not provide alone. This adds

another layer of complexity to realising the TEV. However, to devise reliable accounting systems the incorporation of this idea is required (Fisher, Turner and Morling, 2009).

What and how we choose to measure ESs is key to how successfully they can be used as an instrument to effect policy. The Common International Classification for Ecosystem Services (CICES), of which the newest version, CICES V5.1, was published in 2018, is widely used for mapping, ecosystem assessment, and natural capital ecosystem accounting (Haines-Young and Potschin, 2018). The CICES covers benefits that are both directly and indirectly consumed by humans. For example, pollination can lead to the provisioning of wild plants which can be directly consumed by humans. In this case, pollination is an intermediate ES while the provisioning of wild plants, for nutritional purposes for example, is a final ES (Fisher, Turner and Morling, 2009). The Economics of Ecosystems and Biodiversity (TEEB) and Nature's Contribution to People (NCP) approaches are being used as a method of conserving biodiversity and greening the economy; and could be used as a way of integrating ecosystem services into policy formulation and alteration (Verburg, Selnes and Verweij, 2016; Pascual et al., 2017).

2.1.2 Supply-Demand, Scale and Good Practices

Several scholars have focused on the supply-demand for ESs (O'Higgins et al., 2019; Zhai et al., 2020). Models have been developed for this approach (Boumans et al., 2002; Villa et al., 2009) but this is still to be widely operationalised. The mismatch of supply over demand, or vice versa, largely depends on the scale at which these ESs are observed (Costanza, 2008; González-García et al., 2020). Mismatches are often seen in both rural and urban areas, respectively. For example, in a low density, relatively natural rural area, provisioning services such as food production may be high. Supply may be many times that of the people living there, while the opposite occurs inside a high-density city. These can be described as donor and recipient regions, respectively (O'Higgins et al., 2019). Demand for an ES is essential. That is to say, if there are no users (i.e. there is no demand), who is benefitting from what is being provided? Fisher, Turner and Morling (2009) states it clearly: if there are no human beneficiaries it is not a (-n ecosystem) service. This, along with anthropogenic pressures on services, alludes to the fact that it is essential to find out what ESs are used, produced and valued by local people (Fisher, Turner and Morling, 2009; Martin et al., 2020). The degree to which a region is a donor or recipient may be used as an indicator to inform environmental governance and policy instruments (Paavola, 2007). *Figure 2* below highlights the categorisation of a management area. These areas can be either independent, interdependent, controlling or dependant (O'Higgins et al. 2019).

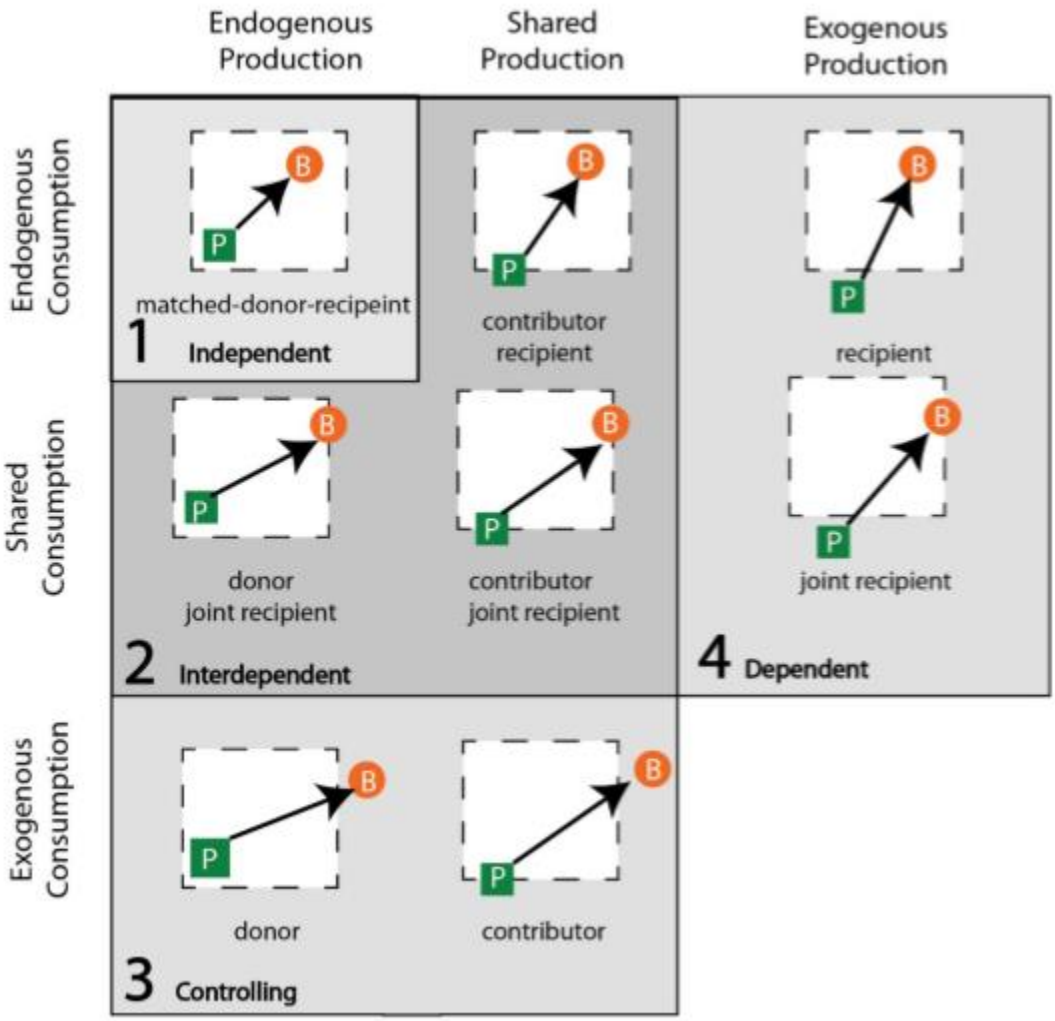


Figure 2 *"Typology of spatial relationships and interdependencies for a management area established by flows of ESs. The dashed box indicates the management area, the green square (P) and the orange circle (B) represent the location of Production and Benefits respectively, relative to the management area." (O'Higgins, 2019)*

A good practice (GP) is defined as "an initiative (e.g. project, project process, technique) which has proved to be successful in a region and which is of potential interest to other regions. Proved successful is where the good practice has already provided tangible and measurable results in achieving a specific objective" (Interreg Europe, 2019). McIntosh et al. (2011) discusses how it is imperative to assess each considered GP and how it contributes to the challenges that have been recognised for the specific case and to look at a broader temporal scale as to avoid any problems that might arise from their implementation[2].

In this thesis, GPs are examined with respect to how they relate to ESs and policy instruments (see section 2.2). If their success or failure to enhance ESs can be determined, this will be noted.

[2] The term best practice is used in MacIntosh et al. (2011) and is defined as "do's and don'ts", this is synonymous with GPs, hence the logic remains sound.

2.1.3 Criticisms

The term “ecosystem services” has been criticised for several reasons. Schröter et al. (2014) provides a comprehensive critique of the concept, these are broadly captured in three categories. First, ethical considerations against its use stem from claims that it is too anthropogenically focused, which demeans the intrinsic value of nature while encouraging the exploitive use of the services that have been provided. The counterargument here is that it encompasses both anthropogenic and intrinsic value, such as the existence value, while the cultural service classification defines a reconnect between society and nature. The second argument deals with conservation strategies, sustainable use, and valuation. The paper remarks that the term ESs may not protect biodiversity but rather shift focus, conveying biodiversity as a resource and the attention is on what services can be provided by this resource. This is further enhanced by the monetised valuation of ESs that often takes place and is based on assumptions that a Payment of Ecosystem Services (PES) model would ensure their provision. Countering these assertions is the fact that there is a growing body of literature that emphasises biodiversity as the foundation of ecosystem functions that form ESs, and the fact that a not all valuation are monetary and even valuation methods that are, such as, willingness to pay (WTP), discreet choice experiments (DCE), hedonistic pricing (HP) and non-hedonistic pricing (NHP), try to incorporate aspects that traditionally could not be monetised into their models (Doherty et al., 2014; Norton and Hynes, 2014; Reynaud and Lanzanova, 2017). It is also argued the PES schemes enable participation and assist conservation outcomes with negotiated compensation logic. Thirdly, the current state of ESs as a scientific approach is criticised for its vagueness, biasedly optimistic assumptions, and normative aims. While others see its vagueness as an opportunity for refinement and facilitate cooperation and transdisciplinary research the assumptions and optimistic intentions as justified as the ESs highlights an important interplay between ecology and socioeconomic systems; and use the term ESs as a normative term, can be used strategically along with many other words in the vocabulary of environmental management and science.

While valid criticisms of ESs clearly persist, these concepts still offer a promising means of uniting ecological and economic goals.

2.2 Policies Theory

This section will use what we have learned from CICES classification system of ESs and will look at how TEEB and other literature lay the path to mainstream ESs into policy making. TEEB (2013), and specifically a TEEB country study (TBS), aims to develop a ‘way of thinking’ when looking to tackle the entangled environmental and economic concerns of a country. This ‘way of thinking’ can also translated to smaller scales and its influence is evident in the models to follow.

To formulate adequate policy recommendations, an existing model created by Simon (1960) was used. This was developed for organisational decision-making and pertains to three *decision phases*. Phase 1, the collection of “intelligence”, assists in identifying the need for change. Phase 2 involves the “design” of possible strategies to tackle the problems identified in Phase 1 and the lack of ESs incorporation into decision-making. Phase 3 is the process of assessing and evaluating the identified options in Phase 2 and finally “choosing” what steps will be taken.

To realise Phase 2, we will be looking at the five priority areas developed by Schmidt and Seppelt (2018). This involves: “(i) quantitatively recognise nature’s value, (ii) develop prioritisation schemes based on ESs valuation, (iii) sensitive stakeholder engagement, (iv) support information access and capacity building to establish ES-based decision-making and (v) consider long-term returns of interventions in ESs”. Areas (i), (ii) and (iii) will be addressed using survey questionnaires and in-depth interviews. These areas are based off a study of over 36,000 studies, projects and methods and identifies six key policy instruments that have been used effectively throughout the literature (see Schmidt and Seppelt (2018) for full details).

1. *Extending accounting systems through nature-based indicators.* Using natured-based indicators in these systems is vital for capturing the value of ESs.
2. *Rewarding benefits through payment markets*. These benefits may be a direct payment, tax incentives or incentivising the markets to buy items of reduced environmental impact. This can be attained by private or public actors who are enabling the delivery (and enhancing) the delivery of ESs.
3. *Reforming environmentally harmful subsidies.* Subsidies, which may be causing environmental degradation, need to be reformed. This will assist in denying governmental funding to harmful practices and shows considerations for the value of ESs.
4. *Addressing environmental degradation through regulation and pricing.* Supports the polluter pays principle but will require rigorous ESs valuation techniques to incorporate all external costs that could be integrated into such payments. This valuation will also be used for justification of the implementation of such rules and regulations.
5. *Regulating use through protected areas and recognition of their value*. The Blackwater Estuary is already a protected SPA, SAC and certain areas are Ramsar sites. Enhancing the governance and how these areas are managed is then the key.
6. *Direct public investment in ecological infrastructure and restoration*. This will assist in the restoration of ecosystems that have been degraded, while possibly improving the usage and accessibility of sites which boast ecological abundance.

Policy plans and GPs (see section 2.3.2 and 2.3.3) will be analysed with the policy instruments mentioned above being considered, to determine which policy instruments are indicated in the policy plans or by the GPs. Fundamental to this thesis is stakeholder engagement, mentioned in Schmidt and Seppelt (2018) above. To ensure adequate selection of stakeholders we will adapt the first principle outlined in Metzger et al. (2017)[3]. Principle 1 emphasises the necessity for the identification of *key-actors*, as well as *involved* and *considered stakeholders*. For this thesis, involved and considered stakeholders will be replaced with two groups, the Regional Stakeholder Group (RSG) formulated as a part of Delta Lady project (see section 4.3.2 for more details), and the public. Key-actors are directly interested in the development of the scenario and must consider its context and design. The RSG and the public may directly or indirectly affect how policy is formulated or the effects of new policy implementation directly or indirectly affect them.

2.3 The River Blackwater Estuary: Background Research

This section provides a brief description of the River Blackwater estuary and PDS. A site visit was complete (delayed due to COVID-19 lockdown) and an ESs assessment was conducted. This is followed by an outline of the regional/local policy plans and GPs in the local area, relevant to the Blackwater Estuary and the PDS. The focus was on identifying how these policy plans and GPs incorporate an ESs approach, either explicitly or implicitly.

2.3.1 The Blackwater Estuary and PDS

O'Higgins (2020) has identified ESs likely to be existing throughout the River Blackwater catchment using the CICES v5.1 (Haines-Young and Potschin, 2018). This provided the basis for determining which ESs were delivered in the estuary and the PDS.

2.3.1.1 The Blackwater Estuary

The River Blackwater Estuary (see *Figure 3*) is a designated Ramsar site and Natura 2000 SPA; due to it containing well-developed marsh grounds, wetland animal species, such as the Black-tailed godwit (*Limosa limosa*), and wetland plant species, such as the Killarney Fern (*Vandenboschia speciose*). While the site also supports the genetic diversity of various flora and aerial, terrestrial, and aquatic fauna (Ramsar, 2020; NPWS, 2012a; NPWS, 2012b). This SPA overlaps with the SAC status for the entire River Blackwater Catchment, which protect numerous other habitats and animals, of which the activities surrounding the Atlantic Salmon (*Salmo Salar*) is of particular economic significance to the catchment and estuary region

[3] Metzger et al. (2017), focused on restoration planning, and discuss the concept of scenarios and scenario development and how it is an important tool for transdisciplinary communication, especially between scientists, stakeholders of varying degrees and decision-makers. The first principle deals primarily with the engagement stakeholders, hence identified as most applicable to this study.

(NPWS, 2012a, O'Higgins, 2020). The protection of the Freshwater Pearl Mussel *(Margaritifera margaritifera*) is also of significance importance.

The estuary receives water from a large agricultural drainage basin. A study by Ní Longphuirt et al. (2015) found the relatively long residence time of the water and light availability may result in phytoplankton absorbing nitrogen and phosphorous entering the estuary. This is known as bioremediation.

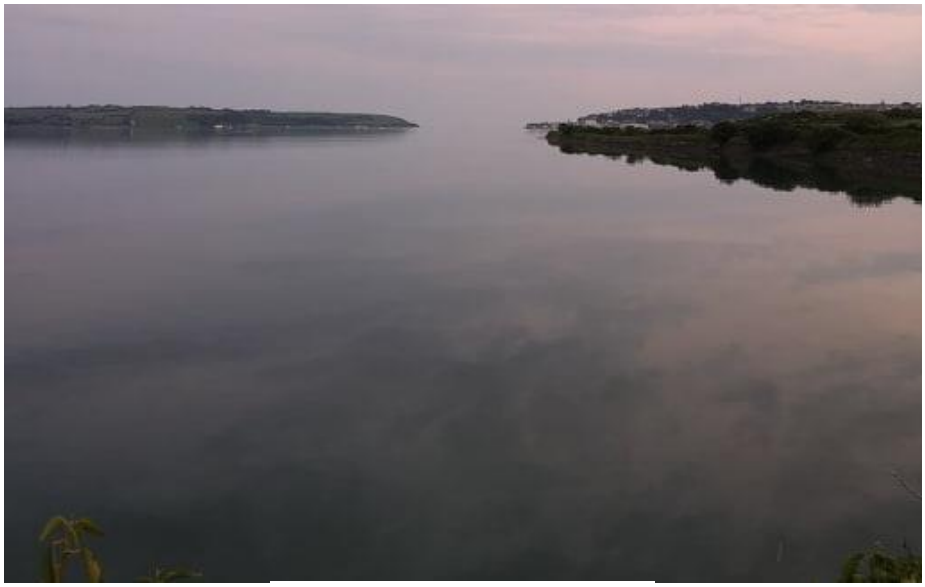


Figure 3 *The River Blackwater estuary.*

2.3.1.2 The Slob Bank

The Slob Bank (*Figure 4*) is a stone lined wall and embankment constructed over 150 years ago during the time of the Great Famine in Ireland as part of a public work programme. The

Figure 4 *The Slob Bank with the River Blackwater estuary lying to the right.*

land to the west is intertidal and attracts many species of waterfowl and sea birds, such as kingfishers (*Alcedo atthis*), little egrets (*Egretta garzetta*) and grey herons (*Ardea cinereal*) (*Figure 4*). It also attracts certain species during the winter period, such as the Greenland White-Fronted Geese (*Anser albifrons flavirostris*). The estuary lies to the east of the Slob bank and provides an opportunity for anglers to fish and for bait-digging. Species of fish such as sea bass (*Dicentrachus Labrax*), flounders (*Platichthys flesus*), plaice (*Pleuronectes platessa*), codling (*Gadus morhua*), and lesser-spotted dogfish (*Scyliorhinus canicula*) can be found in the estuary (Youghal.ie, 2019). The embankment is used as walkway which provides views of the River Blackwater and estuary and provides an opportunity for passive and immersive interactions with nature, through activities such as bird watching and angling. The Slob Bank is also a part of the Youghal Famine Trail. The opportunity to catch wild fish for nutritional, material, or genetic purposes is also offered. The embankment also provides a regulatory service as it prevents the area to the west of it to be claimed by the estuary.

Figure 5 *Two grey herons spotted during the site visit.*

2.3.1.3 The Claycastle site

The Claycastle site is 21-acre area lying to the south of Youghal town and sits at the mouth of the River Blackwater (*Figure 6*). On the east side of the site lies a derelict train station (*Figure 7*) and to the west caravan parks and a pitch and putt club divides the site from the Ballyvergan Marsh. The site has been derelict for over 35 years.

A rudimentary survey of the site has determined it as of poor soil quality and currently offering little in the scope of provisioning ESs, aside from some small reedbeds (T. O'Higgins, personal communication, April 2020). The site runs alongside the Claycastle beach and borders the 378 metre Eco-boardwalk, where there is an opportunity for birdwatching and observing sea life. This is also set to be extended with the Outdoor Recreation Infrastructure Scheme 2018 granting €500,000 for phase 2 of its development (Department of Rural and Community Development, 2018). The new Midleton to Youghal Greenway (see section 2.3.3.1), which is in the early stages of implementation will also run through this site, beginning at the derelict train station. The site does offer some regulatory function as it does offer the town an area to flood and is in a closer proximity to the town relative to the marshland to the west. Data has been gathered on pluvial and coastal flooding which also shows at what temporal scales to expect these floods. The area is naturally well defended against coastal flooding (Cork County Council, 2018a). The Claycastle site may also acts as a partial habitat to some of the species that also exist in the Ballyvergan Marsh (T. O'Higgins, personal communication, April 2020).

