

## ASSESSING IMPACTS

One of the most common reasons for identifying change within estuaries is as a basis for assessing the impacts on a wide range of interests. These may be physical, biological or anthropogenic.

This chapter:

- Provides a brief introduction to the process of environmental impacts assessment and outlines a suitable procedure (Figure 7.1);
- Reviews the methods for assessing impacts occurring within an estuary, which form an important component of the estuary management framework;
- Provides an overview of understanding change and sensitivity in an estuary;
- Discusses impact evaluation and the assessment framework. This discussion includes identifying the environmental changes from proposed activities; understanding the nature of the environmental changes; evaluating the sensitivity of estuarine features and managing impacts deemed to be significant and those which require impact reduction measures to be implemented.

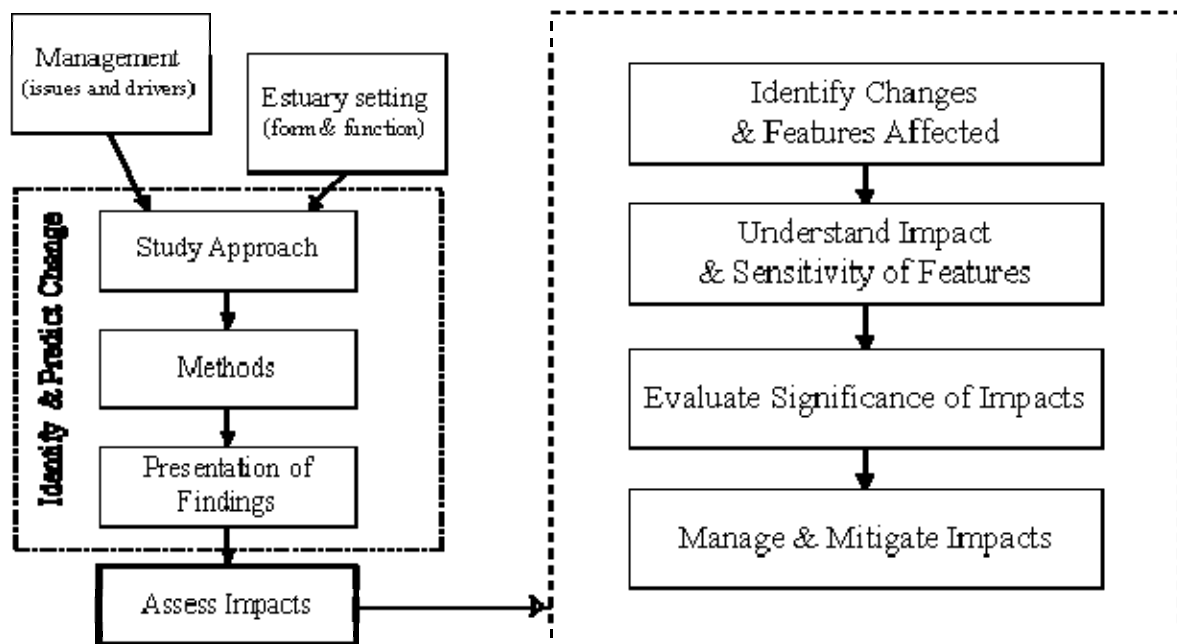


Figure 7.1 Flow diagram to show the structure of identifying impact assessments

### Background to Environmental Impact Assessment

Environmental Impact Assessment (EIA) first emerged as a formal process in the USA in 1969, as a result of the National Environmental Policy Act (NEPA). This act made it compulsory to consider possible environmental impacts before allowing a proposed activity to proceed if it was being carried out, funded or permitted by a federal agency. The enactment of EIA legislation by the US federal government rapidly led to adoption of similar processes in other jurisdictions. California became the first US state to introduce NEPA-style legislation in 1970. New South Wales (1972), Canada (1973) and Columbia and the Australian Commonwealth government (1974) followed. Other examples include Thailand

(1975), France (1976) and the Netherlands (1979). The United Kingdom has had a system of land-planning control since 1948, which provided discretion for local planning authorities to refuse or impose conditions on proposed activities on environmental grounds. As a result, acceptance of formal, mandatory EIA legislation in the UK was delayed until the adoption of the European Directive on EIA (85/337/EEC, as amended by 97/11/EC). This was amended in 2003 following the Aarhus convention (2003/35/EC), which intended to align the provisions on public participation in decision-making of environmental matters.

