Guidelines for Port Environmental Management

E Paipai

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Contract

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Summary

Guidelines for Port Environmental Management

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Ports are the most important gateway for trade in the UK, and Port Authorities need to ensure that their Client's requirements for safe passage of vessels are met. Port development and operations have the potential to impact on environmental and human resources. UK ports have a statutory duty under the Transport and Works Act 1992 and Section 48A of the Harbours Act 1964 to have due regard to the protection of the environment alongside their operations.

The response of the British ports' sector to environmental responsibilities has been progressively more supportive and proactive over the last decade when measured in terms of initiatives, projects and programmes involving management schemes, training, monitoring, research and collaborative involvement in coastal zone management and conservation issues. The British Ports Federation (now British Ports Association, BPA) produced an Environmental Statement and Code of Practice in 1992. It was soon recognised that this approach needed to be adopted on a European basis and consequently the European Sea Ports Organisation (ESPO) published its own Code at the end of 1994 through its Environment Committee.

HR Wallingford was commissioned by the Department of the Environment to undertake a study on the current status of environmental policies and environmental management practices in the UK ports, and subsequently to produce Guidelines for Port Environmental Management. The information given in these Guidelines is intended to be generic in recognition of the variety of activities and operations in UK ports and harbours, their size, location and administrative framework, and applicable to the majority of the small to medium-sized ports. The Guidelines are not intended to be exhaustive and cover the environmental aspects of all port-related and supporting industry, such as oil refineries. They are, however, intended to provide guidance (with some element of detail) on environmental management practices for workshops, garages and filling/bunkering stations found on port and harbour land.

The Guidelines also introduce the Eco-Information project, a Europe-wide port environmental management study and its environmental management tool, namely the Self-Diagnostic Methodology, which is developed by port professionals for port professionals.

Recognising the variety of port and harbour operations and the range of port staff with environmental responsibilities, the information provided in the Guidelines is aimed at those who will be taking the decision to identify their port's *status quo* in terms of environmental performance, as well as to those who need hands-on advice on environmentally responsible development and operational activities.

Summary *continued*

The Guidelines by no means imply that successful environmental management goes hand in hand with certification to either of the two standards on ems. A tailor-made environmental management programme addressing operations with the potential to significantly impact on the environment, identifying actions to prevent or minimise the impacts, and improving communications between those responsible for environmental protection can lead to a successful port environmental management.

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CHAPTER 1. INTRODUCTION

1.1 Ports and the Environment

Ports are the most important gateway for trade in the UK. There are an estimated 600 ports and harbours in the UK, through which nearly 550 million tonnes of freight passed in 1995(DETR, 1996). Ports make a significant contribution to the national economy, and directly or indirectly to employment at all levels. At least 77 ports, including almost all of the major ports in the UK operate within, or have jurisdiction over 44 sites of international importance for birds (RSPB, 1997).

Port development and operations have the potential to impact on environmental and human resources. For example, ports require large areas of land for berths and handling facilities and these areas are often reclaimed from intertidal areas of high nature conservation value. In addition to new berthing facilities, ports need to provide deeper and larger navigation channels for the safe passage of ever increasing ship sizes. Ports therefore need to dredge and dredging can result in major changes to the intertidal and sub-littoral areas of high nature conservation value. Other day-to-day operations can result in the introduction of contaminants into the ambient air, surface water, ground water supplies, soil and harbour sediment. Other sources of pollution in ports include accidental spills of fuel oil or bulk or liquid cargo, as well as the introduction of non-native marine species via the release of ballast water.

More often than not the potential for the Ports to impact negatively on environmental resources depends on their close proximity to highly sensitive environmental resources. This situation, coupled with the ever-increasing pressure from regulators and environmentally aware groups on ports to conduct their business in the most environmentally responsible way, has left ports with the most challenging task since the industrial revolution. The task is to satisfy their customers by responding to their needs for newer, larger, and more efficient facilities as well as to satisfy environmental regulators by complying with laws and stringent numerical environmental quality standards.

1.2 Environmental protection responsibilities of ports

UK Ports have a statutory duty under the Transport and Works Act 1992 to have due regard to the protection of the environment alongside their operations. There are a number of national and regional (ie European) legislation requirements on environmental quality protection, and ports are required to exercise their functions so as to secure compliance with the legislative requirements.

Under the UK Conservation Regulations 1994, which adopt the EU Habitats Directive, Ports are also advised to work together with competent authorities to establish a management scheme for European marine sites, in order to secure compliance with the requirements of the Habitats Directive. Participation in such a scheme should give the ports the early opportunity to ensure that their operational and development needs are not coming into conflict with the statutory powers of the competent authorities under the same Directive.

1.3 Purpose of Guidelines

The information given in these Guidelines is intended to be generic in recognition of the variety of activities and operations in UK ports and harbours, their size, location and administrative framework. Not withstanding their generic nature, they should be applicable to the majority of small to medium-sized ports. The Guidelines are not intended to be exhaustive and cover the environmental aspects of all port-related and supporting industry, such as oil refineries. They are, however, intended to provide guidance on the environmental effects and management of workshops, garages and filling/bunkering stations found on port and harbour land. The Guidelines are intended to provide information on environmental issues so that the majority of ports and harbours can find guidance, with some additional information relevant to specialised operations. The information on the environmental issues and impacts is not detailed as there are a number of recent research projects on good practice guidelines for port and harbour operations, including the recreational activities, taking place in or near the UK marine designated areas under the Habitats and Wild Birds Directives (ABP R&C, 1999 and UKCEED, 1999).

The Guidelines are also intended to provide information on the aspect of environmental management, on the currently recognised international standards on environmental management and on environmental management practices from other ports.

The Guidelines intend to make suggestions on environmental management practices but do not mandate actions to be taken by port and harbour authorities on environmental management. There is no legislative requirement for an environmental management system to be taken up by any organisation, and environmental objectives and targets so long as these are meaningful and measurable can be effective in improving environmental performance, regardless of whether a formal environmental management system is in place or not.

Recognising the variety of port and harbour operations and the range of port staff with environmental responsibilities, the information provided in the Guidelines is aimed at those who will be taking the decision to identify their port's *status quo* in terms of environmental performance, as well as to those who need hands-on advice on environmentally responsible development and operational activities. The principle contents of the Guidelines are based on the replies received from UK Harbour Masters to a consultation letter sent to them by HR Wallingford via the UKHMA in 1998.

The underlying objectives of the Guidelines are listed in Table 1.1.

Table 1.1 The underlying objectives of the Guidelines

- To identify key environmental implications from port and harbour development and operations in order to assist their authorities to understand their relation with environmental resources
- To identify key environmental legislation with which port authorities need to comply (to Oct. 1999)
- To highlight the current environmental policies of the UK ports sector
- To provide examples of other ports practicing environmental management both in the UK and abroad
- To provide generic information on environmental management tools for ports and harbours and on ISO 140001*Environmental Management Systems – Specifications with Guidance for Use* and the EU *Eco-Management and Audit Scheme (EMAS)*
- To provide suggestions on environmental management practices which aim to minimise risks associated with port and harbour activities and operations, and improve external communications particularly with key interested parties

1.4 Report structure

The Guidelines are written in Chapters, which aim to serve three purposes:

- To separate necessary information in text form from information best presented in flowcharts, checklists, diagrams, text boxes and tables and for the purposes of immediate reference to relevant sections
- To follow the order of the objectives listed in Section 1.3 above
- To make reference to current environmental management guidelines complementary to these all of which aim to serve the Ports Sector

The Guidelines therefore include the following chapters, in addition to this Introduction:

Chapter 2 – **Port and harbour activities, environmental impacts and legislation**. This chapter gives information on the port development and operational activities with the potential to impact on environmental resources, and the relevant environmental legislation requirements.

Chapter 3 – **Environmental policies of the UK ports sector.** This chapter includes information on the Eco-Information project, a Europe-wide post research, and its Self-Diagnosis Methodology which is prepared by port professionals for port professionals.

Chapter 4 –**Environmental management practice in selected UK and overseas ports and harbours**. This chapter gives information on the experiences of certain ports in the UK, Continental Europe and America in setting up and sustaining environmental management practices

Chapter 5 – **Environmental management tools for ports and harbours**. This chapter gives general information on the two internationally recognised standards on environmental management.

Chapter 6 – **Guidance on port environmental management practices and programme** completes this report and provides guidance on port and harbour environmental management practices and tools. This chapter suggests more "hands-on" advice on achieving environmental management through suggestions to minimise significant environmental impacts.

Supporting appendices provide information on ISO 14000 series of EMS-related standards, audit checklist and extracts from the Self-Diagnosis Methodology aimed at ports and harbours wishing to identify their current status of environmental performance. A glossary of environmental terms is also attached to these Guidelines.

CHAPTER 2. PORT ACTIVITIES, ENVIRONMENTAL IMPACTS AND LEGISLATION

2.1 Port Activities

Port and harbour activities vary widely, with some activities however being common to a large number of ports if not all. By and large, the port activities can be divided into two major groups, namely the development activities and the operational activities. For instance, building renovation, new building construction, land reclamation, quay extension and capital dredging are some of the development activities common to all ports. Maintenance activities such as paint stripping and painting, the storage and handling of cargo, and vehicle and equipment maintenance are some of the most common operational activities in ports. The majority of port development activities on land and at the land-water interface concern construction works with the associated transfer stations for construction material and possibly demolition works and debris. Some of the operational activities occur at the land-water interface as well as on-land such as cargo handling, equipment maintenance and vessel repair.

Table 2.1 Examples of Typical Port and Harbour Development activities

i) Land-water interface
- Land reclamation and associated land filling works
- Quay construction, extension and restoration
- Raising of quay/berth/pavement level

ii) On-land
- Demolition of old buildings and structures
- Construction of new buildings and structures
- Placement/restoration of aboveground and underground storage tanks

iii) In water
- Channel deepening
- Piling works
- Pontoon placement

Tables 2.1 and 2.2 list some of the most common port and harbour development and operational activities, respectively.

Table 2.2 Examples of Typical Port Operational activities

- Commercial shipping and recreational boating
- Building/vessel repair and maintenance
- Vehicle and equipment maintenance
- Site cleaning and clearance
- Cargo handling
- Cargo storage
- Bunkering
- Grounds maintenance
- Port traffic

2.2 Port and harbour activities and associated potential environmental impacts.

Port and harbour activities can have significant impacts on many environmental resources. Environmental impacts are likely to result from two major groups of port and harbour activities, mentioned above. The impacts are normally of local nature, although activities in rivers or estuaries can be of regional nature. The impacts from the development activities are normally of a similar time scale as the development activity itself, except in cases where the alterations to environmental resources are permanent, (eg the disappearence of a fisheries nursery grounds, or changes in sediment transport on the coast). The impacts from the operation activities last at least as long as the operations do, unless the cumulative effect over a prolonged period of operation has resulted in permanent and irriversible change or loss of the environmental resource.

Experience has shown that port and harbour activities can also provide opportunities for enhancing environmental resources (eg. the beneficial use of dredged material) and benefiting local communities (eg. the local economic benefit as a result of a new ferry terminal or the establishment of wind farms on harbour piers, which produce energy for the local network). These opportunities are normally obvious at the stage of project conception and/or design, where environmental criteria are an integral part of that stage. The primary environmental resources, which could be at risk from port and harbour activities are listed (in no order of significance) in Table 2.3.

The impacts on the environmental resources can be either short or long-term, reversible or irreversible, local or regional, and direct or indirect. For instance, dredging and disposal activities resuspend harbour sediment into the water column. This resuspension is a direct impact on the water quality. The resuspended sediment reduces the amount of sunlight entering the water column and being used by algae for their photosynthetic activity to reproduce. Algae are the food source for some fish species, hence a reduction in their reproduction means reduced food supply available to fish. The resuspension of harbour sediment in the water column is an indirect impact on fisheries resource. Resuspended sediment can also clogg the fish gills, hence directly impacting on the fisheries resources.

Table 2.3 Environmental resources at risk from port and harbour activities

- surface and groundwater quality
- harbour sediment quality
- ambient air quality
- soil quality
- ambient noise levels
- status of natural habitats and individual species
- human health and welfare
- local community interests
- cultural heritage

The number and nature of environmental impacts vary amongst ports and harbours, and clearly for any particular port activity, only a number of the impacts need to be considered. This chapter presents the more common environmental impacts that are likely to be encountered in the development of ports and harbours. There is a plethora of published documents on the subject of environmental impacts from port and harbour activities, and information from these publications is compiled in the form of tables, matrices and text boxes for easy reference. However, the reader is advised to refer to the publications listed in Table 2.4, which give a very comprehensive account of the impacts of port and harbour activities on environmental resources, including very specific information on the impacts on the marine Special Areas of Conservation (SACs) from the commercial shipping activities and the recreational activities in ports and harbours.

Table 2.4 Further comprehensive and issue-specific reading

1. Environmental Considerations for Port and Harbour Developments. The International Bank for Reconstruction and Development/World Bank Technical Paper Number 126, Transport and the Environment Series, 1990.

2. IAPH. Guidelines for environmental Planning and Management in Ports and Coastal Area Developments, Envineering Sub-Committee, Committee on Port Safety, Environment and Construction (COPSEC), 1989

3. UK Marine SACs Project. Task 2.1: Recreational User Interactions. Framework for Reviewing and Managing Potential Recreational Impacts on Annex I and II Features Within UK Marine Special Areas of Conservation. ABP Research, English Nature, *et al*, 1999.

4. UK Marine SACs Project. Task 2.2: Port and Harbour Operations. Good Practice Guidelines for Ports and Harbours Operating Within or Near UK Marine Special Areas of Conservation. UK CEED, English Nature *et al*, 1999.

Table 2.5 Parameters determining the magnitude and significance of environmental impacts

- Nature, extent, intensity and frequency of the activity
- Proximity of activity to environmental resources
- Pathways between the activity and potential environmental target
- External parameters influencing the accessibility through the pathways
- Degree of sensitivity and state of health of the environmental resource
- Control measures in place to prevent or reduce impacts

By and large, the impacts on the physical environment are the impacts on the three media, namely air, surface and groundwater, and soil (including sediment). Depending on the nature and magnitude of an impact, more than one media can be affected, although the time scale and significance of the impacts on the two or more media can be different. For instance, excavation works on land can mobilise contaminants in the soil, release them

into the water in the pores of the soil and facilitate their travel to groundwater resources (eg aquifers). Similarly, the release of fugitive emissions into the atmospheric air is also responsible for soil contamination because of the fall out process. Contaminated dust particulates, which fall out on paved surfaces can eventually find their way into the waterways and precipitate onto the sediments. In other words, there is more than one pathway which contaminants can follow to reach environmental targets, and the effective elimination or reduction of environmental impacts requires an identification of all possible pathways. An understanding of how and why port and harbour development and operation activities impact on environmental targets (including the human health and interests), and primarily the identification of the pathway between activities and environmental targets is the basis of successful environmental protection and management measures (see Chapter 6 on Environmental Management Practices and Tools).

The magnitude and significance of the potential impacts on environmental resources depend on a number of parameters, primarily those listed in Table 2.5

2.3 Port and harbour development activities and potential environmental impacts

Text boxes 2.1 to 2.3 present a compilation of the most common port and harbour development activities with the potential to impact on surface and groundwater quality and their habitats/organisms, air, and humans (ie local community interests, culture, recreational activities). The potential impacts on soil are regarded alongside those on groundwater quality in text box 2.1, because of the contamination link between soil particles, soil pore water and groundwater. Given that the impacts on humans from development activities are by and large the result of reduced water and air quality, text box 2.3 presents some of these impacts or refers the reader to text boxes 2.1 and 2.2 as appropriate. Text box 2.3 also includes impacts on ambient noise and light levels.

Box 2.1 Port development activities potentially impacting on surface and groundwater quality and aquatic habitats

Development activity	Water-related impacts
I Dredging	**1. Dispersal and settlement of resuspended sediments** Sediments become resuspended during excavation and transfer to disposal site. If suspension of sediment is concentrated and prolonged, light penetration into water column may be reduced thus causing damage to aquatic organisms such as photosynthetic algae and corals. Toxins or other contaminants from bed sediment can become disolved into water or stay in suspension and cause mortality amongst aquatic species or contaminate them, with implications for species higher up the food chain. Release of organic substances can deplete available oxygen of water column as a result of aerobic decomposition and thus cause stress to aquatic organisms. Settlement of fine sediment can smother and hence suffocate certain aquatic species or cause their relocation. 2. **Increased channel depth** Dredging for channel deepening can alter the bathymetry of estuarine channels with undesirable changes in the extent of salt wedge (causing saline contamination of freshwater supplies), and can result in increased frequency of maintenance dredging. It can also result in changes in the type of aquatic habitats. Channel deepening can alter flow velocities and directions, which in turn can result in reduction in sediment load being transported upstream and shoreline configuration by erosion or accretion or shoaling. Reduction in sediment load upstream can have further implications for intertidal habitats (eg mudflats) and organisms which depend on them (eg birds). Deepening of channels can have negative impacts on fisheries resources and alter the type of aquatic species colonising the river/estuary bed. Increased water depth can result in intensified wave activity on the shoreline with consequent increased littoral sediment transport and hence lead to accelerated erosion or accretion. 3. **Blasting** Blasting destroys aquatic organisms and can remove whole habitats. The compression effect of the blasting can injure or temporarily disable marine life near or some distance from the blasting site. The compression effect can also interfere with the migration of fish. Blasting and dredging for increased navigable depth can alter subsurface groundwater flows near the land-water interface by accelerate a seaward flow of fresh water and hence lower the watertable level on land, with further implications for agriculture, for instance. 4. **Physical removal of bed sediment** The physical removal of bed sediment can also remove important habitats of aquatic organisms. Depending on the timing of the dredging cycle, the deepened channel can be recolonised by organisms from adjacent areas, but it is possible that the new habitat may differ from the previous because of the different substrate as a result of dredging. If the seaward flow of fresh water is slow, the physical removal of bed sediment with the consequent depth increase can lead to saltwater intrusion of fresh water supplies (eg aquifers). If the seaward flow of fresh water is fast, the physical removal of bed sediment could accelerate the flow, and thus result in the lowering of water table on land.

Box 2.1 (Continued)

Development activity	Water-related impacts
II Unconfined open- water disposal	**1. Sediment resuspension and settlement** Repeated unconfined open-water disposal will lead to loss of bed habitats as a result of "blanketing". Recolonisation may occur, depending on the timing of the disposal cycle but the new habitats are likely to be different, reflecting the new properties of the underlying (disposed) sediment. Introduction of organic matter with disposed sediment can attract aquatic life to the disposal place. Strong currents in the water column or near the bed surface during open-water disposal of dredged material disperses sediment during disposal, however, frequent unconfined open-water disposal can lead to undesirable siltation of other channels, or habitats of nature conservation or commercial value or objects of archaeological importance. Sediment disposal in open water can introduce toxins and contaminants into the water column and possibly the food chain. **2. Decreased water depth** Repeated unconfined open-water disposal at the same place can result in altered bed configuration with consequent changes in current patterns. Such disposal and changes near the shore can lead to increased shoaling and altered shoreline configuration.
III Disposal on land	**1. Run-off** The runoff of water from the disposed sediment and uncontrolled discharge from the de-watering system will initially introduce salt into near-by surface water courses with potentially negative impacts on biota depending on the saline content of the receiving water. Natural leaching of salt from the disposed sediment by rainfall will gradually eliminate the salt content, but the magnitude of the impact on the surface water courses will depend on the timing and seasonal pattern of the disposal cycle. For instance, disposal during the dry time of the year will not release much salt into the adjacent water course but the first rainfall will result possibly in a "salt shock " of the biota. Runoff will also introduce contaminants and toxins into the water course with significant implication for the water quality and humans (in the case of downstream water abstraction point), biota and food chain. Runoff may benefit the biota of near-by surface water courses by introducing organic matter and nutrients. This benefit however may turn into to a significant negative impact, if excessive amounts of nutrients and organic (decomposable) matter enter the surface watercourse. Should this happen, the decomposition of the organic matter could deplete available oxygen to aquatic life, and the nutrients may lead to the overgrowth of certain algae species, which are known to release toxins, fatal to some animals. **2. Leaching** (See Run-off above) Leaching of salt following disposal on land can have devastating effects on the soil structure, by breaking its clay molecular structure and rendering the soil unable to sustain life. Leaching of salt and/or contaminants into soil pore water can lead to the contamination of freshwater supplies (eg aquifers). Leaching may also benefit the underlying soil by introducing waterborne nutrients and other organic matter. **3. Subsidence/Drainage** Disposal of wet dredged material near or on a bankside may result in slumping of the bank , whereas disposal on flood plain may impair the drainage capacity of the plain. Both cases may have significant implications for water quality and habitats by the direct introduction of contaminated sediment (in the former case) and contaminants-laden water into the watercourse (in the latter case).

Box 2.1 (Continued)

Development activity	Water-related impacts
IV Land reclamation	**1. Excavation** Bank/nearshore materials may contain contaminants released into the watercourse from upstream municipal domestic or industrial discharge points or at some point in time they may have been part of a landfill. Should any of this be the case, excavating such material may introduce contaminants and/or debris into the water. Excavation may impact on habitats directly by removing them or indirectly by removing their food sources or nursery grounds. **2. Filling** The import of engineering fill material may introduce contaminants and/or debris into the water. This could be true whether the material is brought in directly from a dredging site, which is subject to receiving contaminants from another site,(eg an offshore licensed disposal site) or it is a recyclable material. During filling for land reclamation purposes, fine sediment from the filling material can escape into water with implications similar to dredging and disposal (see above). In the case of riverine land reclamation works this escape may impact significantly on migratory fish species.
V Construction of waterside structures	**1. Excavation / Filling** (See IV above) **2. Pilling** Pilling can have the same sediment dispersion effect as dredging but of a different scale depending on the nature of the works and the duration. Pilling can puncture a natural impermeable layer (eg clay) and thus permit vertical movement of saline water and/or contaminants. Disturbance (eg noise and vibration) from pilling may temporarily or permanently displace or attract mobile aquatic species. **3. Presence of new structures** The presence of new waterside structures, including breakwaters, pontoons and harbour arms, can impact on the water quality by encouraging accumulation of debris and oil or by stagnating the water. Structures can also alter current patterns, lead to scouring or increased deposition with consequent changes in maintenance dredging practices and navigation. The presence of locks can interfere with fish migration, and encourage debris and oil accumulation. The shading effect from new waterside structures can change the type of habitats and be either beneficial or not by attracting desirable or undesirable aquatic species and predators. The establishment of new structures in inland waterways will physically remove waterside habitats and may interfere with the movements of certain species. The presence of new structures in navigable waterways, particularly paved surfaces and quay sides will (in the absence of interceptors) accelerate the release of contaminants and debris into the water. The use of wood structures can release into the water wood preservatives and pesticides.

Box 2.1 (Continued)

Development activity	Water-related impacts
VI Establishment Of new Buildings /structures on land	**1. Demolition of old buildings/structures** In the absence of site clearance, the demolition of old storage tanks/buildings/pipelines and the associated breaking of equipment/machinery (eg transformers) can introduce contaminants into surface water via runoff and into soil pore water and eventually into groundwater supplies. Stockpiling of contaminated demolition debris may introduce contaminants directly into surface water via runoff and indirectly into groundwater. **2. Building foundations** Excavating for building foundations may puncture old underground storage facilities and thus causing the release of contaminants into ground water eventually. Building foundations in soil contaminated from cargo handling activities in the past may mobilise contaminants and eventually facilitate their release into groundwater. Depending on the depth of the watertable, foundations can change the flow of ground water. This is more the case in deep foundations. **3. Landscaping** Landscaping can impair drainage with consequent increased flooding and possibly erosion. Paving without the appropriate drainage/water interception measures will result in increased water runoff with the potential to introduce contaminants (eg oils, dry bulk residues, pesticides from ground maintenance) and debris into the water course. **4. Infrastructure (roads/rail/pipelines)** Digging/excavating for roads, rail and pipelines can disrupt the water table, drainage pattern, and remove habitats. The presence of roads/rail/pipelines can interfere with the migration routes of wildlife.

Box 2.2 Port and harbour development activities potentially impacting on air quality

I Disposal of dredged material on land	**1. Dispersion of dry sediment** As disposed sediment dries out it may become airborne. Airborne soil particles may also carry contaminants with them.
II Land reclamation	**2. Dispersion of import material** As above
III Establishment of new Buildings / structures on land	**1. Demolition of buildings/structures** The demolition of old buildings will make certain material airborne, including asbestos fibres. The demolition of dry bulk storage buildings/structures will release into the atmosphere various fugitive emissions, such as coal, flour, ore dust. Breaking of refrigerating equipment as part of the demolition process will release CFCs into the atmosphere. **2. Building activities** Activities associated with the erection of buildings/structures on land has the potential to make certain building materials (eg from stockpiles) airborne. There can be more significant implications if "contaminated" recycleable building material is being used. Building for foundations in soil, which has been contaminated by dry bulk handling operations in the past can lead to airborne contaminated dust. **3. Construction vehicles** Increased vehicular traffic during the building activities will increase further the exhaust fumes released into the atmosphere, temporarily.

Box 2.3 Port and harbour development activities potentially impacting on humans (health and interests)

I Dredging	**1. Resuspension of sediment** Depending on local currents and distance from the coast, resuspended sediment may spoil bathing beaches. This is expected to be a short-term and reversible impact. **2. Noise** Depending on the distance between the dredger and residential premises and the prevailing winds, increased noise levels could be an issue, although short-term and reversible and most probably insignificant. It may turn to a significant issue, if dredging operations take place during the night in the spring and summer season.
II Disposal on land	**1. Bank disposal** Bank disposal may interfere with recreational activities by cutting off, for instance, access to towpaths. Bank disposal may also be a health and safety hazard for the public because of debris,sharp objects in particular. Odour may be an issue, particularly when the dredged material contains significant amount of organic matter which has been under oxygen-depleted water for significant length of time. As sediment dries out it may become airborne and cause nuisance to near-by residences. It can also pose a threat to health if sediment is contaminated. **2. Field disposal** Disposal on fields may have the same negative benefits as bank disposal, but normally there is a benefit (assuming no contamination is present in the sediment) to soil properties and consequently to agriculture/husbandry, which is the very reason for this type of disposal.
III Land reclamation	**1. Excavation and filling** The excavation and filling works have the potential to resuspend fine sediment (and their contaminants) into the water, and depending on hydrological conditions and distance from recreational areas, the resuspended sediment may **spoil recreational** areas (eg bathing waters). The magnitude of the impact may be anything from nuisance to health hazard. The latter may happen when land reclamation requires the excavation of sediment/bank material in watercourses, which in the past have been receiving either industrial or municipal discharges. Resuspended solids may also cause an impact on commercial fisheries and shellfisheries. Excavation works (the presence of works-associated vessels and machinery) may also **interfere** with the general **recreational uses** of the waterway. Increased traffic volume by road or sea associated with the reclamation works can also cause an impact on **local road network** and interfere with the **recreational uses** of the waterway. Associated increase in vehicular exhaust fumes can also be an undesirable impact on the local population, although a short-term one. Noise from the land reclamation works can also be an issue, depending on the time of the year.

