



Estuarine conservation and restoration: The Somme and the Seine case studies (English Channel, France)

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ABSTRACT

Megatidal estuaries such as the Seine and the Somme (North-Western France) are rather well delimited and human impacts on them are well understood. Since the middle of the 19th Century, there has been a slow but irreversible degradation of the state of these English Channel estuaries. However, current conservation and restoration strategies tend to freeze habitats in a particular state, their status being defined, most often, through a patrimonial or utilitarian approach. Connectedness between biotopes (*sensu* habitat + community) has a tendency to be neglected, especially with regard to main ecological gradients, i.e., salinity. In this paper, evaluation methodologies are proposed with the intention of assessing changes to ecosystem functions, under anthropogenic disturbance, controlled or otherwise. The Seine (a heavily industrialised ecosystem) is compared to the Somme (considered here for its pseudo-natural features) in order to discriminate between oceanic processes (siltation and plugging of estuaries) and anthropogenic influences. Preservation and restoration of habitats rely on a robust scientific methodology. The multi-scale approach adopted in the projects presented here relies on sensitive socio-ecological assessment procedures, tools for evaluating ecological quality, and well-built monitoring programmes based upon pertinent indicators. Such managerial tools were used to refine strategies and make them compatible with the sustainable co-development of resources in a European context. This paper demonstrates how scientists were able to acquire and apply knowledge in the field of rehabilitation and restoration. Jointly with managers and policy-makers, they have brought scientific information and socio-economics together in order to answer questions about the restoration of sites or habitats and to anticipate future propositions in the spirit of Integrated Coastal Zone Management (ICZM).

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1. Introduction

Amongst coastal ecosystems, estuaries need particular attention as interfaces between fresh and marine waters and the atmosphere. They are defined as zones of transition where emerges a water court which discharges into the sea. They are closely connected to the ecosystems adjacent to them. Such interfaces are known as ecoclines (see [Attrill and Rundle, 2002](#)). Estuarine ecoclines are characterised by a double gradient of salinity changes from the freshwater to the sea, and from the sea to the river. In estuaries there are also rapid flux of materials and organisms. They perform various functions, including mediating water flows, accumulating sediments and organic matter, processing nutrients, fertilising adjacent coastal waters and providing opportunities for recreation. This is why the restoration of habitats and ecological functions requires a broad multi-disciplinary reflexion on the definition of objectives as well as of methods. A true consensus on the

necessity of returning lost estuarine areas to the sea is building up in Europe, thanks to adopting an ecosystemic approach and by developing interdisciplinary synergies. Most of the time, functionalities are still found in an estuary, but more or less degraded, as shown in the two case studies presented here.

The coast of the eastern part of the English Channel in North-Western France is bordered by several important megatidal estuaries. All of them have evolved quickly at the ecological scale, due to natural influences but also because of human influences. Naturally, such drowned valleys have a tendency to silt up due to sands carried in by the tide in relation to the current Flandrian marine transgression. Human activities have resulted in very different impacts on hydrology, and on the volume of water coming into the estuaries, which have produced a reduction of the intertidal zones and mud flats, and an increase of shore bars and salt marshes according to the way the estuaries have been managed, whether for navigation and industry or for agriculture and fisheries. The Seine estuary falls in the first category, where, since the mid 19th Century, the harbours of Le Havre and Rouen have dominated all other activities in the area ([Dauvin, 2006a](#)). The case of the Somme estuary (Bay of

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Somme) is different. Land in the Somme was mostly reclaimed for agriculture, while accessibility was managed in an attempt to keep fishing harbours at St. Valery and Le Crotoy operating (Ducrottoy, 1998). In both cases, the estuaries have been much reduced in size and have lost a great proportion of their intertidal areas.

Recently, confronting an emerging demand from non governmental organisations and pressure groups (such as hunters and fishermen) and, to a lesser degree, from the public for “natural” areas, managers and policy-makers have required scientist information on the feasibility of restoring some of the lost or damaged estuarine habitats caused by, for instance, the construction of dykes or because of pollution.

The Port 2000 project (extension of Le Havre harbour) was striking for the extent of the public debate (a first in France) and can be considered a posteriori as having provided an opportunity to think about the global environmental situation of the Seine estuary. In fact, this major development project was the impulse for the creation of both the Global Management Plan for the Estuary and the establishment of the Estuary Council, in which hopes for a better implementation of sustainable development practices in this estuarine zone are founded. In 2004, the Estuary Council asked the Seine Normandy Water Agency (SNWA) to coordinate a forecast study concerning the perspectives for restoring the environmental functions of the Seine estuary by 2025.