Figure 6 *The Claycastle site from the east side*

Figure 7 *The old Youghal train station located in the Claycastle site.*

2.3.1.4 The Ballyvergan Marsh

The Ballyvergan Marsh, as its name suggests is a marshland, lying southwest of Youghal town (*Figure 8* and *Figure 9*). The marsh itself is the largest freshwater coastal marsh in County

Cork and the area is one of the largest natural reed beds in Europe (T. O'Higgins, personal communication, April 2020). It is also a proposed natural heritage area (pNHA). The biomass from these reed beds are partially harvested, and the reeds are used to make thatch (Ramsar, 2020). Many fields south of the old railway line/ forthcoming Midleton to Youghal Greenway are in agricultural use. Cattle were observed here during the site visit. Other cultivated terrestrial plants or reared animals providing a form of food and/or materials may also exist in this area.

As the marsh is of freshwater by nature and coastal by geography, with only minimal, but increasing, saltwater intrusion (see SECAD, 2017), it acts as a regulatory zone between fresh and saline water. It is also likely to have other water-based regulatory effects such as on the groundwater flow and on flooding. Data on pluvial, fluvial and, especially, coastal flooding in the marsh land has been gathered which shows areas that have flooded in the past and at what temporal scales to expect these floods (OSI, 2020). This is mainly due to the construction of Midleton to Youghal Greenway. This availability to flood offers some protection for the areas surrounding the marsh and the town of Youghal from experiencing these phenomena, although flooding still occurs in the town due to its positioning adjacent to the estuary. Other regulating ESs include the maintenance of nursery populations and habitats which aids the cultural ESs.

An existing, but underutilised, bird hide is located on the northwest corner of the marsh (see section 2.3.3.4). The unique habitat contains an expansive reedbed and is a biodiverse hotspot, however information on ecology in the area is sparse (T. O'Higgins, personal communication, April 2020). Although, poorly documented and with limited published data it is noted that the reedbeds are used as breeding and roosting ground for many birds such as the reed warbler (*Acrocephalus scirpaceus*) and the hen harrier (*Circus cyaneus*). It is also used as a hunting grounds for many predator birds, such as the hen harriers, sparrowhawks (*Accipiter nisus*), barn owls (*Tyto alba*), and sand martins (*Riparia riparia*); and to a rarer extent, kestrels (genus *Falco*), merlins (*Falco columbarius*), peregrines (*Falco peregrinus*) and short-eared owls (*Asio flammeus*). The marsh is most extensively used during the autumn migration period and it is estimated that 36,000 barn swallows and 9,000 sand martins migrate through the marsh in any given year. The activities of several other species have also been documented, such as the starlings (*Sturnus vulgaris)* roosting in the site during the 1980's (Bracken and Smiddy, 2012). This makes the area an attractive spot for birdwatching enthusiasts.

Figure 8 *The Ballyvergan Marsh as viewed from near the SECAD (South and East Cork Area Development) bird hide.*

Figure 9 *The Ballyvergan Marsh as viewed from the South side near Claycastle beach.*

2.3.2 Policies Documents

The following policy documents were chosen for their relevance to the River Blackwater estuary and PDS from a regional to local level. The identification of policies related to ESs at different spatial scales is deemed to be important to enable policy change.

2.3.2.1 RSES

The Southern Regional Spatial and Economic Strategy (RSES) was produced by the Southern Regional Assembly (SRA). The aim of the RSES is to shape how society, the environment,

the economy, and land use evolves in the southern region of Ireland. It looks to achieve this by identifying assets, opportunities, and pressures in the region, in which the Blackwater Estuary exists, and provides suitable policy, objectives and target responses. The main purpose of the RSES is to support the implementation of the Project Ireland 2040 – The National Planning Framework (NPF). All subsequent local plans in the southern region consults with the RSES to guide their content (Southern Regional Assembly, 2020).

The SRA consists of nine counties Carlow, Cork, Clare, Kerry, Kilkenny, Limerick, Tipperary, Waterford and Wexford. Each county has a County Council, as well as Cork City having its own City Council, equating to 10 local authorities. The formulation of the RSES involved transboundary consultation between the public, stakeholder organisations, government departments and the 10 local authorities. During a period from December 2018 to March 2019, submissions for the amendment or addition of materials was accepted. Several of these amendments were adopted (SRA, 2019). One of the proposed inclusions was the incorporation of the concept of ESs into the RSES by the EPA. This recommendation was accepted (SRA, 2020). *RPO 110 Ecosystem Services* considers how a valuation of an ecosystem could help determine if a policy arrangement would enhance the net benefits that could be provided and makes reference to the connection between ecology and economics through a PES scheme (SRA, 2019). *RPO 117 Flood Risk Management and Biodiversity* emphasises that it is of prime importance to enhance biodiversity and protect environmentally sensitive sites and habitats (such as Natura 2000 sites), even in the case of developing flood management infrastructure or measures. *RPO 124 Green Infrastructure* further highlights this, as well as encouraging the expansion and connection of the green infrastructure (GI) network that exists in in the region. GI "promote[s] the concept of connecting corridors [of green and blue spaces] for the movement of wildlife and encourage the retention and creation of features of biodiversity value, ecological corridors and networks that connect areas of high conservation value". Also stated is that, all local area development plans should include the concept of "Green Infrastructure" as a key concept.

EU legislation also requires that a Strategic Environmental Assessment (SEA) is carried out as part of the RSES (See *Appendix 1*).

2.3.2.2 Cork 2050

Cork 2050 is a county-wide strategic development plan for the next three decades (Cork County Council, 2017a). The plan pertains to the harmonious sustainable development of Cork spatially, socially, economically, environmentally and in relation to infrastructure. Cork 2050 was selected for study in this report in preference to the Cork County Development Plan 2014, as Cork 2050 was published this year (2020) and hence should give a greater insight into the

most current policies being considered. However, plans for the new county-wide development plan, due to be published in 2022, will be discussed in 2.3.2.3.

GI, as defined in Cork 2050, is seen as the utilisation and use of natural assets to enhance the delivery of ESs, while also being socially and economically valuable as permanent infrastructure. A broad aim is to use GI to connect regions within and around Cork, including providing access to natural areas, with an emphasis on sustainable spatial planning and environmental management. The term “sustainable” in this case is seen as the recognition of the value of the role and processes of the ecosystems. The concept of ESs then, is recognised to mean the connection between “how a healthy, functioning and resilient environment sustains socio-economic development and human wellbeing, and that the environment, society and the economy must be aligned and mutually supporting.”

Special consideration is given to those areas with a Natura 2000 status, with there being a network of SPA and SAC sites throughout the county. Failure to comply with the EU Directives which underpin these statuses along with other directives such as the Water Framework Directive, results in fines to the National Government. A target in the Environmental Assessment section is the promotion of Green Growth and within this is the valuing of ESs. The Towns, Villages, Rural Areas and Island section, in which Youghal is included, states that the creation and enhancement of economic opportunities in the area, the reduction of outputs that are harmful to the environment and the enhancing of the quality of the environment are important objectives.

2.3.2.3 Cork County Development Plan 2022 - 2028

The commencement to develop the new Cork County Development Plan began in 2020 with plans to have public consultation meetings in town throughout Cork, including in Youghal in March and April of 2020. Due to the COVID-19 outbreak these public consultations were cancelled, with new dates not yet set at the time of writing (August 2020). Online or written submissions from the public were accepted between March and May 2020, with further opportunities to make submissions after a Draft Plan is published in 2021 (Cork County Council, 2020).

The new County Plan will replace and incorporate plans for the 8 current municipal districts (including the East Cork Municipal District Plan, which is discussed in section 2.3.2.4) and the Former Town Council towns, which includes Youghal town (See Youghal Development Plan 2009 – 2015 in section 2.3.2.5) (Cork County Council, 2020).

Within the Core Strategy for the plan the concept of the carrying capacity of the environment and the availability of infrastructure is mentioned. Similar to Cork 2050, ESs have been referenced under GI. GI in the Public Consultation Document is referred to as “natural and

cultural assets". The protection, management, and development of GI, green corridors and, green and blue spaces is also cited as a goal in the preliminary document.

2.3.2.4 East Cork Municipal District – Local Area Plan

The vision for Youghal within the Local Area Plan is the continued development of the town and its surrounding areas (Cork County Council, 2017b). The policies outlined in this however apply to Youghal's environs (hinterlands), while the Youghal Town Development Plan (see section 2.3.2.5) still outlines the key policies of the town (*Figure 10*).

The Local Area Plan makes specific references to the Natura 2000 status of the estuary and the potential of the Ballyvergan Marsh, a pNHA, as both of ornithological and botanical interest as well as harbouring the potential to attract people to observe the unique habitat.

Water quality is also discussed in depth (see *Appendix 2*).

As illustrated in *Figure 10* the Claycastle site and the Slob Bank site are mostly covered by the Youghal Town Development Plan 2009 – 2015. The Ballyvergan Marsh site is also included within 'Other locations' under the Redbarn area. The sustainable development of the marsh is recommended. It is noted that this can be achieved mainly through permitting access to the scenic amenities that cause minimal intrusion to the biotic and abiotic environment. As well as, establishing facilities which provide information about the properties of the habitat and the species which exist within the marsh. It is illustrated in the Youghal Environs section that the Ballyvergan Marsh is an 'Area Susceptible to Flooding' as shown in *Figure 10*. The Ballyvergan Marsh 2017 Biodiversity Action Plan (SECAD, 2017) (see section 2.3.3.3) also highlights actions to be taken on the site. However, this is solely focused on the protection and conservation of species and habitats and not on development.

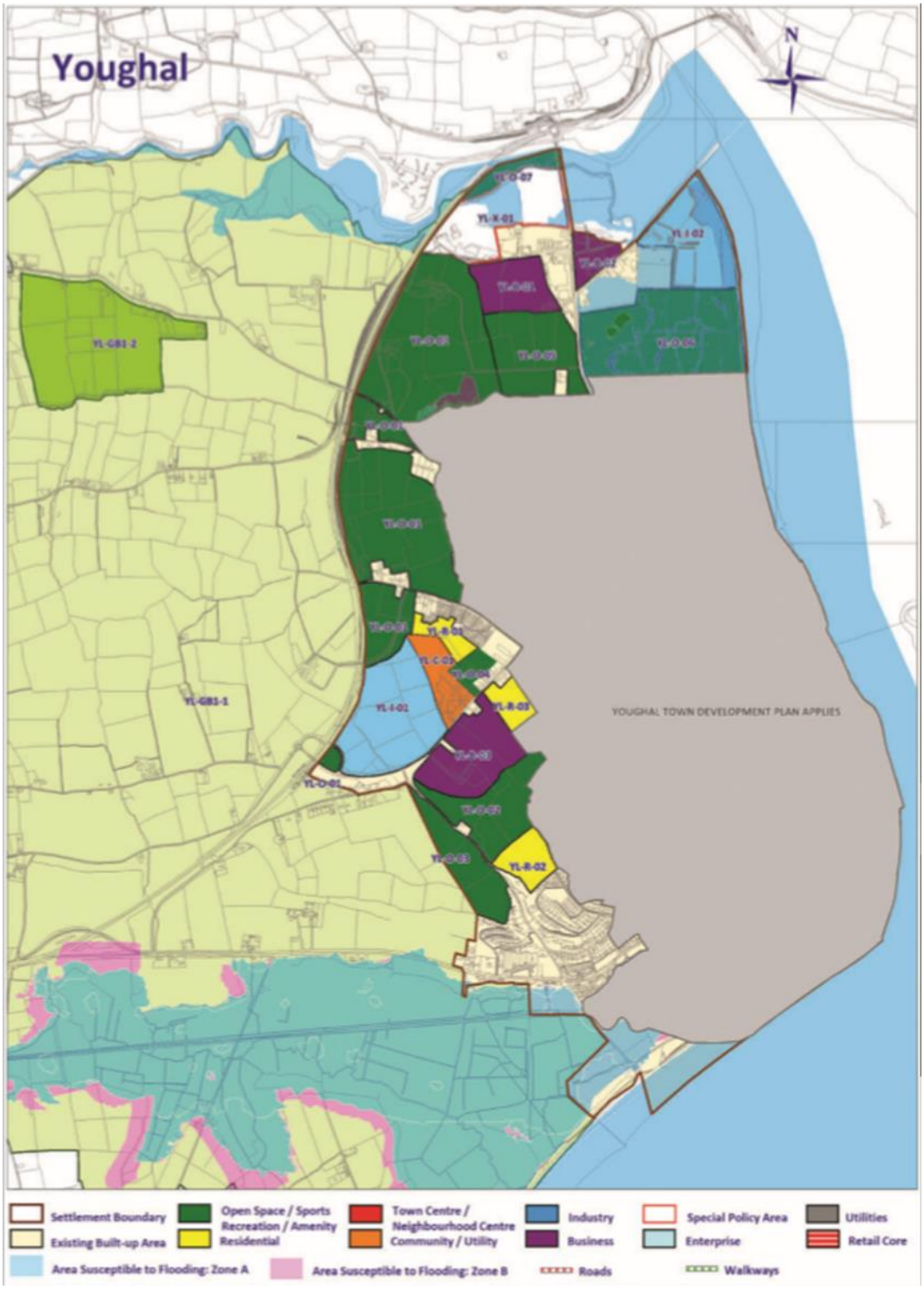


Figure 10 *Area of Youghal which are included in the East Cork Municipal District Plan - Local Area Plan (Cork County Council, 2017b)*

2.3.2.5 Youghal Development Plan 2009 - 2015

The Youghal Town Development Plan 2009 – 2015 was published by Youghal Town Council. The principles and policies, along with the subsequent revisions, in this plan are still effective today. The town (*Figure 11*) will continue to adhere to this plan until the development of the new Cork County Development Plan in 2022. The Youghal Development Plan 2009-2015 and

with the accompanying Strategic Environmental Assessment (SEA) lay the foundation for the town's development from 2009 onwards (Youghal Town Council, 2009a; Youghal Town Council, 2009b).

It is noted, development (e.g. of roads, of infrastructure) in the areas covered by SPA, SAC and pNHA statuses will only be granted approval if the results of an Environmental Impact Assessment (EIA), Appropriate Assessment (AA) and Human Health (noise and air) Assessment (if necessary) are completed and indicate that the development meets the necessary criteria. The coastal nature of the town also means that flood risk assessments and not contributing to increase flood risk elsewhere is of the utmost importance. Policies to develop brownfield rather than greenfield sites, protection and enhancement of views of the harbour and other areas, protection of trees in certain areas and the conservation of the pond and reedbeds at the Claycastle Pitch and Putt are also indicated.

Figure 11 *Youghal Town Council Boundary (Youghal Town Council, 2009a)*

2.3.3 Current Good Practices

GPs were examined in this section to see how policies translated to real world actions. This is a sample of GPs that have occurred or are planned and is not an exhaustive list.

2.3.3.1 The Midleton to Youghal Greenway Approval Process

A GP in the early stage of implementation, at the time of writing this thesis, is the Midleton to Youghal Greenway. This greenway is set to be approximately 22.75km with a bicycle and walking path of 3-4 metres, running along the old unused Midleton to Youghal railway

(AECOM, 2018a). Although the project itself is not yet complete, and thus cannot yet be seen as a GP, the process of approving the project was rigorous and successful. An EIA (AECOM, 2018a), an Ecology Report (AECOM, 2018b) and a Flood Risk Report (ATKINS, 2018) were all been commissioned and published in August and September 2018. The EIA and Ecology Report determine that the risks are limited to the vibration and noise during construction and the loss of habitat will be limited to the physical area the greenway covers and the creation or renovation of carparks that would be needed to facilitate usage of the greenway. The Ballyvergan Marsh, being an area of high biodiversity and a pNHA, is specifically mentioned here. It is also recommended, in the Ecology Report, that the greenway remains unlit as this may influence on the species that dwell there. A Landscape Masterplan is to be developed to ensure the greenway acts as a corridor for life rather than impediment of biodiversity. The Flood Risk Report has determined that the greenway may become partially inundated with water during flooding events, therefore precautions such as signage and prevention of entrapment of users, by installing alternative exit and entry points in these areas is recommended. This process of investigation and the publication of many reports (EIA, Ecology report and Flood Risk Assessment) ensures that the environment, habitats and species and human well-being are all considered prior to the project's approval.

2.3.3.2 The Youghal Eco-Boardwalk to Redbarn

The Youghal Eco-Boardwalk opened in March of 2012 and stretches 378 metres between the proposed Claycastle site and Claycastle beach. Through the Outdoor Recreation Infrastructure Scheme 2018, Cork County Council were granted an additional €500,000 to aid in extending the eco-boardwalk a further 825 metres adjacent to the sand dunes in front of the Ballyvergan Marsh site, down to Redbarn (Department of Rural and Community Development, 2018). The first phase of this project boosted the local economy by attracting tourists from within and outside of Ireland (Cork County Council, 2018b). The second phase of the project will connect Youghal town, alongside the estuary and along the coast to Redbarn.

2.3.3.3 The Ballyvergan Marsh 2017 Biodiversity Action Plan

This Action Plan focuses on surveying and monitoring the performance of regulatory functions in the Marsh while also recommending management actions (SECAD, 2017). The actions are split into prioritised and unprioritised, while considering both habitats and species.

Prioritised actions regarding habitats include establishing the source of saline intrusion on the east side of the marsh, and surveying and monitoring: quality of reed beds, especially regarding drying out; sand dunes habitat; and extent of scrub. Establishing ownership of private land covered by the report is also a priority. The single prioritised action regarding species is establishing the extent of the Water-fern (*Azolla filiculoides*) which is an invasive

species. Creating biosecurity measure and a monitoring/management plan regarding *Azolla filiculoides* is advised by the Wild Works Team. There are restrictions and penalties associated with the dispersal of *Azolla filiculoides* as it is known to have negative effects on native species and habitats (SECAD, 2017)

2.3.3.4 The SECAD bird hide

The SECAD (South and East Cork Area Development) bird hide is located in the north-west corner of the Ballyvergan Marsh and was officially open to the public in April 2019. The bird hide provides an area to observe the many species that inhabit of the Marsh while causing minimal intrusion. It is a stop off point for the annual Cork Birdathon (SECAD, 2020).

3. Research Design

3.1 Research Framework

The research framework for this thesis was based on the model in Verschuren and Doorewaard (2010). The model was used to categorise the important research elements and represent the internal logic of research project (Verschuren and Doorewaard, 2010).

The research objects refer to the actual phenomenon under study (Verschuren and Doorewaard, 2010). The four research objects for this thesis were the ESs that existed in the River Blackwater estuary and PDS, current regional and local policy, GPs in River Blackwater estuary area, and stakeholder values.

The research project took a design-orientated approach. The research perspective was formed from a set of evaluation criteria. These criteria were theories of decision-making, theories on policy instrumentation related to ESs, and on stakeholder engagement, along with knowledge of ESs in the area. The source of the research perspective was derived from scientific and peer-reviewed papers on theories of policy formulation and concepts related ESs and documentation on the good practices and policy were used to gain an insight into the area along with discussions with experts who are involved in the Delta Lady project. A site visit was also conducted. This research confronted opportunities for policy alteration with stakeholder prioritisation of ESs and development strategies. The analysis of this confrontation defined the "best" policy opportunity. See *Figure 12* below.