Box 2.3 (Continued)

IV Construction of waterside structures	**1. Excavation/filling and noise** See Land reclamation above **2. Presence of waterside structures** The presence of waterside structures such as harbour arms, pilings,etc. may cause siltation or scouring of areas used by recreational clubs for moorings or berthing.
V Establishment of new Buildings / structures on land	**1. Demolition works** Dust and other particulates, which become airborne during the demolition of old buildings/structures can be either a nuisance or a health hazard to local population, (eg if asbestos had been used with building material). Depending on the past use of the building/structure, odour can also be an issue. Noise from the demolition works can also be an issue. **2. Building foundations** Digging for foundations in soil contaminated from past activities, can result in contaminants (adhered to soil/dust particles) becoming airborne. **3. Landscaping** Landscaping, including paving, normally has a beneficial impact on the local community as it improves the aesthetics of the area and eliminates sources of airborne particulates. **4. Infrastructure (roads/rail/pipelines)** The construction works for infrastructure can cause a short-term nuisance to local community in terms of noise, dust, traffic, access and visual amenity. Where these added services can be also be used by the local community the long term impacts are beneficial.

2.4 UK Environmental legislation for port and harbour development activities

2.4.1 Environmental Impact Assessment of new development

The European Union Directive on the Assessment of the Effects of Certain Public and Private Projects on the Environment (85/337/EEC) as amended by the Directive 97/11/EC, requires Member States to ensure that, before consent is given to development projects (amongst a number of other industries, including those which are port-related or supporting) likely to have significant environmental impacts, they should be subject to an environmental impact assessment (EIA). The EIA Directive identifies two groups of development projects, those which are always subject to an EIA and those for which an EIA may be required depending on the likelihood of significant environmental impacts. DETR's guidance on determining significance is primarily based on the nature, size and location of the project. This is further discussed in Section 2.4.4 below. The Environmental Impact Assessment (EIA) Directive has been implemented in the UK largely via the land use planning system.

In England and Wales, this directive was first implemented by the **Town and Country Planning (Assessment of Environmental Effects) Regulations 1988** (SI 1988 No. 1199). These regulations have since been amended by the **Town and Country Planning (Assessment of Environmental Effects) (Amendment) Regulations 1990, 1992, 1994** (SI 1990 No. 367), (SI 1992 No. 1494) and (SI 1994 No. 677), and recently by the **Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999.** In July 1998, the DETR consulted on draft regulations to implement Directive 97/11/EC. They also consolidated all the existing town and country planning EIA regulations. The local planning authority (LPA) will have to make a formal decision for all projects described in the regulations as to whether or not an EIA is required. Any decision must be recorded on the planning register. The main reason(s) for granting or refusing planning concept for developments subject to EIA will have to be made public by the LPA. (Croners, 1999).

In Northern Ireland the equivalent is **Planning (Assessment of Environmental Effects) Regulations 1989 (**SR 1989 No.20). The 1989 Regulations are amended by the **Planning (Assessment of Environmental Effects) (Amendment) Regulations (Northern Ireland) 1994** (SR 1994 No. 395).

In Scotland, the Directive was implemented by the **Environmental Assessment (Scotland) Regulations 1988** (SI 1988 No. 1221). These Regulations are amended by the **Environmental Assessment (Scotland) Amendment Regulations 1994** (SI 1994 No. 2012). Schedule 1 of the EIA Regulations (England and Wales, Scotland, Northern Ireland) lists projects for which an EIA is mandatory and those for which an EIA is required if the project is likely to cause "significant" environmental effects.

Section 6 of Schedule 3 of the Transport and Works Act 1992 added Section 48A to the Harbours Act 1964, which places a statutory duty for environmental protection on every harbour authority when a Harbour Revision Order is applied for. This Act ensures that environmental resources within the harbour waters are considered during a port development project and an EIA is carried out.

2.4.2 EIA requirements in port and harbour development projects

In England and Wales, applications for harbour empowerment orders and harbour revision orders are subject to the **Harbour Works (Assessment of Environmental Effects) (Amendment) Regulations 1996.** The **Harbour Works (Assessment of Environmental Effects) (No 2) Regulations 1989** concern harbour works which do not require planning permission and application for a harbour revision or empowerment order. The **Harbour Works (Assessment of Environmental Effects) Regulations 1992** (SI 1992 No. 1421) rectifies a previous omission by making EC Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment applicable to harbour works in **Scotland**. In **Northern Ireland** the equivalent regulations are the **Harbour Works (Assessment of Environmental Effects) Regulations (Northern Ireland) 1990** (SR 1990 No.181)

Schedule 1 of the **Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999** lists projects, for which an EIA is mandatory, and Schedule 2 of the same Regulations lists projects, for which an EIA is discretionary depending on the nature, size and location of the project. The Schedule 1 and 2 projects, which a port and/or a harbour is likely to undertake are listed in Table 2.6.

Table 2.6 Town and Country Planning Regulations 1999 – Schedule 1 and 2 Port and Harbour projects

Schedule 1 port and harbour projects for which an EIA is mandatory

- A trading port
- An inland waterway which can cater for vessels of 1350 tonnes or more
- A port for inland waterway traffic capable of handling vessels of 1350 tonnes or more

Schedule 2 port and harbour-related projects likely to require an EIA

1. Infrastructure projects

- The construction of a road, or a harbour, including a fishing harbour, not being development falling within Schedule 1
- Canalisation or flood relief works
- A tramway, elevated or underground railway, suspended line or similar line, exclusively or mainly for passenger transport
- An oil or gas pipeline
- A yacht marina
- Coast protection works

2. Other projects

- A waste-water treatment plant
- A site for depositing sludge
- The storage for scrap iron
- A test bench for engines, turbines or reactors

Note: Schedule 2 also includes the modification of a development which has been carried out, where that development is within a description mentioned in schedule 1.

2.4.3 Permitted Development Rights

The **Town and Country Planning (Environmental Assessment and Permitted Development) Regulations 1995** (SI 1995 No. 417) allows anyone who is proposing a development project, which might normally have been subject to the provisions of the 1988 general development order, to seek an opinion whether the development requires an EIA. The equivalent regulations in Northern Ireland are the **Planning (Environmental Assessment and Permitted Development) Regulations (Northern Ireland) 1995** (SR 1995 No. 357). However, article 3(10) of the **Town and Country Planning (General Permitted Development) Order 1995** (SI 1995 No. 418) excludes certain developments, which might have adverse environmental impacts, from the description of "permitted development". In this case, planning consent would be required and an EIA would have to be carried out before planning permission was granted. (See also DoE Circular 3/95 *Permitted Development and Environmental Assessment*). The permitted development rights of a developer with a proposed plan in or near a designated site under the EC Directives on Habitats and Wild Birds, are discussed in Section 2.5.3.

2.4.4 DoE Guidance on Schedule 2 projects

The likelihood of "significant" environmental effects as a result of a development project is material to the decision as to which of the Schedule 2 projects listed above (and all Schedule 2 projects for that matter) should be subject to formal EIA. In the normal course of events it will be the competent authority, which will decide on what constitutes a "significant" environmental effect. The DoE Circular 15/88 entitled *Environmental Assessment* suggests three main criteria:

1) whether the project is of more than local importance, mainly in terms of physical scale
2) whether the project is intended for a particularly sensitive location (eg in a Site of Special Scientific Interest), regardless of the scale of the project
3) whether the project is thought likely to give rise to particularly complex or adverse effects, eg in terms of discharge of pollutants

In **Scotland**, the Scottish Development Department published Circular 13/88 *Environmental Assessment: Implementation of EC Directive: the Environmental Assessment (Scotland) Regulations 1988*. There is no **Northern Ireland** equivalent to the DoE guidance on schedule 2 projects.

The DoE's publication *Environmental Assessment: A Guide to the Procedures* includes a checklist of matters to be considered when preparing for an EIS. This guidance includes the requirements of schedule 3. The main components of the checklist are given in Table 2.7.

Table 2.7 Checklist of matters to be considered in an EIA

1) The description of the proposed development should include:
   - The intended use of the site
   - Number and origin of employees
   - The project's physical aspects at all stages
   - Post-development operations, products, services

2) The necessary data in order to identify the main effects:
   - The local community and its proximity to the location of the development
   - Any legal designations on or near the site
   - Details of soil, water, air and heritage on or near the site

3) The description of environmental effects including the following details:
   - The concentration of air emissions and level of noise and their effects
   - The likely change in population level
   - Destruction of and injury to plants and animals
   - Contamination of land

4) Information on the measures to remedy the environmental effects:
   - Design of the site
   - Technical measures
   - Ecological and landscape measures
   - Likelihood of effectiveness

The checklist approach to the use of EIA can form the basis of the approach to an audit of a development during its operational life (Croners 1999).

2.4.5 Environmental Impact Statement (EIS)

The **Town and Country Planning (Assessment of Environmental Effects) (Amendment) Regulations 1994** require that an environmental statement (EIS) is submitted along with the planning application for the development to the LPA by the developer. Schedule 3 of the Regulations, as amended, sets out the specified information (Table 2.8), which will need to be provided in an EIS.

An EIS is defined within Schedule 3 as comprising a document or series of documents providing *specified information* to enable an assessment to be carried out on the likely impacts which the proposed development would have upon the environment.

Table 2.8 Schedule 3 Specified information to be included in an EIS

- A description of the proposed development, including information about the site, the design and the size or scale of the development
- The data necessary to identify and assess the main effects which the development is likely to have upon the environment
- A description of the direct and indirect significant effects which the development is likely to have upon the environment
- A description of the measures which would avoid, reduce or remedy the significant effects
- A non-technical summary of the information listed above

A good EIS should assist the planning authority and other public bodies with environmental responsibilities to make informed decisions.

It is good practice to look at the EIS periodically after the development to assess its effectiveness and the accuracy of predictions (Croners 1999).

2.4.6 Timing of environmental impact studies

A port and harbour developer can undertake an environmental study at any time prior to the preliminary and final design and planning application stage, such as during the conceptual design or even before that during the master planning stage. By and large, in both the UK and abroad the timing of undertaking the environmental studies depends on the available finances, the legislative requirements, and the public relations (eg the relationship with the local community). Also for funded port development projects abroad, the conditions of the majority of the funding agencies, such as the World Bank, determine the timing of environmental impact studies. The World Bank's main reasons for refusing financing for a development project are given in Table 2.9.

Table 2.9 World Bank's reasons for refusing to finance development projects

- Cause severe or irreversible environmental deterioration without mitigation measures acceptable to the Bank
- Unduly compromise the public's health and safety
- Displace people or seriously disadvantage certain vulnerable groups without taking mitigation measures acceptable to the Bank
- Contravene any international environmental agreement to which the member country concerned is a party (eg the IMO MARPOL Convention and the need to provide reception facilities for ship wastes)
- Could significantly harm the environment of a neighbouring country without the consent of that country

The Bank's environmental experience has shown that it is fundamental to the good design of development projects and feasible to incorporate suitable measures to protect the environment. A pragmatic approach as insisted upon by the Bank, is the key. Each project should be regarded as unique within its environmental setting, with the environmental work becoming a continuous process during the preparation and implementation of the project. In other words, the environmental studies for a development project should not be a discreet or "add-on" component. The World Bank endeavours to ensure that projects with unavoidable adverse environmental impacts are located in areas where the environmental damage is minimised, even at somewhat greater cost (The World Bank, 1989).

2.4.7 Planning process involving EIA

The developer is responsible for preparing or commissioning the EIS but the decision as to whether or not the development needs to go through an initial screening process, as required by the EIA regulations, is that of the LPA (the regional council in Scotland and the Planning Service in Northern Ireland). Experience in the UK and overseas has demonstrated the benefits to a developer from seeking early advice, even before definite plans have been drawn up, from the LPA and the relevant environmental regulators. Figure 2.1 demonstrates the main stages of the planning process involving EIA, starting from the initial stage where early advice is sought. The LPA has to treat the planning application like any other although there are additional requirements including those in Table 2.1.

The EIS determination period and the right to appeal

The planning application must be determined within 16 weeks from the date of receipt of the EIS (as opposed to the normal eight weeks) even if the EIS is submitted after the planning application itself. It is possible that the LPA wishes that the determination period is extended beyond the 16 weeks, but this has to be agreed in writing between the parties.

If the LPA considers that additional information is needed, it will ask the developer to provide it, but the determination period of 16 weeks continues to run. The developer will have the right to appeal against non-determination at the end of the 16 weeks.

If there is an appeal against the refusal of a planning application, which has been submitted with an EIS, the application will be reconsidered by a government planning inspector or it may be called in by the Secretary of State. Both the inspector and the Secretary have the power to ask for more information to be provided by the developer, which then will be made available to all parties to an appeal (Croners 1999).

The LPA treats the planning application, which is accompanied by an EIS like any other planning application, although there are a number of additional requirements in order to determine the application. These requirements are listed in Table 2.10.

Table 2.10 LPA's requirements in assessing development application with an EIS

- The LPA must ensure that copies of the planning application and the EIS have been sent to the statutory consultees, who should be invited to comment
- Copies of the application and the EIS must also be sent to the regional office of the DETR, the Scottish Office or the Welsh Office
- The planning application cannot be determined until each statutory consultee has had a copy of the EIS for at least two weeks
- The developer must be advised which organisations and individuals have been consulted
- The application and the EIS should be placed on Part I of the planning register along with any direction or opinion from the pre-application procedure
- The LPA must have regard to all other environmental information besides the EIS, as well as comments from members of the public.

Public involvement

The importance of and benefits from involving the general public in the determination of an EIS cannot be emphasised enough. Experience has shown that the public's negative attitude towards a development was primarily based on the fear of the unknown, whereas an early and genuine involvement has facilitated the determination process and even led to better and informed decisions on mitigating environmental impacts.

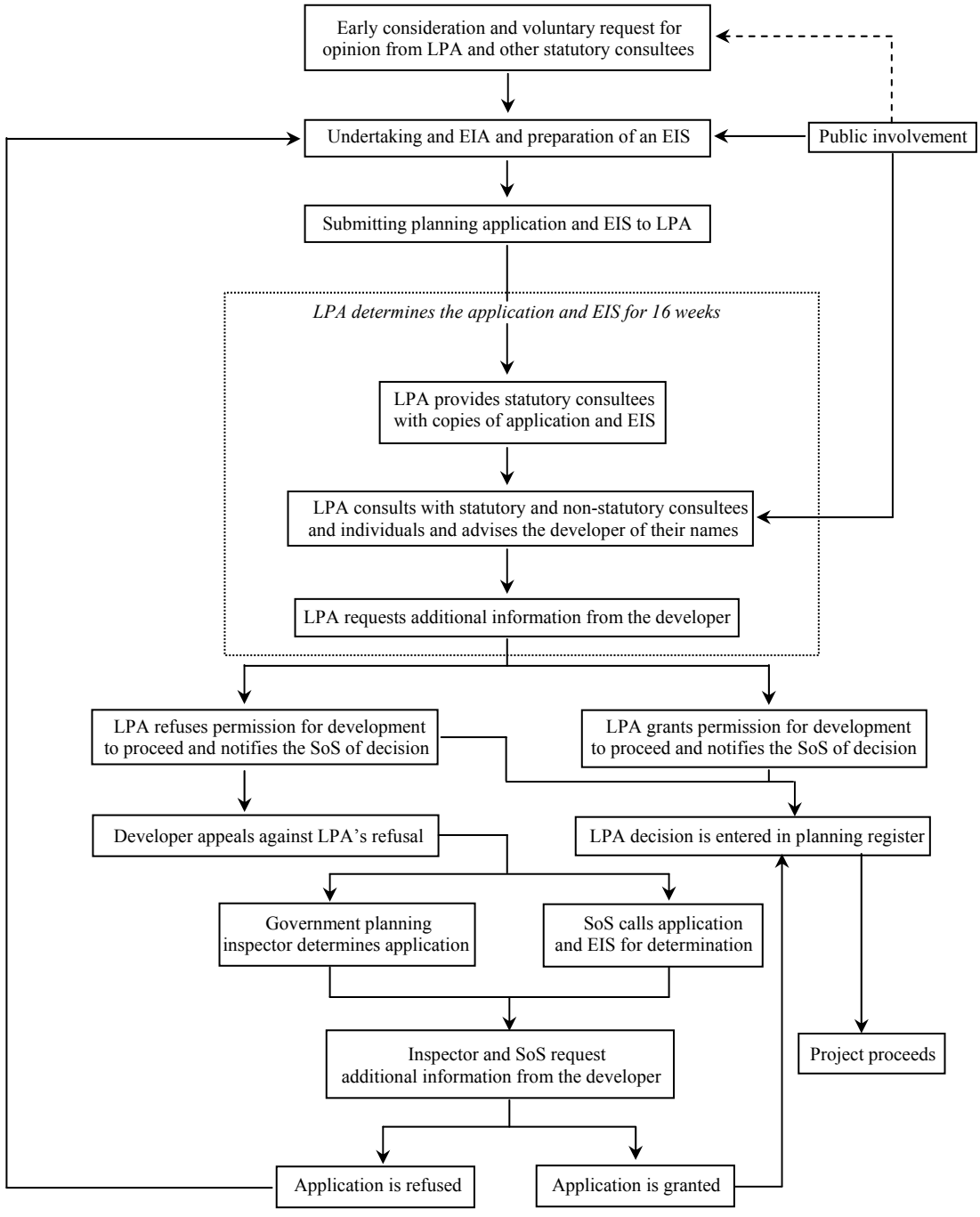


Figure 2.1 Planning process involving EIA

2.5 EC Directives on Nature Conservation in relation to port and harbour development

2.5.1 Introduction

There are two important EC Directives on Nature Conservation, namely the Habitats Directive on the protection of natural habitats and wild flora and fauna (Council Directive 92/43/EEC), and the Birds Directive on the protection of wild birds including migratory birds (79/409/EEC). Under the Habitats Directive, sites are designated as Special Areas of Conservation (SACs) and under the Birds Directive sites are designated as Special Protection Areas (SPAs). SAC sites are either terrestrial or marine (intertidal and/or subtidal), whereas SPA sites are not generally subtidal.

SPAs and SACs are known as European Sites, if the Commission and the Government agree the site as a Site of Community Importance. Where an SAC or SPA covers a marine area, that area is known as a European Marine Site. In particular, a European site is any one of the following:

a) a special area of conservation
b) a site of Community importance which has to be placed on the list referred to in the third sub-paragraph of article 4(2) of the Habitats Directive
c) a site hosting a priority natural habitat type or priority species in respect of which consultation has been initiated under article 5(1) of the Habitats Directive, during the consultation period or pending a decision of the Council under Article 5(3),

or

d) an area classified pursuant to Article 4(1)or (2) of the Wild Birds Directive.

2.5.2 The Conservation (Natural Habitats & c) Regulations 1994

The Conservation (Natural Habitats &c) Regulations, 1994 make provision for the purpose of implementing, for Great Britain, Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. The main implication of these Regulations for port and harbours is that a distinction is made between development proposals (ie plans and projects) and operations and activities within a European Marine Site. The former is discussed below whereas the implication of the Regulations for port and harbour operations are dealt with in Section 2.7.

The Regulations describe marine areas as any land covered (continuously or intermittently) by tidal water, or any part of the sea, in or adjacent to Great Britain, up to the seaward limit of territorial waters.

<u>The Regulations implications for development proposals in ports and harbours</u>
In accordance with the Regulations, development proposals may only be approved by the appropriate competent authority if they can be shown not to have "a significant effect" on a European Marine Site, and if they are likely to have such an effect that the "integrity of the site" remains unaffected. In particular, Regulations 48, 49 and 54 state that an appropriate assessment needs to be undertaken in respect of any proposed plan or project which:

a. ***either alone or in combination with other plans or projects would be likely to have a significant effect on a European Site, and***
b. ***is not directly connected with the management of the site for nature conservation***

Regulations 48,49 and 54 apply to classified SPAs, and to SACs from the point where the Commission and the UK Government agree the site as a Site of Community Importance to be designated as an SAC. They do not apply to potential SPAs or to candidate SACs before they have been agreed with the Commission, but as a matter of policy the Government wishes development proposals affecting them to be considered in the same way as if they had already been classified or designated. Appropriate assessment, therefore, is also required, for potential SPAs, and candidate SACs for the purpose of considering development proposals affecting them.

If a planning authority refuses a development proposal, approval at Ministerial level is possible if there are "imperative reasons of overriding public interest, including those of a social or economic nature". If the site contains a priority habitat or a priority species (as defined in the Habitats Directive), then approval from the Commission would be required for a development with economic benefits (Planning Policy Guidance 9 – Nature Conservation, DETR 1994).

Guidance on the approach to be taken in considering a development proposal that would affect an SPA or SAC is given in Figure 6.2, in Chapter 6.

2.5.3 Permitted development rights, SPAs and SACs

The Government's Planning Policy Guidance on Nature Conservation (PPG9) states that "*developers should bear in mind that if they proceed with a development in or near an SPA or SAC on the assumption that it benefits from a permitted development right, without first checking whether it is likely to have a significant effect on the site, they run the risk of undertaking the project without the benefit of planning permission and being liable to enforcement proceedings*."

Developers in England are advised to refer to the citations, issued by English Nature, which give the reasons for the designation or classification of a site, to assist their initial consultation process. Developers are also advised to seek the advice of English Nature if they are uncertain about the likelihood of significant impacts on a designated site from their proposed development. Table 2.11 lists the information items which a developer must provide to the planning authority.

Table 2.11 Information on a proposed development in or near an SPA or SAC

I. Proposed development

1) A short description of the proposed development or works showing:
- Their broad purpose
- Their physical extent, including the area of land or water likely to be covered
- Any residues likely to be produced and proposals for disposal, and any emissions to air, water, soil, and by noise, vibration, heat, light or radiation
- The timetable for the proposed development

2) A map or maps showing the location of the proposed development in relation to the SPA/SAC boundary, and the position of all proposed buildings, service access routes and works (whether permanent or temporary).

II. Potential impacts

A description of possible direct or indirect effects (including disturbance) on the wildlife, water quality, hydrology, geological, or landform features of the site.

III. Impact controlling measures

Information about any measures the developer proposes to incorporate into the project to prevent, reduce, ameliorate or offset any landtake, residues or emissions.

(Note: Table was reproduced from PPG9 – Nature Conservation)

2.6 Port and harbour operations and environmental impacts

Port and harbour operations, by virtue of their nature, have the potential to impact on environmental resources. Like the development activities, the operational activities may impact on more than one medium as discussed in Section 2.2.1. Table 2.12, summarises the port and harbour operational activities, the environmental resources at risk, and the nature of the potential impacts on these resources. The environmental resources under consideration are primarily the water and sediment quality, air quality, natural habitats, and local community in terms of health, nuisance (noise and light), interests, recreational activities, tourism, and cultural heritage.

Table 2.12 Port and Harbour operations, environmental resources at risk and environmental impacts

Note: Safety aspects of humans (work force and local community) and therefore impacts from hazardous cargo are not being considered here. The IMDG Code of Practice is provides the necessary guidance in handling and storing such cargo.

OPERATIONS	ENVIRONMENTAL RESOURCES AT RISK	ENVIRONMENTAL IMPACT
(I) Cargo handling and storage		
(i) Dry bulk – organic (eg. Flour, grain, sugar)	Water, Sediment, Habitats	Frequent spillage of organic cargo can deplete oxygen from the water and affect aquatic life. Accumulation of organic matter in the sediment will use dissolved oxygen for its decomposition (aerobic); when all dissolved (atmospheric) oxygen is used up, other sources of oxygen will be used for the (anaerobic) decomposition of organic matter. The depletion of oxygen from the sediment will lead to changes in the sediment biota with further changes in the aquatic life (in main water column and sediment-water interface) depending on the sediment biota.
	Air	The (anaerobic) decomposition of organic matter, leading to anoxic (oxygen-starving) sediment will result in releases of malodorous hydrogen sulphide and methane.
	Soil, Humans	Fine dry bulk cargo (eg flour) can become airborne and fall out on land with unpleasant, possibly hazardous consequences (eg organic cargo attracting pests) for working force and local community, and long term soil contamination.
(ii) Dry bulk – ores and minerals	Water, Sediment, Habitats	Spillages during handling and run-off from rainwater or spray water from stockpiling areas can introduce heavy metals directly into the water and consequently the sediment. Certain ores can result in water discoloration (eg iron ore) and changes in the acidity or the salinity of the water with further implications for the aquatic life. In the case of fertilisers, algal blooms and ultimately eutrophication can result; some algae release toxins dangerous to some animals. Decomposition of algal blooms will deplete dissolved oxygen with further implications for aquatic life and air quality (see above).
	Humans	Nitrates may enter the adjacent watercourses with implications for water abstraction points.
	Air, Soil, Humans	Atmospheric fall out will contaminate the soil with heavy metals and nitrates (from fertilizers) from the ores with potential implications for groundwater quality. Some fine-grained ores and minerals are malodorous and dangerous if ingested or breathed in.
(iii) Liquid bulk – organic (eg. Molasses)	Water, Sediment, Habitats, Air, Humans	See Dry bulk – organic above
(iv) Liquid bulk – minerals (including natural gases)	Water, Sediment, Habitats	See Dry bulk – organic above Oil (petrochemicals) can coat and physically foul aquatic life and taint fish and shellfish with implications for commercial resources. Petrochemical (and their derivatives) are known to (cause cancer) carcinogenic and alter the anatomy and functions (mutagenic) of organisms (fish are particularly vulnerable to polyaromatic hydrocarbons (PAHs)).
	Air, Humans	Petrochemicals release volatile organic carbon fumes, which are both unpleasant and hazardous to health. Significant or frequent spillage of oil can interfere with recreational activities, as the formation of tar balls will have a social impact when these reach bathing beaches.

Table 2.12 (Continued)

OPERATIONS	ENVIRONMENTAL RESOURCES AT RISK	ENVIRONMENTAL IMPACT
(I) Cargo handling and storage (continued)		
(v) Timber	Water	Release of wood fragments, pesticides and preservatives (eg chrome, copper, arsenic, creosote); wood fragments in the water will decompose (seeI (1) above on organic decomposition)
	Habitats, Humans	Imported wood may accidentally introduce unwanted pests.
(vi) Refrigerated goods	Water	Spillages of organic matter leading to water and sediment quality deterioration (see I(1) above).
	Air	Potential release of CFCs (ozone depleting chemicals) from faulty or decommissioned refrigeration plants.
(vii) Fish landing and processing	Water	Spillages of organic matter (during landing and processing). See I(1) above for water quality implications.
	Air, Humans	Spillages of fish and fish products can attract pests and their decomposition gives malodours.
(II) Workshop and yard activities		
(1) Vehicle and equipment maintenance (including painting and stripping)	Water	Spillages of oily wastes, oily water petroleum hydrocarbons and paint residues into surface water.
	Soil, Groundwater, Humans	Seepage of oily wastes, paint residues etc. can reach ground water resources via the soil.
	Air, Humans	Release of solvents and coolant fumes with health implications for the work force (mainly). Noise from vehicle maintenance.
(2) Vehicle and equipment washing	Water ,Soil	Discharge of oil and grease, petroleum hydrocarbons, soaps/detergents, and debris.
(3) Handling and storage of chemicals (non-bulk i.e. stored in small containers for cleaning purposes)	Water, soil	Chemicals such as oils, grease, solvents, paints, detergents and any other organic and inorganic chemicals for everyday workshop and yard activities can reach surface water and groundwater through leaks from their containers and spillages during handling/use and transportation.
	Air, Humans	Some of these chemicals give up gaseous emissions and bad odours.
(III) Ship breaking	Water (surface and groundwater), Habitats, Humans	During ship breaking activities there is a potential to release into surface waters contaminants associated with the past use (eg cargo) of the ship (eg. Heavy metals, organic cargo), oils, chemicals associated with the engines (eg PCBs) or hull (eg TBT) or other on-board equipment/machinery (eg refrigerators, (CFCs), transformers (PCBs)). For their impacts on aquatic life see I(1) above.
	Air, Humans	The breaking activities can introduce dust, asbestos and other optic fibres into the atmosphere.
(IV) Vessel and equipment repair and maintenance (including stripping and painting)	Water	The vessel repair and maintenance activities at the land-water interface can introduce into the water oils and greases, TBT-containing paint residues and flakes (eg from water blasting activities) and other particulates (eg sand from the sand blasting activities). See I(1) above for the implications for water quality and aquatic life.
	Air	Release of solvents, fuel and particulates (eg sand) in the air with further implications for humans.