EIA systems in different jurisdictions differ in detail and method of adoption, not least because each is embedded in local legislative and cultural systems. However, as the concept of EIA spread and evolved, a common framework emerged and most systems contain some or all of a set of basic steps:

- Screening to assess whether an EIA is required;
- Scoping of the topics to be included EIA;
- Consideration of alternative methods of achieving the objectives of the proposed activity.
- Design of the selected proposal;
- Preparation of a report, including description of the proposal and the environment affected, and assessment of the magnitude and size of effects;
- Review of the report by stakeholders and consenting authorities;
- Making a decision on the proposal, incorporating information from the report and its review;
- Monitoring of impacts of the proposal, if implemented.

While the above steps form a basic framework for the EIA process, the emphasis or inclusion of each stage varies among countries (including members of the EC). As explained in the following sections, the process is an iterative one, involving (i) assessment of effects, (ii) identification of mitigating modifications to the proposal where required, and (iii) re-assessment of effects. Public consultation is an important part of the process at all of its stages.

### Assessment Framework

The environmental assessment process provides a consistent approach to (i) the evaluation of changes and (ii) the evaluation of impacts. This process is used to determine the impact of developments and the procedures for EIA are now well established and applied internationally. For developments in estuaries, it is important to consider both local and estuary wide impacts. Furthermore, it may be necessary to identify other ongoing changes in the system and the sensitivity of particular features (notably habitats) to such change. This can be quite difficult to disentangle and approach in a consistent manner. For this reason, it helps to follow a systematic procedure that clearly outlines the rationale, which supports decisions on the nature of an environmental impact. A framework based on four key stages has been provided:

- **Identify** the environmental changes from proposed activities and the features of interest/receptors that could be affected;
- **Understand** the nature of the environmental changes in terms of their exposure characteristics, the natural background system, and establish the sensitivity characteristics of specific features;
- **Evaluate** the vulnerability of the features as a basis for assessing the nature of the impact and its significance;
- **Manage** any impacts, which are found to be significant and require implementation of impact reduction measures.

The steps required at each stage are summarised in Figure 7.2, described in brief below and more fully in the [Impact Assessment Guide](#). This approach to the evaluation of impacts, reflects the advice to be found in a number of guidance documents and regulations, including the criteria listed in Annex III of the EC Environmental Assessment Directive (97/11/EC). The impact evaluation particularly draws on the assessment process developed to provide advice on operations within European marine sites (EN, 1998; EC, 2000) and an approach to Environmental Risk Assessment (ABP Research, 1997), which is based upon a UK guide to risk assessment for environmental protection (Department of Environment, 1995).

The environmental assessment process provides a consistent approach to the assessment of changes and evaluation of impacts. Such an assessment should make use of the best available information derived from a wide range of sources, including consultation, literature review, surveys, numerical modelling and historical analysis, and using informed scientific interpretation and judgement based on past experience. There is inevitably an element of subjectivity in this process, which relies on the experience of those undertaking the assessment. However, it is important to present data and rationale supporting decisions in a transparent and explicit way so as to aid discussion and agreement on the nature of environmental impacts.

### ***Identify features and changes***

The first step is to identify changes in the estuary environment that are likely to be caused by the proposed activities, as well as the features that might be affected. This is typically done as part of the EIA scoping exercise and developed and amended in response to consultation with stakeholders and regulators.

### ***Understand change and sensitivity***

In this stage of the assessment, the methods described in earlier chapters are used to examine how the system will respond. This is usually done for the existing case as a baseline and to gain an understanding of how the system is likely to evolve without the proposed change. Repeating the exercise including the proposed activity, or development, allows the relative change to be identified. This information is used to determine the nature of a particular environmental change in terms of its magnitude, and spatial and temporal extent including the response characteristics or sensitivity of a given feature to such change. It is important at this stage to take account of potential uncertainties in both predicted environmental changes and the features sensitivity.

