



Integrating management tools and concepts to develop an estuarine planning support system: A case study of the Humber Estuary, Eastern England



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ABSTRACT

Estuaries are important because of their multiple uses and users which often makes them challenging to manage since management must strike a balance between the needs of users, the estuaries' ecological and economic value and the context of multiple legislative drivers. To facilitate management we have therefore developed an Estuarine Planning Support System (EPSS) framework using the Humber Estuary, Eastern England, as a case study which integrates the current legislation tools and concepts. This integrated EPSS framework is an improvement on previous approaches for assessing cumulative impacts as it takes into account legislative drivers, management tools and other mechanisms for controlling plans/projects specific to the estuary. It therefore enables managers and users to assess and address both the current state and the way in which a new industrial, port or urban development could impact an estuary in an accessible and understandable framework.

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1. Introduction

Estuaries are important areas globally for many activities including industry, being hubs for the import and export of goods, tourism, and biodiversity including species and habitats of conservation importance (Elliott and Whitfield, 2011). The increase in the wide range of associated human activities has increased the pressures on coastal resources, causing environmental degradation and societal problems (Borja et al., 2010a, 2010b; Halpern et al., 2008; Berger and Hodge, 1998).

In order to mitigate the risks on these areas and optimise their use for industry, tourism and nature conservation, estuaries are often managed through the use of an estuarine planning or management scheme e.g. the Humber Nature Partnership (Defra, 2014). In the rare cases where one exists, the estuarine planner's role is to sustainably manage an estuary while taking into account the needs of a large number of potentially conflicting users and stakeholders. In order to achieve this, and irrespective of whether the estuarine planning falls to an individual, a committee or a loose arrangement of statutory bodies, an integrated planning system is required to harmonise the policies, management plans, legislation and administration bodies. This paper proposes an Estuarine Planning Support System (EPSS) as a framework to aid sustainable management with a focus on the Humber Estuary but the general approach can be adapted to other estuaries worldwide.

Recent marine and estuarine management worldwide, but especially throughout Europe, has focused on a set of concepts and approaches which are integral to the implementation of several legislative tools but have not been integrated into one planning support system (Counsell and Haughton, 2006; Mee et al., 2008; Hering et al., 2010; Townsend et al., 2011; Whitfield et al., 2012; Borja et al., 2013). The concepts and tools can be summarised as:

- Governance including legislative tools and sectoral management schemes (Apitz et al., 2006; Fujii, 2007; Environment Agency, 2008; Boyes and Elliott, 2014);
- The administrative complexity of marine and coastal management and the need for harmonisation (Boyes and Elliott, 2015);
- Nested–DAPSI(W)R framework (Elliott, 2014, developed from the DPSIR approach in Atkins et al., 2011);
- Risk Analysis and Risk Management approaches linked to infrastructure developments and as a component of Environmental Impact Assessments (Cormier et al., 2013);
- Ecosystem approach (Helsinki and OSPAR, 2003; Elliott et al., 2006; Carpenter et al., 2009; Haines–young and Potschin, 2011; Farmer et al., 2012)
- Ecosystem services and societal benefits (Beaumont et al., 2007; Atkins et al., 2011; Elliott and Whitfield, 2011; Luisetti et al., 2014; Turner and Schaafsma, 2014)
- The 10–tenets for successful and sustainable management (Elliott, 2013; Barnard and Elliott, 2015).

Given this complexity, there is a need by estuarine managers/planners, statutory bodies and by industry for an EPSS framework to

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integrate these into a conceptual model and then a working framework, which is a simplification of but also an aid to the decision making process. Here we use the Humber Estuary as a case study, however the proposed EPSS framework can be used for other estuaries worldwide as its approach can be adapted to other countries' legislative requirements. The framework does not simplify the legislation but rather demonstrates how it should be enacted and accommodated (Townsend et al., 2011; Boyes and Elliott, 2014).

For an ecosystem management and strategic assessment to be successful, the relevant management levels must be identified to ensure all objectives can be addressed i.e. international directives, national legislation and regional plans (Apitz et al., 2006; Boyes and Elliott, 2014). The various water and land uses, including functions and values should also be identified and assessed within the different disciplines e.g. socio-economists, natural scientists, and policy and decision makers.

To ensure holistic management of a system an effective EPSS should: take into account the different disciplines and hence be based on the natural and social sciences; show the legislative aspects that need consideration; identify the steps that need to be taken to achieve the legislative requirements and objectives of the project, and encompass all relevant stakeholders' views (Gross, 2003; Barbier et al., 2011; Townsend et al., 2011). It should be noted that an EPSS is a representation of a generalised integrated estuarine management process to aid and support the decision making process. Hence it will aid in decision-making rather than be an automated mechanism for taking the decision.

This paper aims to present the conceptual basis of the EPSS framework using a real case-study and incorporate the following objectives:

- What legislative drivers and management tools are available already for the management of an ecosystem?
- How can these tools be modified and taken forward with legal requirements to produce an overarching and integrated EPSS?
- How does the EPSS aid in decision making?