Table 2.12 (Continued)

OPERATIONS	ENVIRONMENTAL RESOURCES AT RISK	ENVIRONMENTAL IMPACT
(V) Fuelling and bunkering (on land and at land-water interface)	Water, Soil	Leaks from vessel fuelling operations can introduce into the water petroleum hydrocarbons (see I(4) above for water quality implications. Leaks from on-land vehicle and equipment fuelling can introduce petroleum hydrocarbons into the soil and eventually the groundwater. Leaks and splashes from emptying and washing of fuelling/bunkering equipment can also have the same impact on water quality.
(VI) Buildings and open area maintenance	Water, Soil	Maintenance of buildings can introduce contaminants such as oil, paint residues, solvents (associated with the painting activities) into the water with implications for the water quality itself and the aquatic life (as discussed already). Maintenance of the open areas, particularly landscaping and the maintenance of vegetated areas can introduce into the surface water, soil and eventually into the groundwater contaminants such as herbicides, pesticides and fertilisers. Landscaping activities can also release into the surface water soil particles and organic matter (eg leaves), other solid wastes with water quality implications (see I(1) above).
(VII) Vehicles storage and transport in car terminals (including washing, Off- and On-loading, fuelling and general maintenance)	Water	Discharges from the washing facilities, and leaks and spillages from the fuelling and storage activities can introduce into the water contaminants such as oil and grease, soap and sediment.
(VIII) Ship and shore solid waste collection (including handling, storage and disposal)	Water, soil, air, humans	Contaminants such as oils, grease, metals, petroleum hydrocarbons, paints, metals, foodstuff, textiles and any other waste matter arising from the shipping and other on-land/shore activities can be introduced into the environmental during collecting, handling and disposing of solid waste. Litter is aesthetically unacceptable, and it can attract pests such as rats. It may also attact seagulls, whose droppings can be a source of salmonella and have high biological oxygen demand, leading to the depletion of dissolved oxygen.
	Habitats	Litter can also be hazardous to wildlife. Birds, large fish, turtles and cetaceans can be entangled in plastics, discarded fish nets and packing material. Certain marine species mistake plastic bags for food and ingest them.

Table 2.12 (Continued)

OPERATIONS	ENVIRONMENTAL RESOURCES AT RISK	ENVIRONMENTAL IMPACT
(IX) Public access/areas and recreation in harbour waters and shore	Water, Sediment, Habitats	Removal of bilge water, spillage of oils and grease, on-board recreational vessel-generated liquid and solid waste, sewage disposal are some of the wastes which can enter harbour waters during recreational activities or from car parks in recreational areas. The impacts of these wastes on water and sediment quality and habitats has been discussed above.
(X) Shipping		
(1) Ship movement	Air, Humans	The operation of ships, particularly in inland waterways can cause nuisance to the public from hazardous air pollutants. Diesel engine emissions can be of particular concern in busy waterways.
(2) Ship discharge – ballast water	Water, Sediment, Habitats	The discharge of ballast water may introduce oily water or "allien" aquatic species, which may displace native species, or introduce pests with significant implications for nature conservation or commercial resources. Oily waters or tar can affect the quality of commercial shellfisheries as hydrocarbons can taint shellfish.
(3) Ship discharge – sewage	Water, sediment, Humans	The effect of organic matter on water and sediment quality and aquatic life has been discussed in I(1) above. Sewage discharges can also have serious health implications for those who use the waterway for recreational purposes.
(4) Ship discharge – bilge water	Water, habitats, Humans	Bilge water releases oils and hydrocarbons in the water with further implications for aquatic life and also commercial resources as hydrocarbons can taint shellfish.
(XI) Transhipment		
(1) Containers	Humans	Container terminals can be sources of high level of noise and intense lighting which can be of nuisance to local residents. A container terminal can also impact on the local road network.
(2) Ro-Ro	Humans	As above. Can impact on local road network and air quality from vehicle exhaust fumes.
(3) Passenger/Ferry	Humans	As above. Can also significantly benefit the local community by increased use of local shops and other facilities.

Table 2.12 (Continued)

OPERATIONS	ENVIRONMENTAL RESOURCES AT RISK	ENVIRONMENTAL IMPACT
(XII) Maintenance dredging and disposal	Water, Sediment, Habitats, Soil	Depending on the past and current discharges from surrounding industry (including and from the port and harbour operational accidents, incidents or bad practice, organic and inorganic contaminants and debris which have reached the sediments, could be released into the water column during maintenance dredging. The implications for the water quality and habitats has been discussed in I(1) above and in Text Box 2.1. Open water disposal can introduce these contaminants into the water column with water quality and aquatic life implications. In addition, the open-water disposal of organically rich and oxygen-poor or oxygen-depleted maintenance dredged material will use up dissolved oxygen supplies from the water column with potentially significant implications for aquatic life. Maintenance dredging can also affect tidal regimes with further implications for the intertidal mudflats which are very rich habitats and very important for internationally protected species (eg birds).
	Humans	Disposal of contaminated dredged sediment on-land/bankside can significant implications for surface water abstraction points and groundwater supplies Depending on the timing of the dredging operations and prevailing winds, the local residential community may be experiencing nuisance from the noise from the dredger. Disposal activities can interfere with recreational uses, as may be the case with bank/land disposal. Drying out of disposed sediment may cause contaminated dust to become airborne, or light debris to be relocated from the disposal area and therefore hazardous.

2.7 Environmental legislation for port and harbour operations

2.7.1 Introduction

This section presents the legislation, which is applicable to port and harbour operations.

There is a great deal of environmental protection legislation, which is increasing at a steady rate. Clearly the applicability of environmental legislation to a port depends upon its operations with the potential to impact on the environment. Table 2.13 presents the port and harbour operations, the environmental resources at risk and the relevant environmental legislation. Table 2.14 summarises pollution control legislation applicable to port and harbour operations.

For port and harbour operations within a European Marine Site, the Habitats Regulations lay down a management procedure. Relevant authorities may establish a management scheme for the Marine Site based on advice, which is received from the appropriate nature conservation body, that is the English Nature for England, the Countryside Council for Wales (CCW) or the Scottish Natural Heritage (SNH). The advice is basically the reasons for the site designation and hence the conservation objectives and the nature of operations which are likely to result in deterioration of the habitat.

A management scheme needs to reflect the way in which the relevant authorities (ie a Harbour Authority having functions in or near a Marine Site) will exercise "their functions, including any power to make byelaws" so as to secure the site's "compliance with the requirements of the Habitats Directive".

This report does not discuss the management schemes any further as these have been the subject of the two separate projects on UK Marine Special Areas of Conservation (SACs), see Table 2.4. The UK Marine SACs Task 2.1 project examines the recreational user interactions with SACs and Task 2.2 project examines the port and harbour operations and their interactions with marine SACs.

Table 2.13 Port and Harbour operations, environmental resources at risk and relevant environmental legislation

OPERATIONS	ENVIRONMENTAL RESOURCES AT RISK	ENVIRONMENTAL LEGISLATIVE REQUIREMENTS
(I) Cargo handling and storage		
Dry bulk – organic (eg. Flour, grain, sugar)	Water, Sediment, Habitats, Air, Soil, Humans	Antipollution Works Regulations 1999 Environmental Protection Act, 1990, Part I (releases to water), Part II (emissions to air, e.g. dust) Water Resources Act, 1991 Salmon and Freshwater Fisheries Act, 1975
Dry bulk – ores and minerals	Water, Sediment, Habitats, Humans, Air, Soil, Humans	Antipollution Works Regulations 1999 Environmental Protection Act, 1990, Part I (releases to water), Part II (emissions to air, e.g. dust) Water Resources Act, 1991 Salmon and Freshwater Fisheries Act, 1975
Liquid bulk – organic (eg. Molasses)	Water, Sediment, Habitats, Air, Humans	Antipollution Works Regulations 1999 Environmental Protection Act, 1990, Part I (releases to water), Part II (emissions to air, e.g. dust) Water Resources Act, 1991 Salmon and Freshwater Fisheries Act, 1975 Groundwater Regulations 1998
Liquid bulk – minerals (including natural gases)	Water, Sediment, Habitats, Air, Humans	Antipollution Works Regulations 1999 Environmental Protection Act, 1990, Part I (releases to water), Part II (emissions to air, e.g. dust) Water Resources Act, 1991 Salmon and Freshwater Fisheries Act, 1975 Groundwater Regulations 1998 Bathing Waters Regulations 1991
Timber	Water, Habitats, Humans	Environmental Protection Act, 1990, Part II, Sections 33 and 34 (see Table 2.14) Water Resources Act, 1991
Refrigerated goods	Water, Air	Environmental Protection (non-refillable Refrigerant Containers) Regulations 1994 Water Resources Act, 1991 Salmon and Freshwater Fisheries Act, 1975
Fish landing and processing	Water, Air, Humans	Environmental Protection Act, 1990, Part II (odour) Water Resources Act, 1991 Salmon and Freshwater Fisheries Act, 1975

Table 2.13 (Continued)

OPERATIONS	ENVIRONMENTAL RESOURCES AT RISK	ENVIRONMENTAL LEGISLATIVE REQUIREMENTS
(II) Workshop and yard activities		
Vehicle and equipment maintenance (including painting and stripping)	Water, Soil, Groundwater, Air, Humans	Antipollution Works Regulations 1999 – Special Waste Regulations 1996 Environmental Protection Act, 1990, Sections 33, 34, 78 and 79 (see Table 2.14) Water Resources Act, 1991
Vehicle and equipment washing	Water ,Soil	Antipollution Works Regulations 1999 Water Resources Act, 1991
Handling and storage of chemicals (non-bulk, i.e. stored in small containers for cleaning purposes)	Water, Soil, Air, Humans	Antipollution Works Regulations 1999 – Environmental Protection (Duty of Care) Regulations 1991 Environmental Protection Act, 1990, Sections 33, 34 and 78E (see Table 2.14) Water Resources Act, 1991
(III) Ship breaking	Water (surface and groundwater), Habitats, Humans, Air	Antipollution Works Regulations 1999 Environmental Protection Act, 1990, Sections 33, 78E and 79 Water Resources Act, 1991 Groundwater Regulations 1998 Food and Environmental Protection Act (FEPA) 1985 Control of Pollution Act 1974 (Scrap metal)
(IV) Vessel and equipment repair and maintenance (including stripping and painting)	Water, Air	Antipollution Works Regulations 1999 – Special Waste Regulations 1996 Groundwater Regulations 1998 Environmental Protection Act, 1990, Sections 34, 78 and 79 (nuisances) Water Resources Act, 1991 Salmon and Freshwater Fisheries Act, 1975
(V) Fuelling and bunkering (on-land and at land-water interface)	Water, Soil, Air	Antipollution Works Regulations 1999 Groundwater Regulations 1998 Environmental Protection Act, 1990, Section 79 (nuisances) Water Resources Act, 1991 The Wildlife and Countryside (Amendment) Act 1985 Salmon and Freshwater Fisheries Act, 1975
(VI) Buildings and open area maintenance	Water, Soil, Air Humans	Antipollution Works Regulations 1999 Groundwater Regulations 1998 Clean Air Act 1993, Section 2, The Wildlife and Countryside (Amendment) Act 1985 Asbestos Regulations 19983 Clean Air (Emission of Dark Smoke) (Exemption) Regulations 1969
(VII) Vehicles storage and transport in car terminals (including washing, Off- and On-loading, fuelling and general maintenance)	Water	Antipollution Works Regulations 1999 Groundwater Regulations 1998 Water Resources Act, 1991 Environmental Protection Act, 1990, Sections 78E and 79

Table 2.13 (Continued)

OPERATIONS	ENVIRONMENTAL RESOURCES AT RISK	ENVIRONMENTAL LEGISLATIVE REQUIREMENTS
(VIII) Ship and shore solid waste collection (including handling, storage and disposal)	Water, soil, air, humans	Antipollution Works Regulations 1999 – Environmental Protection (Duty of Care) Regulations 1991 Environmental Protection Act, 1990, Sections 33, 34, 78E and 79 Groundwater Regulations 1998 – Water Resources Act, 1991 (S85) - Waste Management Licensing Regulations 1994 Food and Environmental Protection Act (FEPA) 1985 - Special Waste Regulations 1996 Control of Pollution Act 1974 (Scrap metal) - Merchant Shipping Notice 1709 Port Waste Management Plans
(IX) Public access/areas and recreation in harbour waters and shore	Water, Sediment, Habitats	Water Resources Act, 1991 EPA 90 Section 34 Salmon and Freshwater Fisheries Act 1975
(X) Shipping		
Ship movement	Air, Humans	Merchant Shipping (Prevention of Pollution by Garbage) Regulations 1988
Ship discharge – ballast water	Water, Sediment, Habitats, Humans	Water Resources Act, 1991 Salmon and Freshwater Fisheries Act, 1975 Surface Waters (Shellfish) (Classification) Regulations 1988 Bathing Water Regulations 1991
Ship discharge – sewage	Water, sediment, Humans	Water Resources Act, 1991 Salmon and Freshwater Fisheries Act, 1975 Food and Environmental Protection Act (FEPA) 1985 Bathing Water Regulations 1991
Ship discharge – bilge water	Water, habitats, Humans	Water Resources Act, 1991 Salmon and Freshwater Fisheries Act, 1975 Food and Environmental Protection Act (FEPA) 1985 Bathing Water Regulations 1991
(XI) Transhipment		
Containers	Humans	Environmental Protection Act, 1990, Part II
Ro-Ro	Humans	Environmental Protection Act, 1990, Part II
Passenger/Ferry	Humans	Environmental Protection Act, 1990, Part II
(XII) Maintenance dredging and disposal	Water, Sediment, Habitats, Soil, Humans	Environmental Protection Act, 1990, Part II (nuisances, wastes) Water Resources Act, 1991, Sections 85 and 90 Salmon and Freshwater Fisheries Act, 1975 Food and Environmental Protection Act (FEPA) 1985

Table 2.14 Pollution Control legislation applicable to Port and Harbour operations

Pollution Control legislation	Protected Environmental resource	Explanations
Environmental Protection Act (EPA) 1990	Air, water, land	This is the main British legislation on integrated pollution control (IPC) applicable to a range of (prescribed) processes leading to emissions and discharges of a range of (prescribed) substances to air, water and land
Environmental Protection (Prescribed Processes and Substances) Regulations 1991	Air, water, land	These Regulations, as amended, list the relevant prescribed processes which have considerable pollution potential and are subject to local authority air pollution control (LAAPC), such as port operations
EPA 1990, Part I	Air	Part I of the **EPA 1990** requires that processes prescribed for air pollution control must obtain authorisation from the relevant local authority. Operators of such processes must use Best Available Techniques Not Entailing Excessive Costs (BATNEEC) to prevent, reduce or render harmless emissions of prescribed substances to air.
EPA 1990, Part II	Air	Under **Part II** of **EPA 1990**, it is an offence to create a statutory nuisance, such as as smoke, fumes or dust, odour or noise. Where any of these statutory nuisances occurs, the local authority has the power to serve an abatement notice on whoever is causing the nuisance. Failure to comply with the abatement notice is an offence.
Clean Air Act 1993	Air	Provisions of the **Clean Air Act 1993** restrict emissions of dark and black smoke
Antipollution Works Regulations 1999	Water	These Regulations will allow the Environment Agency to serve a notice on anyone who has polluted or has the potential to pollute water obliging the offender, or potential offender, to take action to rectify the problem.
Water Resources Act (WRA) 1991	Water	This Act covers protection of water against pollution, and it applies to England and Wales. In **Scotland**, the protection of water against pollution is covered by the **Control of Pollution Act 1974**. Under the **WRA 1991**, it is an offence to cause or knowingly permit the discharge of polluting substances into the controlled waters
Salmon and Freshwater Fisheries Act 1975	Fisheries	This Act makes it an offence to discharge effluent which damages fish, their food, their spawn or their spawning grounds, into water containing fish
Environment Act 1995 Scotland	Water	Section 106 and schedule 17 of the 1995 Act amends the **Control of Pollution Act 1974** with respect to water pollution control in **Scotland**.
Groundwater Regulations 1998	groundwater	These Regulations partly implement the EC Groundwater Directive (80/68/EEC) in England, Wales and Scotland
Surface Waters (Dangerous Substances) (Classification) Regulations 1997 and **1998**	Water	These Regulations provide statutory environmental quality standards for a number of substances. The EA (in England and Wales) and SEPA (in Scotland) use these standards when they issue discharge consents
Control of Pollution Act 1974	Soil and groundwater	This Act still applies to the deposit of scrap metal until this comes under the control of EPA
EPA 1990, Part II, Section 33	As above	Under Section 33 of the EPA it is an offence to dispose of, treat or store controlled waste without a waste management license
EPA 1990, Part II, Section 34	As above	Section 34 places a **Duty of Care** on anyone who produces, imports, treats, keeps, carries, disposes of, or is a broker for, controlled waste
Environmental Protection (Duty of Care) Regulations 1991	As above	These Regulations require that a written description of waste, a transfer note, is produced for the purposes of transfer of waste. Both the producer and the receiver of the waste must complete and sign the transfer note.
Waste Management Licensing Regulations 1994 and 1995 Amendments	As above	These Regulations implement the waste management licensing scheme introduced by Part II of the EPA. The provisions in these regulations include certain exemptions, such as the disposal of dredged material to land for beneficial use purposes.
EPA 1995	As above	The **Environment Act 1995** inserts new sections into the **EPA 1990**. In particular, section 78E enables a local authority to issue a land remediation note to the offending part, specifying the action required to remediate the land.

2.7.2 Legislation and Marine Conservation

Legislation on marine conservation has an impact on the port operation activities. The majority of ports are administered by statutory Harbour Authorities, who are each governed by their own legislation tailored to the needs of each port. The Docks and Harbour Act 1972, places statutory responsibility on the Harbour Master to ensure navigation and safety within the harbour limits. In addition, ports have a duty to have regard to the environment under the Harbours Act 1964. Various Acts, Regulations, Codes of Practice and Policies apply to port and harbour operation activities.

In relation to marine areas any competent authority having functions relevant to marine conservation shall exercise those functions so as to secure compliance with the requirements of nature conservation legislation and policies. This applies, in particular, to functions under the following enactments:

- The Sea Fisheries Acts within the meaning of section 1 of the Sea Fisheries (Wildlife Conservation) Act 1992
- The Dockyard Ports Regulation Act 1865
- Section 2(2) of the Military Lands Act 1900 (provisions as to use of sea, tidal water or shore)
- The Harbours Act 1964 (with the relevant amendments made by Part III of the Docks and Harbours Act 1966
- Part II of the Control of Pollution Act 1974
- Sections 36 and 37 of the Wildlife and Countryside Act 1981 in relation to marine nature reserves
- Sections 120 to 122 of the Civic Government (Scotland) Act 1982 in relation to the control of the seashore, adjacent waters and inland waters
- The Water Resources Act 1991
- The Land Drainage Act 1991
- Salmon and Freshwater Fisheries Act 1997

2.7.3 Marine Pollution Conventions and International Agreements

There are a number of international conventions and agreements on marine pollution, which have been implemented by British legislation. This Section briefly describes the two primary ones, namely the International Convention for the Prevention of Pollution from Ships (MARPOL) 1973 and the Oslo and Paris Conventions on Dumping at Sea 1972.

Oslo and London Conventions on Dumping at Sea 1972

These are the two main Conventions covering disposal at Sea. The main definition of disposal (up until 1997 it was referred to as dumping) in use is provided by the London Convention 1972, Article III which reads as follows: "*dumping means any deliberate disposal at sea of wastes or other matter from vessels, aircraft, platforms or other man-made structures at sea"*. The main objectives and areas covered by these Conventions, which are relevant to port and harbour operations, are listed in Table 2.15.

Table 2.15 Main objectives of the London and Oslo Conventions

Convention	Main objectives
London (Dumping) Convention 1972 In force in 1975 and amended in 1992	Annex I ("*black list* ") lists substances, disposal of which at sea is prohibited: organohalogen compounds, mercury, cadmium, high level radioactive materials, biological and chemical warfare materials, persistent plastics, and various oils including crude and refined oil, heavy diesel, lubricants, hydraulic fluids, as well as mixtures of these. Annex II ("*grey list*") lists substances the disposal of which requires a special treatment. The list includes arsenic, lead, copper, zinc, organosilicon compounds, cyanides, fluorides, pesticides, chromium, nickel and mixtures of these. It also includes radioactive wastes not included in Annex I, as well as containers, scrap metal, and other bulky wastes likely to significantly interfere with fishing or navigation
Oslo (Dumping) Convention 1972	This Convention is similarly structured as the London Convention. It makes additional requirements in Annex II regarding the disposal of certain substances (and quantities of) in deep waters and 150 miles from land, which are likely to significantly interfere with recreation

International Convention for the Prevention of Pollution from Ships 1973 (MARPOL)

MARPOL Convention took place in 1973 but entered into force in 1983. It aims at protecting the Seas from pollution from a range of pollutants as a result of shipping operations. In particular, it includes the following Annexes:

- Annex I on oil
- Annex II on noxious liquid substances in bulk
- Annex III on packaged goods
- Annex IV on sewage
- Annex V on garbage

Each one of the MARPOL Convention Annexes are implemented by separate British legislation as listed in Table 2.16. Table 2.16 also lists the British legislation, which implements the Oslo and London 1972 Conventions.

Table 2.16 British legislation implementing International Conventions and Agreements on Marine Pollution

International Conventions on Marine Pollution	British Legislation
MARPOL Convention – Annex I: oil pollution	Merchant Shipping (Prevention of Oil Pollution) Regulations 1983
MARPOL Convention – Annex II: noxious liquid substances in bulk	Merchant Shipping (Control of Pollution by Noxious Liquid Substances in Bulk) Regulations 1987
MARPOL Convention – Annex V: garbage	Merchant Shipping (Prevention of Pollution by Garbage) Regulations 1988, and Merchant Shipping (Reception Facilities for Garbage) Regulations 1988
Oslo and London Convention on Dumping at Sea 1972	Food and Environmental Protection Act 1985

CHAPTER 3. CURRENT ENVIRONMENTAL POLICIES OF THE UK PORTS SECTOR

3.1 Introduction

In the last decade or so, British organisations of all kinds are becoming increasingly concerned with the way in which their operations and products are affecting natural and human resources, particularly so with those operations, which are subject to UK, European and International legislation and regulations on environmental protection. In the context of increasingly stringent legislation, development of economic policies and other measures on environmental protection, and a general growth of concern from interested parties, including the public, on environmental matters, these concerned organisations seek to achieve and demonstrate sound environmental performance.

The Chemical Industry was the first to start controlling the impact of its activities, products or services on the environment, by carrying out in-house audits to assess their environmental performance. It soon became apparent that on their own these audits were not sufficient to provide an organisation with the certainty that its environmental performance is and will continue to meet its legal and policy requirements. It was soon, therefore, realised that a more structured and systematic practice/methodology would address all aspects of environmental performance and would reassure companies of their continual performance.

Standards addressing environmental management are intended to provide organisations with the elements of an effective environmental management system, which can assist organisations to improve environmental performance. There are two internationally recognised EMS standards and these are presented in Chapter 5.

3.2 Current status of environmental management practice in the UK Ports Sector

A port authority's environmental policy is arguably one of the most important statements it can make in terms of its ability to deliver positive environmental protection and to implement an effective strategy of sustainable development. Environmental policy may be defined as a declaration by the organisation of its intentions and principles in relation to its overall environmental performance which provides a framework for action and for the setting of its environmental objectives and targets. (Examples of policy statements are given in Chapter 4)

Although it has long been recognised that ports have a major role to play in environmental protection and sustainable development, and that they are significant components of any coastal zone management system, it is only in recent years that the sector has started to take a collective approach to the common challenges and opportunities posed by environmental concerns.

Until the mid 1980's, it may be suggested that any environmental policy was subsumed within normal operations of the port and was fragmented between various departments of port management. Generally, there were no specific environmental policy statements which focussed on environmental protection through the implementation of appropriate administrative, procedural or technical options. The passing and adoption of new international, European and national legislation acted as a spur for representative bodies of the industry to formulate a response, so that by the mid 1990's a series of significant initiatives were in place to develop policy statements and machinery for realisation aimed at effective and practicable environmental management of port areas by the port sector itself.

The response of the British ports' sector to environmental responsibilities has been progressively more supportive and proactive over the last decade when measured in terms of initiatives, projects and programmes involving management schemes, training, monitoring, research and collaborative involvement in coastal zone management and conservation issues. The British Ports Federation (now British Ports Association, BPA) produced an Environmental Statement and Code of Practice in 1992. It was soon recognised that this approach needed to be adopted on a European basis and consequently the European Sea Ports Organisation (ESPO) published its own Code at the end of 1994 through its Environment Committee. The Code is a combination of recommendations on a management approach along with a succession of objectives and targets for the most important issues. These include environmental

monitoring, port planning and development, dredging and emergency response plans (ESPO, 1994). The Code had to take into account the remarkable geographical and commercial diversity of the port sector both within the UK and throughout Europe. Its widespread adoption has encouraged strong interest in environmental issues and has served as a catalyst for dedicated research programmes aimed at raising awareness of the environmental imperative, and the development and execution of effective port environmental management systems. Until the setting up of ESPO in March 1993, port affairs involving a European dimension had been handled by port representatives working directly with the Commission without the benefit of an independent organisation funded and organised by port members. ESPO has provided a framework within which ports can establish their own policies (including environment) based on day to day operational experience. U.K. Ports have been active participants in all the major environmental initiatives including the establishment of ECEPA (Environmental Challenges for European Port Authorities) set up at the same time as ESPO to provide a platform for managing joint environmental research projects between ports from different member states.

It is important to note that the U.K. ports sector environmental policies have both contributed to, and evolved with, the growing European dimension of legislation and the increasing awareness of the trans-boundary nature of physical process and pollutant pathways coupled with the potentially regional scale impacts that constitute environmental concerns. In addition to corporate environmental projects carried out in collaboration with other ports and external agencies at national and international levels, individual U.K. ports can demonstrate a well established environmental management system based on several years of experience constituting best practice through effective environmental protection of the port area and its surroundings from the impacts of day-to-day operations and longer term port development projects.

Nevertheless, it is acknowledged by the port sector that there is no case for complacency. Several research programmes have shown the need for ports to take the initiative and to be proactive when it comes to the formulation and fulfilment of environmental policies. Legislation can only provide a framework and a broad list of statutory conditions that may, or may not, reflect the operational, geographical and commercial intricacies of an individual port. Any environmental initiatives and policy statements need to be set in the context of the increasing volume of environmental legislation and the growing demands and expectations of society at large. Legislation such as the recently amended and strengthened Environment Assessment Regulations act as a control on port development and ensure that port expansion is compatible with EU and national environmental standards. The Habitats Directive which identifies both marine and land sites requiring a high level of protection, has meant that ports within or adjacent to such areas require a higher level of expertise in the detail of site management.