### ***Risk of exposure***

In order to determine the risk of a particular change actually occurring, the likely *magnitude* of the change and the *probability* that it will happen need to be determined. The magnitude of change has to be considered in terms of its spatial extent. However, changes can also occur intermittently, or continuously, and can be permanent or temporary. Hence the magnitude is based on the scale of change in terms of spatial extent, and frequency of occurrence. In order to establish the likely exposure, or risk that the change will actually happen, it is also necessary to establish the likelihood that the change or event will actually take place. Both of these measures can be based on judgement, or estimated using suitable analytical tools. Taken together, magnitude and probability define the risk of exposure to be attributed to the change.

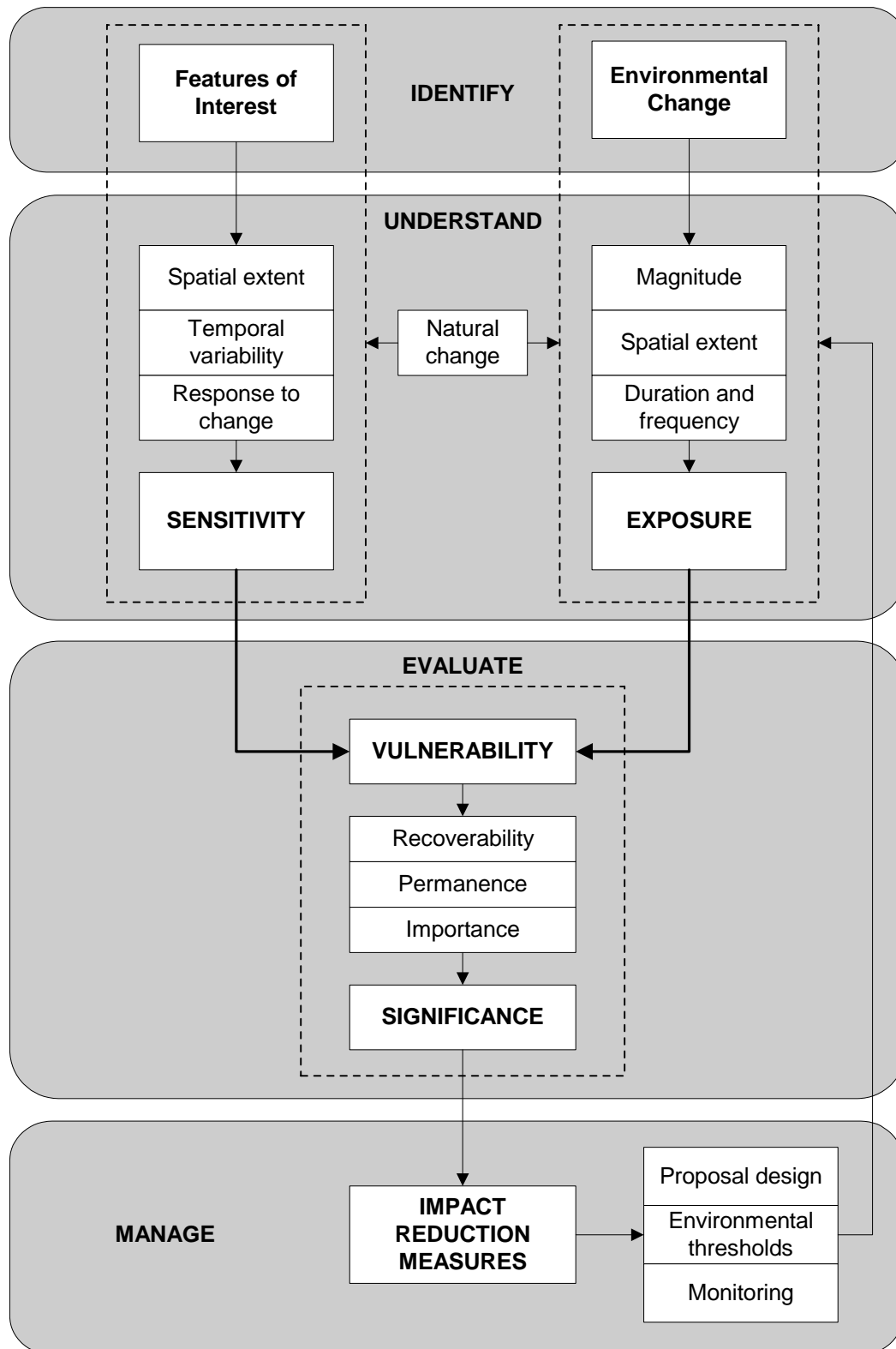


Figure 7.2 Flow diagram for impact assessment process

### *Sensitivity of features to change*

The various features will all respond differently to environmental changes. Some features will be unaffected, others will adapt, or recover, whilst there may be some that are permanently damaged or destroyed. The relative ability to tolerate change provides a measure of the features sensitivity. As well as sensitivity, it is necessary to determine the relative importance of a particular feature, in terms, for example, ecological role, conservation status, or commercial value. Some features will be of only local interest, while others may be of regional, national or international importance.

### **Impact evaluation**

Once the environmental changes and feature sensitivities are understood, the likelihood of a feature being vulnerable to an aspect of the proposal can be evaluated.

The vulnerability of the feature of interest depends upon the anticipated exposure and the features sensitivity or response characteristics. Where the exposure and sensitivity characteristics overlap, then vulnerability exists and an affect may occur, which may be beneficial or adverse. Where an exposure or change occurs, for which the receptor is not sensitive, then no direct impact can occur. The degree of overlap of the exposure and sensitivity characteristics will be a measure of the certainty of a response and hence an impact.

To assess how important a particular vulnerability will be requires knowledge of other factors, such as the spatial extent of the feature affected and its potential to recover from the impact. These factors, together with knowledge of the importance of the feature can be applied to assess the overall significance of any impact.