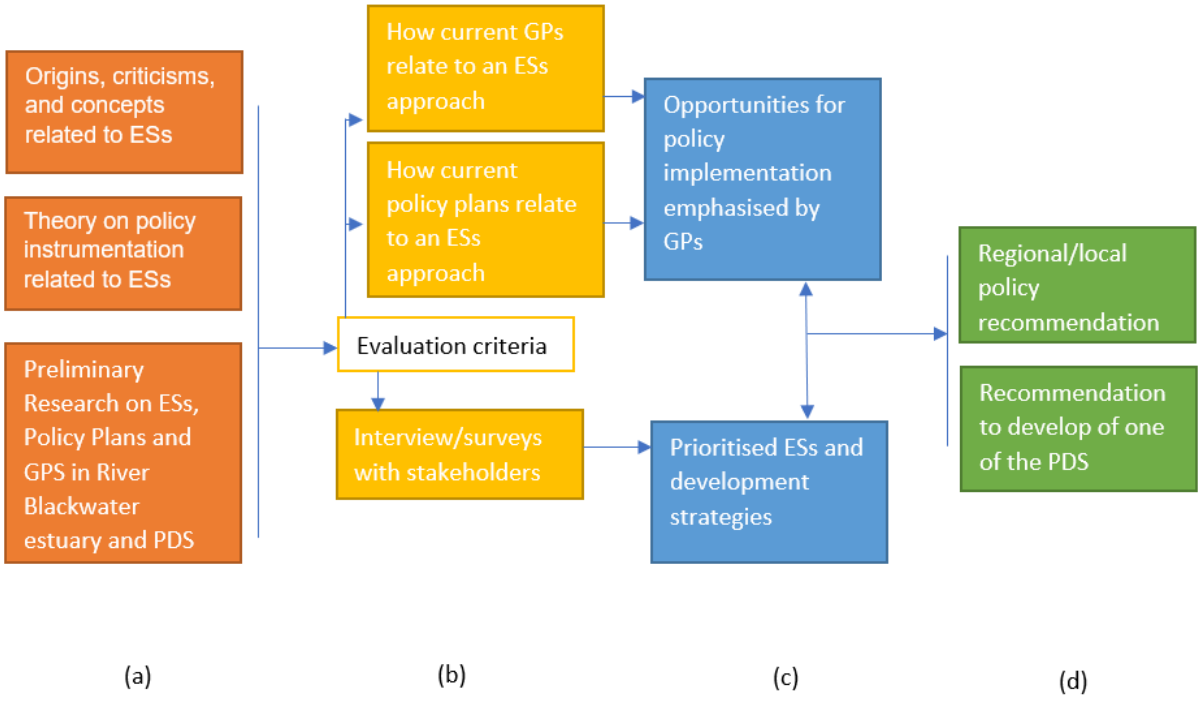


***Figure 12**: Schematic illustration of research framework*

3.2 Defining Concepts

Stakeholder prioritisation

How stakeholders, through either survey questionnaires or interviews or other means, rate the importance or potential for a particular ESs, the development method by which an ESs are enhanced or other associated topics related to ESs and development.

"Best opportunities"

These are the prospects for policy formulation where there is a synergy between policy opportunities and stakeholder prioritisation of ESs and development methods, and an opportunity of developing ecological, economic, or social structures.

3.3 Research Material and Data Collection

The information and data that was needed to address the research questions was collected through:

1. *A document review*.

   The documents related to current policies underwent an evaluation as data sources. This includes the latest version of the RSES, Cork 2050, documents related to Cork County Development Plan 2022-2028, and local policies reports from the East Cork Municipal District and the Youghal Development Plan 2009. Documents related to GP that were identified were also evaluated. The primary aim of these reviews was to establish how ESs were portrayed, either explicitly or implicitly, and what policy instruments underpinned these portrayals and how these policies had manifested as GPs. The policy instruments presented in Schmidt and Seppelt (2018) were referenced throughout the results.

2. *An Interview and survey questionnaires*.

   An analysis of different stakeholder groups served a knowledge and data source. A semi-structured interview was be held with representative of key-actor group, Cork County Council (see *Table 1* for details), while survey questionnaires were used to gather larger amounts of data on the prioritisations of all stakeholders. Two surveys were created (see *Table 2* for details). The first was the Public survey which was distributed on relevant Facebook pages. This survey asked respondents about how they used the PDS, their opinions on how or if these sites should be developed and then looked for their opinions on the importance of individual ESs. The survey did have to be revised and updated after being circulated for several days as members of the public were having issues understanding some of the concepts that were discussed, found it quite long or a combination of both. The updates included the removal of

several ESs that were deemed to be not delivered in the area, ESs were combined, and the public survey only asked for an importance rating and not a potential rating (see section 3.4.1). The second survey was emailed to the Regional Stakeholder Group (RSG) that was put together as a part of the Delta Lady project. This survey requested that the representatives express the views of the organisation they worked for and input an importance and potential ratings for ESs and give an indication of how and why they would like to see ESs development take place.

Interviews and survey questionnaires were chosen to acquire an extensive amount of information from stakeholders. This provided a real-world view of ESs at different scales (institutional to individuals) and provide insight into any differences in opinion that exist.

Table 1 *Description of interviewee and interview details.*

Expert	Affiliation	Title and role	Type of interview
John Lalor	Cork County Council	Senior Executive Planner with Cork County Council, and is involved in the Delta Lady project	25-minute semi-structured Skype interview.

Table 2 *Description of surveys and relevant details.*

Survey	Target audience	Nature of survey	Respondents
Public survey	The Local people of Youghal and others in close proximity to the River Blackwater estuary.	A combination of open and closed questions which require local knowledge.	89 responses in total. 34 fully complete responses
RSG survey	Cork County Council and the rest of the RSG.	Closed questions.	10 fully complete.

3.4 Data Analysis

Data analysis refers to using systematic frameworks and logical reasoning to process the data that has been gathered.

3.4.1 Method of Data Analysis

This research primarily used qualitative analysis, with a partial quantitative analysis of data. As discussed in Verschuren and Doorewaard (2010), the onsite analysis of ESs, GPs,

regional/local policy arrangements and stakeholder data collection took an **embedded case study approach**. This entailed gathering qualitative data about the sites. A small number of research units (River Blackwater Estuary, the Slob Bank, the Claycastle site and the Ballyvergan Marsh) with intensive data generation ensured a depth of knowledge is attained.

Firstly, to determine if an ES was delivered in a research unit a simple scale was used. *Green* indicated that the ES was delivered on the site, *Yellow* indicated that the ES may be delivered on the site (uncertainty of existence), *Red* indicated that the ES was not delivered on the site and *Blue* indicated that the development of the Midleton-Youghal Greenway would mean that this ES would be delivered on this site when the project is complete.

Quantitative Analysis

Secondly, to calculate the importance or potential for enhancement rating, the Likert scale was first used to give the respondent a choice of six responses. The importance scale (*1 – Extremely Unimportant, 2 – Unimportant, 3 – Neutral Importance, 4 – Important, 5 – Extremely Important, DNK – Do Not Know*) and the potential for enhancement scale (*1 – Extremely Unlikely, 2 – Unlikely, 3 – Neutral, 4 – Likely, 5 – Extremely Likely, DNK – Do Not Know*) both use the same method to calculate the Importance rating and Potential rating, respectively. If the ES was given a rating of 1 or 2 it received a score of 0. If an ES was given a rating of a 3 it received a score of 1. Given a rating of 4 it received a score of 3. Given a rating of 5 received a score of 5. This answer was then divided by the total number of responses minus the number of DNK responses. The highest possible rating was 5.

$$Importance\ or\ Potential\ rating\ for\ an\ ecosystem\ service\ (ES) = \frac{(\#3\ ratings\ for\ ES) + 3(\#4\ ratings\ for\ ES) + 5(\#5\ ratings\ for\ ES)}{(\#Total\ Responses - \#DNK\ responses\ for\ ES)}$$

The preferred development method question in the survey asked people to rank five development methods from least desirable (=1) to most desirable (=5). The options were:

1. Leave nature to its own accord
2. Minimal development – few facilities but accessible
3. Medium development – Some damage to the environment and better facilities
4. High development – Considerable damage to the environment but many useful facilities and amenities
5. Full development – Natural environment is completely transformed, however, effort to build a semi-natural environment is complete and extensive facilities and amenities are available

To calculate the *assigned value rating*, A, the following system was used. If an option was given a rank of 1 or 2, it was assigned a score of 0. A rank of 3 was assigned a score of 1, a

rank of 4 was assigned a score of 3 and a rank of 5 was assigned a score of 5. There were 34 fully completed respondents to this question. The formula below describes the calculation process with the set n representing the five development methods.

$$\underset{value\ rating\ of\ n = A_n}{Assigned} = \frac{(\#3\ ratings\ of\ A_n)+3(\#4\ ratings\ of\ A_n)+5(\#5\ rating\ of\ A_n)}{(\#Total\ Responses)},\ n \in \{1,2,3,4,5\}$$

The *average rank, Y,* was calculated by multiplying the number of times a method was assigned that rank by the rank number and divided by the total number of respondents. The formula below describes the calculation process with the set n representing the five development methods.

$$Average\ rank\ of\ n = B_n = \frac{\begin{matrix}(\#1\ ratings\ of\ B_n)+2(\#2\ ratings\ of\ B_n)+3(\#3\ ratings\ of\ B_n)\\ +4(\#4\ ratings\ of\ B_n)+5(\#5\ rating\ of\ B_n)\end{matrix}}{(\#Total\ Responses)}, n \in \{1,2,3,4,5\}$$

The motivations for ESs enhancement question used similar formulas. People were asked to rank six different reasons why people might believe it is important to enhance ES. The six options were a combination of environmental, economic, and social factors and people were asked to rank from least important (=1) to most important (=6). The options were:

1. Local businesses benefit economically
2. Encourages new businesses and industries to be set up in the area
3. Attracting tourism/ecotourism leading to economic and gain
4. Enhancing flood protection, carbon storage and regulation of climate-related processes
5. Enhancing social wellbeing
6. Protecting native species and existing habitats

To calculate the *assigned value rating*, X, the following system was used. If an option was given a rank of 1 or 2, it was assigned a score of 0. A rank of 3 was assigned a score of 1, a rank of 4 was assigned a score of 2, a rank of 5 was assigned a score of 3 and a rank of 6 was assigned a score of 5. There were 34 fully completed respondents to this question.

$$\underset{value\ rating\ of\ n = X_n}{Assigned} = \frac{(\#3\ ratings\ of\ X_n)+2(\#4\ ratings\ of\ X_n)+3(\#5\ ratings\ of\ X_n)+5(\#6\ rating\ of\ X_n)}{(\#Total\ Responses)},$$

$n \in \{1,2,3,4,5,6\}$

The *average rank, Y,* was calculated by multiplying the number of times a method was assigned that rank by the rank number and divided by the total number of respondents. The formula below describes the calculation process with the set n representing the six motivations.

$$Average\ rank\ of\ n = Y_n = \frac{(\#1\ ratings\ of\ Y_n)+2(\#2\ ratings\ of\ Y_n)+3(\#3\ ratings\ of\ Y_n)+4(\#4\ ratings\ of\ Y_n)+5(\#5\ rating\ of\ Y_n)+6(\#6\ rating\ of\ Y_n)}{(\#Total\ Responses)},$$

$n \in \{1,2,3,4,5,6\}$

Qualitative Analysis

The analyse the qualitative information that was gathered in the survey and from the transcription of the interview that was conducted, open coding was used. This was adapted from a grounded theory approach for the case study approach taken in this research. These methods were used to establish categories in which the information of qualitative questions could be placed and then categories which were judged to be intrinsically linked were combined to turn the data into useful information.

Ecosystem service valuation

The quantitative and qualitative analysis methods used looked to define what ecosystem services are valued and why are these ecosystem services valued. Causal conditions for these phenomena are defined as ESs use, ecological value, social value, and economic value to the individual or organisation. The action strategy was then the policy recommendations and output of this report with the intended consequences being to foster the capabilities of ecosystem services provided by the River Blackwater estuary to strengthen the local economy.

Research Matrix

Table 3 indicates the research material, the research strategy, and the assessment method for each main- and sub-research question.

Table 3 *Research Matrix*

Research Question	Research Material	Research Strategy	Assessment Method
Q1 What is the best opportunity to formulate new local policy arrangements that incorporate ecosystem services?	See from Q1.1, Q1.2, Q1.3, Q1.4 and Q1.5 below.	See from Q1.1, Q1.2, Q1.3, Q1.4 and Q1.5 below.	See from Q1.1, Q1.2, Q1.3, Q1.4 and Q1.5 below.
Q1.1 What ecosystem services are found in the River Blackwater estuary and proposed development sites?	- Reports and documents on the area - Conversations with ESs scientist and Cork County Council "project manager"	- Desk Research - Short-interviews (descriptive)	- Content analysis - Questioning during interviews
Q1.2 What are the good practices in place and how do they relate to ESs?	- Reports and documentation on the area	- Desk Research - Short interviews	- Content analysis - Questioning during interviews

	- Conversations with experts - Site visit		
Q1.3 What opportunities for policy arrangements, that could support ESs, can be identified?	- Local and regional policy documentation - Theory of policy implementation	-Desk Research - Using information from Q1.2. - Consider different policy instruments	- Content analysis -Confrontation with Q1.2. - Application of policy theory
Q1.4 Which ESs found in the River Blackwater estuary and on the proposed development sites are important to stakeholders? Why are these important?	- Three different stakeholder groups	- Interview and surveys	- Qualitative and Quantitative analysis method outlined in section 3.4.1
Q1.5 What are the synergies between stakeholder prioritisation and policy opportunities?	- Data gathered on policy opportunities and stakeholder prioritisation	- Using theory on decision-making - Theory on policy instrumentation (Schmidt and Seppelt, 2018)	- Confrontation
Q2. Which of the three PDS is recommended for ESs development/enhancement?	- Research Question 1	- Interview and surveys - ESs enhancement potential	- An assessment of each site

3.4.2 Validation of Data Analysis

To prevent research bias, survey questionnaire and interview questions were designed to limit ambiguity. Where ambiguity may exist in the interview questions, the respondent was asked to validate the interpretation of their response. It was important then that no/minimal ambiguity exists in the survey questions as those respondents could not be contacted again, especially in the Public survey where responses were completely anonymous. The quantitative analysis involved in attributing an assigned value rank was adapted from Washbourne et al. (2020). The qualitative analysis used open coding. Open coding uses a 'sensitising concept' - "what amenities people believe could enhance ESs", for example - and the data that is gathered can be processed by comparing, labelling and classifying what is observed; through a survey, for example (Verschuren and Doorewaard, 2010).

3.5 The Method in Summary

The method for this thesis is as follows. Preliminary research which involved to a site visit, discussions with experts to identify which ESs were delivered in the River Blackwater estuary and PDS and the identification relevant stakeholders. This was followed by a document

analysis of both local GPs and policy plans (from regional to local scales), in which the explicit or implicit existence of an ESs approach was indicated. This was followed by illustrating which policy instruments were indicated, from Schmidt and Seppelt (2018), in the policy plans and by the GPs. The category of ESs (provisioning, regulating and cultural) that each GP supported was also indicated. Through two surveys and an interview the data on ESs valuation was collected. The data was synthesised into information (see section 3.4.1 for details). Synergies between stakeholder prioritisation and the document analysis were then identified which allowed for the identification of the best opportunity to incorporate ESs into policy. Lastly, based on what was learned and observed throughout the thesis, a recommendation for development of one of the PDS was delivered.

3.6 Ethical Consideration

This study was approved by the BMS Ethics Committee of the University of Twente. This approval means that the correct procedures regarding collection, storage and, eventual, disposal of data were submitted to the Ethics committee. It is judged that no physical or psychological harm came to the participants of this thesis.

4. Results

In this chapter, results of this study are presented and are organised as follows. First, the ESs found in the River Blackwater estuary are identified. Second, the results of the GPs analysis and the policy documents analysis are presented in relation to the key policy instruments found in Schmidt and Seppelt (2018). The category of ESs which the GPs support are also outlined. Thirdly, the ESs that are prioritised by stakeholders are identified along with preferred development methods and other information gathered through the surveys and interview.

4.1 Ecosystem Services found in the Blackwater estuary and PDS

An extensive list of the biotic and abiotic ESs that are delivered in the River Blackwater estuary and the PDS can be seen in *Table 4* and *Table 5* below. This section address Q1.1

Table 4 *Biotic ecosystem services found in the Blackwater Estuary, the Slob Bank, the Claycastle site and the Ballyvergan Marsh (adapted from O'Higgins, 2020). Green = ES is delivered, Yellow = ES may be delivered/Do not know, Red = ES is not delivered, Blue = ES will be delivered on completion of the Midleton to Youghal Greenway.*

Division	Group	Class	Code	Estuary	BV Marsh	Claycastle	Slob Bank
Provisioning ESs							
Biomass	Cultivated terrestrial plants	Nutrition	1.1.1.1				
		Fibres and materials	1.1.1.2				
		Energy	1.1.1.3				
	Reared animals	Nutrition	1.1.3.1				
		Fibres and materials	1.1.3.2				
		Energy	1.1.3.3				
	Wild plants	Nutrition	1.1.5.1				
		Fibres and other materials	1.1.5.2				
		Energy	1.1.5.3				
	Wild animals	Nutrition	1.1.6.1				
		Fibres and other materials	1.1.6.2				
		Energy	1.1.6.3				
Genetic materials	From plants	Seeds, spores and other plant materials collected for maintaining or establishing a population	1.2.1.1				
		Higher and lower plants (whole organisms) used to breed new strains or varieties	1.2.1.2				
		Individual genes extracted from higher and lower plants for the design and construction of new biological entities	1.2.1.3				
	From animals	Animal material collected for the purposes of maintaining or establishing a population	1.2.2.1				
		Wild animals (whole organisms) used to breed new strains or varieties	1.2.2.2				
		Individual genes extracted from organisms for the design and construction of new biological entities	1.2.2.3				
Regulating ESs							
Transformation of biochemical or physical inputs	Mediation of wastes or toxic substances of anthropogenic origin	Bioremediation	2.1.1.1				
		Filtratration/sequestration/storages	2.1.1.2				

	Mediation of nuisance	Smell reduction	2.1.2.1				
		Noise attenuation	2.1.2.2				
		Visual screening	2.1.2.3				
Regulation of physical, chemical, biological conditions	Regulation of baseline flows and extreme events	Control of erosion rates	2.2.1.1				
		Buffering and attenuation of mass movement	2.2.1.2				
		Hydrological cycle and water flow regulation	2.2.1.3				
		Wind protection	2.2.1.4				
		Fire Protection	2.2.1.5				
	Lifecycle maintenance, habitat and gene pool	Pollination (or 'gamete' dispersal in a marine context)	2.2.2.1				
		Seed dispersal	2.2.2.2				
		Maintaining nursery populations and habitats	2.2.2.3				
	Pest and disease control	Pest control (including invasive species)	2.2.3.1				
		Disease control	2.2.3.2				
	Regulation of soil quality	Weathering processes and their effect on soil quality	2.2.4.1				
		Decomposition and fixing processes and their effect on soil quality	2.2.4.2				
	Water conditions	Regulation of the chemical condition of freshwaters by living processes	2.2.5.1				
		Regulation of the chemical condition of salt waters by living processes	2.2.5.2				
	Atmospheric composition and conditions	Regulation of chemical composition of atmoshphere and oceans	2.2.6.1				
		Regulation of temperature and humidity, including ventilation and transpiration	2.2.6.2				
Cultural ESs							
Direct, in-situ and outdoor interactions with living system	Physical and experiential interaction	Characteristics that that enable activities promoting health, recuperation or enjoyment through active or immersive interactions	3.1.1.1				
		Characteristics that enable activities promoting health, recuperation or enjoyment through passive or observational interactions	3.1.1.2				
	Intellectual and representative interactions	Characteristics that enable scientific investigation or the creation of traditional ecological knowledge	3.1.2.1				
		Characteristics that enable education and training	3.1.2.2				
		Characteristics that are resonant in terms of culture or heritage	3.1.2.3				
		Characteristics that enable aesthetic experiences	3.1.2.4				
Indirect, remote, often indoor interactions with living systems	Spiritual, symbolic and other interactions	Elements that have symbolic meaning	3.2.1.1				
		Elements that have sacred or religious meaning	3.2.1.2				
		Elements used for entertainment or representation	3.2.1.3				
	Other biotic characteristics that have a non-use value	Characteristics that have an existence value	3.2.2.1				
		Characteristics that have an option or bequest value	3.2.2.2				

Although agriculture is the main economic activity throughout the River Blackwater catchment (O'Higgins, 2020), it is less common on the PDS. Some agricultural activities were observed during the site visit with cattle grazing in some fields to the south of the Ballyvergan Marsh. According to Ramsar (2020) reedbeds in the area are also harvested for thatch, however this could not be confirmed elsewhere. Other activities include angling on the Slob Bank. Apart from these activities no other biotic provisioning ESs could be identified. With respect to biotic regulating and cultural ESs, many were deemed to have

been delivered in the estuary and PDS. Given the unique habitats of the Slob Bank and the Ballyvergan Marsh, their availability to maintain nursery population of species and regulating services related to water conditions are of significance given the coastal nature of the town and its proximity to the estuary. The estuary and the PDS also deliver many biotic cultural ESs due to the natural beauty, the habitats, and ability to explore the areas.