As multimodal terminals often attracting processing, storage and other related industries, ports pose unusual problems in terms of environmental management and protection. Although they serve the most environmentally friendly mode of transport, many ports occupy areas of sensitive coastline and may create heavy concentrations of vehicular traffic. The mix of commercially driven port activities has the potential to have a profound impact on land, sea, air and seabed habitats and systems, and this requires a multidisciplinary and innovative approach to research and the implementation of effective policies aimed at sustainable development of port operations and activities.

3.3 Eco-Information project

3.3.1 UK ports and major environmental issues

In 1996, ESPO commissioned membership surveys through an environmental questionnaire in order to establish the extent to which environmental policies were being implemented. A total of 281 ports from 15 member states (including 73 U.K. ports) responded, providing significant base line data from which an industry response profile could be monitored. The results of the survey contributed to the growing volume of information about port environmental management and provided important preliminary data for the ECO-Information project. UK ports are active participants and contributors to a project that is arguably more ambitious than any of its predecessors in that it takes an holistic perspective on port environmental management rather than the issue by issue approach characteristic of previous research. The ECO-

information project represents a systematic and dedicated approach by ESPO members to respond to international and European environmental legislation in a unified manner through shared experience and self monitoring for the mutual advantage of environmental protection and sustainable development of port activities. Its main components are a data base configured as an Information Retrieval System, a Self Diagnosis Methodology for assessing compliance, and supporting details of experience to assist decision making.

The objectives of the project have been detailed by H. Journée (1997) and include the goals of:

- assessing the current environmental situation in ports through the collection and analysis of information related to activities, issues, impacts, priorities and cost effective solutions applied in European ports;
- exchanging practical experiences between partnerships;
- supporting managers in policy development and response options;
- demonstrating good practice and a pro-active stance to legislators and third parties.

3.3.2 Web-site access and Membership

Details about the ECO-information project can be obtained from the Website www.ecoports.com which serves as a communication tool on environmental subjects for European ports. Membership of the Network is open to ports which contribute environmental information (based on their own experience of dealing with any environmental issues) to the database. The system is voluntary and facilitates the free exchange of environmental information between port professionals. Enquiries concerning membership should be sent to :

H. Journee	*or D. Whitehead*
Prime Co-ordinator ECO-info.	*Senior Management Team, ECO-info*
Port of Amsterdam	*British Ports Association*
Fax +31 206200 98 21	Fax + 44(0) 1171 405 1069

The ECO-Information research programme has received strong support from U.K. ports with two special seminars convened by BPA to introduce the work taking place and in particular the evolution and introduction of the Self Diagnosis Methodology (SDM) - a strategic analysis questionnaire for the (environmental) port manager. (SDM, 1998.) The SDM contains a series of checklists which assist an individual port in assessing and reviewing its performance in terms of environmental management procedures. An example of the section of the questionnaire relating to Environmental Policy is given in Appendix 3. The SDM is in principle prepared for the port's own use and benefit. However, due to the spirit of co-operation and mutual support on environmental issues, most participating ports in the U.K. have contributed their completed SDM form anonymously for analysis thus facilitating a port sector profile of environmental management achievements and status which can be compared with some results from the 1996 ESPO survey.

Comparison of the results from the 1996 ESPO environmental questionnaire survey and the 1999 ECO-Information SDM returns allows an assessment to be made on various aspects of environmental management procedures within the U.K. port sector.

Acknowledging that trends are probably more significant than absolute values, the following progress can be recorded for respondent European ports (including UK):

3.3.3 Progress in implementation of environmental policy by European ports 1996-1999

More ports:

- have an Environmental Plan (+ 17%)
- designate environmental personnel (+18%)
- aim for 'Compliance Plus' (+28%)
- encourage environmental awareness (+45%)

- involve local community and other stakeholders (+ 17%)
- carry out environmental monitoring (+13%)

It may reasonably be suggested that the series of Conferences, Workshops and Publications surrounding the project have played their role as catalysts for action and have contributed to the continued evolution of the sector's policy on environmental management.

The involvement of U.K. ports in various environmental research programmes has identified the major environmental issues within port areas. The average ranking of the most important environmental issues as seen by port authorities (based on the ECO-information Project 1999), therefore, is as follows:

1. Health and Safety
2. Waste
3. Dredging
4. Water Quality
5. Noise
6. Soil Contamination
7. Dust
8. Air Authority
9. Habitat loss
10. Energy Use

These research projects have also confirmed that for the U.K. port sector as a whole, in terms of environmental management there is:
- a wide range of proven experience;
- high levels of expertise in specific areas and issues;
- well established examples of best practice;
- common areas of interest;
- relevant example of technical solutions and costings.

There is also:
- evident disparity in resources and status accorded to environmental management;
- opportunities for enhanced training initiative for port personnel'
- the case for integrating port and shipping environmental management efforts;
- integration of environmental management into the day-to-day business plans of the port.

Crucial to all these processes are the individual port management plans and the objective of much of the port industry's work is to ensure that every port has set out its plans in writing and has nominated staff with sufficient experience and authority to see them implemented. These plans should also be available for inspection to outside interests and organisations.

Success in establishing all these good intentions will require additional knowledge, sound planning, the identification of relevant targets and a systematic review and revision of environmental management systems based on analysis of appropriate performance indicators. As commercial enterprises, strongly aware of competitive pressures and with a high profile in the local community, ports have tended to act alone. The new approach and guidelines being developed encourages ports to share experience and expertise in ways not previously available.

CHAPTER 4. ENVIRONMENTAL MANAGEMENT PRACTICES IN SELECTED UK AND OVERSEAS PORTS AND HARBOURS

4.1 Introduction

Each port has a different management structure and culture, which is reflected generally in their approach to tackling environmental management. For the purposes of these Guidelines, a selection of ports and harbours were consulted as to their understanding of environmental management and consequently on their experiences of their environmental management practices and systems. This Section gives examples of environmental management practices in selected ports and harbours in the UK. An overseas port with a different organisational structure and links with the municipality than the UK ports was also consulted because in reality it comprises a series of smaller scale ports. The UK port examples selected as case studies in this report have been chosen to represent the different approaches to environmental management practices and to include both those ports that sought to establish a comprehensive environmental management system and those that opted for a gradual development of an informal system.

The following port environmental management case studies are presented in this Section:

-Port of Dover
-Ports of Falmouth, Truro and Penryn
-Port of Rotterdam

Extracts from the consultation replies are also included, particularly where information on organisational structure of an informal environmental management practice or Environmental Code of Practice is given.

4.2 Dover Harbour Environmental Management Practice

4.2.1 Dover Harbour profile

Dover is one of the world's largest international ferry ports and is the U.K.'s leading link with Europe. In 1998 it handled 19.4 million passengers, 3.3 million cars, 7.5 million freight vehicles, 14 million tonnes of cargo and had over 66,000 shipping movements. All this was achieved within a compact port area of 243 ha water and 140 ha land so that environmental impact and performance of these operations are significant considerations in the 24 hours a day, year-round management programme.

In addition to catering for large volumes of cross-Channel ferry traffic, the port has recently developed its general cargo, cruise and non-ferry businesses. As a result, Dover is now the fourth largest importer of fruit and vegetables in the United Kingdom and the busiest cruise port in northern Europe (128 cruise ships, 1997). It is currently extending its marina capacity by a further 120 berths and is constructing a second cruise terminal at Western Docks. Space usage at terminals has reached its optimum and the Board is increasingly mindful of the environmental considerations inherent in port development projects.

4.2.2 Background on the development of environmental management

In the early 1990s, Dover Harbour Board decided to incorporate environmental issues into its management and activity programme because of: -

- The growing awareness of new and rapidly evolving legislation aimed specifically at protecting the coastal and marine environment,
- the protocol involved in obtaining dredging licences, and
- a series of port developments including berth extensions, reclamations and terminal developments requiring some environmental consideration and information.

The decision was taken early on to evolve an environmental management system over a series of phased developments rather than to adopt a rigorously formatted, comprehensive model in one go. This has allowed a planned progression of effort and resources over the years producing a system that reflects the

special geographical, hydrographic and commercial characteristics of the harbour, yet which parallels the components and requirements of such systems as ISO 14001 and EMAS should the Board decide to adopt a formally accredited system.

The first systematic studies of environmental issues started in 1993 when an initial environmental review of the marine environment was undertaken in order to establish preliminary baseline data and to assess the range and quality of information available as a starting point from which to evolve an appropriate environmental management programme.

4.2.3 Current status of the environmental management practice

The planned progression of environmental measurements has encouraged the development of in-house expertise and ensured that the system capabilities and deliverables reflect the unique characteristics and circumstances of the port, and confirm compliance with relevant legislation.

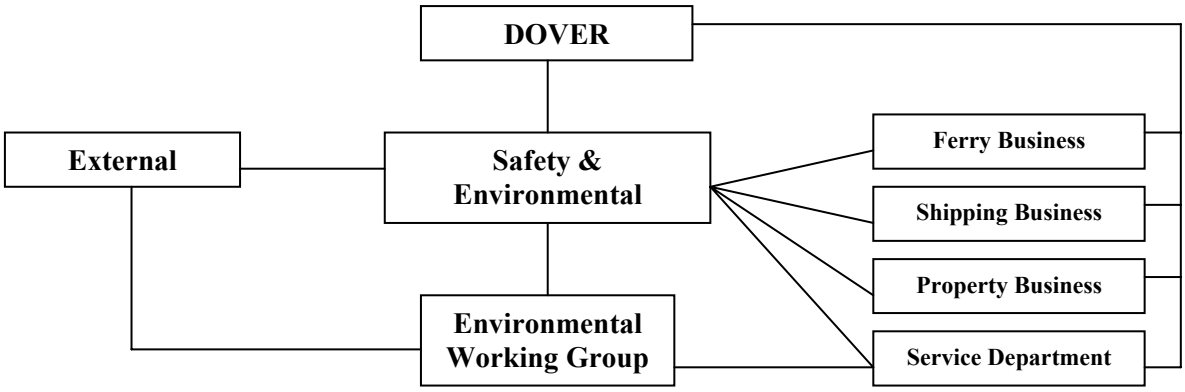
Environment initiatives grew out of the Board's long established hydrographic capability. The port was experienced in monitoring and promulgating data related to bathymetry, wind, wave, tide and currents – all of which is relevant and indeed fundamental to improving environmental quality and protecting habitats. The skills required to survey, monitor, analyse and map/chart hydrographic information easily lend themselves to taking on the environmental parameters related to air, water and sediment quality.

The port's environmental programme has evolved from preliminary and selective baseline surveys to a comprehensive annual programme of monitoring and reporting that stands scrutiny at international level. The tangible deliveries include a suite of publications focussing on environmental issues, a dedicated computerised database and an annual Environmental Review which publishes environmental performance indicators (Dover Harbour Board and Cardiff University, personal communication,1999).

Since the inception of the initiative, hydrographic and environmental programmes have become integrated, reflecting the process-based interrelationships and the cost-benefit of collaborative surveys. The structure of the Board's environmental management organisation is shown in Figure 4.1.

The status of environmental issues is reflected by the Board's decision to issue its Annual Environmental Review in conjunction with the Annual Accounts and Performance Reviews.

Figure 4.1 Dover Harbour Environmental Management and Organisational Structure



External Bodies

Ferry Operators

Cruise Lines

Cargo Lines

British Ports Association

European Sea Ports Organisation

Cardiff University

University of Kent at Canterbury

Universite du Littoral, Wimereux, France

Kent County Council

Dover District Council

Dover Town Council

English Nature

National Trust

Environment Agency

Ministry of Agriculture, Fisheries and Foods

Department of Environment Transport and the Regions

MARPOL

Safety & Environment Performance Group

Manager, Marine Services

Ferry Business Manager

Corporate Secretary

Manager, Engineering Services

Port Safety Manager

Environmental Working Group

Advisor on Hydrography and the Environment

Hydrographer and Environmental Administrator

Assistant Corporate Secretary

Duty Terminal Manager

Duty Marine Manager

Electrical Maintenance Manager

Technician (Mechanical)

Port Safety Officer

4.2.4 Dover Harbour Board's Environmental Policy

The Dover Harbour Board's Environmental Policy Statement is published in its annual Environmental Review:

The Port of Dover is committed to ensuring the best practicable protection of the environment under its jurisdiction and responsibility commensurate with its overall mission and sustainable development.

The Board fully endorses the principles contained in the European Sea Ports Organisation's Environmental Code of Practice and is pledged to work towards a cleaner environment through the implementation of effective management strategies, co-operation with relevant authorities and consultation with user and interest groups.

The Board recognises that the setting up of a rigorous, systematic and scientific programme of repeated monitoring and surveying is one of the most profound statements of commitment and intent that a port or harbour authority can make in support of the environmental imperative. The commissioning of such studies provides the Board with:

- a datum against which to assess change with time;
- relevant information for environmental management decision-making;
- a body of knowledge to support research into specific issues and port development projects;
- the potential to be forewarned of any environmental problems;
- port specific detail that could be submitted as evidence of environmental status or quality in the event of any incident involving prosecution or legal action;
- a tangible demonstration of effort and investment for purposes of public relations, marketing and investment;
- a data base from which to assess environmental performance and evaluate the cost-benefit of such activities.

4.2.5 Dover Harbour Board's Environmental Programme

The Board's environmental programme routinely reports on the following aspects:

Environmental Quality	
Navigable water:	**Ammonia, pH, Salinity, Total Coliforms, Faecal Coliforms, Faecal Streptococci, Salmonella, Dissolved Oxygen.**
Seabed sediments:	**Cadmium, chromium, copper, mercury, lead, zinc, organotins.**
Biology:	**Benthic fauna, benthic invertebrates, littoral fauna and flora, Terrestrial fauna and flora, plankton, nutrients, habitats.**
Air - particulates:	**Diesel exhausts, grain handling.**
Air - gases:	**CO, CO_2, NO_2, N_2O.**
Odour:	**Reporting system established.**
Noise:	**Environmental noise map produced.**
Light pollution:	**Compliance with Guidance Notes for Reduction of Light Pollution.**

Resource Conservation	
Fuel Oil:	**Degree day system oil consumed: climatic conditions.**
Oil - Vessels:	**Consumption monitored.**
Petrol- Vessels:	**Monitored by budget cost.**
Gas:	**Metered at point of intake.**
Water:	**Consumption metered, leakage reduction, wastewater monitored.**
Electricity:	**Consumption monitored, energy efficient lamps, PCB's, dry cells.**
Alternative energy:	**Feasibility - solar, wind, tide, wave, LPG, CNG, degree day system.**

Management Response	
Waste Management:	**Compactor, skips, clinical waste, recycling.**
MARPOL:	**Port Waste Management Plan - DETR.**
Dredging:	**Monthly bathymetric charts, volumes, target contaminants.**
Development:	**Reclamation, environmental impact assessment.**
Landscaping:	**Aesthetic improvements and habitat quality.**
Community:	**Sea angling, beaches, cycle water, water sports, nature reserve.**
Habitats and Ecology:	**Kent Biodiversity Action Plan, Habitat Atlas.**
Coastal Zone Management:	**DETR, MAFF, English Nature, Heritage Coast.**
Shipping:	**Oil Pollution Plan, Waste Management Plan.**
Training, Education and Research:	**Seminars, University students, collaborative research, DETR, ESPO, BPA, Cardiff University, Kent University, ECO-Information.**

4.2.6 Dover Harbour Board's benefits from environmental management practice

- Healthy seas and a clean harbour is seen as a positive attribute in terms of marketing (particularly for the cruise, ferry and water sports industries), public relations and overall image.

- The phased development of the Board's environmental management system through its environmental performance indicators is beginning to reveal potential cost benefits particularly with respect to resource conservation and data provision for environmental impact assessment.

- The Board is deliberately setting out to implement a regime of 'compliance plus' in terms of the quality of the environment and its management systems. This is perceived as being advantageous for forward planning, corporate representation in negotiation, in-house training and self regulation.

- The phased adoption of a recognisable EMS has encouraged the specification of relevant objectives and targets, prioritised issues in terms of action and resources, and provided quantitative data for the assessment of environmental performance.

- Active involvement in environmental research with a range of agencies and institutions has proved to be both cost effective and scientifically beneficial to the aims of environmental protection of the harbour area and its environs.

- Experience is beginning to indicate that the more that environmental management is integrated into the business and operational plans for the harbour, the more effective is its impact and the greater the cost-benefits.

- The development of an in-house capability provides continuity and efficiency, and the integration of environmental and hydrographic activities is logistically and financially advantageous.

- The phased implementation of EMS, structuring of appropriate working groups, designation of responsible personnel, and supportive resource funding is contributing to the evolution of an appropriate system for Dover Harbour Board which can be monitored for:

    - Compliance with legislation
    - Environmental performance
    - Management performance
    - Cost-benefit

4.3 Ports of Falmouth, Truro and Penryn Evironmental Management Systems

4.3.1 Background

In 1995 the ports of Falmouth, Truro and Penryn produced their own environmental management system (EMS) in accordance with the BS 7750 *Specifications forEnvironmental Management Systems*. Their EMS therefore includes the following:

- Environmental policy statement
- Environmental management organisation
- Environmental effects (including relevant legislation) register
- Environmental targets and objectives
- Environmental management programme
- Operational control
- Verification procedures
- Corrective action procedures
- Environmental management records
- Environmental management audit and review procedures
- The environmental management manual

Certain extracts from the above listed elements of their EMS are given below.

At present the Ports of Falmouth, Truro and Penryn are undertaking corrective actions following their EMS's first audit by accredited auditors.

4.3.2 Environmental Policy

The following are extracts of the Environmental Policy:

"The ports of Falmouth, Truro and Penryn are committed to the protection and conservation of the environment. The Harbour Authorities recognise the need to conserve the natural environment of the estuary and waters under their control through sound environmental management. Environmental policies for the Ports will ensure, wherever possible, that duties carried out by harbour staff and recreational and commercial activities within the area of jurisdiction will take place without any adverse effects on the quality of the environment. To this end published copies of the Harbour Authorities Policy and environmental objectives will be made freely available at the Harbour Offices to all staff and harbour users.

The Harbour Authorities consider that educating and training employees, as well as the public, on the importance of conserving and enhancing the estuary environment will contribute to achieving environmental goals."

4.3.3 Environmental management organisation

Their environmental management organisation comprises the following elements:

- Management Representatives from each of the Ports
- Staff Responsibilities from each of the Ports
- Training
- Contractors/suppliers familiarisation of the Ports of Falmouth, Truro and Penryn Environmental Management System

4.3.4 Training objectives

The harbour personnel will need to fully understand the rational behind their Ports' EMS and what is expected of them to maintain and where possible to improve it. All staff will therefore be instructed as to why such a system is being put into place and will be kept fully informed of its ongoing development. This will be achieved by the following training objectives:

- The Harbour Master will hold an initial meeting for all staff in order to explain the importance of the EMS and the responsibilities of the staff
- The Harbour Master will be responsible for holding monthly meetings with site managers to identify problems with the EMS
- Monthly team briefings will be held by the Deputy Harbour Master to update staff on new procedures
- All new staff will be presented with information on the EMS and requested to show that they have read it and understood it

4.3.5 Environmental Management Programme

The following information is on selected port activities in the Ports of Falmouth, Truro and Penryn with the potential to impact on environmental resources, and which are included as targets in their Environmental Management Programme.

Target	Tasks	Responsibility
Dredging and disposal	Consultations with English Nature to identify means of limiting adverse environmental impacts. Means could be: • Timing of works to ensure least environmental damage • Dredging methods utilised to keep disturbance of sediment to a minimum	Harbour Master (HM)
	Seek alternatives to sea disposal for the dredged sediment	HM
	Maintain a register of dredging events to log date, location of dredging event, quantities and disposal location	HM
Recycling – Dredged material	Beneficial Use of dredged material for the production of a top soil substitute	HM
	Monitor the effectiveness of a "soil factory" through the analysis and use of trial areas to assess the suitability of a top soil substitute	HM HM
	Investigate the possibility of funding and research for "soil factory" initiatives	
Oil/Fuel contamination of harbour waters	Staff will be made aware of all procedures for refuelling operations and of any potential risk from oil/fuel spillage	Assistant HM
	Absorbent material will be provided at all refuelling points	Assistant HM
	All waste oil/fuel will be collected and disposed of according to disposal procedures	Harbour Staff
	All spills will be contained with absorbent material, collected and disposed of in an oily waste bin or skip	Harbour Staff
Bait digging	Consultation with English Nature to identify the level of bait digging activity which would necessitate controls	HM

4.3.6 Environmental Management Records

The following is an extract from the environmental management records on Record Procedures and Information required on selected activities.

Recorded port operations	Information required for the Records
Dredging	(i) Identify the total amount of dredged sediment (ii) Identify the areas where dredging takes place (iii) Keep records of dredged sediment analysis (iv) Record the type of dredger used
Recycling	(i) Record the total amount of dredged sediment recycled as top soil substitute (ii) Record where the top soil has been used (iii) Keep records of any soil substitute analysis
Bait digging	(i) Record the areas where bait digging takes place (ii) Record the number of bait diggers

4.3.7 Ports of Falmouth, Truro, and Penryn, benefits and lessons learnt from EMS

The Ports believe that setting up their EMS has definitely resulted in a *culture change* with regard to their attitude towards environmental protection. Sustaining their commitment and complying with the requirements of their EMS has resulted in good qualitative and quantitative records. Their main lesson is not to take up too much in an initial EMS, but rather adopt a staged approach, particularly where a number of partners need to demonstrate the same degree of commitment (Truro Harbour Authority, personal communication, June 1999).

4.4 Port of Rotterdam

4.4.1 Port profile

Located on the New Waterway with direct access to the North Sea and the Rhine, the Rotterdam port complex is the world's busiest port and the main port of Europe serving the inland regions via the network of inland waterways. The Rotterdam/Rijnmond area is the most densely populated area of the Netherlands with more than 1 million people living in an area of slightly less than 700 Km^2 and an industrial complex spread along the south bank of the 40 Km waterway.

The range and scale of the Port of Rotterdam and its activities may appear atypical in terms of UK experience. In fact the Port is a series of interconnected smaller ports of varying operational activities in close juxtaposition with each other providing an excellent example of the importance of understanding port and city links, demonstrating just about every facet of environmental issues.

4.4.2 Background on the development of environmental management

In 1992, the Dutch government established an environmental protection agency, the DCMR, operating at both municipal and provincial levels in the Rijnmond area. DCMR is the largest regional environmental protection agency in Europe and it grants permits, issues licenses, executes enforcement, and monitors the quality of the environment in the Rijnmond area. Licensing and enforcement are the most important DCMR environmental activities. The legislative criteria on which decision-making is based are the interests of protecting the environment and the principle that in so far that any adverse impact on the environment cannot be avoided, the license regulation must provide the greatest possible protection to the environment, unless this cannot be reasonably required. The emphasis in implementation is shifting away from issuing licenses for new initiatives towards modifying existing licences in line with developments in policy, regulations and/or techniques.

In addition, DCMR is active in the "Target Group Approach on Policy", which was developed as a result of the realisation that several long-term targets on emission reductions would not be met using the traditional "command and control approach" of permitting and enforcement. The approach was shifting towards making the polluting companies accept environmental responsibility and consequently become more self-regulated. In brief, the "Target Group Approach on Policy" aims at central government entering into joint agreements with various sectors of industry on environmental policy and objectives. Subsequently, the companies draw up corporate environmental plans, in which they outline how they intend to achieve the environmental targets. DCMR amongst other regulating authorities react to these plans.

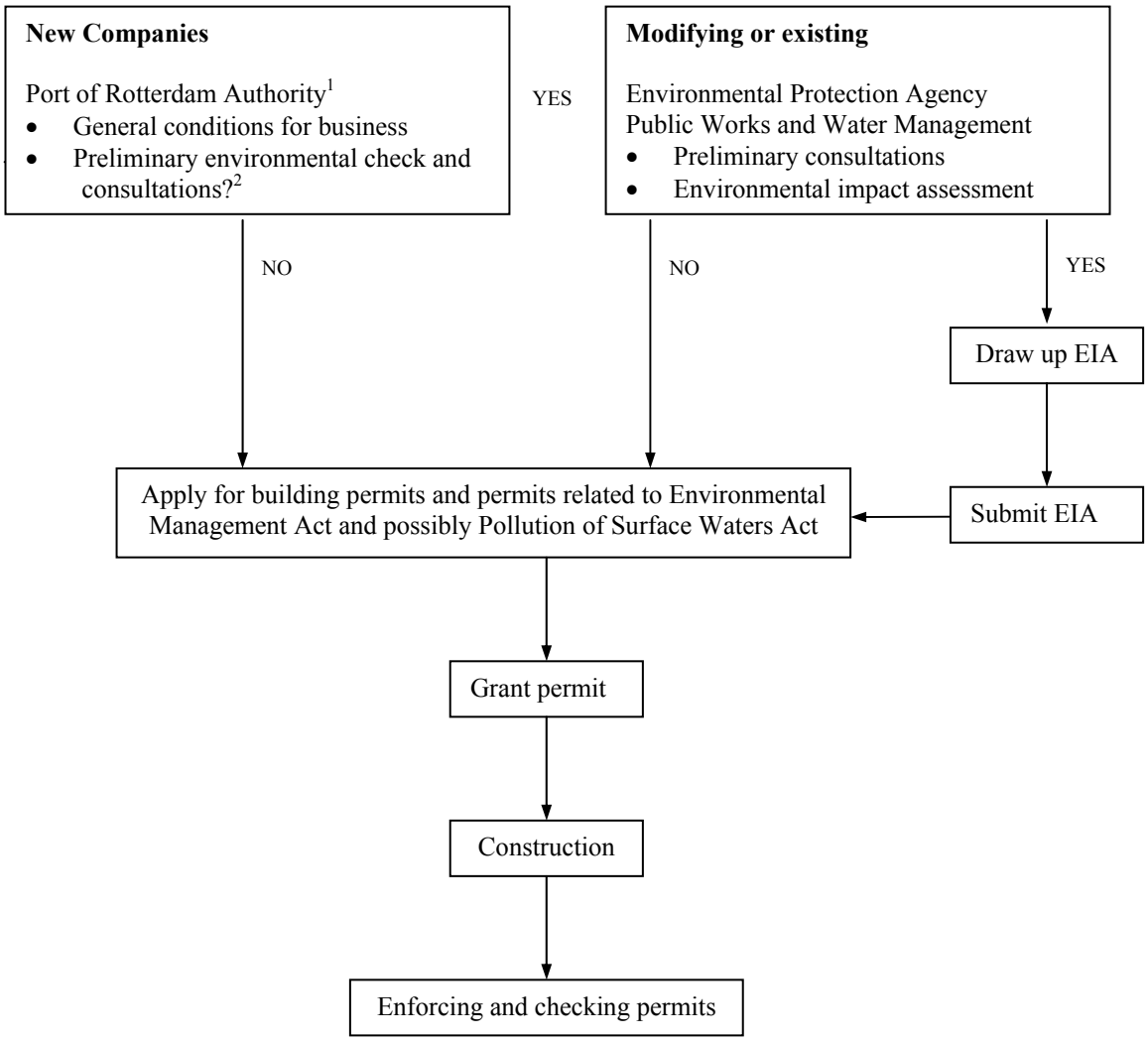
4.4.3 The role of the Port of Rotterdam Authority in environmental management

The Rotterdam Municipal Port Management (RMPM) has various powers and responsibilities with respect to the environment. In carrying out these duties RMPM works closely with the DCMR, the environmental protection agency and the Ministry of Transport, Public Works and Water Management, the Province of South Holland, and Rotterdam Public Works Department – Environment Policy Section.