### **Impact reduction measures**

As a project is developed, it may become apparent that some impacts are likely to be significant and may be considered unacceptable. This invokes an iterative process to determine whether the impact can be diminished through design, by changing the works in some way, or by identifying some form of mitigating measure that would lessen the impact. Such measures can take the form of monitoring and control, constraints and conditions on the activity or construction process, or compensating enhancements. A particular form of control is the use of 'environmental thresholds' against which the changes resulting from the activity can be monitored and managed. Within the assessment procedure, the use of mitigation measures, or environmental thresholds, changes the exposure risk and hence requires the significance to be re-assessed. This is shown as a feedback loop in the flow diagram (Figure 7.2).

### **Summary of the Assessment Framework**

The framework outlined above of identification, understanding, evaluating and managing the impacts provides a simple and transparent route through the assessment process. Combining the risk of exposure with the sensitivity provides a measure of the feature's vulnerability to the proposed development. Wherever possible this should be expressed in a form that can be tested objectively through observation of subsequent events. Whether this is significant, or not, will depend on the relative importance of the feature. The significance statement provides a summation of the above process in terms of adverse or beneficial impacts, which may have varying degrees of significance. Typically this is expressed as a range such as minor, moderate, and major.

This approach provides a clear delineation of the:

- Processes of change;
- Magnitude of change;
- Risk of a change actually happening;
- Response of particular features to change;
- Resultant vulnerability of the feature to change;
- Relative importance of the particular feature in the affected environment, and hence;
- Overall significance of the impact.

Even when some or all of these aspects can only be assessed subjectively, it has the advantage of making the assumptions explicit.

For further reading for assessing impacts within Ports see the [ESPO Code of Practice on the Birds and Habitats Directive](#) and DFT's non-statutory [port appraisal framework](#).

### References

ABP Research, 1997, A guide to the environmental risk assessment package (ERA), ABP Research, Southampton, Report No: R.717.

Department of Environment, 1995, A guide of risk assessment and risk management for environmental protection, HMSO, London.

EC, 2000, Managing Natura 2000 sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, Office for Official Publications of the European Commission, Luxembourg, -69.

EN, 1998, Natura 2000 European marine sites: guidance relating to statutory conservation objectives and operations which may cause deterioration or disturbance, EN, SNH, EHS (DOE(NI)), CCW, JNCC, SAMS, English Nature, Peterborough.