Table 5 *Abiotic ecosystem services found in the Blackwater Estuary, the Slob Bank, the Claycastle site and the Ballyvergan Marsh (adapted from Haines-Young and Potschin, 2018). Green = ES is delivered, Yellow = ES may be delivered/Do not know, Red = ES is not delivered, Blue = ES will be delivered on completion of the Midleton to Youghal Greenway.*

Division	Group	Class	Code	Estuary	BV Marsh	Claycastle	Slob Bank
Provisioning ESs							
Water	Surface water used for nutrition, materials or energy	Surface water for drinking	4.2.1.1				
		Surface water used as a material (non-drinking purposes)	4.2.1.2				
		Freshwater surface water used as an energy source	4.2.1.3				
	Ground water for used for nutrition, materials or energy	Ground (and subsurface) water for drinking	4.2.2.1				
Non-aqueous natural abiotic	Mineral substances used for nutrition or materials	Mineral substances used for nutritional purposes	4.3.1.1				
		Mineral substances used for material purposes	4.3.1.2				
	Non-mineral substances or ecosystem properties used for nutrition,	Non-mineral substances or ecosystem properties used for nutritional purposes	4.3.2.1				
		Non-mineral substances used for materials	4.3.2.2				
		Wind energy	4.3.2.3				
		Solar energy	4.3.2.4				
		Geothermal	4.3.2.5				
Regulating ESs							
Transformation of biochemical or physical inputs to ecosystems	Mediation of waste, toxics and other nuisances by non-living processes	Dilution by freshwater and marine ecosystems	5.1.1.1				
		Dilution by atmosphere	5.1.1.2				
		Mediation by other chemical or physical means (e.g. via filtration, sequestration, storage or accumulation)	5.1.1.3				
	Mediation of nuisances of anthropogenic origin	Mediation of nuisances by abiotic structures or processes	5.1.2.1				
Regulation of physical, chemical, biological conditions	Regulation of baseline flows and extreme events	Mass flows	5.2.1.1				
		Liquid flows	5.2.1.2				
		Gaseous flows	5.2.1.3				
	Maintenance of physical, chemical, abiotic conditions	Maintenance and regulation by inorganic natural chemical and physical processes	5.2.2.1				
Cultural ESs							
Direct, in-situ and outdoor interactions with natural physical systems that depend on presence in the environmental setting	Physical and experiential interactions with natural abiotic components of the environment	Natural, abiotic characteristics of nature that enable active or passive physical and experiential interactions	6.1.1.1				
	Intellectual and representative interactions with abiotic components of the natural	Natural, abiotic characteristics of nature that enable intellectual interactions	6.1.2.1				

Indirect, remote, often indoor interactions with physical systems that do not require presence in the environmental setting	Spiritual, symbolic and other interactions with the abiotic components of the natural environment	Natural, abiotic characteristics of nature that enable spiritual, symbolic and other interactions	6.2.1.1				
	Other abiotic characteristics that have a non-use value	Natural, abiotic characteristics or features of nature that have either an existence, option or bequest	6.2.2.1				

No substantial evidence of abiotic provisioning ESs could be observed to be delivered to the estuary or PDS. The abiotic regulating ESs related to waterflow and dilution of pollution by the freshwater and ecosystems is deemed significant given the geography of the town. Like with the biotic cultural ESs, many abiotic cultural ESs could also be observed and is closely tied with the town's natural features.

The results in *Table 4* and *Table 5* were obtained and altered throughout the thesis when new information came available through the site visit, conversations with experts and from the surveys and interview.

4.2 Document analysis and indication of ESs

4.2.1 Policy Plans and ESs

The results of the policy documents analysis are presented in this section. The policy instruments (outlined in Schmidt and Seppelt (2018)) that can support ESs implementation from these documents are identified. This section addresses Q1.3.

4.2.1.1 RSES

Four policy instruments could be identified to some extent in the RSES. Policy instrument 1 and 2, *extending accounting systems through nature-based indicators* and *rewarding benefits through payment markets,* are explicitly indicated in *RPO 110 Ecosystem services*. Although, how this should be operationalised remains unclear. Policy instrument 5, *Regulating use through protected areas and recognition of their value*, is also explicitly stated in the protection of environmentally and ecologically sensitive sites. Policy instrument 6 then, *Direct public investment in ecological infrastructure and restoration,* is somewhat implied in referencing the expansion of the existing GI network.

The reference to beneficiaries and providers, referring to individual users or producers of ESs (while the terms recipient and donor refer to the regions that use and produce ESs in O'Higgins et al. (2019)) alludes implicitly to a rudimentary supply-demand concept. However, this does not specify the importance of different stakeholder groups and their values.

4.2.1.2 Cork 2050

The concept of ESs is intricately connected with GI within Cork 2050. GI refers to physical natural infrastructure which so by definition only relates to abiotic ESs (as defined defined by CICES) that have been outlined in *Table 5*. The use of the term “ecosystem services” is explicitly implied as underpinning the term “green infrastructure”.

Four policy instruments have been identified that may form the basis for an ESs approach. Policy instrument 5, *Regulating use through protected areas and recognition of their value*, is achieved through the compliance with the Natura 2000 status, SPA and SAC statuses, of the River Blackwater estuary. Policy instrument 4, *addressing environmental degradation through regulation and pricing*, which has been enforced at an international level by the EU on the Irish government, who have and will penalise infringements, including non-compliance to the WFD (2000) (Cork County Council, 2017a). Nationally, the EPA have the right to prosecute individuals or businesses who breach environmental regulations to discourage reoccurrence (EPA, 2020). However, ultimately, payment for pollution is unsustainable, as there would be substantial damage to human welfare, species, and habitats (Cork County Council, 2017a). Policy instrument 6, *direct public investment in ecological infrastructure and restoration* has been stated in the form of GI implementation to connect natural areas around Cork. Policy instrument 3, *reforming environmentally harmful subsidies* has been indirectly referenced within the aim to reduce environmentally harmful outputs.

As a side note, a potential barrier to the comprehensive implementation of the concept is the use of the word “ecosystem” in two different contexts. The definition that is used in this report is the ecological definition by Tansley (1935) (“denoting the importance of the integration of the biotic whole and its physical environment as a cardinal unit in ecology”), while the term ecosystem is used in the Cork 2050 report in a more general sense to denote a complex network. An example is the reference to the “R&D ecosystem” which is mentioned several times. The term ecosystem services then may be misunderstood, while the term ecosystem is used ambiguously.

4.2.1.3 Cork County Development Plan 2022 - 2028

Two policy instruments that are indicated at this early stage. Policy instrument 5, *Regulating use through protected areas and recognition of their value*, which is referenced as the protection and management of green corridors and spaces, and policy instrument 6, *Direct public investment in ecological infrastructure and restoration*, which is implicitly referenced as the development of such corridors and spaces, in the form of greenways and urban parks (Cork County Council, 2020).

4.2.1.4 East Cork Municipal District – Local Area Plan

Like the Cork County Development Plan, Policy instrument 5 and 6 were indicated. *Regulating use through protected areas and recognition of their value,* once again, is referenced concerning the Natura 2000 statuses on the estuary and the pNHA status of the Ballyvergan Marsh and the potential of these areas to attract people. *Direct public investment in ecological infrastructure and restoration* is indicated with investment in the Ballyvergan Marsh and upgrade of the facilities on the beaches, including the Claycastle beach.

4.2.1.5 Youghal Town Development Plan 2009 - 2015

One policy instrument was of was represented significantly in the Town Development Plan. Policy instrument 5, *Regulating use through protected areas and recognition of their value.* Here there are policies, once again, protecting the SAC, SPA and pNHA by using necessary assessment. However, they also indicate policies to protect greenfield sites by encouraging the use of previously developed brownfield sites and protecting specific habitats, such as the reedbeds at the Claycastle Pitch and Putt. This shows a desire to protect natural areas and local habitats.

Conclusion

All policy instruments from Schmidt and Seppelt were identified either explicitly or implicitly in the policy document analysis. *Regulating use through protected areas and recognition of their value* and *direct public investment in ecological infrastructure and restoration* seem to be referenced consistently at both regional and local scales. Where ESs have been integrated, they have been noted to underpin GI.

4.2.2 Good practices and ESs

The results of the GPs analysis are presented in this section. The category of ESs that these GPs support are determined, along with the policy instruments related to ESs that they are deemed to have stemmed from. This section addresses Q1.2.

4.2.2.1 The Midleton to Youghal Greenway Approval Process

The Greenway project will provide a means of access to the Claycastle site and the Ballyvergan Marsh and establish or enhance a host of cultural ESs. As noted in *Table 4* and *Table 5*, there are ESs that will only be established at the completion and opening of the Greenway. This is due to the inaccessibility of the Ballyvergan Marsh (see section 4.3.2.1).

The Ballyvergan Marsh is currently recognised as a pNHA. This status has ensured that the Marsh received special consideration in the EIA, Ecology Report and Flood Risk Management Report for the greenway, prior to the decision being made for the greenway's construction. This indicates policy instrument 5, from Schmidt and Seppelt (2018), *Regulating use through*

protected areas and recognition of their value. Also, the investment into restoration and repurposing of the old railway line shows that policy instrument 6, *Direct public investment in ecological infrastructure and restoration* is taking place.

The approval and the acceptance of such a large project was deemed to be due to the through communication with stakeholders, along with the reports mentioned above according to a Senior Executive Planner from Cork County Council (see section 4.3.1 and *Appendix 3*)

4.2.2.2 The Youghal Eco-boardwalk to Redbarn

This will provide another opportunity to observe the sea life in the along the coast and the Ballyvergan Marsh with minimal intrusion to the habitats. The eco-boardwalk extension will enhance delivery of many of the cultural ESs by the eco-boardwalk to date and make them available to the people of Youghal, Redbarn, as well as tourists.

Policy instrument 6, *Direct public investment in ecological infrastructure and restoration* is indicted explicitly from the funding received from the Outdoor Recreation Infrastructure Scheme 2018.

4.2.2.3 The Ballyvergan Marsh 2017 Biodiversity Action Plan

The Ballyvergan Marsh Biodiversity Action Plan primarily focuses on the performance of several regulating ESs related to the habitats and species found in the Marsh. Two of the priority actions are monitoring the ability of the Marsh to act as an abiotic structure against saline water intrusion that is occurring, and its ability manage the invasive fern species *Azolla filiculoides.*

Policy instrument 1, *Extending accounting systems through nature-based indicators,* is somewhat indicated here by looking at the performance of factors that influence ESs. The evaluation and creation of the Biodiversity Action Plan also indicates policy instrument 5, *Regulating use through protected areas and recognition of their value*.

4.2.2.4 The SECAD bird hide

The SECAD bird hide provides cultural ESs around observatory and immersive interaction with the biotic environments. The construction of the bird hide by SECAD represents policy instrument 6, *Direct public investment in ecological infrastructure and restoration.*

Conclusion

It can see that policy instrument 5, *Regulating use through protected areas and recognition of their value*, and policy instrument 6, *Direct public investment in ecological infrastructure and restoration,* are the most common policy instruments seen in recent GPs in the River Blackwater estuary area. Cultural ESs, followed by regulating ESs, are the focus in these practices.

4.3 Stakeholders

This section addresses Q1.4. This was achieved through the findings of two surveys which were distributed to two different groups and an interview with a representative from Cork County Council. Cork County Council was been chosen as the sole key actor as they were identified as having the most important influence on policy decisions within the County and Youghal town, hence an interview was conducted.

The first survey was distributed to the organisations in the RSG (which includes Cork County Council, see section 4.3.2 for details) formulated for the Delta Lady project. The second survey was distributed to the public via Facebook pages followed by people in the Youghal and East Cork region. The decisions made in policy formulation and site development may directly or indirectly affect the organisations in the RSG and individuals in the public domain (Metzger et al., 2017). Public consultation is also important for the assessment of the supply-demand of ES, as the public are consumers of many ESs and play an important role in the continued provision of certain ESs.

The aim of both surveys was to see which ESs were valued based on the ESs judged to be prevalent in the River Blackwater estuary and PDS outlined in *Table 4* and *Table 5*. The public survey also gave people the opportunity to suggest amenities would enhance the delivery of ESs and encourage use of the PDS.

4.3.1 Cork County Council Interview

An interview was conducted with a representative of Cork County Council to get their input on the development sites (see *Appendix 3* for full interview transcription); namely what kind of development has happened in recent times, what would the barriers to development be and what are the sites potential regarding the delivery of ecosystem services. The interviewee is a Senior Executive Planner in Cork County Council and is one of the representatives of Cork County Council in the Delta Lady project.

Regarding the Slob Bank, there has been no serious development that has occurred on the site in recent decades. Signage related to the South and East Cork Bird was erected at both ends of the Slob Bank. A proposal and funding application to develop a pontoon area/marina in the southern area of the Slob Bank was submitted under the rural regional development fund in 2018 but the application was unsuccessful. The refusal to grant the fund may have to do ecological sensitivity of the area, however the nature of the refusal was not discussed in the interview. However, there is was said to be "*untapped potential in terms of the relationship with water in Youghal*". The interviewee believed that the locals in the area would be supportive of the development of recreational facilities in Youghal in general, assuming they meet the standards of the environmental and ecological assessments that any development

would be subjected too. This is especially true for the Slob Bank as it lies right on the Blackwater estuary which is protected as a SPA and SAC site.

The Claycastle site is a 21-acre site which is under the ownership of Cork County Council. The Midleton to Youghal Greenway is due to cross this site, beginning at the old Youghal railway station. The Greenway will be the first-time development has occurred in several decades since the closure of the Youghal to Midleton trainline according to the Senior Executive Planner. The site offers several challenges related to flood risk, irregular configuration and it being backland to residential properties. It is hoped that the Greenway will act a stimulus for other facilities and amenities on the site. Partial habitats may exist on the site and they would need to be recognised and accounted for before any development takes place. The interviewee said upon recognition of these habitats, a buffer zone should be placed around such areas of high ecological value to encourage and enhance any habitat that does exist.

The Ballyvergan Marsh is noted to have the most ecological potential of the three sites. No physical development has happened on the Marsh in the last number of decades aside from the SECAD bird hide located at the north-west corner of the Marsh as part of the establishment of the South and East Cork Bird Trail. The Senior Executive Planner did speak about development in the form of artificial drainage, which is occurring in certain areas of the Marsh by private landowners, the legality of such activities is uncertain. The SECAD bird hide was mentioned to have been not as successful as hoped. It suffers from its distance from Youghal town and is not easily accessible for walkers. A major barrier to development of the Marsh is landownership uncertainty, which was highlighted by the interviewee and in the SECAD (2017). This effects the viability and feasibility for funding options and is a reoccurring obstacle to development. The interviewee stated there are known to be 5 private landowners as well as partially being under public landownership. Youghal Tidy Towns are also preliminarily looking at plans to develop a Nature Education/Community Centre at the southwest corner of the marsh. These plans are currently in the idea-development stage but would be a practical method of educating people about the benefits of the Marsh and the ESs that the Marsh provides to the area. A development pointed out by interviewee was a connection between the Greenway and the Eco-boardwalk on the Claycastle beach. When both projects are completed, this would increase the use of both facilities and provide a practical method for cyclists and walkers to move between Youghal-Redbarn and Youghal-Midleton. To the knowledge of Cork County Council, the pNHA status of the marsh is not being pushed to an NHA. In the case it is proposed, the consequences on development proposal is unknown but unlikely to disrupt any plans.

The Midleton to Youghal Greenway was then discussed briefly in relation to the level of public objection. The Senior Executive Planner mentioned, although he is not involved in the project, had been in contact with the Greenway Project Manager, and said that the approach that the team took with relation to private landowner and extensive public consultation worked very well and this reduced the level of public objection on the project. This approach was noted to have thoroughly engaged the stakeholders involved, leading to the project being widely accepted.

When asked which site the interviewee believed that Cork County Council would like to go ahead with developing, he answered that it is still too early to say and that all three sites are still being seriously considered. However, from a practical point of view, the Claycastle site would offer a space which is already under the ownership of Cork County Council and offers an opportunity to develop and enhance ESs relatively close to the town. It was mentioned that the Ballyvergan Marsh has the most ecological potential and is a great environmental asset, being a unique and expansive habitat. The interviewee noted that the aim of the Delta Lady project will be to leave a legacy related to ESs incorporation into regional and local policy that could help facilitate development on the chosen site.

A final question to the interviewee was in relation to policy instrument preference and how it related to the Delta Lady project. He answered that the aim of Delta Lady to get ESs incorporated into regional policy was achieved, in the RSES, however specific policy instruments were not specified. A secondary focus was then on local policy incorporation. The new County Development Plan 2022 will look to incorporate plans for all towns in Cork, hence the new Youghal plan will be imbedded with this county-wide plan. Whether the valuation of ESs will a *"… specific objective or be a complimentary text in various spots throughout the plan…"* is yet to be decided, therefore an opportunity to influence this still exists, as well as an chance to specify policy instruments.