The RMPM acts as a representative of the municipality in leasing land to industrial companies in the area. In collaboration with the prospective company the best location is decided from the sites available and

RMPM rents out the industrial site. RMPM deliberately sets out to function as a one-stop-shop where port businesses can apply for all the necessary environmental licenses or at least set the necessary procedures in motion. The procedures for obtaining environmental permits and the role of RMPM are depicted in Figure 4.2.

Figure 4.2 Procedures for obtaining Environmental Permits and the role of the Port of Rotterdam Authority



Notes :

1. (i) The Port of Rotterdam Authority develops, operates and manages the port infrastructure.
   (ii) The Authority is the 'landlord' for companies and is responsible for attracting new companies with the aim of promoting economic activity within the port.
2. If any proposed new activities have the potential for a serious environmental impact the Authority introduces the company to the official bodies which issue permits and inform of relevant procedures.

RMPM, reflecting the Dutch Government's policy on soil and groundwater quality protection, apply strict controls on the land quality in their jurisdiction. A soil quality survey is conducted both when the site is rented out and when the lease expires. The purpose of the soil survey is to determine whether the tenant has contaminated the site and therefore has to cover the clean-up costs.

RMPM maintains and encourages commitment to environment by:

- The high profile given to environmental quality in its policy statements and business plans
- Discharge of its responsibilities in licensing and permit procedures for various activities
- Active cooperation and co-ordination with port business, other authorities, departments and neighbouring municipalities
- Identifying the environmental training requirements of its employees
- Providing some information to the employees on the:
    - consequences of non-compliance
    - economic benefits of improved performance
- Raising awareness of port employees to the:
    - importance of compliance with environmental policy
    - potential environmental effects of their work activities
    - their responsibility to conform to the environmental policy and management objectives
    - environmental benefits of improved performance

4.4.4 Port of Rotterdam Environmental Policy and benefits from environmental management

The following environmental performance aims are included in the RMPM's environmental policy:

- Environmental protection is seen as an integral part of RMPM's business policy and day-to-day operational management activities
- RMPM actively seeks to maintain its "Clean Port" image and sees this as an asset in terms of attracting new economic activity. In its 2020 "*Integrated Prospectus for Port and Industry*", the RMPM states that "*a healthy environment offers a competitive advantage: it is becoming an increasingly important business location factor*"
- RMPM strives for the pragmatic approach to environmental management based on clear regulations and practicable technology rather than a bureaucratic-driven system.

RMPM's benefits from the environmental management approach and activities include:

- Port personnel with responsibilities on environmental management stress the significance of well defined responsibilities and clear lines of communication
- There is a well established belief and commitment to the "polluter pays" and "prevention is better than cure" principles, as demonstrated through the licensing and monitoring protocols
- The RMPM is an active participant in a series of environmental research programmes which it sees as a positive activity for enhancing internal experience and strengthening its service to business
- RMPM is a leading partner in ECEPA (Environmental Challenge for European Port Authorities) environmental group engaged in studies on soil quality and noise in ports
- Working in conjunction with other government agencies, RMPM has been able to assess the benefits of companies (including its own) in developing and implementing environmental management
- RMPM produces or contributes to, a whole series of publications in which environmental issues feature strongly. It sends out a strong and positive message of awareness and involvement in environmental affairs.

CHAPTER 5. ENVIRONMENTAL MANAGEMENT TOOLS FOR PORTS AND HARBOURS

5.1 Introduction

Ports and harbours that wish to set or improve existing environmental performance goals, can do so by means of a number of environmental management tools. The most comprehensive, yet costly, tool is the environmental management system (EMS). The aim of an EMS is to improve overall environmental performance and ensure that improvements in performance are continual. The criteria for environmental improvement can apply to any number of parameters, for example, improving efficiency in the use of energy or resources, minimising waste and reducing pollution. Organisations decide their own parameters and set their own rate of continual improvement.

Other environmental management tools include a port-wide or operation-based environmental review, a site-based environmental audit against set environmental procedures, an environmental awareness training programme, and good records keeping systems. By and large these tools are elements of an EMS. However, ports and harbours wishing to establish where they stand in terms of environmental performance, identify their environmental needs and establish an informal and relatively inexpensive environmental management programme, could benefit from these environmental management tools without necessarily having to implement a full EMS in accordance with either of the two standards on EMS.

Bearing in mind that no one environmental management programme is suitable for all ports and harbours, this chapter describes those environmental management tools, drawing substantially on the specifications of the two internationally recognised environmental management systems, ISO 14001 and EMAS. More extensive information on these international standards is also given in this chapter, but the Guidelines by no means imply that successful environmental management goes hand in hand with certification to either of these standards. A tailor-made environmental management programme addressing operations with the potential to significantly impact on the environment, identifying actions to prevent or minimise the impacts, and improving communications between those responsible for environmental protection can lead to a successful port environmental management. The trend in the Ports Sector appears to be to adopt and adapt a best practice in terms of environmental management.

The two internationally recognised EMS standards are the *ISO 14001 Environmental Management Systems – Specifications with Guidance for Use* and *EMAS, the European Commission's Eco-Management and Audit Scheme (EMAS)*. An environmental management system as specified in these standards enables an organisation to establish, and assess the effectiveness of, procedures to set an environmental policy and objectives, achieve conformance with them, and demonstrate such conformance to others. These standards, like other International Standards, are not intended to be used to create non-tariff trade barriers or to increase or change an organisation's legal obligations (BS EN ISO 14001:1996).

ISO 14001 points out that "*establishment and operation of an environmental management system will not, in itself, necessarily result in an immediate reduction of adverse environmental impacts.*

In the UK, ISO 14001 replaced the British Standard *(*BS*)* 7750 *on Environmental Management Systems (EMS*), which was the first of its kind to provide specifications for a structured and systematic management system addressing all aspects of environmental performance.

The Ports Division of the Department of Environment, Transport and the Regions advised HR Wallingford to include in this report as extensive as necessary information on ISO and EMAS Standards on Environmental Management Systems. Sections 5.3 and 5.4, therefore, contain extracts from the British Standards Institute (BSI) publications on BS EN ISO 14001 and 14004 (where BS denotes its adoption as a British Standard and EN denotes adoption as a European Standard). Information on ISO 14001and on EMAS from other sources is also included. The aim of Sections 5.3 and 5.4 is to familiarise the reader with the main principles of an environmental management system and the principle requirements of the two internationally recognised standards, and make reference to other sources of extensive information on ISO 14001 and EMAS.

Setting up and implementing the other environmental tools, also described in this section, can equally help a port and harbour identify their environmental needs and proceed to developing their environmental management programme. More practical guidance on identifying the environmental management needs of a port and harbour by implementing the environmental tools described in this section, and consequently setting up and implementing an environmental management programme is given in Chapter 6.

This chapter also present the Self-Diagnosis Methodology 1998 (SDM), which is an environmental management tool that has been designed to allow Port managers to regularly review their environmental management practice and to identify their environmental priorities as the first step in an environmental review. The SDM98 is a component of the EU project Eco-Information, involving about 50 ports in Europe, and aims at assessing the current environmental situation in ports, exchanging practical experiences between partnerships and supporting port managers in environmental policy development and response options.

5.2 Environmental Management System

An environmental management system, as defined in EMAS, is "that part of the overall management system, which includes the organisational structure, responsibilities, practices, procedures, processes and resources for determining and implementing the environmental policy".

The elements of an EMS, are listed in Table 5.1 below and their main characteristics are given in Table 5.2.

Table 5.1 The Elements of an EMS

- **Environmental Policy:** a statement of intent to improve and sustain environmental performance
- **Planning:** identification of legal requirements, objectives and targets and establishment of a management programme
- **Implementation** and **operation** : training of appropriate personnel, record keeping and establishment of emergency planning
- **Checking** and **corrective action**: auditing EMS, implementing corrective actions
- **Management review**: assessment of EMS (ie objectives and targets) relevance to operations and defined policy

Table 5.2 The elements of an EMS and their main characteristics

Elements of an EMS	Main characteristics (as quoted from ISO 14001)
Environmental Policy: it is a statement, which is prepared by an organisation intending to adopt an environmental management system to improve its environmental performance. Such a policy includes in general the intentions and principles of an overall environmental performance.	Be **appropriate** to the nature, scale and environmental impacts of an organisation's **activities, products or services** Include a commitment to **continual improvement** on environmental **performance and prevention** of pollution Include a commitment to comply with **relevant** environmental legislation and regulations, and with other requirements to **which the organisation subscribes** Provide the framework for **setting and reviewing** environmental **objectives and targets** Be **documented, implemented** and **maintained**, and **communicated** to all employees Be **available** to the **public**
Planning	Procedures to identify the **environmental aspects** of its activities, products or services that it can control and over which it is expected to have an influence Procedures to identify **legal and other requirements** which are applicable to the environmental aspects of its activities, products and services Documented **environmental objectives and targets**, consistent with the stated environmental policy and therefore relevant to its activities, legal obligations, technological options, and its financial, operational and business requirements **Environmental management programmes** for achieving its objectives and targets, and where necessary they shall be amended to reflect new or modified activities, products and services

Table 5.2 (Continued)

Elements of an EMS	Main characteristics (as quoted from ISO 14001)
Implementation and operation. This requirement for setting up environmental management focuses mainly on the human element. At the implementation and operation stage of an environmental management system, the roles and responsibilities are defined and the degree of environmental awareness and subsequent training are identified.	**Structure and responsibility**: the roles and responsibilities are identified and the necessary resources (human resources, specialised skills, technology and financial resources) are made available to ensure that the EMS is implemented and controlled. **Training, awareness and competence**: the organisation shall make sure that all personnel whose work may have a significant impact on the environment receive appropriate training, and establish procedures to make their personnel aware of environmental policy, their impacts on the environment and consequences of non-conformance with environmental protection measures **Communication**: internal between various levels and functions of the organisation, and external between the organisation and interested parties, including public authorities regarding emergency planning and other relevant issues. **EMS documentation**: the core elements of the management system and how they interact together as well as direction to related documentation must be documented **EMS document control**: procedures must be in place to ensure that all EMS documentation is easily located, reviewed, revised and updated, including the easy identification of obsolete documents. **Operational control**: the organisation shall identify those operations and activities that are associated with the identified significant environmental aspects in line with its policy, objectives and targets **Emergency preparedness and response**: procedures shall be established, (and periodically reviewed, revised and tested) to identify the potential for and response to accidents and emergency situations with significant environmental impacts, and for preventing and mitigating the environmental impacts that may be associated with them.
Checking and corrective action	**Monitoring and measurement**: documented procedures shall be established to monitor and measure the key characteristics of the organisation's operations and activities, including the calibration of monitoring equipment and compliance with relevant environmental legislation and regulations **Non-conformance, corrective (and preventive) action**: procedures shall be established and maintained for defining responsibility for investigating non-conformance, taking necessary action to mitigate any impacts and ensure corrective (and preventive to ensure future compliance) actions are implemented **Records**: procedures shall be established and maintained for keeping legible, identifiable, traceable and readily retrievable environmental records, including training records, and the results of audits and reviews **Environmental management system audit**: programmes and procedures shall be established and maintained for audits in order to identify whether or not the environmental management system is properly implemented and maintained, and conforming to the requirements of ISO 14001
Management review	Ensure the **continuing suitability, adequacy and effectiveness** of the environmental management system Identify possible needs for **changes to environmental policy, objectives** and other elements of the system

5.3 EN ISO 14001: Environmental Management Systems-Specification with guidance for use

ISO 14001 specifies the requirements for third-party certification/registration and /or self-declaration of an organisation's environmental management system. It is an international voluntary standard and there is no legal requirement for organisations to register to the standard. ISO 14001 complements ISO 9000 (Quality Assurance) in that they both adapt similar approaches in demonstrating compliance with specified organisational procedures and requirements. ISO 14001 offers a generic system of environmental management, and can be adapted to all types and sizes of organisation in both the industrial and service sectors. ISO 14001 does not include requirements for health and safety management but is flexible enough to allow organisations to include these issues in their environmental management system, if they so choose (Croner's 1998).

The principle behind ISO 14001 is continual improvement in environmental performance. The basic approach to the environmental management system model for ISO 14001 comprises the elements listed in Table 5.3 below, and depicted in Fig. 5.1. The main characteristics of the environmental management system model for EN ISO 14001 are listed in Table 5.4.

Table 5.3 ISO 14001 elements of continual improvement

- **Environmental policy**
- **Planning:** legal requirements, objective and target setting, establishing a management programme
- **Implementation and operation:** responsibilities, training, document and operational control and emergency planning
- **Checking and corrective action:** monitoring and measurement, non-conformance and corrective action procedures and EMS auditing
- **Management review:** assess progress against defined policy, objectives and procedures

Source: Croner's Environmental Policy and Procedures 1999

Table 5.4 The main characteristics of EN ISO 14001

- It is an **international voluntary** standard and the only **certifiable** standard in the 14000 series
- It **specifies** the **requirements** of an environmental management system
- It is **applicable** to **all** types and sizes of organisations
- It can accommodate **diverse** geographical, cultural and social conditions
- It contains management system requirements, based on the **dynamic** cyclical process of "**plan, implement, check** and **review**
- It is the **tool** which **enables** an organisation to pursue a **systematic** and **continual** effort for **improved** environmental performance
- It can only be **beneficial** to an organisation seeking environmental performance, if it has the support of all levels of management, particularly the top management
- It does **not** by itself bring an **immediate reduction** of adverse environmental impacts
- It does **recognise** that the commitment for environmental performance should be **in balance with socio-economic needs** and other circumstances
- It contains only those requirements that may be objectively audited for certification/registration or self-declaration purposes
- It shares common management system principles with the ISO 9000 series of quality system Standards (see Section 5.5)
- It does not include requirements for aspects of occupational health and safety management
- It can be integrated with health and safety management

ISO 14001 makes a distinction between a management systems specification for certification or registration purposes, and a more broadly defined management systems guide (eg ISO 14004) which is not intended for registration purposes. There are no legal requirements for organisations to register to the ISO 14001. Those organisations requiring more general guidance on a broad range of environmental management system issues should refer to EN ISO 14004*:*1996 *Environmental Management Systems – General guidelines on principles, systems and supporting technique*.

Other standards in the series provide guidance on a range of related environmental management issues, including environmental auditing, performance evaluation and eco-labelling (See Appendix 1).

5.3.1 Scope of EN ISO 14001

This International Standard specifies requirements for an environmental management system, to enable an organisation to formulate a policy and objectives taking into account legislative requirements and information about significant environmental impacts. It applies to those environmental aspects, which the organisation can control and over which it can be expected to have an influence. It does not itself state specific environmental performance criteria.

This Standard is applicable to any organisation that wishes to:

- *Implement, maintain and improve an environmental management system*
- *Assure itself of its conformance with its stated environmental policy*
- *Demonstrate such conformance to others*
- *Seek certification/registration of its environmental management system by an external organisation*
- *Make a self-determination and self-declaration of conformance with this International Standard*

Setting up an environmental management system requires organisations to identify and evaluate the environmental impacts associated with their activities, products or services. ISO 14001 defines *aspect* as an "element of an organisation's activities, products or services that can interact with the environment". ISO 14001 also defines an environmental *impact* as "any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services".

All the requirements in the EN ISO 14001 are intended to be incorporated into any environmental management system. Factors such as the nature of the activities of an organisation, the conditions in which an organisation operates determine the extent of the application of the Standard into the environmental management system of an organisation.

5.3.2 Compatibility between Standards on Quality Assurance and Environmental Management

The ISO 14000 series was designed to be compatible with the Quality Management System (QMS) ISO 9000 series (formally BS 5750 in the UK) and shares common management principles and techniques.

Organisations may elect to use an existing management system consistent with the ISO 9000 series as a basis for its environmental management system. In doing so, however, organisations must not loose focus of one of the fundamental differences between ISO 9000 and ISO 14001. While quality management systems deal with customer needs, environmental management systems address the needs of a broad range of interested parties, which can change with time. In addition, ISO 14001 additionally requires:

- A commitment to a policy of continual improvement
- Setting quantified objectives
- The publication of a policy statement
- Awareness of relevant legislation
- Personnel to be competent on environmental issues
- A preparatory review of status with regard to environmental performance

The requirement for a preparatory review in terms of environmental performance is not assessable under ISO 14001 (unlike under EMAS, see below) but it is advisable. Relevant advice is given in the standard ISO 14004 *Environmental Management Systems – General guidelines on principles, systems and supporting techniques.*

5.4 Eco-Management and Audit Scheme (EMAS)

The EU's Eco-Management and Audit Scheme (EMAS), (EC Regulation No 1836/93) was formally adopted by the EU in June 1993 and came into force in April 1995. Although it is an EU Regulation, the scheme is entirely voluntary and there is no legal requirement for companies to participate.

Essentially, EMAS provides a model for the design, implementation and maintenance of an environmental management system in the same way that ISO 14001 does. There are, however, certain significant differences between the two. For instance, under EMAS a full environmental statement in non-technical language should be published and independently verified, whereas under ISO 14001 only the environmental policy needs to be made public. Moreover, ISO 14001 does not require a Preliminary Review, whereas for EMAS it is both mandatory and assessable.

5.4.1 Scope of EMAS

EMAS is mainly for use by manufacturing organisations and it applies to individual sites. This means, that organisations with more than one site must register those sites individually. Article 1 of the EMAS Regulation (EU No 1863/93) refers specifically to the evaluation and improvement of environmental performance of industrial activities. Article 14 of EMAS allows Member States to adapt the scheme for other sectors, on an experimental basis. In the UK, the scope of the standard has been broadened to allow local authorities to participate. The voluntary EMAS for Local Government (LA-EMAS) is intended to help local authorities evaluate and improve their environmental performance. An estimated 30% of local authorities are actively implementing the scheme, although currently there are only around twenty sites which have been verified (Croner's 1998).

There are a number of criteria, which need to be met for a site to be registered under EMAS, and these are listed in Table 5.5 below.

Table 5.5 Criteria for EMAS Registration

Environmental policy* – including commitment to comply with relevant legislation and continuous improvement in environmental performance
Environmental review* – to provide baseline data for establishing an environmental programme
Environmental programme* – including quantified objectives and targets, together with measures to show how these will be achieved
Environmental management system* **–** including organisational structure, responsibilities, practices, procedures and resources, to ensure implementation of the policy and programme
Environmental audit* – a systematic, documented, periodic and objective evaluation of the performance of the organisation, management system and processes to ensure compliance with company environmental policy and the effectiveness of the system itself
Environmental statement* – including a description of activities, an assessment of significant environmental issues and impacts and information on environmental performance. The statement should be written in non-technical language, be made publicly available, and be validated by an independent, accredited environmental verifier. The environmental statement is then submitted to the Competent Body for EMAS Registration. The Institute for Environmental Assessment (IEA) is the Competent Body in the UK.

***:** need to be verified by an independent body or individual so that a site's environmental management system can comply with EMAS.

*Source:*Croner's Environmental Policy and Procedures 1999

5.5 EU decision on EMAS and ISO 14001 compatibility

In April 1997, the EU recognised that ISO 14001 meets the EMAS requirements for an environmental management system (Commission Decision 97/265/EC, OJ L104 22.04.97). This means that those organisations with an environmental management system certified to ISO 14001 can move towards achievement of registration under EMAS.

However, there are a number of significant differences between the requirements of the two standards (see Table 5.6 below), and organisations wishing to register under EMAS will need to ensure that all its environmental management system and auditing requirements are met. In order to assist these companies obtain EMAS verification, the European Standards Body (CEN) has produced a "bridging document" highlighting the differences between ISO 14001 and EMAS.

Table 5.6 Main common features and differences between EMAS and ISO 14001 requirements

EMAS and ISO 14001 requirements

- Environmental policy
- Internal environmental protection system
- Objective and periodic evaluation of environmental performance of the system

EMAS requirements only

- Preliminary Environmental Review (recommended under ISO 14001)
- Publicly available information on environmental performance
- Publicly available non-technical environmental statement, validated by an accredited environmental verifier

5.6 Environmental Review, Environmental Aspects and Impacts, Environmental Audit and Environmental Awareness Training

5.6.1 Introduction

As already mentioned in Section 5.1, certain of the EMS elements, such as the environmental review, the environmental aspects and impacts, environmental audit and environmental awareness training, could be used as environmental management tools to improve environmental compliance. These useful management tools are described in this section.

5.6.2 Environmental Review

An environmental review, often referred to as an Initial Environmental Review (IER), is a fact-finding exercise to establish the current situation of a port or harbour in environmental terms. The main objective of the review is to highlight those port and harbour activities, which will need further attention in order to improve environmental performance. An IER is an analysis of the issues, impacts and performance related to port activities. An IER provides a snapshot of the port's current environmental practices and a baseline against which to both judge and demonstrate improvement. It allows port managers to assess the strengths and weaknesses of their existing procedures, to identify priority concerns or issues, and to examine new opportunities for improved environmental performance. It is a fundamental tool for assessing compliance and a critical step in evolving an environmental management practice or programme.

There are four main areas, which the environmental review should examine:

- Port and harbour activities likely to have impact on environmental resources
- Environmental and planning legislation requirements
- Existing environmental management procedures
- Accidents, incidents, public outcry (complaints)

Carrying out an IER may at first glance seem a daunting task in terms of availability, accessibility and quality of information and data where there is no existing environmental database. However, several port sector-based surveys confirm that in fact many ports have a wealth of information and experience that is entirely appropriate and valid but that the detail is spread throughout the port in a variety of buildings, departments, formats and media. Carrying out an IER is very often an exercise in identification and compilation of already existing resources/assets rather than a project requiring substantial investment of time and finance in the acquisition of new data.

Some sources of information for the IER may not be immediately obvious having originally been collected for other, more traditional purposes, such as navigation, engineering or port planning. Nevertheless, a systematic approach to compiling, interpreting, analysing and reporting an IER can:

- Establish what information exists already
- Identify location, format and staff responsible
- Avoid repetition of effort, duplication of results
- Serve as a catalyst, building block and cost efficient procedure for phased development of an environmental management practice
- Encourage in-port expertise and confidence

There are four main stages in an environmental review, namely the planning stage, the implementation stage, the reporting stage and the follow-up actions stage. These stages and their main characteristics are listed in Table 5.7.

Table 5.7 Environmental Review stages and their characteristics

Stages	Characteristics
Planning stage	• The scope of the environmental review: will it be activity-specific or port/harbour-wide? • The composition of the team to carry out the environmental review: an in-house team with some degree of external assistance is beneficial to the port authority and less costly • The timetable of the review exercise, areas/activities to be subject to the environmental review and the review methods: these can be questionnaires, checklists, site observations and personnel interviews
Undertaking the environmental review	• Identify the environmental legislation requirement, which are appropriate to the port/harbour activities. Where breaches in the law are identified these should be given high priority in the actions list • Identify and evaluate environmental impacts and compile a register of significant environmental impacts from the port/harbour operations • Existing management structure, as this provides the evidence to establish where the port/harbour currently stands in terms of environmental management • Establish hypothetical abnormal operations and incidents/accidents in a port or harbour area leading to significant environmental impacts
Environmental review report	• An executive summary • An outline of the scope and objectives of the review • A description of the site • A description of the methodology used to collect the information • The review findings (as detailed as possible) • Recommendations for priority actions Depending on the resourse requirements and applicability to the port or harbour situation, the environmental review report may also provide recommendations for establishing an environmental management system, based on either of the two internationally recognised standards, or at the very least, an informal environmental management programme.
Follow-up actions stage	The environmental review may identify areas of serious concern, for example a source of significant contamination or non-compliance with waste management handling and storage requirements. Targets should be set for action to rectify these non-compliances and the areas/activities where there is a need for environmental awareness training should be identified. The findings of an environmental review can also be regarded as the building stones of an environmental management programme.

5.6.3 Environmental aspects and impacts

Environmental aspects

An environmental aspect is described in BS EN ISO 14001 as an "*element of an organisation's activities, products or services that can interact with the environment*". Identifying environmental aspects should take into account of whether a particular activity causes:

- Air emissions
- Effluent discharges
- Waste production
- Use of resources
- Soil contamination

One way of identifying environmental aspects is to identify a link between an activity/operation and environmental legislation. If such a link is identified, then the activity/operation in question is an environmental aspect.

Environmental impacts

According to ISO 14001, an environmental impact is "*any change to the environment, whether adverse or beneficial – resulting from an organisation's activities, products and services*".

Evaluation of significance of environmental aspect

The evaluation of the significance of the environmental aspects and impacts is not a straightfoward process. The first criterion to be used to evaluate the significance is the identification of relevant environmental legislation. A good approach to evaluate significance of environmental effects and impacts is to identify which of the activities of an organisation are subject to environmental regulations. The next step in evaluating the significance would be to identify breaches in the law, for instance, knowingly permitting a polluting substance to enter a watercourse. However, it is worth remembering that even if the law is not breached, such as the case of noisy operations not exceeding the statutory noise levels, it is still possible that the operations may raise complaints from the local community.

The significance of the environmental impact will also depend upon the sensitivity of environmental resources at risk, such as those listed below as well as on parameters determining the likelihood of an environmental impact taking place such as the contaminants pathways and seasonal sensitivity of the environmental resources.

- local ecology (eg local nature reserves, protected species)
- local community (eg the proximity of the residential areas, schools, hospitals)
- local built environment (eg features of archaeological interest (eg listed buildings and ancient monuments)
- local air/soil/water quality

Register of environmental aspects and impacts

The Register is a document describing the following information:

- the significant environmental impacts
- the methodology to identify the aspects and impacts and evaluate their significance
- the corrective action(s)
- the methodology to update the register

5.6.4 Environmental audit

The focus of an environmental management audit is to check whether a company's own environmental management practices and programme (where applicable) are being adhered to, and whether they are effective in helping to achieve environmental objectives as stated by the company. Environmental auditing is mainly undertaken for internal management purposes, without references to a formal EMS (Croner's 1999). In order to conduct an environmental audit, some form of environmental policy, at the very least, and procedures on how to conduct activities in an environmentally responsible manner, should be in place.

An environmental audit can be either activity-specific or site-based or based on specific environmental legislation requirements, such as water pollution control. A number of organisations opt to conduct activity specific audit, at least at the beginning, and then use the lessons learnt from the small scale audit to conduct and perfect audits of larger scale, such as a port-wide audit.