In the Somme, ecotourism is developing fast. In order to manage the environment in a sustainable way, local authorities have installed a management body, called Syndicat Mixte pour l'Aménagement de la Côte Picarde (SMACOPI). The syndicate claims restoring and rehabilitating estuarine features as well as opening new facilities to tourists in the area.

The Seine-Aval programme, created in 1995, has been able in the third stage (2004–2006) to bring together people having acquired competences on ecological restoration and the main managers of the Seine such as the independent port authorities (Port Autonome du Havre: PAH, and Port Autonome de Rouen, PAR), and the SNWA in order for them to come to an agreement. In the

Somme, the PICCEL (PICardie: Connaissance et Exploitation du Littoral – Knowledge and exploitation of the coast) programme was launched in 2003, to provide scientific information on possible changes in ecology of the estuary in response to the climatic global change.

The secondary objectives of the above programmes were multiple and included:

1. To gather knowledge on the natural environments and other ecosystems in the estuaries.
2. To examine the potentials for restoration of the habitats concerned in order to restore ecological quality.
3. To suggest long-term actions in order to renovate the estuary from an ecological point of view.
4. To follow-up any required operations.

To begin with, the paper introduces the sites: the Seine and the Somme estuaries. It then considers the methods to be applied. Stakeholders are presented and examples of past restoration experiences are commented on. The discussion opens out onto proposals for better-integrated operations in the future.

2. Site presentation

2.1. Seine estuary

The Seine estuary is the largest estuary in the English Channel, located in its Eastern part (Fig. 1). Its geographic zone of influence runs from just upstream of the Poses dam – some 160 km upstream Le Havre, at the limit of the tidal penetration into the estuary – to the eastern part of the Bay of Seine (Dauvin, 2006a). This zone can be divided into three sections (Fig. 2): the fluvial, or upstream, estuary from Poses to Tancarville Bridge; the middle estuary between Tancarville Bridge and Honfleur; and the marine, or downstream, estuary which opens into the Channel. The freshwater flow of the river at Poses is relatively small ($480 \text{ m}^3 \text{ s}^{-1}$ on

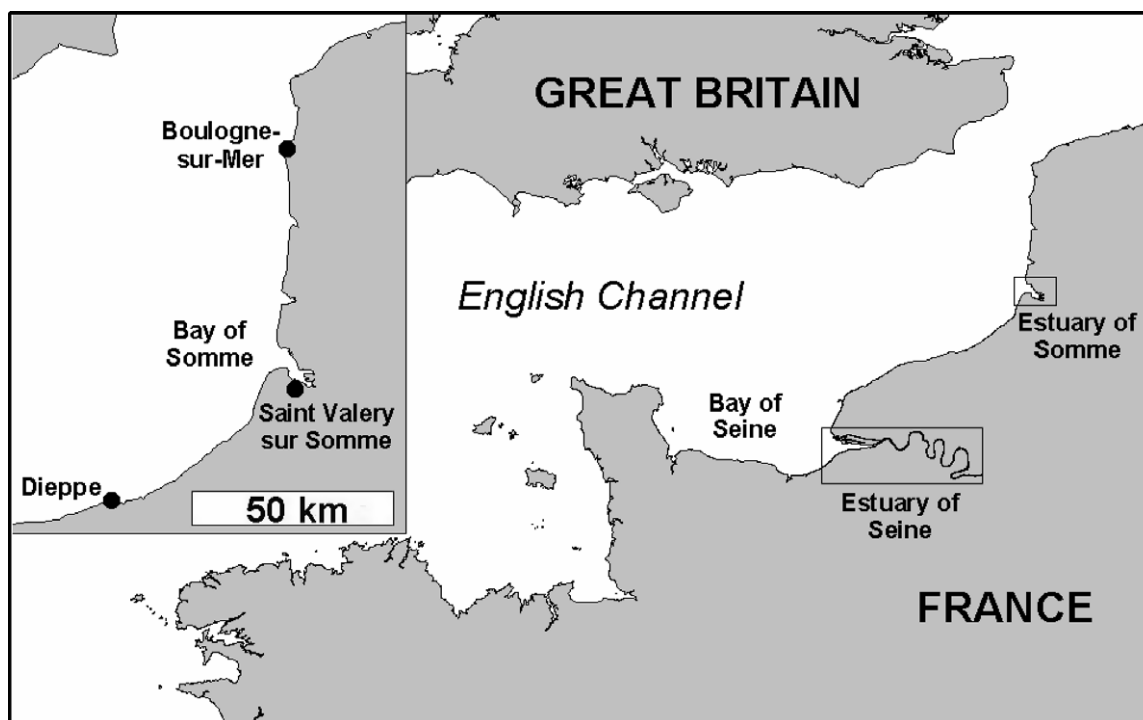


Fig. 1. Location of the Seine Estuary and the Baie de Somme in France (from Dauvin, 2007).

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