1.1. Study area and method for developing the EPSS framework

This study uses the Humber Estuary, Eastern England, as a case study area. It begins at the confluence of the River Ouse and River Trent and flows easterly to the city of Kingston-Upon-Hull where it then flows south eastwards, and enters the North Sea between Spurn Point and Donna Nook (Fig. 1). The Humber drains approx. 20% of the land mass of England and is important for both regional and national economic development, acting as a route for ~20% of the UK import trade in 2012 and 10% of the UK export trade (DfT, 2014). It is also of international importance for its nature conservation features and tourism features and its conservation designations. The high level of economic activity in the Humber Estuary and its many uses and users demonstrate the requirement for sustainable and holistic management to ensure that the features of this estuary will be available for future generations while allowing for continuing economic, recreational and environmental development.

In order to provide the necessary context for management the following section reviews the different legislation, management schemes and tools for the Humber Estuary that should be integrated into an EPSS framework.

1.2. Governance

A key problem in managing a large ecosystem such as the Humber Estuary is defining the hierarchy of decisions within the management framework (Apitz and White, 2003; Boyes and Elliott, 2015). It is important to recognise that the management of an ecosystem needs to incorporate the natural cycles, interactions and relationships, and must not focus on just one aspect in one discrete area. For any estuary, the first step is to identify the high-level managers and stakeholders. The

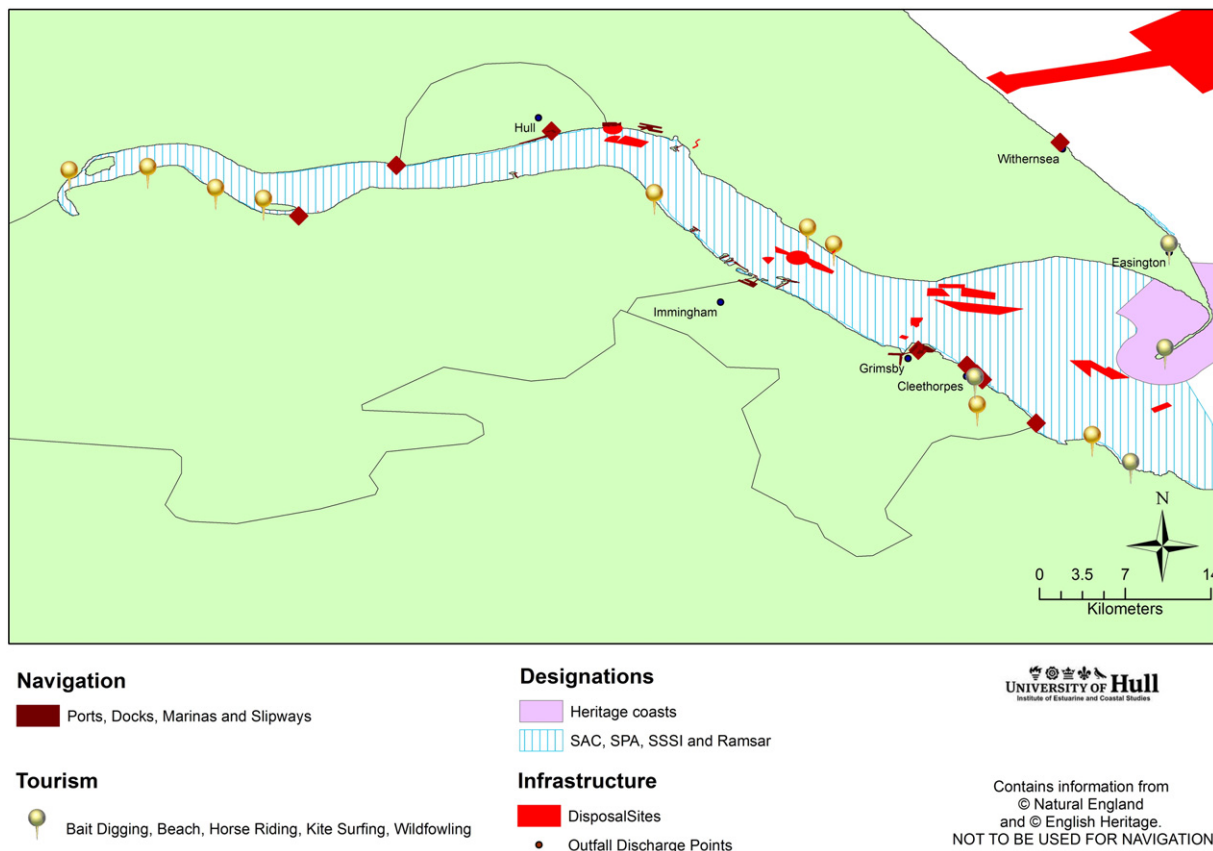


Fig. 1. The Humber Estuary and its uses and users.

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