The key elements of the audit process are as follows:

- Suitably trained and qualified internal auditors
- A schedule for auditing the different components of the environmental management programme (if in place), or for identifying activities which need to be more frequently audited by virtue of the likelihood for environmental impacts

- Audit checklists
- Audit reports, highlighting non-compliance (see Section 5.7.2)

The AAPA in their Environmental Management Handbook identifies four categories of environmental audits, including the Health and Safety audit (AAPA, 1998):

i) the inventory audit which identifies and documents the storage, use and disposal practices related to hazardous materials and wastes, and assesses the potential to discharge contaminants into the environment

ii) the compliance audit which determines compliance with environmental regulatory requirement. A compliance audit may be targeting one specific regulation. While a typical environmental compliance audit may begin with an inventory, the audit is expanded to collect sufficient information to evaluate the compliance status of each activity, and then used to develop an overall environmental management programme.

iii) The systems audit: the port evaluates its own and possibly its tenants' current procedures to manage environmental issues. A systems audit would evaluate whether written procedures are in place, how those procedures are implemented, who is responsible for each aspect of environmental management, reporting procedures, and emergency response and safety procedures

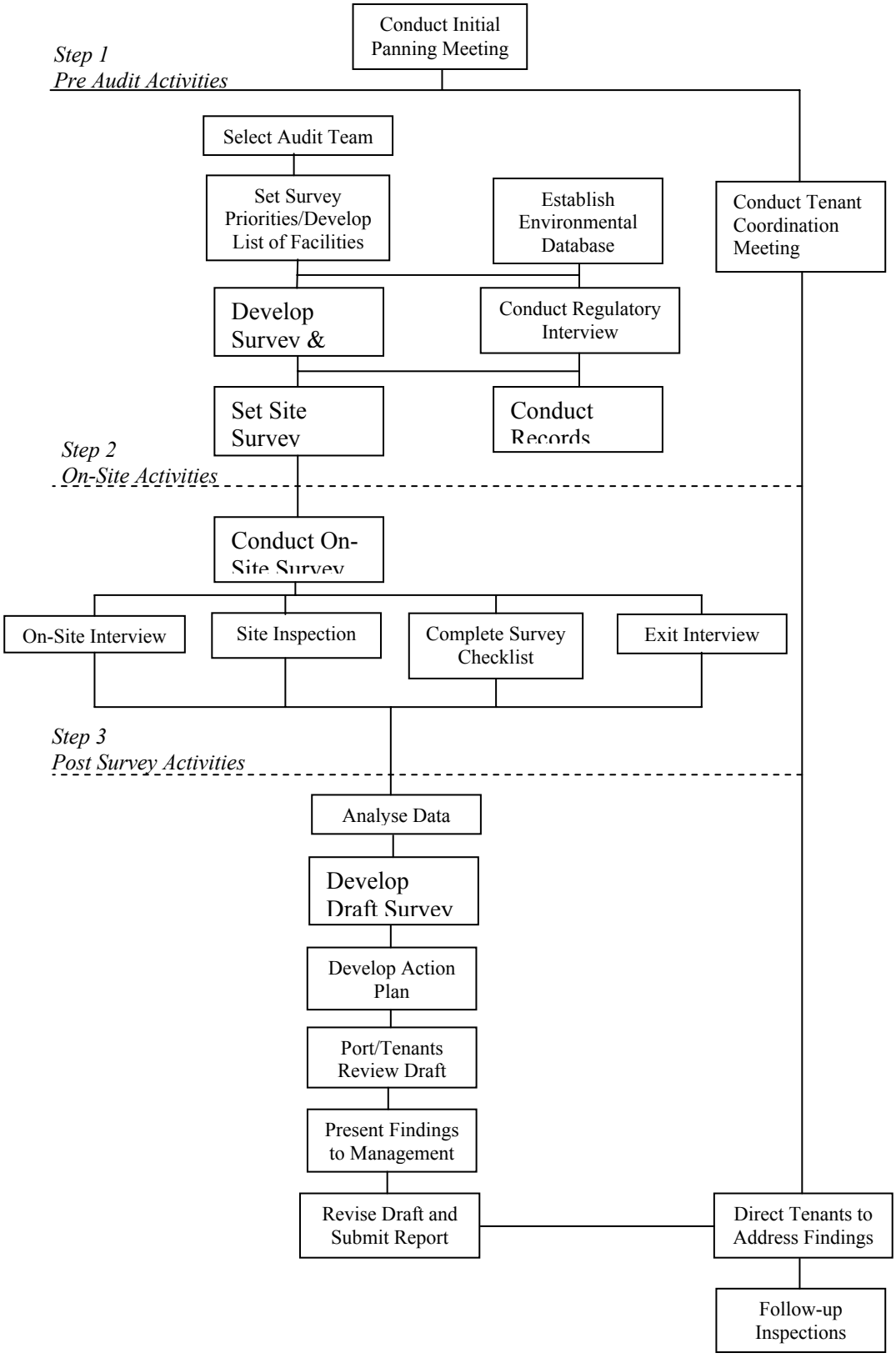
A comprehensive environmental audit checklist is presented in Croner's Environmental Policies and Procedures (Croner's 1999) and an example is appended to this report (see Appendix 2). For a full and comprehensive guidance to environmental auditing refer to *Environmental Audit: A Complete Guide to Undertaking an Environmental Audit for Your Business (*ISBN 1 85252 100 7).

Both EMAS and ISO 14001 (see Sections 5.6 and 5.7) require internal auditing for the purposes of accreditation. Internal environmental auditing could, however, be a useful environmental management tool of an informal internal environmental management programme, regardless of the size and nature of an organisation. Many companies, in fact, can use their experience of quality management audits (for ISO 9000) to plan and implement an environmental audit.

Stages of an environmental audit

By and large an environmental audit is divided into three stages (see Table 5.8), namely the planning stage, the implementation stage and the post-audit stage. Figure 5.1 depicts the stages and the activities per stage of an environmental audit, and it is reproduced from the AAPA's Environmental Management Handbook. Although the environmental audit process as shown in Figure 5.1 appears to be geared towards the larger ports, it is possible for the smaller ports to tailor it to their needs by selecting the main and most significant activities of each stage, as the majority of these activities for smaller ports could be conducted by one person.

Figure 5.1 Typical Audit Process



(Source: AAPA Environmental Management Handbook, 1998)

Table 5.8 Stages of an environmental audit

Stages	Activities
Planning stage. The success and effectiveness of an audit depends on good planning. The planning stage is further subdivided into four stages (Croner's 1999):	• Setting objectives • Selecting and scheduling the site or activity to be audited • Selecting the audit team members • Preparing a specific audit programme
Implementation stage	• On-site interview • Site inspection • Presentation of key findings
Post-audit stage	• Evaluation of the key findings • Production of a final report • Formulation of a corrective action programme • Identification of the needs for training • Identification of follow-up inspections

5.6.5 Environmental awareness training

Environmental awareness training of port and harbour personnel can be an important environmental management tool, relatively inexpensive and yet potentially very effective. Smaller ports can benefit significantly from making their employees aware of the potential and actual impacts the port activities and operations can have on the environment.

The scope of environmental training can vary depending on the nature of operations, the size of the port, the available funding and the concerns of the local community. Environmental awareness training can range from a "make the personnel aware and remind them as necessary" approach, to a more systematic environmental awareness training programme. Whichever the form of the environmental awareness training, it is essential to keep it specific to the port's operations and short, provide straightforward practical advice, particularly if it is in the form of environmental management practice notices, and keep good records.

Environmental awareness training could be made available to port tenants but a port cannot dictate its training programme or any other environmental tool to its tenants. Based on the experience of a number of ports and other industries, the AAPA has identified the following as the most effective elements of an environmental awareness training programme (AAPA, 1999). These are listed in Table 5.9.

Table 5.9 Elements of an environmental awareness training programme

Frequency	• Conducted regularly: in doing so, the port's environmental targets and objectives can be met, and any environmental management practices are being carried out correctly. It is recommended that some level of environmental awareness training is carried out at least twice a year
Applicability	• Specific to the port's operations and activities: in keeping the training material specific to the operations the trainees can relate better to the guidance and consequently they will be more likely to implement it
User friendly	• Providing user friendly guidance: it is essential that the any guidance on conducting port activities in a more environmental friendly way is easily incorporated into the day-to-day operations
Specific	• Conducted on single issues: dealing with single environmental issues at a time can be more effective than covering a whole range of environmental issues
Interactive	• Although the traditionally conducted training programmes are less costly than the hands-on programmes, drills and exercises are more effective in training personnel
Duration	• Training sessions should be brief and not interfere with the port operations
Contribution	• Use input from operations and maintenance staff: often the most effective environmental management practices are substantially written by technical port staff, who can advice trainees on how to assess the operations and identify cost-effective ways to reduce environmental impacts

Developing an environmental awareness training programme

The process for developing and implementing an environmental awareness training programme is primarily based in identifying operations, environmental risks and contaminant pathways, complaints from local residents, environmental legislation requirements, and subsequently developing a training methodology and assessing the effectiveness of the environmental awareness training programme.

The effectiveness of an environmental awareness training programme depends, *inter alia*, on the evaluation of the competence of trained personnel either placed at key operations with high potential to have a negative impact on the environment or given the added responsibility of environmental protection.

5.7 Documents and Records

Documents are a permanent source of reference material that are relevant to the elements of environmental management system and whose contents can be changed or updated as necessary. For instance, the register of environmental aspects is a document, which can be changed as required to reflect new operations or activities with the potential to impact significantly on the environment. Likewise, the register of environmental legislation is a document, which could be amended to include or exclude environmental legislation requirements to which an organisation needs to comply by virtue of its operations.

Records, unlike documents, are a source of information at a certain point in time. For instance, a complaint from the local community will be the subject of record keeping, as well as a breach of environmental legislation (eg. Water quality standard).

There can be no universal format of documentation, as each organisation has different documentation requirements reflecting the nature of its operations. In general, however, the following elements of an environmental management system, be it formal or informal, could have their own documents and records:

- Environmental policy
- Register of environmental legislation requirements
- Register of environmental targets and objectives
- Register of significant environmental aspects and impacts
- Environmental awareness training programme
- Environmental audit

Croner's *Environmental Management: Policies and Procedures* give useful information and examples of document and record-keeping templates.

Superseded documents must be replaced as soon as necessary to ensure that reference is always made to current documents.

Organisations with a quality management system already in place may find it useful to use the relevant documents a basis for their environmental management system.

5.8 Non-conformance with EMS standards

As already stated in earlier sections, the Guidelines do not intend to imply that accreditation with the two international standards, ISO 14000 and EMAS on environmental management system is mandatory or necessary in order to achieve sound environmental performance. For those port and harbour authorities, however, which intend to go for accreditation as well as for those which would rather set an efficient and effective informal environmental management programme, this section provides guidance on the most common non-conformities to the standards on EMS, as found by Croner's research (Croner's Environmental Policy and Procedures, Issue No 35, August 1998).

The European Accreditation of Certification (EAC) body differentiates between a major and a minor non-conformity. A major non-conformity is one, which raises significant doubts as to whether the environmental performance will achieve the set targets and objectives, particularly where a serious risk of a negative environmental impact is quite possible. For instance, major breaches of environmental legislation requirements and failure to communicate breaches to the regulatory authorities is regarded a major non-conformity. A non-conformance is regarded as a minor when it does not carry the risk of significantly compromising the requirements of an environmental management programme, be it formal and based on an EMA standard (ie ISO 14001 or EMAS) or be it informal. Failure to systematically record training events, is for instance a minor non-conformance. EAC, however, points out that a minor non-conformance can become a major one if persistant, or a series of minor non-conformances can lead to failure to achieve accreditation.

Tables 5.10 to 5.13 below list some of the more common non-conformities as identified in the EAC's *Guidelines for the Accreditation of Certification Bodies for Environmental Management Systems*. Some of the non-conformities listed in those tables are also the findings of some of the leading assessors in the UK (Croner's Environmental Policy and Procedures, Issue No 35, August 1998). The guidance given on non-conformities focuses on the main elements of an EMS, which can also be used, selectively, by any organisation wishing to set and implement an informal tailor-made environmental management programme.

As already stated elsewhere in this report, this Guidance does not wish to imply that accreditation with a recognised EMS standard is essential. On the contrary, it wishes to point out that by focusing on certain environmental management tools or operations-specific environmental management practices it is possible to improve environmental performance.

Table 5.10 Common non-conformities – Environmental Policy and Environmental Review

- The Environmental Policy is not defined by "top management"
- The use of a corporate policy where a site/group of activities or operations policy is more relevant
- The Environmental Policy is not relevant to activity and scope
- The Environmental Policy does not include the objectives and targets towards improved environmental performance
- Commitment to continual environmental improvement, eg. Continual improvement and prevention of pollution, is not clearly defined
- Identification of relevant environmental legislation requirements is not sufficiently comprehensive
- Access to environmental legislation documents cannot be demonstrated
- Verification of compliance with environmental legislation requirements cannot be demonstrated

Table 5.11 Common non-conformities – Environmental objectives and targets

- The objectives and targets are not set out in the environmental policy
- There is no link between the environmental objectives and targets and the relevant environmental legislation, particularly where there is a potential for non-compliance with an environmental legal requirement
- There is no link with the analysis and evaluation of significant aspects and impacts
- Environmental objectives and targets are not fully documented

Table 5.12 Common non-conformities – Environmental management structure, responsibilities and environmental awareness training

- The role of the top management representative is not clearly defined
- Environmental responsibilities and authorities of other personnel are not clearly identified
- Environmental responsibilities are not communicated to relevant personnel
- Significant changes to job descriptions to reflect environmental responsibilities are not clearly acknowledged and communicated to relevant personnel
- Appropriate training is not delivered, particularly where the training needs assessment has identified potential environmental impacts associated with certain responsibilities and activities
- Training of personnel and contractors with environmental responsibilities is found to be inadequate or not complete
- Failure to maintain the training records
- Failure to undertake an evaluation to determine competence of trained personnel with environmental responsibilities

Table 5.13 Common non-conformities – External communications and good records-keeping

- The environmental policy is not made available to the public
- Communications procedures are not established or maintained
- Complaints from the public are not communicated to the appropriate personnel
- Responses to the complaints from the public are not recorded
- Internal communications are not effective in conveying environmental policy targets, training programmes, recommendations for improvement, significant changes to personnel responsibilities to include environmental responsibilities, etc
- Procedures and responsibilities for setting up, updating and controlling an internal documentation system, on environmental management programme, are not properly defined
- Environmental management documents are reviewed periodically to ensure that reference is made to current procedures and not out of date
- There is no good cross-referencing between documents
- Breaches of environmental legislation compliance are not recorded
- The identification, traceability and retrievability of records is poor

5.9 Self-Diagnosis Methodology 1998 (SDM98)

SDM98 is an environmental management tool and one of the main components of the Eco-Information project, which represents a systematic and dedicated approach by the members of the European Sea Ports Organisation (ESPO) to respond to international and European environmental legislation. ESPO members are doing so in a unified manner through shared experience and self-monitoring for the mutual advantage of environmental protection and sustainable development of port activities.

This SDM98 has been designed to support port managers to regular review the actual environmental situation in their port. This environmental management tool can lead to a comparison of environmental performance with previous years and to assess the effect of particular investments. Moreover it creates the opportunity to benchmark the performance with other ports in Europe. The SDM98 has been developed in the ECO-Information project by 25 ports and several research organisations.

The SDM98 was designed in the form of a preliminary environmental review (ie Initial Environmental Review) and aimed to:

- Be specific to the ports industry and confidential
- Be easy to use and logically structured

- Explain and inform about environmental management
- Enable the collection or collation of baseline data
- Enable inventory of potential environmental effects
- Enable inventory of key legislation and compliance
- Form the basis of an environmental report
- Support continual improvement
- Compare environmental performance with international standards
- Compare environmental performance between ports

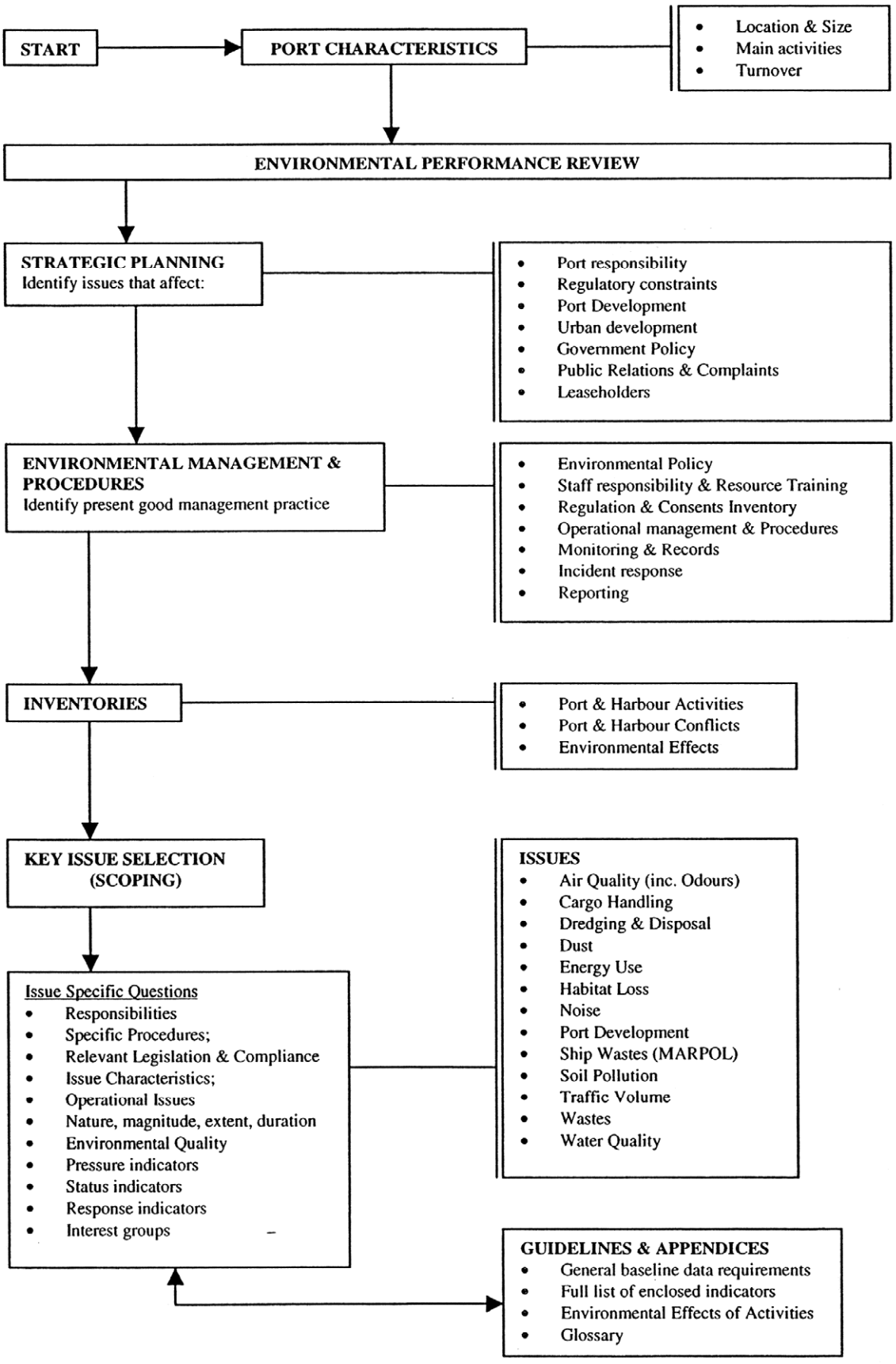
To achieve the aims stated above, the project research team arranged the SDM in a systematic and logical format composed of the following elements:

- Description of the site
- Examination of present management practices
- Inventory of port activities
- Inventory of potential environmental effects
- Selection of key issues
- Key issue characteristics

The Key issue approach used throughout the project was adopted because the key issues complimented the sectoral management of many ports and allowed the relevant port expertise to be targeted more efficiently. It was hoped that this would reduce the time required for any individual to complete the SDM. The final version of the SDM98 was designed to identify potential problems or concerns and prioritise areas that require management attention. It embodies the principles of **S**trengths, **W**eaknesses, **O**pportunities and **T**hreats (SWOT analysis), and the project team believes that the entire SDM98 contributes to this principle (Cardiff University, personal communication, July 1999). Figure 5.2 depicts the SDM98 as applied to the european ports participating in the ECO-Information project.

The questionnaire in the first version of the SDM98 is focussing on the strategic aspects of environmental issues in ports. Main objective is to review the management activities and procedures regarding the environment and the way the port authority deals with its main environmental issues. The results are regarded as a list of attention points and can be used to detail the port's environmental strategy (SDM, 1998). SDM98 has been tested amongst several European and UK Ports and finalised at the third plenary meeting in October 1998. The final version is being circulated to over 50 ports in Europe and the UK. The completed SDM98 is currently undergoing analysis to provide individual ports with an overview of their environmental strengths and weaknesses and review the environmental situation in the European port sector. Selected extracts from the SDM98 report are appended to this report (Appendix 3).

Figure 5.2 Self Diagnosis Methodology (Courtesy of Cardiff University Eco-Information project team, July 1999)



CHAPTER 6. GUIDANCE ON PORT ENVIRONMENTAL MANAGEMENT PRACTICES AND PROGRAMME

6.1 Introduction

This Chapter concludes the guidelines. It presents guidance on environmental management practices, which can be used by any member of staff in a port or harbour, who is given the responsibility of developing and implementing environmental management. Guidance on major accidental oil spill and waste management as these are the subjects of oil spill contingency plans and waste management plans, respectively, is not provided. Generic guidance on how to handle solid waste, however, is given.

The guidance on environmental management practices is divided into guidance for port and harbours development activities (see Tables 6.1, 6.2a, 6.2b and 6.3) and guidance for port and harbour operational activities (see Tables 6.4 to 6.19), in order to reflect the information given in Chapter 2 on port and harbour operations, environmental resources at risk and environmental impacts. The guidance format of the environmental management practices for both development and operations reflects the format of the environmental management practices in the Environmental Management Handbook, prepared by the AAPA (American Association of Port Authorities). This was because it was found to be a user-friendly format, which also makes available explanations on relevant environmental issues and legislation.

This chapter is designed to be a stand-alone guidance for both development plans and operations.

6.2 Environmental Management Practices for Port and Harbour Development Plans and Operations

6.2.1 Environmental Management Practices for Development Plans

Development plans in ports and harbours include a range of activities from building a small building to capital dredging and disposal, all of which can impact on both the natural and human environment. As discussed in Chapter 2, the environmental legislation requires each developer to submit, alongside the planning application, adequate information on the development and potential environmental impacts.

As development projects in ports and harbours are by and large construction projects and each one comprises a range of construction activities, a developer should, early in the planning and design stages (ie preliminary design stage) identify the potential environmental impacts of those construction activities.

The concept of the Environmental Impact Assessment (EIA), when it was first introduced, identified the environmental impact matrix as an effective environmental management practice in the assessment of the environmental impacts. Table 6.1 presents an overview of the components of an environmental impact matrix. Tables 6.2a and 6.2b present a checklist of information items and questions which should be answered in an Environmental Statement, and which a developer can prepare to facilitate the gathering process of environmental information and ensure adequacy of an Environmental Statement. Checklists of environmental information need to be general and flexible so that they can become both project-specific and development-wide, as required, and hence a useful environmental management practice.

The nature and magnitude of environmental impacts can vary regardless of the size of the development/construction activities. Identifying potential pathways between the activity and the environmental resources at risk is the building stone for identifying effective environmental management practices for development projects. Figure 6.1 presents a suggested basic approach for developing environmental management practices for development/construction activities, regardless of the need for an environmental impact assessment or not. As with any management programme, an environmental management practice should have built in an element of reviewing and evaluating its effectiveness. Table 6.3 presents an example of a general environmental management practice for construction activities.

Figure 6.2 presents the approach to be taken in considering a development proposal that would affect an SPA or SAC, whether the decision-taker is the Secretary of State or the local planning authority. The questions asked in the process of taking the decision can be regarded by the developer as a useful guide for the information, which he would have to gather and present in his application. Figure 6.3 explains the process, which developers should follow to find out whether the particular development they propose would benefit from a permitted development right. It identifies the role of the local planning authority and English Nature. Both Figures 6.1 and 6.2 are reproduced from the DETR Planning Policy Guidance (PPG) Number 9: Nature Conservation. Further information is given in Chapter 5.

6.2.2 Environmental Management Practices for operations

This section gives guidance on environmental management practices for the typical port and harbour day-to-day operations, ranging from handling and storage of bulk products to workshop operations and grounds maintenance. The guidance is tabulated in Tables 6.4 to 6.19 and is the result of discussion and consultation over the years with representatives of the Ports Sector, and reviews of related publications, in particular the Environmental Management Handbook by the AAPA. The information on the nature of the operations, environmental resources at risk, potential impacts and relevant legislation, which is given in Tables 2.12 and 2.13, is also reproduced in Tables 6.4 to 6.19 for ease of reference and consistency.

Given the recent guidelines issued by the UK Government on how to prepare waste management plans, these Guidelines do not include guidance on such plans. The reader, therefore, is urged to refer to the two recent publications on work management listed below:

1. DETR, 1998. Port waste management planning – how to do it.
2. Keep Wales Tidy Campaign and International Centre for Environmental Management, Education and Guidance, 1998. Advisory Manual on Developing a Port Waste Management System.

6.3 Developing and implementing an environmental management programme

The main concern of ports and harbours, particularly the smaller ones, is the financial burden attached to their plans to achieve sound environmental performance and compliance with the statutory duties on the environment, whilst meeting their business needs. Chapter 5 has described the environmental management tools, ranging from the complete environmental management system to the simpler and less costly environmental review, which can help any organisation to achieve sound environmental performance. This chapter presents guidance on how a port or harbour, regardless of size, can assess its existing environmental performance and consequently identify its environmental management needs.

The environmental review process, as described in Chapter 5, is the starting point to identify which port and harbour activities are subject to environmental legislation and are having an impact as well as how significant the impact may be. Figure 6.4 presents a basic process for assessing the need for an environmental management, beginning with the assessment of the existing environmental performance and leading to the identified need for the development of an effective, tailor-made environmental management programme. Figure 6.5 presents a basic process for identifying an environmental management programme.

It is worth noting that an organisation may choose to issue an environmental policy prior to conducting an environmental review, stating its main intent to improve its environmental performance, whereas another organisation may choose to issue its environmental policy statement having first gone through the process of identifying its environmental management needs. EMAS refers to the latter as the Environmental Statement (see Chapter 5, Table 5.5).

The methodology for assessing environmental performance and environmental management needs, as seen in Figure 6.4, is basic because the guidance aims to assist ports and harbours to tailor an effective environmental management approach to suit their own needs.