Conclusion

Cork County Council are focused on the goals of Delta Lady in getting ESs incorporated in local policy after it was successfully integrated into the RSES. The specifics on how the concept of ESs would be operationalised is unknown. The Claycastle site and the Ballyvergan Marsh seem to be the preferred PDS, however all sites are still being considered.

4.3.2 RSG Survey Questionnaire

The RSG consists of Cork County Council, the SRA, the EPA, the Youghal Socio-Economic Development Group (YSEDG), the Local Authority Waters Programme, Teagasc, Inland Fisheries Ireland and the Department of Agriculture, Food and the Marine (An Roinn Talmhaíochta, Bia agus Mara). Representative from these organisations were asked to fill out

a survey in which they would rate their 'preferred development method to improve ESs', 'why people thought it was important to enhance ESs', and the 'importance and potential for enhancement of the specific ESs identified in CICES V5.1' (Haines-Young and Potschin, 2018), in line with the values of their organisation. Two representatives from both Cork County Council and the Department of Agriculture, Food and the Marine answered the survey. Thus, the average of these participants results was taken to ensure that each of the eight RSG members received equal representation in the results.

Table 6 below, indicates the average rank and assigned value rating of the preferred development methods for enhancing ESs by the RSG.

Table 6 *Preferred development method for enhancing ESs. RSG Survey.*

Development method	**Average rank**	**Assigned value rating**
Minimal development – few facilities but accessible	4.23	3.63
Leave nature to its own accord	3.63	2.63
Medium development – Some damage to the environment and better facilities	3.38	1.86
Full development – Natural environment is completely transformed, however, effort to build a semi-natural environment is complete and extensive facilities and amenities are available	2.38	1.25
High development – Considerable damage to the environment but many useful facilities and amenities	1.88	0.25

The mean assigned rank rating, $\bar{x}_{11}=1.92$, with a standard deviation, $\sigma_{11}=1.29$. It is observed that *Minimal Development* (3.63), followed by *Leave nature to its own accord* (2.63) and *Medium Development* (1.86) are preferred whereas the two methods that would grant access to many facilities but cause the most harm or transform the natural environment are not favoured.

Table 7 below, shows the average rank and assigned value rating for the motivations as to why ESs should be enhanced from the RSG survey.

Table 7 *Why ESs should be enhanced. RSG Survey.*

Why ESs should be enhanced	**Average rank**	**Assigned value rating**
Protecting native species and existing habitats	5.75	4.5
Enhancing social wellbeing	4.38	2.63

Enhancing flood protection, carbon storage and regulation of climate-related processes	3.88	2
Local businesses benefit economically	2.88	0.88
Encourages new businesses and industries to be set up in the area	2	0.5
Attracting tourism/ecotourism leading to economic and gain	2.38	0.5

The mean assigned rank rating, $\bar{x}_{12}$=1.84, with a standard deviation, σ_{12}=1.56. The environmental and social motivations namely, *protecting native species and existing habitats* (4.5)*,* followed by *enhancing social wellbeing* (2.63) and *enhancing flood protection, carbon storage and regulation of climate-related processes* (2) were the most highly rated. The economic motivations were ranked lower on average.

Local knowledge was required to accurately value certain ecosystem services in the area, therefore to ensure that a lack of local knowledge did not skew the results an interview was conducted with a Senior Executive Planner in Cork County Council As the sole key actor Cork County Council are the primary establishers of policy in the Cork region both throughout the county and at a local level. The Senior Executive Planner, along with a Senior Executive Scientist in Water Quality & Agriculture from Cork County Council, completed the survey (as a member of the RSG), to get an idea of true state of certain ecosystem services and the PDS. The RSG results, including the results of Cork County Council, were then used to assess the values held by the organisations and what was important to these organisations in relation to ESs in the River Blackwater estuary. Several of these ES have been combined and an average value was calculated as to align with the Public survey. For example, *Smell reduction, Noise attenuation* and *Visual Screening* have received individual ratings in the RSG survey but just one rating in the Public survey, under *Average - Smell reduction, Noise attenuation and Visual screening.* Hence the average was also calculated in the RSG survey. This allows comparison between survey results. The RSG were also asked to give a rating for the "potential for enhancement" of specific ESs. The results can be seen in *Table 8, Table 9,* and *Table 10* below.

Table 8 *Provisioning ESs valuation from the RSG survey. All ratings ≥3.5 are in bold.*

Provisioning ESs – Biotic	**CICES V5.1 code(s)**	**Importance Rating**	**Potential Rating**
Wild plants – nutrition and materials	1.1.5.1, 1.1.5.2	**3.5**	**3.5**

Genetic material – plants and animals (e.g. seed collection for maintaining/establishing population)	1.2.1.1, 1.2.1.2, 1.2.1.3, 1.2.2.1, 1.2.2.2, 1.2.2.3	**3.5**	3.25
Wild animals – nutrition and materials	1.1.6.1, 1.1.6.2	2.63	3.25
Reared animals – nutrition and materials	1.1.3.1, 1.1.3.2	1.86	0.75
Cultivated plants – nutrition (e.g. food) and materials (e.g. fibres)	1.1.1.1, 1.1.1.2	1.75	1
Provisioning ESs – Abiotic			
Non mineral substances or ecosystem properties used for nutrition properties	4.3.2.1	3.33	2.67
Wind energy	4.3.2.3	3.29	3
Coastal and marine water used as energy source (e.g. tidal power)	4.2.1.4	3.14	3.43
Solar energy	4.3.2.4	3.14	3
Geothermal energy	4.3.2.5	2.83	2.8
Surface water used for non-drinking purposes (e.g. irrigation)	4.2.1.2	2	1.5
Ground water used for non-drinking purposes (e.g. irrigation)	4.2.2.2	1.38	1.25
Fresh surface water used as an energy source (e.g. hydropower)	4.2.1.3	1.14	0.71
Mineral substances used for nutritional purposes (e.g. salt)	4.3.1.1	0.5	0.57
Mineral substances used for material purposes	4.3.1.2	0.43	1

Of the provisioning ESs, the biotic services of *food and material provided by wild plants* ((importance = 3.5, potential = 3.5) = (3.5, 3.5)) and services related *genetic material* (3.5, 3.25) ranked highly while an abiotic service of note was the high rating for the potential to enhance *coastal and marine water used as energy source* (3.14, 3.43). In contrast to this a low potential rating for *fresh surface water used as an energy source* (1.14, 0.57). *Wind energy* (3.29, 3) and *Solar energy* (3.14, 3) received moderate ratings for potential.

Table 9 *Regulation and maintenance ESs valuation from the RSG survey. All ratings ≥3.5 are in bold.*

Regulation and maintenance ESs – Biotic	**CICES V5.1 code(s)**	**Importance Rating**	**Potential Rating**

Pollination (e.g. by bees or other native pollinators)	2.2.2.1	**4.75**	**4.75**
Regulating water flows (e.g. natural flood control and coastal protection)	2.2.1.3	**4.75**	**4.25**
Regulating the quality of freshwater	2.2.5.1	**4.5**	**4.25**
Providing nursery population and habitats for wild plants and animals that can be useful to people (e.g. an estuary)	2.2.2.3	**4.25**	**3.5**
Decomposition of waste/pollution (e.g. microorganism in the estuary treating agricultural runoff (e.g. nitrogen or phosphorous))	2.1.1.1	**3.86**	2.26
Storage and filtration of waste/pollution	2.1.1.2	**3.86**	1.71
Average - Naturally regulating the quality of freshwater and saltwater	2.2.5.1, 2.2.5.2	**3.6**	3.2
Regulating the global climate (e.g. carbon storage by peatlands or trees)	2.2.6.1	**3.5**	**3.5**
Soil stabilisation	2.2.1.1, 2.2.1.2	3.38	**3.88**
Spreading the seeds of wild plants (e.g. via birds)	2.2.2.2	3.25	3.25
Disease control	2.2.3.2	2.75	2.75
Visual Screening	2.1.2.3	2.75	2
Smell reduction	2.1.2.1	2.63	1.75
Regulating the conditions of saltwater	2.2.5.2	2.57	2.5
Average - Smell reduction, Noise attenuation and Visual screening	2.1.2.1, 2.1.2.2, 2.1.2.3	2.54	2.08
Regulating the physical quality of air for people	2.2.6.2	2.5	2.75
Controlling pests and invasive/non-native species (e.g. birds that hunt non-native rodents)	2.2.3.1	2.5	2.5
Noise attenuation	2.1.2.2	2.25	2.5
Wind protection	2.2.1.4	2.25	2.25
Regulating ESs – Abiotic			
Physical barriers to water (e.g. sand dunes providing flood protection)	5.2.1.2	**3.5**	**3.57**
Natural processing of wastes	5.1.1.3	3.25	2.13
Regulating living conditions by the physical environment	5.2.2.1	3	2.71

Average - Dilution of waste by the freshwater and marine ecosystems, the atmosphere and other natural processing of waste	5.1.1.1, 5.1.1.2, 5.1.1.3	2.83	1.75
Protection of nuisances (smell, noise or visual) by land or water	5.1.2.1	2.75	2
Dilution of waste or pollutants by freshwater of marine ecosystem	5.1.1.1	2.75	1.36
Physical barrier to landslides	5.2.1.1	2.63	2.13
Dilution of airborne pollutants by the atmosphere	5.1.1.2	2.5	1.75
Physical barrier to air flow (e.g. by a land mass - a bank)	5.2.1.3	2	1.57

The regulating biotic ESs of *pollination* (4.75, 4.75), *regulating the flows of water* (4.75, 4.25), *regulating the quality of freshwater* (4.5, 4.25) *providing nursery population and habitats for wild plants and animals that can be useful to people* (4.5, 3.5), *decomposition of waste/pollution* (3.86, 2.26), *storage and filtration of waste/pollution* (3.86, 1.71), *soil stabilisation* (3.38, 3.88) and *regulating the global climate* (3.5, 3.5) ranked highly on importance, potential, or both. *Physical barriers to water* (3.5, 3.57) and the *natural processing of wastes* (3.25, 2.13) gained high rating as regulating abiotic services.

In policy in Ireland, this valuing of water quality can be traced back to Water Pollution Act 1977 Water Quality Standards for Phosphorus Regulations 1998 (S.I. No. 258/1998) which was unique in Europe at that time as it incorporated an ecological assessment (biological quality rating) (Ní Longphuirt et al., 2015). This was prior to the implementation of the WFD (2000).

Table 10 *Cultural ESs valuation from the RSG survey. All ratings ≥3.5 are in bold.*

Cultural ESs – Biotic	**CICES V5.1 code(s)**	**Importance Rating**	**Potential Rating**
Partaking in passive activities (e.g. to destress, to observe plants and animals)	3.1.1.2	**4.75**	**4.75**
Partaking in recreational activities (e.g. walking, jogging, or fishing)	3.1.1.1	**4.5**	**4.25**
Learning or teaching about the environment	3.1.2.1, 3.1.2.2	**4.5**	**4.25**
Things we believe should be preserved / experience by future generations (e.g. native species)	3.2.2.1, 3.2.2.2	**4.5**	**4.25**
Natural beauty	3.1.2.4	**4.43**	**4.43**
To meet friends and/or to take part in social activities	3.3.1.1	**3.75**	**3.75**

Experiencing cultural heritage/associate with cultural identity (e.g. native species)	3..1.2.3	**3.5**	**3.75**
Inspiration to create something (e.g. photograph, painting, poem, or song)	3.2.1.3	3	3
For spiritual/religious purposes	3.2.1.2	1.88	1.71
Cultural ESs – Abiotic			
Things in the physical environment that we can experience actively or passively (e.g. beaches)	6.1.1.1	**4.25**	**4.25**
Things in the physical environment that we think are important to others and future generations	6.2.2.1	**4**	**4.25**
Things in the physical environment that are important as symbols (e.g. a mountain or a river with cultural significance)	6.2.1.1	**4**	**4**
Things in the physical environment that we can study or think about (e.g. for academic study or rock faces for climbing)	6.1.2.1	**3.75**	3

Cultural ESs both abiotic and biotic were all rated relatively highly, many having a score of over 4 in both importance and potential. An exception to this was the ESs related to *religious/spiritual purposes* (1.88, 1.71). This may reflect a decrease of importance placed on religion in organisations in general.

Conclusion

Table 11 summarises the average ratings for ESs by category. Cultural, followed by regulating ESs received the highest ratings in both importance and potential.

Table 11 *Average ESs ratings by category for the RSG.*

Average of ratings	**Importance**	**Potential**
Provisioning ESs	2.06	2.10
Regulating ESs	3.22	2.82
Cultural ESs	3.91	3.82

4.3.3 Public Survey Questionnaire

4.3.3.1 The PDS

A total of 89 responses was gathered from the public survey. Of these 89 responses, 34 respondents fully completed the survey. The explanation for the high drop-off rate can be explained at least partly due to the language that was used in the survey. The survey used language close to that of the "*simple descriptor's*" which is used in CICES V5.1 to describe

specific ES in a basic manner. Several comments on Facebook addressed the language and the concepts used:

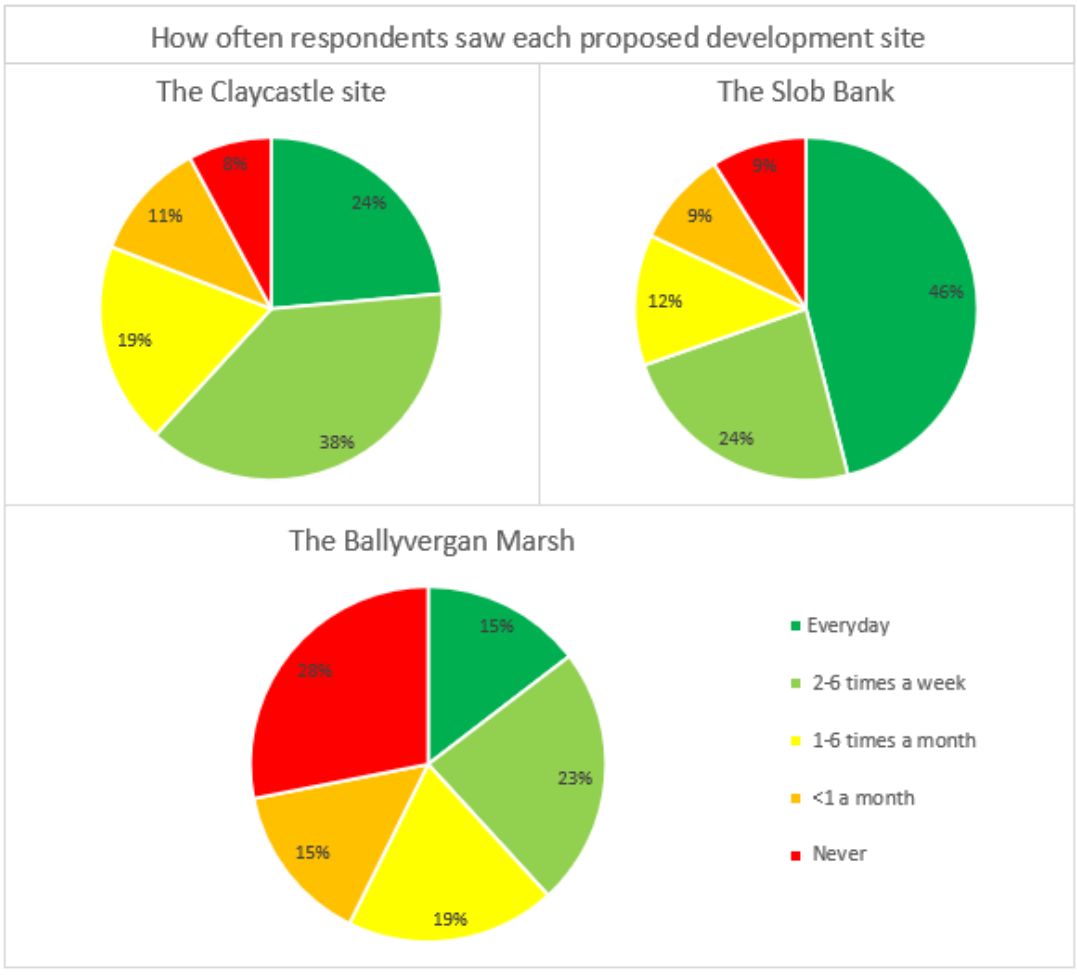
"Many people are very interested in the topics that you raise but might find the concepts and language of the questionnaire difficult to grasp" – Facebook user

Of 89 respondents, 65.2% lived within 2km of the estuary and 92.1% of people lived within 10km. Looking at the three PDS we look to how the sites are used and how often.

The activity of *walking/dog-walking/running* was performed either *every day* or *2-6 times a week*, by 23% (20/87) of respondents at the Slob Bank, 49.4% (43/87) of respondents at the Claycastle site (people likely counting Claycastle beach) and 10.3% of respondents at the Ballyvergan Marsh. For more statistics relating activities on the PDS, see *Appendix 4*.

66.3% (53/80) of people said they never part took in *observing nature* in the Ballyvergan Marsh, while the same figure is 27.4% (23/84) for the Claycastle site and 34.9% (30/86) for the Slob Bank.

Respondents were then asked how often they saw each site. At least *2-6 times a week*, 69.7% (62/89) of respondents said they saw the Slob Bank, 61.8% (55/89) of respondents said they



saw the Claycastle site and 37.1% (33/89) of respondents said they saw the Ballyvergan Marsh (*Figure 13*).

The survey then asked an open-ended question about what amenities and services would encourage greater use of each site. People were asked to keep in mind the categories of ESs and consider the environmental impact of their suggestions. The answers were sorted into one or more categories depending on their content using open coding.

For the Slob Bank the most sought-after amenities was the development of the walkway (37.7% (20/53)). This included suggestions about making the walking route circular and improving the surface. Other popular suggestions were flora/fauna/history signage, seating areas, (sheltered) observation areas and bins/dog-fouling bins.

The Youghal-Midleton Greenway which is currently in the early stages of development had a big influence on the responses for this question for both the Claycastle site and the Ballyvergan Marsh, with 25.5% (12/47) and 44.4%(20/45) of respondents, respectively, mentioning the greenway or suggesting a walkway be implemented. Other amenities that were popular at the Claycastle site included seating areas and bins/dog-fouling bins. At the Ballyvergan Marsh the most common response aside from that of the greenway was that of better access and promotion, and more observation areas. It was stated by one respondent that the current SECAD bird hide is not open to the public.

The preservation and the protection of these sites were also voiced by several respondents. 17.8% (8/45) of the Ballyvergan Marsh, 10.6% (5/47) of the Claycastle site and 5.7% (3/53) of the Slob Bank respondents.

Figure 13 *How often respondents saw each site.*

Of the 34 respondents who completed the survey, 50% (17/34) indicated they would like to see the Slob Bank developed, 29.4% (10/34) indicated the Ballyvergan Marsh and 20.6% (7/34) indicated the Claycastle site.

4.3.3.2 Ecosystem service valuation

The survey then asked people to rank their preferred development method to improve ES, which can be seen in *Table 12* below.