Figure 6.1 Suggested approach in developing environmental management practice for development/construction activities

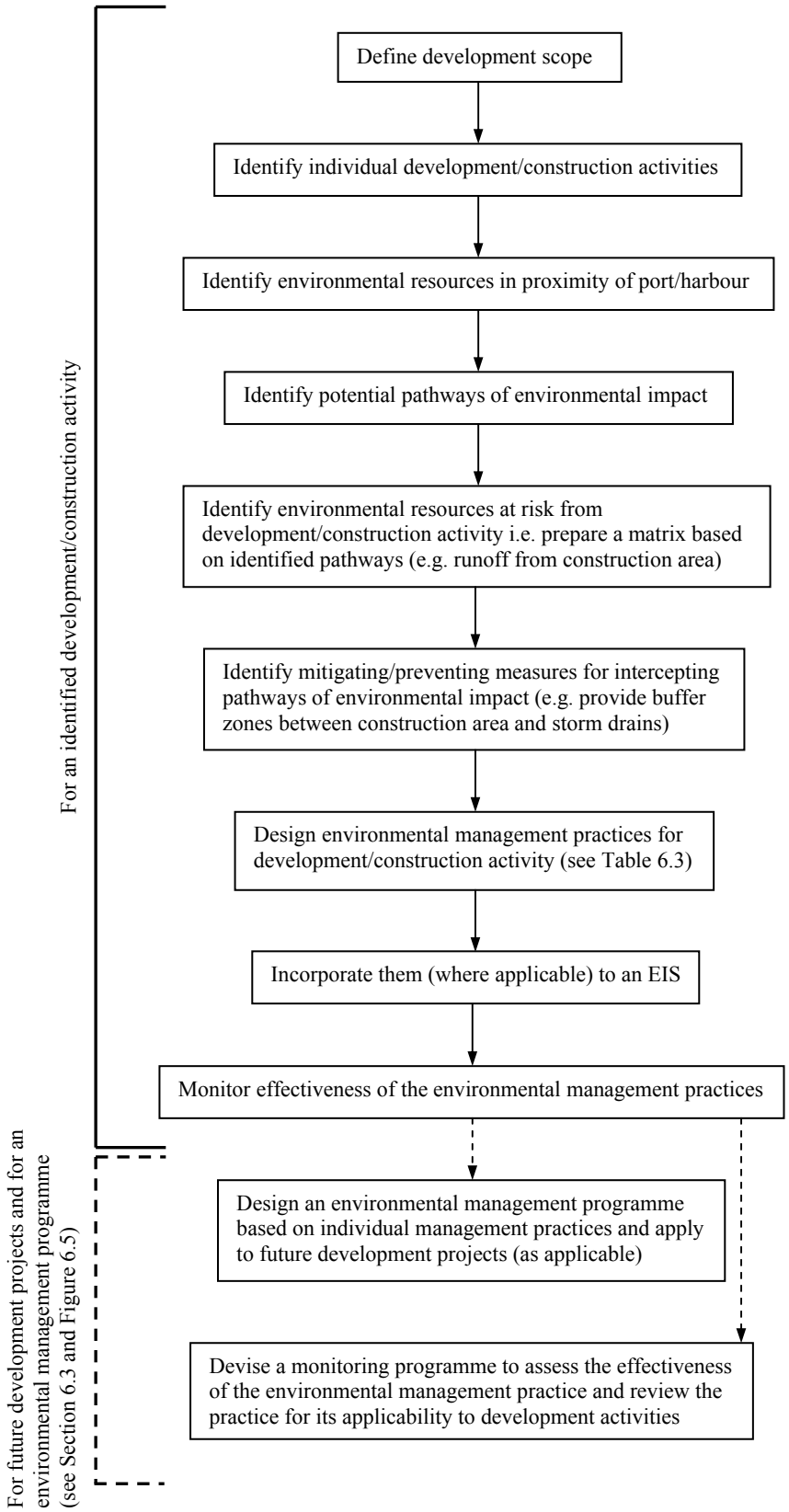
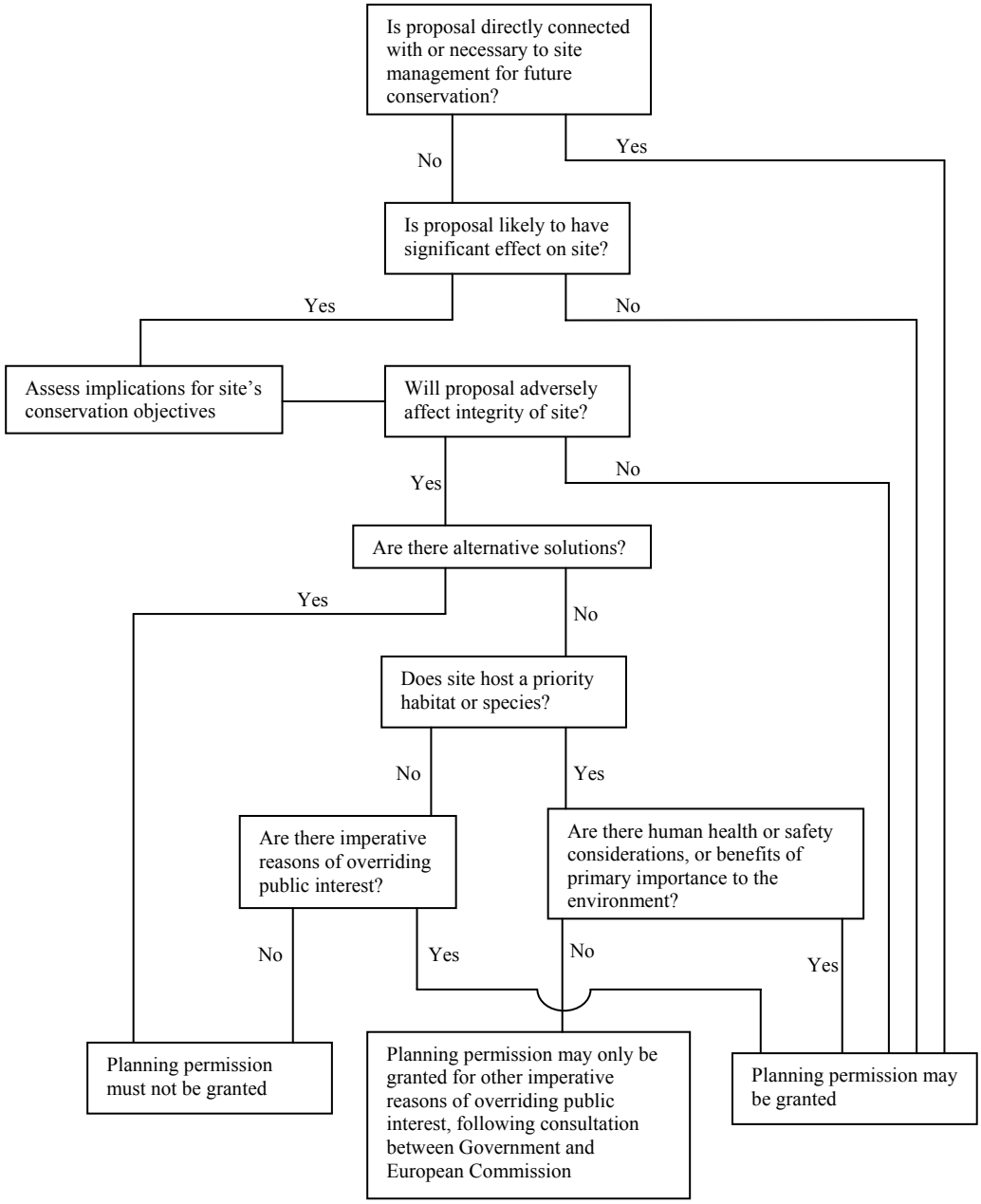
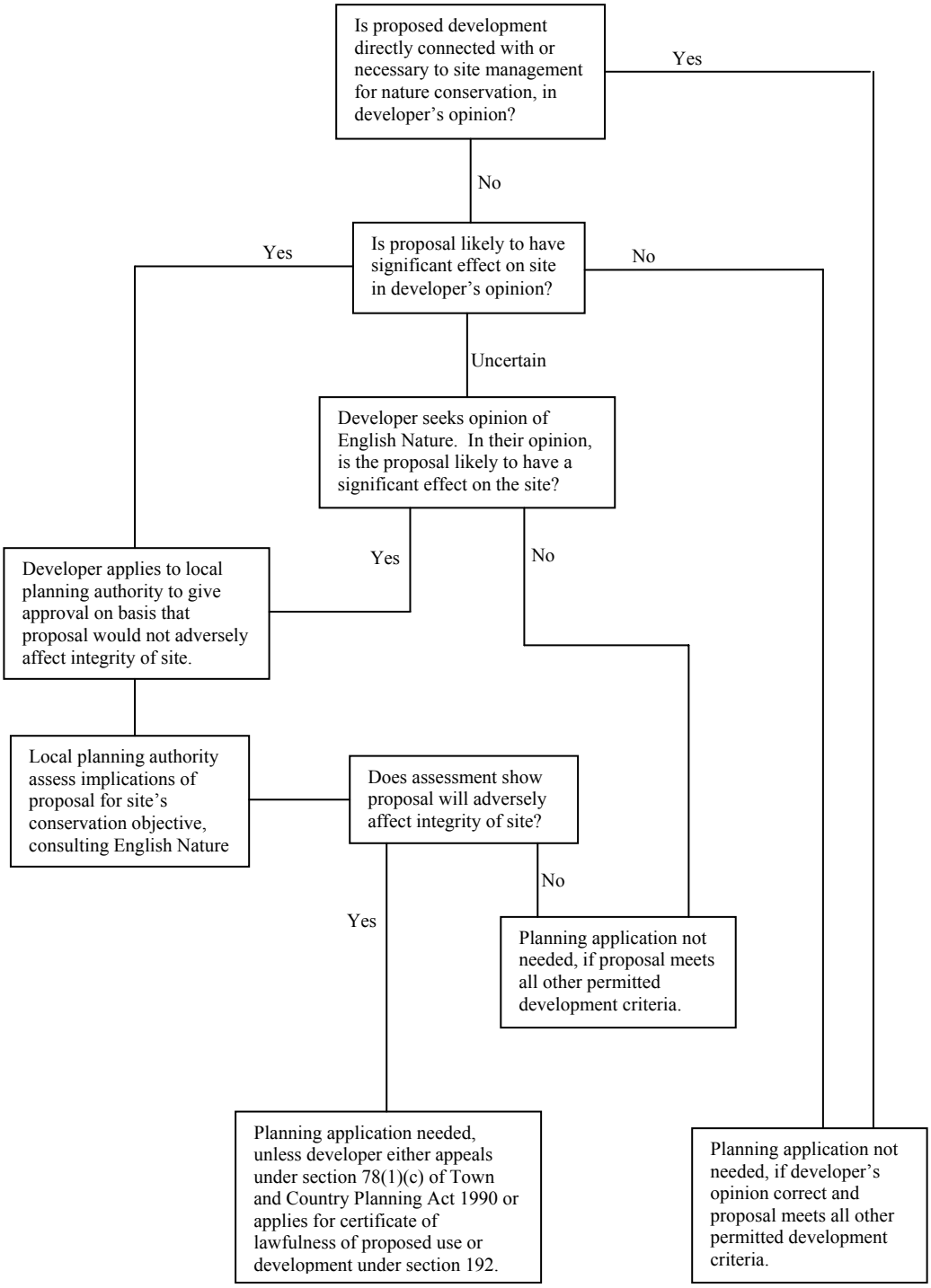


Figure 6.2 Consideration of development proposals affecting SPAs and SACs



(Reproduced from DOE PPG9 – Nature Conservation)

Figure 6.3 Permitted Development Rights, SPAs and SACs



(Reproduced from DOE PPG9 – Nature Conservation)

Figure 6.4 Assessing the need for environmental management programme

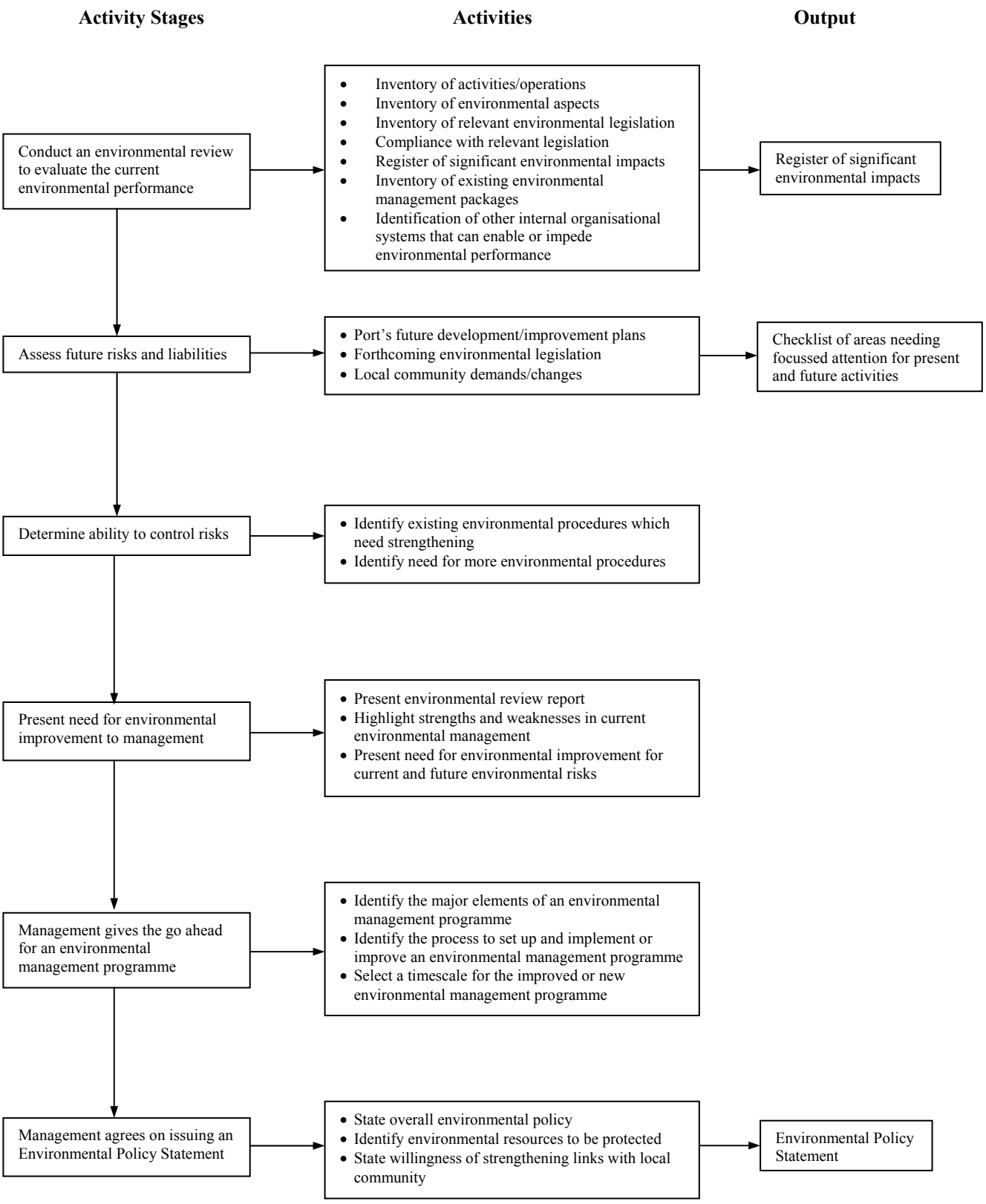


Figure 6.5 Developing an environmental management programme

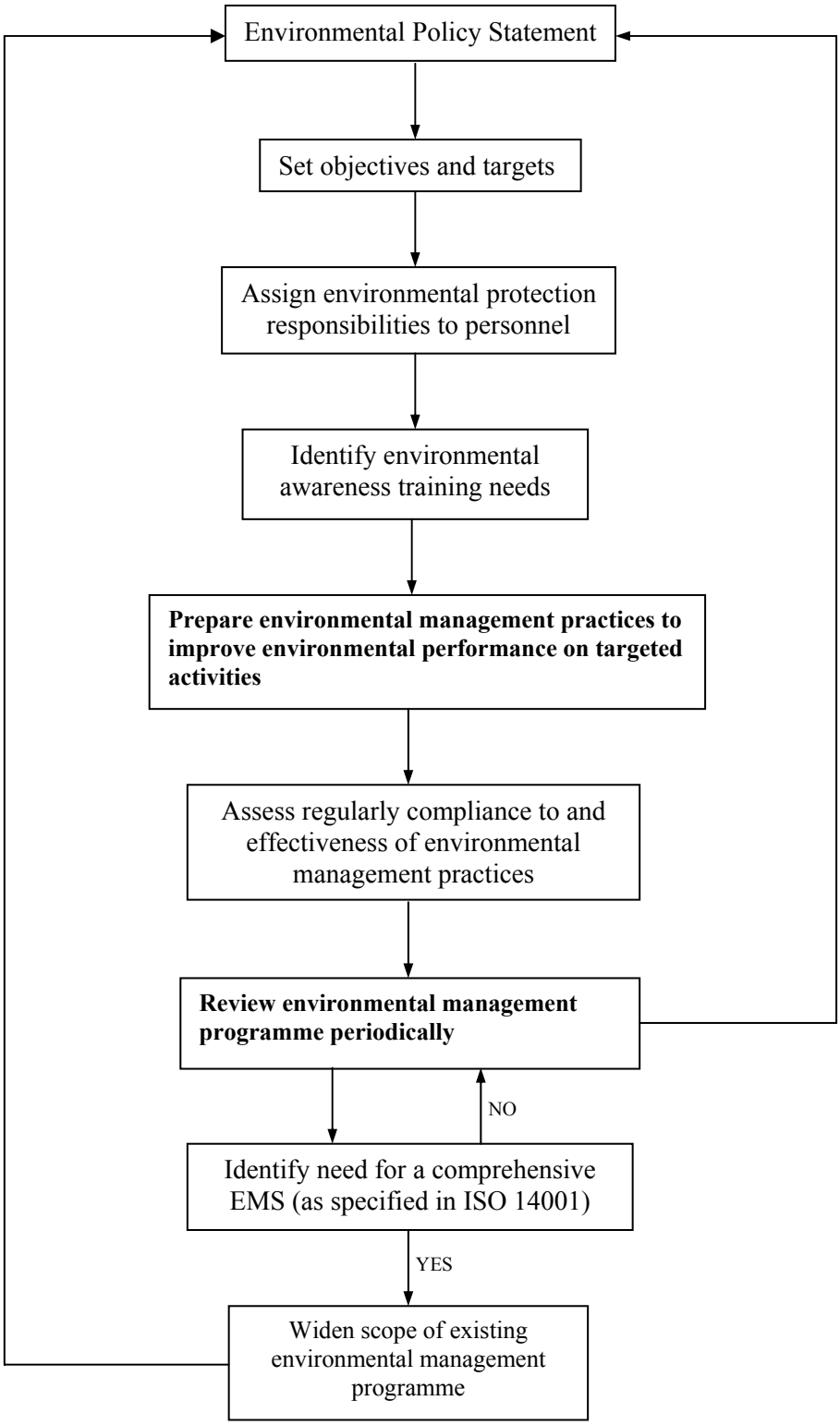


Table 6.1 Example of EIA Matrix on potential impacts from development activities

	Natural and Human Environment										
Development activities	Surface Water quality	Sediment quality	Hydro dynamic regime	Sediment transport	Ground Water quality	Soil	Air	Aquatic flora	Aquatic fauna	Recreational users	Listed buildings
Building demolition											
Building construction											
Pier construction / extension											
Surface excavation											
Pavement construction											
Blasting											
Drilling											
Dredging											
Reclamation											

Depending on the extent and duration of development activity, its potential to release contaminants or cause physical disturbance or nuisance, and the proximity and sensitivity of environmental resources (natural, human, built environment), environmental impacts can be:

- Short or long term
- Minor, moderate or major
- Reversible or irreversible
- Negative or beneficial

Table 6.2a Checklist to Determine the Basic Adequacy of an ES

1.	**Description of Development Proposal:** Is sufficient information provided to identify all components of the development which are likely to have significant effects on the environment?
2.	Has the site been clearly identified on a map or plan which can be related to the ordnance survey national grid?
3.	Is the scale of the map or plan clearly marked?
4.	Have elevations and/or sections of buildings and plant been provided to identify their size, height and mass?
5.	**The Data Necessary to Identify and Assess the Main Effects:** Does the ES provide a list or summary of the main effects which the development is likely to have on the environment?
6.	**Description of Likely Significant Effects:** Does the ES refer to each of the environmental topics listed, and describe likely impacts? If not, does it give reasons for excluding individual topics on the grounds that no significant effects are envisaged under that heading? a. **human beings;** b. **flora;** c. **fauna;** d. **soil;** e. **water;** f. **air;** g. **climate;** h. **landscape;** i. **the inter-action between any of the foregoing;** j. **cultural heritage/material assts.**
7.	**Avoiding, Reducing or Remedying Significant Adverse Effects:** Where significant adverse effects are identified, has a description of mitigating measures been provided?
8.	**Non Technical Summary:** Has a Non-Technical Summary been provided?

(Reproduced from DOE Planning Research Programme – Evaluation of Environmental Information for Planning Projects – A Good Practice Guide, 1994)

Table 6.2b Framework for Reviewing the Content of an ES

QUESTIONS WHICH SHOULD BE ANSWERED IN THE ES	
Section 1 -	***Elements of the Project:*** - What are the basic components of the development? - What processes are involved? - What requirements exist for raw materials, energy and other resources? - What residues and emissions will be produced? - What alternative sites/processes have been considered?
Section 2 -	***Policy Framework:*** - How sensitive is the site in terms of environmental designations? - Has the ES identified planning policies which are relevant to the decision?
Section 3 -	***Main Environmental Effects:*** Has the ES identified key environmental issues relating to effects on: - Human beings? - Flora? - Fauna? - Soil? - Water? - Air? - Climate? - Landscape? - Cultural heritage/material assets?
Section 4 -	***Mitigation Measures:*** - Are proposals advanced for avoiding, reducing, or remedying significant adverse effects?
Section 5 -	***Risks:*** - Although not formally required under the UK Regulations, has reference been made to any risks of accidents or hazardous development?

(Reproduced from DOE Planning Research Programme – Evaluation of Environmental Information for Planning Projects – A Good Practice Guide, 1994)

Table 6.3 Environmental management practices for development/construction activities

Activities:	I. On-hand development (construction/demolition/paving) works
Potential Contaminants and Nuisances:	Asbestos, Dust (including coal dust), PCBs, Petroleum hydrocarbons, Noise
Environmental Resources at Risk:	Air, Water (surface, groundwater), Soil, Humans, Habitats
Environmental Legislation/ Planning:	Environmental Protection Act (EPA)1990, Water Resources Act (WRA) 1991, Asbestos Regulations 1983, Town and Country Planning (General Permitted Development) Order 1995*, Waste Management Licensing Regulations (WMLR) 1994, The Wildlife and Countryside Act (Amendment)1985.

Environmental Management Practices:

- Clearly identify asbestos-containing material and have it removed by a licensed professional.
- Store and dispose of properly in accordance with WMLR – Duty of Care Requirements all demolition from debris.
- Take particular care near traffic management if contaminated debris is being transported.
- Consider recycling and sorting of all appropriate materials such as brick/tiles, steel, glass, wood, plastic/rubber.
- Identify, remove and dispose prior to demolition of all PCB-containing equipment.
- Adhere to get (by planning authority) working hours for noisy demolition/construction activities.
- Communicate in advance with local community and notify close by residents of noisy activities, and their duration.
- Have in place plans to deal with unforeseen discovery of contaminated ground, particularly drums, canisters, old spoil heaps. Contaminated soil may be a material consideration for the purpose of granting planning permission.
- Ensure that vibration during demolition/construction and from construction traffic does not damage listed buildings in and around the port/harbour grounds.
- Prevent run off from flowing across disturbed soil
- Maintain original vegetation cover and replenish it as much as possible.
- Clearly identify, mask and/or fence-off sensitive areas.
- Protect water features and habitats from run off.
- Ensure that all construction staff are aware of why and how to protect sensitive areas.
- Ensure regular inspection of protection measures for a sensitive site.
- Locate stockpiles of demolition debris in places where sediment control is feasible.
- Cover dust sources for as long as practicable.
- Make maximum use of the beneficial effect of vegetation cover on drainage and run offs. For example, create buffer zones (eg. Vegetation cover) between sensitive areas (eg. A watercourse) and development activity.
- Wet over dust sources and use vegetation cover as sediment trap to minimise the volume of sediments reaching storm drain or a natural watercourse.
- Provide sediment and erosion control devices such as earth dikes (preferably with vegetation cover), interceptors, silt fences, storm drain protection against sediment.
- Provide truck wash-out areas for site leaving vehicles – clean these areas regularly.
- Train drivers of in-coming trucks to ensure that vehicles do not bring debris onto port/harbour grounds.
- Solid debris on roads to and from the construction/demolition sites should be removed regularly.

* The Town and County Planning (Environmental Assessment and Permitted Development) Regulations 1995.

Activities:	II. Construction activities at land-water interface and waters of port/harbour
Potential Contaminants and Nuisances:	Sediment (suspended solids), Sediment-bound contaminants, Debris (construction), Noise, Lighting
Environmental Resources at Risk:	Water, Habitats, Humans
Environmental Legislation/ Planning:	WRA 1991, FEPA 1985, Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999, Harbour Works Regulations 1989 and 1996, The Conservation (Habitat &c.) Regulations 1994, Salmon and Freshwater Fisheries Act 1975.

Environmental Management Practices:

- Clarify the Permitted Development Rights situation early on at the planning stage of a development plan.
- Consult with both statutory and non-government organisations on sensitive of aquatic habitats and nature conservation management policies and practices in place.
- Work with nature conservation bodies to identify ways of implementing developing plans with the least impact on nature conservation sites.
- Identify impacts on aquatic life and appropriate mitigation measures.
- If possible determine and stick to seasonal construction "opportunities" (eg. Avoid piling in channel during salmon migration season.
- Consider the use of silt controls as much as practicable, both structural (eg. Silt curtains) and natural (eg. During ebb tide) or time works at low tide.
- If it is financially feasible, consider the use of concrete instead of steel as the latter may release paints and metals into the water over time.
- Limit the use of creosote-treated wood in the water because of the potential of toxic substances being released into water.
- Study the impact of new structures on sediment transport and safe navigation.
- Provide for easy passage of marine life (eg. Allow space between berths and berthed vessels).
- Provide adequate information on existing environmental protection controls to all contractors and sub contractors.
- Provide adequate information on nature and timing of construction activities to other meter users (eg. Recreational clubs).
- Inform local community of timing of noisy (eg. Blasting) works and keep such works within working hours.

Table 6.4 Environmental management practices for establishing facilities for dry bulk and for storage and handling activities

Operations:	Bulk Storage and Handling – Dry
Potential Contaminants and Nuisances:	Dust, Sediment
Environmental Resources at Risk:	Water (surface/groundwater), Air, Humans, Soil, Habitats
Environmental Legislation/ Planning:	Antipollution Works Regulations 1999, EPA '90 Parts I (Water) and II (Air) Water Resources Act '91, Salmon and Freshwater Fisheries Act 1975, Groundwater FEPA '85, Regulations 1998, EPA Regulations (Non-refillable refrigeration containers) 1994, Bathing Water Regulations 1991.

Environmental Management Practices:

- Cover storage areas (eg. Stockpiles) and handling equipment (eg. Conveyor belts) (where practicable and necessary.
- Utilise water sprays where practical (but consider measures to control run off).
- Use pneumatic conveyors or continuous screw conveyors where possible.
- Use telescopic arm loaders to reduce spillage (ie. free fall) of dry bulk.
- Clean up spillages as soon as it is practicable and ensure regular sweeping of handling areas.
- Provide sediment trap measures for storm drain systems.
- Provide vegetation buffer zones between operational site and residential sites.
- Provide truck wash out facilities.
- Maintain handling and storage facilities regularly.
- Cover transport vehicles and ensure regular inspection for spillages.
- Encourage ship masters to ensure regular deck clean-up.
- Provide means of environmental awareness and training.
- Consider hours of noisy handling operations.

Table 6.5 Environmental management practices for establishing facilities for liquid bulk and for handling and storage activities

Operations:	Liquid bulk (organic and minerals) handling and storage
Potential Contaminants and Nuisances:	Organic (high biological oxygen demand leading to acute reduction of oxygen in water) inorganic (polyesomatic hydrocarbons, minerals, greases/oils)
Environmental Resources at Risk:	Water (surface/groundwater), Humans, Soil, Habitats
Environmental Legislation/ Planning:	See Table 6.4..