Table 12 *Preferred development method to enhance ESs. Public survey.*

Development method	**Average rank**	**Assigned value rating**
Minimal development – few facilities but accessible	3.44	2.47

Medium development – Some damage to the environment and better facilities	3.32	1.91
Leave nature to its own accord	3.06	1.79
Full development – Natural environment is completely transformed, however, effort to build a semi-natural environment is complete and extensive facilities and amenities are available	2.44	1.44
High development – Considerable damage to the environment but many useful facilities and amenities	2.73	1.38

The mean assigned rank rating, $\bar{x}_{21}=1.80$, with a standard deviation, $\sigma_{21}=0.44$. As can be seen from the table above, *Minimal development* and *Medium development* are the most favoured development methods for the enhancement of ES. The least favoured options being high development (1.38) and full development (1.44), which would cause considerable damage to the natural environment.

The next question was on the topic of why people thought it was important to enhance ES. They were asked to rank the following six options from least preferable to most preferable. The results can be seen in *Table 13* below.

Table 13 *Why ESs should be enhanced. Public Survey.*

Why ESs should be enhanced	**Average rank**	**Assigned value rating**
Enhancing social wellbeing	4.12	2.32
Protecting native species and existing habitats	3.79	2.32
Enhancing flood protection, carbon storage and regulation of climate-related processes	3.91	2.03
Attracting tourism/ecotourism leading to economic and gain	3.5	1.85
Local businesses benefit economically	3.15	1.44
Encourages new businesses and industries to be set up in the area	2.71	1.18

The mean assigned rank value, $\bar{x}_{22}=1.86$, with a standard deviation, $\sigma_{22}=0.47$. From the results we see that the most important factors are the *protection of native species and existing habitats* (2.32) along with the *enhancement of social well-being* (2.32). These are followed by *enhancing flood protection, carbon storage and regulation of climate-related processes* (2.03) and *attracting tourism/ecotourism leading to economic and gain* (1.85). Encouraging new businesses and industries to be set up in the area received the lowest rank (1).

Respondents were then asked to rank the importance ES (that may or may not have existed in the area, due to the delayed site visit caused by the COVID-19 lockdown). The results can be seen in the *Table 14, Table 15* and *Table 16* below.

After the revision of the survey took place, these ES were judged to either exist in the River Blackwater estuary or one of the PDS.

Table 14 *Provisioning ESs valuation from the Public survey. All ratings ≥3.5 are in bold.*

Provisioning ESs- Biotic	**CICES V5.1 code(s)**	**Total Responses**	**Importance Rating**
Wild plants – nutrition and materials	1.1.5.1, 1.1.5.2	42	**3.98**
Wild animals – nutrition and materials	1.1.6.1, 1.1.6.2	42	**3.68**
Genetic material – plants and animals (e.g. seed collection for maintaining/establishing population)	1.2.1.1, 1.2.1.2, 1.2.1.3, 1.2.2.1, 1.2.2.2, 1.2.2.3	42	3.15
Cultivated plants – nutrition (e.g. food) and materials (e.g. fibres)	1.1.1.1, 1.1.1.2	42	2.7
Reared animals – nutrition and materials	1.1.3.1, 1.1.3.2	41	2.22
Provisioning ESs – Abiotic			
Ground water used for non-drinking purposes (e.g. irrigation)	4.2.2.2	35	2.85
Surface water used for non-drinking purposes (e.g. irrigation)	4.2.1.2	35	2.53
Coastal and marine water used as energy source (e.g. tidal power)	4.2.1.4	35	2.49
Mineral substances used for nutritional purposes (e.g. salt)	4.3.1.1	35	2.41
Fresh surface water used as an energy source (e.g. hydropower)	4.2.1.3	35	2.14

Looking at biotic provisioning ES we see that the respondents rated *wild plants* and *wild animals for their nutritional and material value* (3.98 and 3.68, respectively) to be significant. No abiotic provisioning ES gained a rating of over 3.

Table 15 *Regulating ESs valuation from the Public survey. All ratings ≥3.5 are in bold.*

Regulating ESs – Biotic	**CICES V5.1 code(s)**	**Total Responses**	**Importance Rating**

Pollination (e.g. by bees or other native pollinators)	2.2.2.1	41	**4.34**
Decomposition of waste/pollution (e.g. microorganism in the estuary treating agricultural runoff (e.g. nitrogen or phosphorous))	2.1.1.1	42	**4.20**
Regulating water flows (e.g. natural flood control and coastal protection)	2.2.1.3	42	**4.05**
Naturally regulating the quality of freshwater and saltwater[4]	2.2.5.1, 2.2.5.2	41	**3.96**
Providing nursery population and habitats for wild plants and animals that can be useful to people (e.g. an estuary)	2.2.2.3	42	**3.81**
Spreading the seeds of wild plants (e.g. via birds)	2.2.2.2	23[5]	**3.78**
Regulating the global climate (e.g. carbon storage by peatlands or trees)	2.2.6.1	42	**3.66**
Controlling pests and invasive/non-native species (e.g. birds that hunt non-native rodents)	2.2.3.1	42	3.36
Smell reduction, Noise attenuation and Visual screening[6]	2.1.2.1, 2.1.2.2, 2.1.2.3	42	3.31
Regulating ESs- Abiotic			
Physical barriers to water (e.g. sand dunes providing flood protection)	5.2.1.2	35	**3.77**
Dilution of waste by the freshwater and marine ecosystems, the atmosphere and other natural processing of waste	5.1.1.1, 5.1.1.2, 5.1.1.3	34.66[7]	3.29
Protection of nuisances (smell, noise or visual) by land or water	5.1.2.1	35	3.11
Physical barrier to air flow (e.g. by a land mass - a bank)	5.2.1.3	35	2.47

Biotic regulating ESs received high ratings. *Pollination* (4.34), the *decomposition of waste and pollution* (4.20) and *regulating waterflows* (4.05) were rated very highly. The example, given for the *decomposition of waste and pollution* was “microorganism in the estuary treating agricultural runoff (e.g. nitrogen or phosphorous))”. Relating this example to the estuary and

[4] In the revised version of the survey, these two ES were placed in the same category and the average of the ratings were taken at that point. This was done to shorten the survey.

[5] This ES was erroneously removed in the updated version of the survey, however it may play a vital role in the survival of plant species in the estuary and development sites, so a decision was made to include it in *Table 15.*

[6] In the revised version of the survey, these three ES were placed in the same category and the average of the ratings were taken at that point. This was done to shorten the survey.

[7] In the revised version of the survey, these three ES were placed in the same category and the average of the ratings were taken at that point, hence the non-whole number of respondents. This was done to shorten the survey.

to agriculture may will have contributed to its importance ranking. *Regulating water flows* along with the abiotic regulating ES of *regulating liquid flows* (3.77 through the biotic and abiotic environment includes the use of sand dunes which are found on the Claycastle beach and exist along the boundary between beach and Ballyvergan Marsh. Other highly rated biotic ES include r*egulating the quality of fresh- and salt-water* (3.96), *providing nursery population and habitats for wild plants and animals that can be useful to people* (3.81), *spreading the seeds of wild plants* (3.78*) and *regulating the global climate* (3.66) were also rated highly.

Table 16 *Cultural ESs valuation from the Public survey. All ratings ≥3.5 are in bold.*

Cultural ESs- Biotic	**CICES V5.1 code(s)**	**Total Responses**	**Importance Rating**
Natural beauty	3.1.2.4	42	**4.36**
Things we believe should be preserved / experience by future generations (e.g. native species)	3.2.2.1, 3.2.2.2	42	**4.26**
Partaking in passive activities (e.g. to destress, to observe plants and animals)	3.1.1.2	42	**4.10**
Partaking in recreational activities (e.g. walking, jogging, or fishing)	3.1.1.1	42	**3.98**
Learning or teaching about the environment	3.1.2.1, 3.1.2.2	42	**3.88**
Experiencing cultural heritage/associate with cultural identity (e.g. native species)	3..1.2.3	42	**3.81**
Inspiration to create something (e.g. photograph, painting, poem, or song)	3.2.1.3	42	3.29
To meet friends and/or to take part in social activities	3.3.1.1	41	2.98
For spiritual/religious purposes	3.2.1.2	41	1.44
Cultural ESs– Abiotic			
Things in the physical environment that we think are important to others and future generations	6.2.2.1	33	**4.12**
Things in the physical environment that we can experience actively or passively (e.g. beaches)	6.1.1.1	35	**4.11**
Things in the physical environment that are important as symbols (e.g. a mountain or a river with cultural significance)	6.2.1.1	34	3.29
Things in the physical environment that we can study or think about (e.g. for academic study or rock faces for climbing)	6.1.2.1	35	3.06

Both biotic and abiotic cultural ESs were generally rated very highly with the exception of *spiritual/religious purposes* (1.44). Like the RSG, this may reflect a decrease of importance placed on religion by the local people.

Conclusion

The language used in the CICES has been brought into question. The lack of use of the Ballyvergan Marsh is significant, however the development of the Midleton-Youghal Greenway is expected to enhance the usage and increase accessibility to both the Ballyvergan Marsh and the Claycastle site. *Table 17* illustrates the average importance rating of the categories of ESs.

Table 17 *Average ratings for ESs by category for the public*

Average of all ratings	**Importance**
Provisioning ESs	2.82
Regulating ESs	3.62
Cultural ESs	3.59

Chapter Conclusions

From the ESs assessment we see that regulating and cultural ESs were primarily delivered in the estuary area and the PDS. The proximity of the PDS to the estuary and the coast mean that ESs related to the regulating of water conditions and water flows in the area are likely to be important, in fact some of these are delivered by the PDS. Their position relative to the water bodies also enhance cultural ESs which are found in abundance in the estuary and PDS.

All six of the policy instruments outlined in Schmidt and Seppelt (2018) could be identified in the policy plans that were summarised in section 4.2.1. However, two policy appeared regularly and were further observed in the recent GPs that were summarised in section 4.2.2. These policy instruments were *regulating use through protected areas and recognition of their value* and *direct public investment in ecological infrastructure and restoration.* Two other policy instruments, *extending accounting systems through nature-based indicators* and *rewarding benefits through payment markets,* are alluded to in the RSES, however how these would be operationalised is unclear at this stage. Also, the categories of ESs that the GPs seem to support are both cultural and regulating.

In relation to stakeholder prioritisation, both surveys indicated that *minimal development -few facilities but accessible* was the preferred development method (see *Figure 14* below). For the options given as to why ESs enhancement is important, *enhancing social wellbeing,* followed by *protecting native species and existing habitats,* ranked highest in the Public survey (See *Figure 15* below). It is worth noting that these results were collected during the COVID-19 lockdown. The RSG survey ranked *protecting native species and existing habitats* ranked highest followed by *enhancing social wellbeing.* In relation to ESs categories, cultural and regulating ESs were ranked higher on average relative to provisioning ESs.

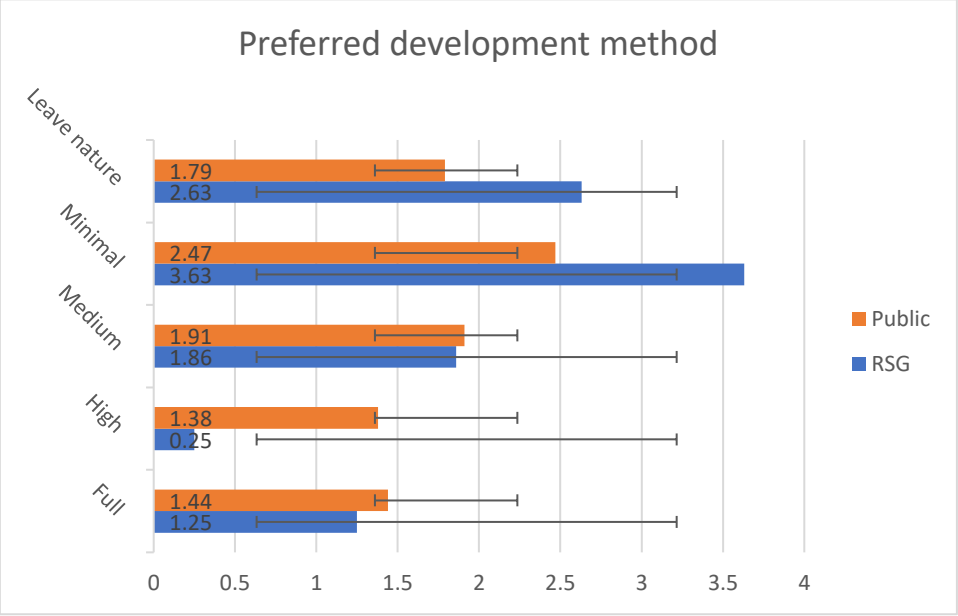


Figure 14 *Average rank of preferred development methods to enhance ESs. Indication of ± 1 standard deviation of the mean is shown.*

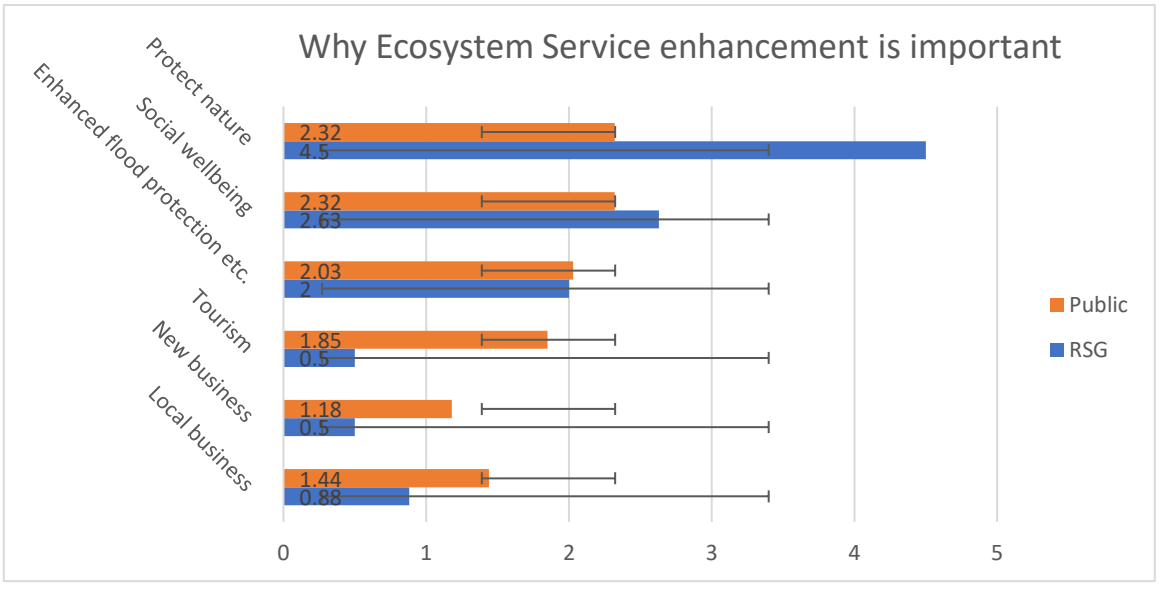


Figure 15 *Motivations as to why ESs should be enhanced. Indication of ± 1 standard deviation of the mean is shown.*

5. Analysis of Results

This chapter first discusses the opportunities related policy for ESs incorporation, highlight which policy instruments are most prevalently indicated by current policy plans and GPs and how these could be arranged in new policy plans. Secondly, an analysis of the survey and interview results are broken down into three sections: Cork County Council, the RSG and the Public. Finally, a discussion of the synergies between policy opportunities and stakeholder prioritisation takes place.

5.1 Policy Opportunities

From studying the policy documents at the regional and local scale it is evident that, although ESs have been preliminarily incorporated into the regional policy (the RSES), there is much room to solidify and develop the concept. This may be due to the ambiguity which still exists in the use of the concept of ESs in academia, which was mentioned in the Schröter et al. (2014)[8]. The new Cork County Development Plan, which is due to be published in 2022, will provide an opportunity to draw from new policy instruments and concepts that have been developed in the policy documents that were examined in section 4.2.1. Whether the concept is seen as something that is valuable at a local policy level will entirely depend on how it is portrayed at a higher level, i.e. The Southern RSES and County Development Plan.

With regards the policy instruments that have been discussed within the documents in section 4.2, we see that all six instruments mentioned in Schmidt and Seppelt (2018) have been indicated either explicitly or implicitly. Of these, it is clear from the GPs that have been discussed in section 4.2.2, that *regulating use through protected areas and recognition of their value* and *direct public investment in ecological infrastructure and restoration,* are the most prevalent policy instruments. The Midleton-Youghal Greenway Approval Process and the Youghal Eco-Boardwalk, respectively, support these policy instruments. The Ballyvergan Marsh Biodiversity Action Plan is a GP which further supports *regulating use through protected areas and recognition of their value*. The Ballyvergan Marsh is an pNHA (recognition of national importance), an area of high biodiversity and provides several regulating, cultural and provisioning ecosystem services. The Biodiversity Action Plan implicitly aims to ensure that these ESs remain intact and the areas biodiverse nature is not damaged.

The RSES alludes to *extending accounting systems through nature-based indicators*, which may be the future in quantifying ESs using ecological and monetary units of measurement where deemed appropriate. For many ESs, these accounting systems do not yet exist and are

[8] ESs in Fisher, Turner and Morling (2009) are defined as ecological phenomena while MA (2005) allow things outside of the ecological system, which account for many cultural ESs.

sometime away from implementation at a local level where it would make a difference. Rudimentary accounting systems documents may be similar to the Ballyvergan Marsh Biodiversity Action Plan, where actions are sorted into priority and non-priority categories and an estimation of the price to complete an action is stated. Within this plan a “plan to re-survey entire pNHA and develop [a] management plan” further highlights how this policy instrument might be modelled with the essential task of re-assessing accounting systems (SECAD, 2017)

Related to the accounting systems is *rewarding benefits through payment markets* which is also indicated in the RSES. Like the accounting system instrument, the details for payment markets have not been established. There are many questions related to instrument, such as what ESs should be rewarded, who pays for the ESs, who gets paid for ESs and how is the concept of supply-demand incorporated into these payments. PES is a concept that is discussed in academic literature and is mentioned in the RSES. Initial decisions related to which ESs need to be paid for and how ESs are paid for (i.e. direct payment, tax incentives, market incentives) is an activity that would involve analysis at a local level but would need approval at a regional or even national level. This PES could be received by private or public actors who are enabling the delivery of (and enhancing) ES. Eventually, accounting systems and payment markets may be the only way to ensure the enhancement of much needed ESs for a growing world population. However, developing these systems would be complex and an ethical argument could be made against creating economic systems which govern ESs.

Policy instrument 3*, Reforming environmentally harmful subsidies* seems to be an area of opportunity to redirect funding to practices which are less environmentally damaging and hence lead to a better ecological status of the River Blackwater and Blackwater estuary. The statistics from the Central Statistics Office (CSO) (see *Appendix 5*), indicate that subsidies can be classified as directly or indirectly causing environmental degradation. In this case, alternatives to such subsidy should be explored. ESs could be used here to determine what services are being deteriorated and which services need to be enhanced to alter or completely change the nature of the subsidy.

Addressing environmental degradation through regulation and pricing is likely to be a policy instrument that will remain in force at all levels, from EU to local, to discourage improper use of the environment. The GPs discussed earlier, such as the Youghal Eco-boardwalk and the SECAD bird hide would penalise perpetrators of local, national and EU environmental degradation policies if caught. Furthermore, any legal dumping or deposal of waste into the River Blackwater or Blackwater estuary should be made more expensive; with activities becoming more costly and, where possible, should be made illegal.

The term ESs, although used within the RSES, Cork 2050 and the Public Consultation Document for the new Cork County Development Plan 2022, still lacks the ability to systematically engage with the concept. The use of the term “ecosystem services” in Cork 2050 is explicitly implied as underpinning the term “green infrastructure”. The link between this definition and certain ESs, such as bioremediation or the use of genetic material from plants and animals for enhancing a population elsewhere, is not immediately apparent.

The policy instruments discussed above offer avenues to which engagement could be made possible. However, unless the value of the concept is recognised and is fully establishment in Policy Plans these cannot be realised. In several of the documents the concept of “ecosystem services” is a term that is being considered under the concept of “green infrastructure”. A re-evaluation of this decision should be considered as, the value of ESs is not entirely captured under GI while the value of GI can be captured under ESs, as well as, Transport and Mobility, Built and Natural Heritage, and Tourism. Cork County Development Plan 2022 is a key opportunity to develop this idea further.

5.2 Stakeholder Prioritisation

This section outlines what ESs are important, what development method re preferred and the reasons why ESs should be enhanced from the perspective of different stakeholder groups, namely, Cork County Council, the RSG and the Public. This section address Q1.4.

5.2.1 Key actor – Cork County Council

Two representatives from Cork County Council completed the RSG survey and an interview was conducted with a Senior Executive Planner.

In relation to the survey and specific ESs, provisioning ESs all ranked relatively poorly on importance and potential, indicating that provisioning ES are not of prime concern in the estuary area and the development sites. The regulating ESs that ranked highest, indicate that the management of waterflow and the regulating of freshwater quality in the river are of prime importance. As a town sitting on an estuary and the coast this makes intuitive sense. *Pollination* and *providing a nursery population and habitats that can be useful to humans* also rank highly. This corresponds to the preferred development method average ratings out of 4.5/5 for *minimal development*, 4/5 for *leaving nature to its own accord* and 3.5/5 for *medium development*.

The highest ranked reason for why ESs should be enhanced also verifies this, with both member of Cork County Council ranking the *protection of native species and existing habitats* as the most important factor, with *enhancing flood protection, carbon storage and regulation of climate-related processes* acquiring the third most popular rating. *Regulating the global*

climate, natural processing of wastes and *regulating living conditions by the physical environment* were also highly rated biotic and abiotic regulating ESs, respectively. It is worth noting that the sole drinking water source for the town of Youghal comes from a stream in Boola, Co. Waterford. The estuary or groundwater are not being considered as a source of drinking water[9] (see *Appendix 2*). The estuary or the sites are also not currently being considered as areas to generate electricity.

The second highest average score for why ESs should be enhanced was *enhancing social well-being*, this relates to the high rating for many of the cultural biotic and abiotic ESs. This reflects the importance of the biotic and abiotic features, such as bird species and beaches, respectively, that play an important role in the societal well-being for the people of Youghal.

Concerning the development sites and the interview that was conducted, it was noted that there is not yet, a development site that is clearly favoured by Cork County Council. Currently, the Midleton to Youghal Greenway and the extension of the Youghal Eco-boardwalk seems to be making precedence currently. When the greenway is complete, both the Claycastle site and the Ballyvergan Marsh will be much more accessible to the public. The success of public consultation further emphasises the success of the project process in relation to the acceptance of the Greenway. The Delta Lady project will look to establish ESs within regional and local policy and when these sites, along with the Slob Bank, have been made accessible through the greenway, ESs may be a tool that can be used to determine the best way in which to use and develop these sites further.

5.2.2 The RSG

The RSG survey brought together the opinions of eight groups and organisations through the Delta Lady project. The results indicate that the group values development methods which cause minimal damage and transformation of the natural environment and are their motivation to enhance ESs are primarily environmental and social.

The services that the RSG valued were quite like that of Cork County Council. Of the provisioning ESs, *Wild Plants for nutritional and material purposes* and *Genetic material* being valued seems to correlate with the desire to develop sites in such a way as to preserve the natural environment. Also indicated is the interest in the tidal, wind and solar energy as a possible renewable energy source. With the details of the Green New Deal coming to fruition, an exploration of renewable energy feasibility will likely take place in many areas previously not considered. The regulating ESs that were valued were once again in line with the desired

[9] This was only discovered during the policy document analysis and the interview; hence the importance and potential of ESs related to drinking water were still raised in the RSG survey and the first version of the Public survey which was circulated.

development methods aiming to preserve the natural environment and enhance biodiversity but also deal with a key concern for the town that is the management of water and protection of water quality, being both a coastal town and sitting on an estuary. Flood events in recent years warrant this being of prime concern. Like with Cork County Council, many cultural ESs were valued very highly. This is possibly partially due to the ease of understanding of these services. Although motivations for the enhancement of ESs were not economic, high cultural value in an area inevitably lead to tourism and the betterment of the local economy. Cultural ESs also lead to a higher quality of life for residents and offer opportunities for education, leisure, and immersion into the local environment.

5.2.3 The Public

The public, along with being asked what was asked in the RSG survey, were asked how the development sites were used and what amenities they believed would enhance usage.

Like Cork County Council and the RSG, the public indicated that their preferred development method was of *Minimal development.* However, *Medium development* was preferred to *Leave nature to its own accord* which was seen in the RSG survey and by Cork County Council This indicates that although the public are willing to accept, at some level, a trade-off between the natural environment and facilities.

We see also that when looking at motivations to enhance ES, *Social wellbeing* and *Protecting native species,* followed by *existing habitats* and *Enhancing flood protection, carbon storage and regulation of climate-related processes.* Given that this survey was distributed during the COVID-19 lockdown, this may have skewed motivations. Also, major flooding events have occurred in recent years which may have contributed to this the high rating for *Enhanced flood protection, carbon storage and climate-related processes* and associated ESs.

Considering provisioning ESs, the high rating of both wild animals and plants for nutritional purposes. This may relate to people valuing wild plants and animals in general, as well as, anglers fishing for nutritional purposes, for example. Regulating ESs that were valued were similar to the ESs that were valued in the RSG survey. Particularly ESs related to water flows and biodiversity, the biotic environment spreading the seeds of wild plants for instance. Cultural ESs were rated as highly important in general. These ESs likely resonated easier with the public than some of the more ecological and academic language which may have also contributed to the high ratings.

In terms of usage of the development sites, the Ballyvergan Marsh was cited as being used to observe nature and for walking/dog-walking far less than the other two sites. It is noted that when answering the survey many people likely indicated they used the Claycastle site when they used Claycastle beach. This may have altered the statistics for the usage of the

Claycastle site. However, with the high ecological value of the Ballyvergan Marsh, a high percentage of people having not used the pNHA for any kind of nature observation o recreation, indicates that the site is not being utilised to its full potential. Many people stated that inaccessibility was an issue. The sustainable development of the Marsh alongside measures to ensure that it is protected is crucial to ensure the habitat continues to thrive while access is granted to the public. This will be first realised through the Midleton-Youghal Greenway, along with granting access to the Claycastle site. The public survey indicated that the public would like to see the Slob Bank developed the most. From the site visit, the Slob Bank is an area of natural beauty and high ecological value, as well as having historical significance. Suggestions to included improving the surface and making the path a circular walk, rather than having to walk back into the town along the main road may be realised. The Youghal Landfill site stands at the Northern end of the Slob Bank, which is under the ownership of Cork County Council, so it may be a project that could be realised in the future, however the ecological sensitivity of the area may prevent this form of development. The Claycastle, compared to the other two sites, may not have issues with ecological sensitivity and is a "blank canvas" as on respondent to the Public survey noted. It is also relatively central to the town and is located right behind the popular Claycastle beach.

Amenities that were requested for the enhanced usage of each site were relatively rudimentary and could likely be developed in on the Claycastle site and the Ballyvergan Marsh as part of the Greenway project and on the Slob Bank if deemed necessary.

The issue of the effectiveness of the current description of ESs arose during the Public survey. If the "simple descriptor's" for ESs outlined for the CICES V5.1 cannot be understood by the lay person this may cause communication and acceptance issues between policy makers, academics, and the public. When looking to incorporate the concept into policies, it is essential that these ideas are easily understandable for not only the people who are writing them but for the people who are affected by them.

Chapter Conclusions: Synergies

The analysis of the surveys and policy documents indicate the usage of certain policy instruments based on stakeholder prioritisation. This section address Q1.5

In relation to the category of ESs which are delivered in the River Blackwater estuary and PDS, regulating and cultural ESs were prevalent. Regulating and cultural ESs were also valued highly by the stakeholders and the GPs that were identified also supported these categories.

Direct public investment in ecological infrastructure and restoration may be required to enhance the many cultural ESs that were valued by the RSG and the public. Those who

expressed the desire to protect PDS, especially the Slob Bank and the Ballyvergan Marsh, may desire to have their *use regulated through protected areas and recognition of their value.* The Slob Bank, being built during the famine, certainly has claim as a heritage sites while the Ballyvergan Marsh is already recognised as a pNHA, with the possibility of been recognised as an NHA in the future. Both the RSG and Public surveys highlight the importance of regulating the quality of freshwater (and saltwater in the Public survey) while may be realised by less harmful practices upstream related to industry and, more specifically, agriculture. Reducing the amount of expenditure on subsidies which could harm life in the river and estuary could lead to a positive impact on biodiversity, as well as being useful to humans by allowing the beaches in the local area to retain status as clean beaches with high water quality. Reducing harmful practices may also enhance the ability of other waste/pollutant processing ESs to be enhanced. *Direct public investment in ecological infrastructure and restoration* and *regulating use through protected areas and recognition of their value* are likely needed to also protect and enhance regulating ESs.

Of note, Pollination was very highly rated in all surveys. This may be due to the effectiveness of communication with the public of the importance of native pollinators and the importance of bees. The All-Ireland Pollinator Plan 2015-2020 (Fitzpatrick et al., 2015) is an example of an initiative that supports such actions. The success of this initiative may define a strategy to encourage the enhancement of ESs that are important in the local area.

6. Conclusions

This thesis used a method involving ESs identification, examination of current policy plans and GPs, and gain an understanding of what different stakeholders' value in relation to ESs to make policy recommendations. These recommendations outline how ESs may be incorporated into regional/local policy for the area surrounding the River Blackwater estuary. Incorporating not just stakeholder engagement but also engaging with the local area, through the identification of GPs to see how policy plans relate to the area get translated to real life projects and processes, is what makes this research distinctive.

Determining which ESs existed in the River Blackwater estuary and the PDS was a key first step in the method that was developed for this thesis. Generally, the sites were deemed to deliver numerous regulating ESs, and cultural ESs. The delivery of provisioning ESs was less evident on the sites.

The four identified good practices relate to ESs by supporting regulating and cultural ESs, as well as indicating the use of several policy instruments, outlined in Schmidt and Seppelt (2018), which can potentially encourage an ESs-approach.

Having identified all the policy instruments in Schmidt and Seppelt (2018) in the policy document analysis, several strategies were possible using a combination of these. ESs could be developed as a core concept within policy or it could be a complimentary text to established core concepts, such as GI. We see how prominent the policy instruments that could be related to an ESs approach already exist with the policy plans. These already prominent instruments may form a good starting point to incorporate the concept. The two most prominent policy instruments that were identified in the policy plans were policy instrument 6, *Direct public investment in ecological infrastructure and restoration,* and policy instrument 5, *Regulating use through protected areas and recognition of their value.* With the inclusion of ESs, mainly under a section called Green Infrastructure in Cork 2050 and the Public Consultation Document for Cork County Council Development Plan 2022-2028 an opportunity to establish ESs as a primary topic in the Cork County Development Plan 2022-2028 exists. The indication of the desire to *extend accounting systems through nature-based indicators* as was seen in the RSES could prove to be a useful tool in accessing policy options and with adequate backing such an accounting system could aid in the formulation of new policy arrangements.

From the surveys we saw that the primary motivations for enhancing ESs were primarily for social and ecological reasons, however the primary aim of Delta Lady is strengthening the regional and local economy. Therefore, the aims to enhance social and ecological wellbeing,

must also be coupled with avenues for local people and local businesses to obtain some economic gain through the policy arrangements associated with ESs. Many cultural ESs and regulating ESs were rated highly in the surveys so these ESs should be protected and enhanced. How should this be achieved? We can see that many GPs in the area involve developing ecological infrastructure and that it has been successful, the Youghal Eco-boardwalk for example. Ensuring that further development enhances cultural ESs but does not disrupt or damage regulating ESs, water flow regulation for example, is also important while having the economic value to the local area. With a long-term goal of creating a town with a larger population, creating the need for more local businesses while maintain the same ecological and social quality that exists in the town today is pertinent.

The primary synergies existed in the fact that cultural ESs were valued highly by all stakeholders and the most prominent policy instruments, along aside the fact that many of the good practice identified supported the importance that was placed on cultural ESs. Importance was also put on many regulating ESs related to water quality and water flows. The importance of water and the estuary could be seen in the SAC and SPA status of the estuary; policy instrument 5, *Regulating use through protected areas and recognition of their value* was referenced either directly or indirectly in every policy plan that was examined.

From what was observed throughout the report then, recommending that ESs be established as a primary topic in the Cork County Development Plan 2022-2028, using the four policy instruments. *Direct public investment in ecological infrastructure and restoration* and *regulating use through protected areas and recognition of their value* are already prominent in current policy plans and could continue to be under the topic of ESs. *Extending accounting systems through nature-based indicators* and *rewarding benefits through payment markets* are the other two instruments which form a part of this strategy. Many stakeholders would need to be involved to realise and operationalise these policy instruments, however they could form the long-term goal and development of the concept of ESs within regional and local policy.

The Claycastle site, being the chosen area for development, brings together an opportunity to develop and enhance ecology, ensure that any regulating ESs that it provides, especially in relation to waterflows and flooding, is maintained and becoming an area that delivers numerous cultural ESs. The greenway project which is set begin development of the site will provide a canvas to begin this journey of development and delivery of ESs for the people of Youghal.

All things consider, the use of this method has proven to be a useful tool in the identification of how ESs could be incorporated into the policy of an area. This method is replicable and can

be used at a range of different scales. This method of engaging with people and practices is deemed to have given a greater understanding about how policy works in the area surrounding River Blackwater estuary. Further integration of concepts that could be integrated into such a method, such as supply and demand, may also be used to refine this approach.

This thesis was complete to aid the Delta Lady project. Similar case studies using this method are recommended to further enhance the techniques that are used and to contribute to the goals of the projects.

7. Recommendations

Incorporating the concept of ESs as a primary topic in Cork County Development Plan 2022-2028, a key opportunity to establish the concept of ESs and a systematic approach towards ESs. This includes policy instruments, based on and building on the most recent instruments that were indicated in the policy document analysis and taking into the account of the values held by the public, the RSG and Cork County Council

This thesis recommends the establishment of “Ecosystem Services” as a key topic within the Cork County Development Plan, under which Green Infrastructure would become a sub-concept to ESs and other relevant topic such as Transport and Mobility, Built and Natural Heritage, and Tourism. *Direct public investment in ecological infrastructure and restoration*, is a key instrument that should be highlighted. The restoration of ecological infrastructure, in particular, should always be considered before new development as restoration projects are nearly always going to be more sustainable. An example of this form of restoration being the Midleton to Youghal Greenway, as its primary function as a railway line, which is now redundant, is now being repurposed. Secondly, *Regulating use of areas through protected areas and recognition of their value* should be used to remind of the significance of sites that receive a protected area status. Respect for the environment in its entirety should be emphasised but through statuses such as pNHA, SAC, SPA and other heritage and protection statuses, a story can be told and creates a place to visit, enjoy, learn, and appreciate. Thirdly, the work that has begun on *Extending accounting systems through nature-based indicators* and *Rewarding benefits through payment markets,* which was discussed in the Southern RSES, should be encouraged to continue and possible methods to realise these instruments should be examined. Importantly, the language used to write this needs to be simplified and the concepts need to be broken down so they can be understood by a layperson. The Public survey had to be amended because, at least partially, the language used was too difficult. To ensure that this concept is successful in regional and local policy it needs to be simplified.

These four policy instruments are deemed to be the best strategy towards establishing the concept of ESs in regional and local policy plans. The other policy instruments that were discussed are still deemed to be useful, but these methods could be applied to other policy areas. For example, *Reforming environmentally harmful subsidies* is likely to contribute to the enhancement of certain ESs however the initiative to reform subsidies needs to be taken at the national level within the applicable government department.

This report recommends local public surveys to get an idea of what the local people value. These values can then be considered when development projects are taking place. The development of the Midleton to Youghal Greenway offers a great opportunity to consider such

ESs that are value by the public and the RSG. Pollination for example was rated very highly all around and ensuring that wild flowers and plants can return to the areas in which development took place, along the sides of the greenway, for example will ensure that these projects receive input from all levels.

From the site visit, the RSG and Public survey along with the interview with Cork County Council the development site that seems to have the most potential for the development and enhancement of ESs is the Claycastle site. The Claycastle site does not offer much ecological value, however, what habitat does exist can be established and enhanced. The real value of the Claycastle site is in the cultural and regulating ESs that it can provide. One of the issues with the site is that it is prone to flooding. Ensuring that development that occurs on the site allows the site to flood naturally while maintaining and enhancing its ability to drain is important to the success of its development. The location of the site is also ideally situated relative to the town. The old Youghal train station is located on the site and is designated start to the greenway project. This provides another opportunity to enhance cultural ESs there is and to restore the train station as to preserve it for future generations. The reason for choosing the Claycastle site over the Ballyvergan Marsh is simply that the greenway is set to open up the marsh to the public but it seems logical that the area where the greenway will start in Youghal should be considered before considerations to develop along the greenway. The Slob Bank would have been the second choice; it is the most accessible and used of the three sites and is an area of natural beauty and ecological value to the local area. Amenities which would not require intense development that were suggested included bins and seating areas, which could be considered. The Ballyvergan Marsh then, synchronously with the greenway will likely be considered for further sustainable development. Some form of raised viewing area in the future could provide a beautiful view of the marsh, allow people to observe the wildlife and habitat and believe that the site would become a significant tourist attraction for the town. However, as the Claycastle site is currently in the ownership of Cork County Council, combined with its location and potential ability to provide a host of ESs, this report would suggest that it would be the chosen site to be developed.

More work is needed to be done to further refine and develop the method used for this thesis, but what is provided is the framework of a strategy to incorporate ESs elsewhere. The techniques used for this thesis were rudimentary. With more time, a more sophisticated procedure to identify ESs and GPs could be deployed. Assumed in the report is the fact an ESs approach is implicitly implied under different categories as the policy instruments that support it are seen in many places. The benefit then to explicitly addressing ESs in the recognition on the value of the ecosystem to humans, allowing it to be at the fore front of our mind and our policy.

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Appendix 1

There is a national legal planning framework in place which requires a Strategic Environmental Assessment (SEA) to be carried out as part of plans such as the RSES. This is done to insure accordance with national and EU legislation, namely with Article 15G of the Planning and Development Regulations (S.I. No. 436 of 2004) and Article 8 of EU Directive 2001/42/EC regarding decision making, which both involve information concerning the development of SEA's (see SRA, 2020). Accordance with general regional planning guideline are also adhered to as outlined under Article 24 and 25 of the Planning and Development Act 2000.

Article 18, 19 and 20 of the Planning and Development Act 2000 are regarding the development of local-level development plans, that policy arrangements (made in this report or otherwise) would be obligated to adhere to. These articles cite the requirement for relevant stakeholder participation and sustainable development. However, this report was interested in the policies contained within these documents and assumes compliance with national and EU legislation.

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Appendix 2

Regarding water quality of the River Blackwater estuary, the opening of the WWTP in Youghal in 2018 has contributed to improving the ecological status of the river, however the levels of P and N loading may be effected by the removal of the milk quota system through the possibility of the further intensification of land use leading to larger quantities of these nutrients being applied (O'Boyle et al., 2017). The water quality of the estuary directly effects the beaches in the Youghal area, including Claycastle beach. An impact from the implementation of the WWTP, can be directly seen as the water at the Claycastle beach received a rating of 'Excellent Quality' in 2019 after receiving a rating of 'Good Quality' for the three previous years (EPA, 2020). In 2020, the beach was also awarded Blue Flag status for the first time since 2011. These are significant assets to the town, and it is suggested that facilities, such as toilets, showers and changing areas are maintained and developed where necessary to encourage use.

The water-supply for the town is solely supplied by the River Glendine in Boola, Co. Waterford. Groundwater is cited as the only possible alternative source of drinking water in the area.

However, a large portion of Youghal is classified as either being vulnerable or extremely vulnerable to flooding due to the high groundwater level (Youghal Town Council, 2009).

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Appendix 3

Transcript of Interview with John Lalor from Cork County Council:

So, the first question is regarding to the slob bank, and I just like to know if you are aware of any kind of development that is happened during the last couple of decades.

Yeah, I just want to start off as a caveat, and the general local knowledge, I wouldn't specifically have that but whatever I do know, whatever I've gleaned from last year's working on the [Delta Lady] project I will pass on. Yeah, and in relation to the slop bank. I' unaware of any recent developments, I think it's mainly used by walkers and fishermen and anglers, that sort of stuff. Obviously, there is some signage that has been erected in relation to the south and east bird trail, at bought ends. One up by the Recycling Centre at the northern end and one at the pedestrian entrance down at the southern end. There has not been any major tangible development I suppose that I am aware of.

And are you aware of any plans?

So, I think back in 2018, just from talking to the municipal district office, there had been an application made under the NPF, or national planning framework, under the rural regeneration development fund in 2018. They had a kind of an idea for developing a pontoon and a marine area down at the southern end, there is two larger fields at the southern end just up from shipping yard. As you are aware, and the rest of it is a narrow strip which runs in a northern direction. So, what they looked for was about €21,000 funding application. It's a phase delivery, there looking to deliver a new public carpark, port cabins, slip, boat storage repairs, purpose built marine centre, I think and a small pontoon and

possibly to develop that into larger pontoon. Ultimately [the goal is] to try developing more of the water related potential. The application was not successful, but I do know that it is something that the local office is keeping in mind with regard to any future development proposals in the area. When you get a chance to get down there David, you will see that there definitely is a bit of untapped potential in terms of relationship with water in Youghal. Then, I suppose that is what that is what the thinking is with that land that is in the council ownership, can anything be done there to try and improve that.

From the results of the survey I see people were recommending some of the things you just mentioned. I was down there [at the Slob Bank] yesterday and it is a beautiful area. So definitely, there is potential for some kind of development. My next question. Are you aware of kind of resistance from people looking preserve the area or would you be aware of anything like that?

Keeping to the Slob bank, I was not personally involved in the funding application, but I can say generally resistance takes the form of official objections to planning applications as part of that procedure. My personal opinion would be that I think that locals are generally supportive of development of proposals that would enhance the water recreation facilities in Youghal. As mentioned, there is definitely untapped potential. In that particular instance the Slob Bank proposal was more of a funding applications so it (objections/resistance) wouldn't have come in yet in that format because it was not a formal development but there hasn't been anything major otherwise yet. I do think, as a general point the locals would be supportive of that type of development on that site, if their able to get over all the obstacles.

I did notice that from the survey as well a lot of people said, there could be something done with area so very good. Are you aware of what effects that the SAC and SPA statuses have on the Slob Bank because obviously, they are right beside the estuary there, and so would you be aware of what kind of effect that would have on development?

You could say it could be restricted to a point, but any development proposal would have to go through full environmental and ecological assessment. I would be the view in relation to Slob Bank, a full ecological assessment of all protected habitats and species would have to be done to establish a baseline, and then that should inform any development proposal on the lands. So I think that's the key starting point, that's a particularly kind of sensitive area as well in relation to bird species so you definitely need that done before going ahead with anything else there I would imagine.

Yeah very good. Moving on down to the Claycastle site and I suppose Claycastle and Ballyvergan [Marsh] are joined and, again, I will start off with are you aware of any current developments going on the Claycastle site. It has been derelict now for a while.

Claycastle is kind of a legacy site, it has been in council ownerships a good while and I am not aware of anything. I think it's been something of a problem site, it's something that's been in ownership and we're looking for something to be done with it, but it is a tricky one.

Yeah, absolutely. So that is under council ownership is it?

Yeah, its 21 acres I think, and it is all in public ownership.

Okay, very good. I suppose with the new Greenway coming, that's definitely something that is going to happen so is there any plans for amenities around that [in Claycastle] or is the main focus on the greenway at the moment?

The Greenway is the main thing that is happening. What we are hoping, through Delta Lady, you know, the greenway could act as a stimulus for something else to happen on that site, and I suppose there isn't anything concrete or present, but we're working closely with local municipal district office to see what potentially could be done that would have an ecosystem services theme. Given that the site is in our ownership, we've kind of been given the steer that it may be the preferable one (site) from the council's point of view in terms of land ownership restrictions alone, there's no issue from that point of view. So, we're hoping to assist through the project obviously we can't deliver anything physically through the project we're to assist the channels and maybe try and work with the municipal district office or community groups or whoever, to see what can be done down there. Ideally, we would like to leave a legacy from the project, and we'll see what happens in the next year or so.

Absolutely. And what have been the big barriers then because it has been there for a while and you have said it has been something of a problem site so what are the big issues with it?

Well, when I say problem site-, you have been down there you have seen the photos and stuff, it is an irregular site configuration, there is flood risks, its prone to tidal flooding. If you

look at the flood risk maps [you will see]. I suppose it is backland location behind a large number of established residential properties that could possibly be a barrier to any potential development, they have a lot of interest in what could happen there. Anything that would be developed on the site would have to be done sensitively, taking into account of the residential amenity of the neighbouring properties and you would definitely get a lot of interest if we were looking to do something down there. Those would be the three main barriers: flood risk, backland, residential properties and the [irregular] configuration.

Okay very good, that makes sense. I was just driving past the site yesterday I am going to go have a look at it today. It seems like a big site and there could be a lot done with it.

The habitat you were referencing David, you said that one of the questions, what were you talking about there, where exactly?

So, as far as I am aware, from what I've gathered from documentation there are small clumps of reed beds within the Claycastle site. Do you think there would there be much pushback in terms of development on that site [for ecological reasons], are you aware of any resistance or do you think that might cause and issue with development?

I honestly think you are not going to get conventional physical development on that site because of the particular characteristics that it has. I would be surprised if a buffer cannot be established around any habitat that warrants it. To my mind, flood risk, insurance, all those factors, it really does impact on the feasibility of development proposals. We'd be looking at some form of complimentary infrastructure there, I wouldn't have extensive hard surfacing or anything like that and we should really be enhancing and trying to promote whatever habitats are there and have something complimentary to assist that so I think definitely could be incorporated and, maybe, enhanced if there is established habitat on the site.

I will move on to the Ballyvergan Marsh site then, obviously the biggest site in terms of size. And again, I will start off with a quick question about any development on the site in the last maybe couple of decades, and if there's plans then as well.

This is probably the site with the most ecological potential, the most natural environment and has the most natural assets, definitely, of the three sites. There has not been any physically development that I am aware of in recent years. Something I am aware of though, there has

been some artificial draining of the lands by private landowners in the area, which has taken place. The legality or otherwise as such, I am not sure but look, it has taken place. I understand, SECAD have probably seen that, they have carried out a survey of the marsh. I think UCC are assessing some of the potential impacts of saline intrusion, and that's probably something you've talked to Tim about, but that's kind of a knock on from the artificial draining and has there been changes to the habitat as a result of that, it's something that I think UCC looking at. You might want to develop that more with Tim. The only physical development David that I am aware of, is the SECAD bird hide up in the north-western corner, that was constructed I think about 2001 or 2002 as part of the rollout of the south and east Cork bird trail. So, the idea behind it was to enhance the awareness of the habitat on the marsh to encourage visits and ecotourism. It has not been as successful as hoped. It is not regularly used. It probably suffers from its physical location at the edge of the town. That is probably the main thing piece of development that has happened on the Marsh in any semi recent times.

Yeah, that makes sense. Yeah, I've gathered from the local surveyed, quite a few people did comment on it [the SECAD bird hide] and requested that there be different locations for observation areas and things like that and a few people commented that the bird hide was close to the public as well. Something I did look into was the Ballyvergan Marsh Biodiversity Plan 2017, so they looked at the saline intrusion there as well. I am going to ask you a question about potential barriers and, in particular the issue with disputed or uncertain ownership of land, would that be probably one of the prime barriers to development at the moment?

I could be wrong but from what I have picked up there is roughly five private landowners and it's a mixture of public and private land ownership. From my experience with previously working in planning, issues such as land ownership directly impacted viability of funding options to deliver development, and it is a key consideration. It keeps coming back from the locals and local office, and anyone I have talked to before, that is the big thing on the Marsh and trickiest obstacle to overcome. As a follow on from the bird hide and the Marsh, just something to be aware of and there are no concrete proposals in place but Youghal Tidy Towns, I've been in contact with them, and they're carrying out a biodiversity action plan for Youghal through SECAD and Wild Works as well. And I suppose an idea they have, and that's all it is at this stage is an idea, is down at the opposite end at south-eastern corner down by the beach, they're looking at the possibility of a Nature Education Centre stroke Community Centre. I suppose from talking to them I suggested that they have a look at

Harper's Island, and what has been done there. Some really good work has been done there in terms of an informal education centre, and it's been a couple of months ago now with the way things have gone (i.e. COVID-19), when I was talking to them last but it's definitely an idea that they have and they are looking into the possibility long term of seeking funding to try and do something. The idea really is to remove the peripheral location, come to a busy spot close to the beach, try and have a prominent place where the appreciation of the values of the Marsh can be given higher prominence among the public. That is something that Youghal Tiny Towns are thinking about as an idea. We will see where it goes. It is on the radar.

Very good. One of the big statistics I picked up from the survey considering the three different sites was the amount of people who never visited the Ballyvergan Marsh for anything or any activities, compared to the other two sites. So that is something to highlight, it is untapped, there is quite a few people calling for its conservation as well but definitely holds untapped potential. The development at the corner of the Marsh sounds interesting. I will keep that in mind when I am making recommendations. I appreciate that.

Another thing David is the linkup between the greenway and the eco-boardwalk. That could definitely increase accessibility and awareness as well and I know that the municipal district office are interested in that, it's not in place at the moment but like it's an obvious thing to try and do if possible. They run side by side and it would provide heavier traffic and all that kind of thing. So, that to me would be a thing that would definitely help the Marsh.

Very good. And then a quick question about the status of the Marsh, it's still a proposed National Heritage Area at the moment and do you have any idea what a transition to being a full National Heritage Area would mean for it, or would that affect any possible development plans for the site?

I suppose, from my planning days I have seen those pHNA and they can be in place for many years. Moving on to next stage, and I have not actually even seen it happen too often. It is just a standard consent procedure; you go through all of that. I have not seen directly what is involved in that. It is a balance really, yes, increasing its protection designation potentially could impact [development] but I'd still think it possibly warrants it, you know, it's a really good asset, and it's one of the largest reedbeds around, and it's definitely has a huge

amount of habitat potential as well, that should be preserved so I would be leaning more towards the protection side anyway. I am not aware of any push that has been on to change that designation. Under the County Development plan submissions, it might come on the radar there. That's under review at the moment with a draft plan due in December, it might be something that could be considered as part of that, I would raise it on the radar but to my knowledge, it hasn't been something that's been pushed.

That is perfect John. Next a question about the new Greenway and the ecological report, has there been much kind of pushback on it or is it largely welcomed by the local people?

The Greenway project manager, I had been in contact with her while, obviously I wasn't directly involved in the greenway project but, I understand the approach that they've adopted it seems to have worked really well, they have taken part in really extensive consultation, with all of the private landowners along the Greenway route. It has not just been the standard box ticking stuff now, they have really engaged and gone back to people and because of that engagement there has been a lot of buy-in to the project. I think they were down in single figures in relation to issues with certain landowners, which is really good given the extent of the area that it is covering. So, I think a lot of the environmental issues, a lot of the concerns people had been alleviated by proposed mitigation measures and what way they are going to do it. There was very comprehensive environmental analysis carried out along the route, and I think initial concerns were potentially allayed really by giving draft proposals of how they were looking to address stuff through mitigation measures. So, effective consultation worked, and I think that reduced the kickback by informing people really.

Then a primary question for yourself John, regarding the Delta Lady project, which site, would you (Cork County Council) believe and you would like to move forward with when taking into account the potential of these sites to enhance these ecosystem services for the goals Delta Lady and boosting the local economy?

The whole idea with Delta Lady is to try and improve the use of ecosystem services, we need to show how they are valuable and in a practical sense that also kicks back to environmental protection and economic growth. So, you are trying to come in the middle there and show how ecosystem services can link up the two. In relation to the site preference, it is probably too early to say David to be honest. I cannot say at this stage. If

you are looking purely from an environment assets point of view, the Ballyvergan Marsh would be the obvious one. But if you are looking at it in a practical feasibility sense, the Claycastle site would be the one that is in our ownership, it has the impetus with the delivery of the Greenway. I think through the project there is definitely an opportunity to highlight the importance of ecosystem services, leaving some form of legacy true complimentary infrastructure potentially on that site. In terms of issues and obstacles, it probably has the least of the three [sites], you know, but all three are still on the table at the moment. We just have to pin down what is the most viable option and run with that in the next couple of months.

Yeah. Very good. A question that might require some local knowledge, but I said I would ask anyway. So regarding the main water source in the town I believe it comes from Boola, County Waterford, I was just wondering what the nature was of that water is, does it come from that stream that runs through the Boola area, or is it groundwater that they use from the area?

I spoke to the engineer yesterday, so the stream feeds into the plant basically, it definitely is where supply come from. Irish Water is fully responsible for it and there is no obvious issues that the engineer was aware of, which possibly explains why it wasn't included in the most recent capital plan. It is a stream feed in from Boola.

Yeah, very good. And then finally John just a question on the policy instruments that Cork County Council like to use when looking to develop a site. I have identified a couple of policy instruments while examining the Regional Spatial and Economic Strategy, Cork 2050, the East Cork Municipal District Plan, and the Youghal Development Plan. I am trying to get a feel for exactly what you would use so I can incorporate that into the policy recommendations that I would use. I suppose the main ones that you may use would be these four: Direct public investment in ecological infrastructure and restoration, so the likes of the Greenway. Regulating use through protected areas and recognition of their value, so the likes of the SPA and SAC statuses. Addressing environmental degradation through regulation and pricing, so maybe fining people for dumping and illegally polluting the river. And then finally, reforming environmental harmful subsidies. So, within Cork County Council and within the Delta Lady project, would there be a particular one of those, or two or three of those that you would most likely use? Perhaps direct public investment, but I am not entirely sure which one you would be more inclined to use.

I suppose through Delta Lady there is a conciliatory networking linking procedure that we're trying to engage in, but a lot of it is to do with the policies side of things and the regulatory side of things, and our focus with the project is really a policy focus. Regarding, direct public investment, we have to be careful with that in relation to an EU project. There are certain constraints there in terms of procedures. So, what we're trying to do is influence the policy framework and, our feed on from that then would be investments through, I guess it could be public funding, if we were facilitating that to maybe raise awareness among groups of potential funding avenues for the system, and maybe go ahead with something. But, in relation to the policy side of things, our main target with policy was at the regional level, the Regional Spatial and Economic Strategy so that has been achieved. They were adopted at the end of January so that is a great win for projects straight off. It was a bit early in terms of the project timeline, but it is a great win. A feed on then from that, now we want to have a secondary focus on, on the local level policy. All the towns in Cork, you mentioned the Youghal Town Development Plan, it's my understanding, the new county development plan is incorporating all of the towns so I'm not sure if there is separate town development plans as such, but then they are going to do that as part of the next framework in the plan. We'll work closely with planning policy unit, and see where is the most appropriate sections, you know, to look at incorporation of ecosystem services, be that a specific objective or be a complimentary text in various spots throughout the plan and we will be hoping that ideally, some local level projects could happen which were assisted through Delta Lady, that could potentially be referenced in development plan. As case study examples of how things can be done so we have set the policy framework, and this is how it can work. So, we will see what come out of that, hopefully it will all come together.

Very good. I appreciate that John, that that was my final question there as well. So, I thank you for your valuable input.

Appendix 4

Other activities occurring at the Slob Bank include *observing nature*, 24.4% (21/86) of respondents at least *2-6 times a week* and 57.1% (12/21) of those respondents specifically partook in *birdwatching*, while *fishing* and *bait-digging* happened less frequently with 8.6% and 7.5% saying they would partake in these activities at least *1-6 times a month*, respectively.

At the Claycastle site, 36.9% (31/84) of respondents said they would *observe nature* at least *2-6 times a week* with 54.8% (17/31) of these people also involved in *birdwatching*.

At Ballyvergan Marsh, 10% (8/80) respondents said they would *observe nature* at least *2-6 times a week*, while 50% (4/8) of those said they took part in *birdwatching*.

Appendix 5

According to the Central Statistics Office (CSO) figures, over €4 billion in subsidies which pose an environmental risk (either directly or indirectly) were issued in 2016 (most recent figures). 61.9% of these subsidies went to 'Fossil Fuel Support' and 36.4% went to 'Agriculture and Food Support' (CSO, 2017). However, 69.7% of subsidies which cause a direct potential environmental risk are in the 'Agriculture and Food Support' sector (CSO, 2017). The River Blackwater catchment, due to agriculture being a prime economic activity and the large region it covers, is likely being affected by these subsidies. This in turn will lead to environmental issues in the River Blackwater estuary. In 2016, €701 million was issued in subsidies which fell into the 'Environmental Protection/Resource Management' domain which included "greening" agricultural subsidies. They may play a role in counteracting the negative effects of potentially environmentally damaging subsidies that are provided.

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