Environmental Management Practices:

- Ensure available capacity to contain accidental (major) spills from storage facilities.
- Ensure adequate containment measures (eg. Strength of surrounding mound) and inspect regularly for cracks and likelihood of wall failure.
- Provide oil/water separators and maintain them regularly.
- Pave areas around storage tanks to prevent seepages into the spoil and groundwater – and inspect regularly for voids.
- Provide liners under storage for tank wash down and cleaning waters, to prevent them from entering drainage (storm) system.
- Provide adequate space (eg. Sump) for capturing spills and leaks and clean the area regularly.
- Inspect storage tanks and loading equipment regularly for leaks – maintain these facilities regularly.
- Provide spill response equipment or ensure their swift availability from sources outside the port/harbour.
- Conduct (as frequently as practicable) inspections of handling and storage facilities – maintain them as regularly as possible.
- Make staff aware of consequences of neglect and provide training.
- Conduct spill response training and drills.
- Clean up spills immediately.

Table 6.6 Environmental management practices for storing and handling timber products

Operations:	Storing and handling timber
Potential Contaminants and Nuisances:	Timber preservatives, timber fragments, timber by-products, unwanted (imported) pests.
Environmental Resources at Risk:	Water (surface/ground), soil habitats, humans
Environmental Legislation/ Planning:	WRA 1991, EPA 1990 (Public Health), EPA 90 Part II Sections 33, 34, FEPA 85.

Environmental Management Practices:

- Locate storage areas at considerable distance from a watercourse.
- Avoid long term stockpiling and cover product as much as possible to minimise/prevent leaking of wood preservatives into run off water.
- Clean up storage areas regularly to prevent wood chips from entering drainage system and/or natural watercourses.
- Ensure adequate product inspection upon arrival to minimise risks of pests (see appropriate Guidance from Customs and Excise or LA).
- Make staff aware of the risks of pests and the benefits of "good-housekeeping" with regard to timber by-products (eg. Bark fragments).
- Identify potential recycling/other beneficial uses of wood chips/by-products.

Table 6.7 Environmental management practices for storing and handling facilities of refrigerated goods and fish landing and processing

Operations:	I.	Handling and storing of refrigerated goods
	II.	Fish landing and processing
Potential Contaminants and Nuisances:	I.	Organic waste (high biological oxygen demand leading to acute reduction of oxygen in water); potential releases of CFC's; malodour; attraction of unwanted "visitors" (birds, rats, flies).
	II.	As above; salt.
Environmental Resources at Risk:	Water (surface/ground), air, habitats (eg. Run off high in salt reaching a fresh or brackish watercourse), humans	
Environmental Legislation/ Planning:	WRA 1991, EPA 1990 Part II (odour), Environmental Protection Regulations 1994..	

Environmental Management Practices:

- Ensure containment of organic waste and prevent leachates from biodegrading waste from reaching storm drainage.
- Ensure swift collection of organic waste if refrigeration is not possible particularly in the warmer months.
- Maintain regularly and repair faulty CFC-containing refrigerating equipment.
- Minimise malodour to prevent the attraction of pests.
- Provide regular and frequent pest inspection.
- Sweep up immediately after spillages.
- Provide adequate run off control from fish processing areas.

Table 6.8 Environmental management practices for workshop and yard activities

Operations:	Vehicle equipment maintenance and washing – workshop areas
Potential Contaminants and Nuisances:	Oily wastes, greases, textiles, metals, debris, solvents, paint residues, soaps, detergents, petroleum hydrocarbons, noise, vehicle exhaust fumes
Environmental Resources at Risk:	Water (surface and ground), soil, air, humans
Environmental Legislation/ Planning:	Antipollution Works Regulations 1999; Groundwater Regulations 1998; FEPA '85; WRA 1991; EPA 1990, Sections 33, 34, 78 and 79; Control of Pollution Act (Scrap Metal) 1974; Clean Air Act 1993, Section 2; The Wildlife and Countryside (Amendment) Act 1985.

Environmental Management Practices:

a) Vehicle and equipment maintenance – workshops.

- Provide covered (ie. enclosed) and paved maintenance areas.
- Provide oil/water separators on floor drains and connect drains to dead end sump.
- Do not keep oil filled containers near floor drains.
- Provide adequate storage area for chemicals and waste.
- Prevent as much as practicable storm water from entering maintenance area.
- Clean up immediately after spills of chemicals/oils and debris.
- Keep debris containers well labelled and away from storm drains.
- Avoid using chlorinated solvents.
- Do not overstock with cleaning agents/solvents to ensure that no half empty containers are left or discarded unresponsibly.
- Use and empty regularly drip pans and locate absorbent material at key points to prevent spilled oils/chemicals from entering storm drains.
- Provide and label clearly containers for receiving solid oily wastes.
- Drain well containers of chemicals/oils before discarding to designated (well labelled) skips.
- Try dry mop cleaning before washing floor of maintenance area and avoid hosing down work areas to the storm drain.
- Drain all fluids and remove batteries from vehicles and equipment which is to be destroyed.
- Store equipment likely to leak oils, antifreeze, transmission fluid, in places away from storm drain or other natural watercourse and carry out inspections regularly for leaks.
- Provide adequate supplies of oil spill response equipment.
- Ensure collection and off-site removal of waste by a professional waste handler.
- Make workshops staff aware of environmental consequences from failing to opt any of the above practices.
- Provide training in handling and storage.

(b) Vehicle and equipment washing

- Provide cover over washing facilities and barriers to prevent storm water from entering them.
- Washing areas should be paved, equipped with an oil/water separator.
- Consider sloped paved areas to drains discarding into the sewerage system.
- Prevent solid debris from entering drains into oil/water separators – clean them regularly.
- Designate and clearly mark vehicle wash areas for in-coming (external) vehicles.
- Avoid hosing down of vehicles and equipment near storm drains or natural watercourse.
- Clean up immediately after dry washing and before wet washing.
- Provide clearly labelled waste skips.
- Use (as much as practicable) biodegradable detergents.
- Provide containment and well labelled areas for detergents.
- Do not overstock to prevent discarding of containers with residual detergents/soaps inside.
- Consider recycling of washwater wherever possible.

Table 6.9 Environmental Management Protection for handling and storage of non-bulk chemicals

Operations:	Handling and storage of chemicals in containers (e.g. drums)
Potential Contaminants and Nuisances:	Organic and inorganic chemicals, oils, grease, lubricants
Environmental Resources at Risk:	Water (surface/groundwater), soil, air, humans
Environmental Legislation/ Planning:	Antipollution Works Regulations 1999; Groundwater Regulations 1998, WRA'91, EPA'90, Sections 33, 34, 79; The Wildlife and Countryside (Amendment) Act 1985.

Environmental Management Practices:

- Provide storage area which
  - allows easy collection/clean up of spills and leaks
  - prevents spills/leaks from reaching storm drains
  - prevents storm water from entering storage area
  - is connected to dead-end sump (also true for handling areas)
  - is paved and contained to prevent spills/leaks from reaching groundwater or escaping to other areas.
- Restrict and control (as much as practicable) access to storage areas.
- Clearly label storage areas.
- Inspect regularly storage areas for damaged containers or damages to storage bunds or paved areas (e.g. cracks/voids) – and contain leaks as soon as identified.
- Ensure all containers are marked and labelled properly.
- Store compatible materials together.
- Provide data sheets on the properties of stored/handled materials.
- Have a contingency plan in place and have emergency drills.
- Clearly label spill response equipment and make staff aware of trained employees to combat spills.
- Ensure that outside oil spill response is available if none exists in port/harbour (subject to size of port/harbour).
- Use drip pans under dispensing equipment.
- Do not designate storage/handling areas near storm drains.
- Do not overstock with chemicals-containing drums.
- Ensure drums are empty and if possible mesh them in designated areas prior to discarding them.
- Do not leave drums on non-paved areas or close to watercourses/storm drains.
- Encourage reuse/recycling of drums.
- Provide regular checks of storage and handling areas and keep good records of inspection finding and corrective actions.

Table 6.10 Environmental Management Practices for ship breaking activities

Operations:	Ship breaking and scrap metal handling.
Potential Contaminants and Nuisances:	Oils, greases, paint chips, paint residues, solvents, battery fluids (PCBs), TBT in suspension, dust, debris, sharp objects, noise.
Environmental Resources at Risk:	Water (surface/groundwater), soil sediment, habitats, air, humans
Environmental Legislation/ Planning:	Antipollution Works Regulations 1999; Groundwater Regulations 1998; Control of Pollution Act (Scrap Metal) 1974; WRA'91; EPA'90 (Sections 33, 78 and 79 Salmon and Freshwater Fisheries 1974; FEPA '85.

Environmental Management Practices:

- Use dry dock facilities as much as possible.
- If ship/vessel is at pier – prevent debris from falling in water.
- Provide cover to dismantling facility, if possible, and to scrap/debris particularly in wet weather.
- Provide paved and bunded areas for dismantling and storage facilities.
- Clearly identify hazardous material (e.g. asbestos, PCBs etc) and designate areas for their storage prior to being transported to a licensed disposal site.
- Ensure handling and transport of hazardous material is done by licensed qualified professionals.
- Ensure that stormwater is collected and pumped to sewerage – recycle water as much as possible.
- Install and maintain oil/water separators.
- Prevent debris from entering storm drain and soil/water separators.
- Remove fluids (e.g. battery fluids, lubricants) before dismantling.
- Identify areas where hazardous materials are likely to be encountered and remove these materials or their residues before dismantling.
- Restrict access to dismantling/storage areas.
- Clean up spills of fluids immediately and certainly prior to scrapping.
- Clean up frequently during dismantling to prevent material from either becoming airborne and/or being blown into water.
- Do not sand blast over open water.
- Dispose of sand blast/paint/metal residues to licensed disposal sites.
- Reuse blast material if possible.

Table 6.11 Environmental Management Practices for vessel repair and maintenance

Operations:	Repair and maintenance of vessels.
Potential Contaminants and Nuisances:	Oils, greases, fuel, solvents, paints, oily water, debris
Environmental Resources at Risk:	Water (surface/groundwater), sediments, soil, air habitats
Environmental Legislation/ Planning:	Antipollution Works Regulations 1999; WRA'91, EPA'90, Sections 34, 78 and 79; Salmon and Freshwater Fisheries 1974; Groundwater Regulations 1998.

Environmental Management Practices:

- Conduct repair/maintenance work in a dry dock if possible, if not designate a paved and bunded area away from a natural watercourse.
- Provide storm water capture and pumping (to sewerage) systems.
- Cover work areas if possible, particularly while paint spraying takes place.
- Designate special areas for painting/paint stripping – covered if possible.
- Provide measures to capture paint drips and strips if repair/maintenance activity takes place at a pier.
- Clean up spills and dry paint stripping waste immediately particularly if it can become airborne.
- Use low volatile paints.
- Maintain and clean equipment used in repair works to eliminate/minimise build up of contaminants.
- Remove fluids from operating equipment prior to repair work.
- Inspect regularly repair/maintenance facilities and equipment and restore/repair accordingly.
- Make staff aware of environmental implications if environmental practices listed above are not followed.
- Provide environmental training if feasible.
- Install wind screens and solids collection screens.
- Dispose off properly of hazardous stripping wastes.
- Avoid hosing down maintenance areas – opt for sweeping regularly.
- Do not overstock paints and solvents.
- Provide designated and clearly labelled storage areas for paints and solvents.
- Dispose off properly of empty containers – ensure they are empty.
- Reuse reusable material.
- Use water-based paints and solvents – if possible.
- Opt for brush-roller painting rather than spraying.
- Re-use blast material if possible.
- Use less toxic antifouling paints if possible.

Table 6.12 Environmental Management Practices for fuelling and bunkering activities

Operations:	Fuelling operations (on-land and at land/water interface)
Potential Contaminants and Nuisances:	Petroleum hydrocarbons
Environmental Resources at Risk:	Water (surface/ground), sediment, habitats, air
Environmental Legislation/ Planning:	Groundwater Regulations 1998; Antipollution Works Regulations 1999; WRA'91; EPA'90, Section 78; Salmon and Freshwater Fisheries Act 1974; The Wildlife and Countryside (Amendment) Act 1985, Surface Waters (Shellfish) (Classification) Regulations 1997.

Environmental Management Practices:

- Pave, slope and bund the fuelling area to prevent spills/leaks from reaching groundwater, to collect spills towards an oil/water separator and to prevent storm water runoff escaping.
- Clean regularly oil/water separators.
- During oil/water separators cleaning prevent run-off from reaching a natural watercourse or unpaved areas.
- Provide secondary containment of fuel storage tanks, if possible.
- Ensure adequate and regular inspection of fuel storage tanks and record inspection findings and corrective actions.
- Ensure that leak detection and overfill protection are working correctly.
- Provide absorbent material at key locations.
- Clean up immediately afier spills and properly dispose off collected spills.
- Do not locate fuelling areas near storm drains – if possible.
- If storm drains are near a fuelling activity, cover it whilst refuelling is taking place.
- Intercept storm water runoff to prevent it from reaching fuelling facilities.
- Automatic emergency shut down of flow system should be in place and regularly maintained.
- Ensure maintenance of fuelling facilities in accordance with manufacturers guidelines.
- Maintain or ensure the (external) provision of adequate supplies of spill response equipment in key locations.
- Provide spill response training to employees or at the very least make them aware of environmental implications

Table 6.13 Environmental Management Practice for buildings and grounds maintenance and restoration

Operations:	Maintenance and restoration works on buildings and grounds.
Potential Contaminants and Nuisances:	Oils, paint residues, solvents, metals, scrap metal, pesticides, herbicides, brick and silica dust, asbestos, noise.
Environmental Resources at Risk:	Water (surface and groundwater), soil, air
Environmental Legislation/ Planning:	Antipollution Works Regulations 1999; Groundwater Regulations 1998; WRA'91, EPA'90 Clean Air Act 1993, Section 2; Asbestos Regulations 1983

Environmental Management Practices:

- Provide protection measures to watercourses prior to demolition works.
- Provide screens to trap dust and label waste skips correctly.
- Identify parts of buildings or ground which, if disturbed, may release contaminants or irritants, and contain/control them.
- Secure all loose material – provide cover to prevent them from being blown out.
- Inspect regularly dampened stockpiles to ensure they are staying damp.
- Ensure collection and disposal of demolition/restoration waste is handled by licensed waste management companies.
- Separate and clearly label different types of wastes.
- Do not overspray with weedkillers and choose a dry day to do so.
- Provide and clearly identify storage space for weedkillers, fertilisers and restrict access to that space.
- Do not overstock with weedkillers and other pesticides as they will require proper disposal once the have reached their expire date.
- Clean up immediately after spillages – do not hose down near storm drains.
- Provide and clearly identify storage space for paints and paint stripping material.
- Do not rinse out empty containers near a storm drain or a water feature – do not hose down paved (landscaped) areas after spraying vegetation borders with weedkillers.
- Inspect storage areas regularly for leaks.
- Identify and make employees aware of the importance of protecting designated areas (e.g. watercourses, woodlands) in or near the port/harbour.
- If possible fence off and provide signs to sensitive areas.
- Protect water features, species and habitats from runoff from demolition/restoration site.
- Consult with relevant competent authorities to ensure adequate protection of sensitive features (e.g. make one employee responsible for assuring that maintenance/restoration work does not cause any damage).
- Protect root system of trees (generally any area covered by the tree canopy) and overhanging trees from on-site demolition/restoration traffic.
- Opt for native vegetation to minimise the need for weedkillers and maintenance in general.
- Use pesticides, herbicides and fertilisers in accordance with directions.
- Train employees to deal with spill control and response and pollution control (e.g. discard washdown water into sewerage not into storm drains).

Table 6.14 Environmental Management Practices for vehicle storage and transport in car terminals

Operations:	Transport and storage of cars in port/harbour areas including washing and fuelling vehicles.
Potential Contaminants and Nuisances:	Oils and greases, car exhaust fumes, fuel, soap/detergents.
Environmental Resources at Risk:	Water (surface/groundwater), air
Environmental Legislation/ Planning:	Groundwater Regulations 1998; Antipollution Works Regulations 1999; WRA'91; EPA'90, Sections 78E and 79;

Environmental Management Practices:

- Provide paved areas for storage and on-/off loading of vehicles to reduce airborne (dust) particles and protect groundwater from oil seeping.
- Inspect paved areas regularly for cracks and seal them as soon as possible.
- Provide oil/water separators (and maintain them regularly) to the storage areas.
- If possible (feasible) provide separate storm drain system to the paved storage areas and shape them to ensure maximum trapping of oily waters.
- Do not wash vehicles near storm drain system – wash water should be directed to sewerage system.
- Inspect vehicle storage area frequently for evidence of oil, brake fluid, battery leaks.
- Discourage unnecessary vehicle transport to reduce air emissions and keep noise levels and duration in control.
- Train (or at least make aware) employees of the environmental implications from vehicle storage, handling and transporting.

Table 6.15 Environmental Management Practices for solid wastes "generated on ships" and on port/harbour grounds

Operations:	Collecting , handling , transporting , storage of solid wastes.
Potential Contaminants and Nuisances:	Oils, metals, solvents, putrescible waste
Environmental Resources at Risk:	Water (surface and groundwater), soil, air, habitats, humans
Environmental Legislation/ Planning:	Groundwater Regulations 1998; FEPA '85; Control of Pollution Act 1974; (Scrap Metal) WRA'91, EPA'90 (Sections 33, 34, 78E and 79; (WMLP'94), Salmon and Freshwater Fisheries Act 1979, Surface Waters (Shellfish) (Classification) Regulations 1997.

Environmental Management Practices:

- Separate recyclable from non-recyclable waste and store them separately.
- Store oily wastes separately from rest of solid waste.
- Store hazardous waste – clearly labelled – separately.
- Restrict access to storage areas.
- Provide paved surfaces and cover to storage areas and protect them from storm water run-on and off.
- Compact waste (e.g. drums) as much as possible but ensure that no materials residues (e.g. paints, solvents) are present.
- Empty waste receptacles frequently.
- Empty waste receptacles for putrescible (garbage) as soon as they are filled up.
- Record accurately storage and disposal activities.
- Ensure handling, transport and disposal are carried out by licensed and competent people.
- Monitor receptacles for disposed wastes which should be handled differently (e.g. batteries).
- Inform vessel masters of waste collection/storage facilities and monitor (as much as practicable) proper use of these facilities (i.e. hazardous waste disposed off in designated receptacles),
- Make personnel aware of the environmental implications of badly handled/stored/disposed of wastes.
- If a waste management plan is in place review its applicability and effectiveness regularly and carry out corrective actions immediately.

Table 6.16 Environmental Management Practices for Recreational activities in harbour areas

Operations:	Public access, recreational activities/events
Potential Contaminants and Nuisances:	Solid waste, TBT, sewage, bilge water (oils)
Environmental Resources at Risk:	Water (surface), sediments, habitats
Environmental Legislation/ Planning:	WRA'91, EPA'90, Section 34; Salmon and Freshwater Fisheries Act 1975.

Environmental Management Practices:

- Provide sewage pump out and bilge water collection facilities and encourage their use by not making their use costly or access to them difficult.
- Provide adequate solid waste storage facilities and good signs to their location.
- Provide onshore paved and bunded space for boat restoration/maintenance activities.
- Provide, and maintain regularly, oil/water separators in on-shore maintenance and car parking areas.
- Provide adequate and easily accessible solid waste storage facilities, and good signs to their location.
- Inspect regularly the sewage pump out and bilge water collection facilities.
- Empty waste receptacles regularly and inspect regularly for leaks.
- Discourage in-water boat cleaning.
- Encourage use of less toxic antifouling paints.
- Provide the public with information on key locations on environmental implications from not carrying out any of the practices listed above.
- Any facility aiming at minimising/preventing contamination of water sediments or soils should be clearly signed and easily accessible.
- Clearly sign sensitive areas and provide information on boards at key locations on reasons for sensitivity/designations (e.g. Nature reserve) and if possible fence off sites or provide buffer zones.
- Provide information on how to protect sensitive/designated areas.
- Ensure adherence to management practices/protection measures by regular inspection and verbal reminding (as appropriate and if feasible).

Table 6.17 Environmental Management Practices for Shipping activities

Operations:	Ship movements, ship discharge: - ballast water, bilge water, sewage
Potential Contaminants and Nuisances:	Oils, petroleum hydrocarbons, tar, sewage "alien" species, chemical residues, air emissions, malodour, noise
Environmental Resources at Risk:	Water, sediment, habitats, air, humans
Environmental Legislation/ Planning:	Bathing Water Regulations 1991; FEPA 1985; WRA'91, EPA'90 (Clean Air, Noise), Salmon and Freshwater Fisheries Act 1975; Surface Waters (Shellfish) (Classification) Regulations 1988.

Environmental Management Practices:

Note: The majority of environmental management practices have been listed in previous tables as appropriate. For example, see Table 6.16.

Table 6.18 Environmental Management Practices for Transhipment activities

Operations:	Container handling and storing, Ro-Ro, Passenger/Car ferries
Potential Contaminants and Nuisances:	Oils, greases, solid waste, sewage, exhaust fumes
Environmental Resources at Risk:	Water, sediments, habitats, air
Environmental Legislation/ Planning:	EPA'90 Part II (Clean Air and Nuisances)

Environmental Management Practices:

- Encourage skippers to maintain on-board engines in good order to reduce exhaust emissions.
- Encourage ship captains to reach safe distances offshore before achieving full power.
- Provide adequate ship to shore waste handling facilities and ensure good signs to the location of waste skips.
- Maintain ship to shore handling equipment in good order to reduce leaks of oils/greases in the water.
- Encourage skippers to adhere to set speed limits for manoeuvring near shore.
- If possible, conduct noisy handling activities within working hours – but keep good communication links with local community.
- Keep light masts to such angles so that security is enhanced but local residences are not affected.
- Provide adequate waste reception facilities to reflect the number of passenger turnover – maintain these facilities in good order.

Table 6.19 Environmental Management Practices for maintenance dredging and disposal

Operations:	Dredging, handling/transport/storage/disposal of dredged materials
Potential Contaminants and Nuisances:	Metals (debris, scrap metal) organic (e.g. pesticides, sewage matter, petroleum hydrocarbons) and inorganic (e.g. heavy metals) contaminants, gases (e.g. methane, hydrogen sulphide) dead organisms, branches/leaf matter, objects, malodour, noise, suspended solids
Environmental Resources at Risk:	Water (surface and groundwater), sediment, habitats, air, humans
Environmental Legislation/ Planning:	WRA'91; FEPA'85, EPA'90 Part II; Salmon and Freshwater Fisheries Act 1975; Bathing Water Regulations 1991; Surface Waters (Shellfish) (Classification) Regulations 1997.

Environmental Management Practices:

- If the use of silt curtains is a cost prohibiting option – identify "windows" of time to carry out dredging/disposal activities with the least impact on sensitive environmental resources.
- If possible use dredgers with the least possible sediment resuspension impact.
- Ensure that sensitive/designated areas outside of the dredging/disposal area are not likely to be significantly affected by means of plume dispersion and subsequent resettlement of suspended solids or runoff from disposal site.
- Ensure that adequate studies on environmental impacts are carried out and that advice from nature conservation authorities is fully sought.
- Conduct continuous inspection of dredging and disposal activities.
- Consider the use of confined disposal facilities with the potential to reuse the dredged sediment beneficially at a later stage – pre-treatment to remove contaminated fraction may be necessary to maximise the potential for beneficial use.
- Explore beneficial uses of dredged materials with competent authorities and interested organisations.

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- Queen's Harbour Master, Plymouth
- Medway Ports
- Chichester Harbour Conservancy
- Salcombe Kingsbridge Estuary – Local Nature Reserve
- King's Lynn Conservancy Board
- Langstone Harbour Board
- Cyngor Sir Ceredigion, Adrany Priffyrdd, Eiddoa Gweith (Ceredigion County Council, Highways, Property and Works Department)
- Lerwick Harbour Trust
- Whitstable Harbour
- American Association of Port Authorities

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Appendices

Appendix 1

BS EN ISO14000 Standards on issues related to EMS

Appendix 1 BS EN ISO 14000 Standard on issues related to EMS

BS EN ISO 14000 Standards on issues related to EMS

Standard	Application	Committee/Working Group/Status
1. ISO 14001 Environmental Management Systems – Specification with Guidance for Use	Specification for an EMS to which organisations can gain third party certification.	**SC 1/WG 1** Published as BS EN ISO 14001 in September 1996.
2. ISO 14002 Environmental Management Systems	Guidelines on special considerations affecting small and medium enterprises	**SC 1 Project team** Preliminary Stage – Evaluation of market need currently in progress
3. ISO 14004 Environmental Management Systems – General Guidelines on Principles, Systems and Supporting Techniques	Additional guidance to organisations on design, development and maintenance of an EMS.	**SC 1/WG 2** Published as BS ISO 14004 in September 1996.
4. ISO 14010 Guidelines for Environmental Auditing – General Principles on Environmental Auditing	General principles of environmental auditing.	**SC 2/WG 1** Published as BS EN ISO 14010 in October 1996.
5. ISO 14011 Guidelines for Environmental Auditing – Audit Procedures – Auditing of Environmental Management Systems	Procedures for planning and conduct of an EMS audit.	**SC 2/WG 2** Published as BS EN ISO 14011 in October 1996.
6. ISO 14012 Guidelines for Environmental Auditing – Qualification Criteria for Environmental Auditors	Guidance on qualification criteria for environmental auditors, lead auditors, for both internal and external audits.	**SC 2/WG 3** Published as BS EN ISO 14012 in October 1996.
7. ISO 14014 Initial Reviews.	-	**SC 2/WG 1 SC 2** have passed to SC I for consideration at 1999 revisions of ISO 14001 and ISO 14004.
8. ISO 14015 Environmental Aspects of Sites and Entities.	-	**SC 2/WG 4** Committee Draft due to be published in 1999.
9. ISO 14020 Environmental Labels & Declarations – General Principles.	Principles on the basis of which all environmental claims should be made.	**SC 3/WG 3** Committee Draft. Due to be published 1999.
10. ISO 14021 Environmental Labels & Declarations – Environmental Labelling – Self Declaration Environmental Claims – Terms & Definitions.	Guidance on the use of terms for self-declared environmental claims.	**SC 3/WG 2** Draft international standard. Due to be published 1999. ISO 14021/22/23 were amalgamated in 1997.
11. ISO 14024 Environmental Labels & Declarations – Environmental Labelling TYPE I – Guiding Principles and Procedures.	Guidance for establishing a certification programme for third party environmental claims.	**SC 3/WG 1** Committee Draft. Due to be published 1999.
12. ISO 14025 Environmental Labels & Declarations – Environmental Labelling TYPE III – guiding Principles and Procedures.	Guidance on profiling of product environmental effects.	**SC 3/WG 1** Early working draft stage.
13. ISO 14031 Environmental Performance Evaluation – Guidelines.	Guidance on design and use of environmental performance evaluation.	**SC 4/WGs 1 & 2** Draft International Standard. Publication expected 1999.

Standard		Application	Committee/Working Group/Status
14.	**ISO TR 14032** Environmental Performance Evaluation – Case Studies illustrating The Use of ISO 14031.	-	New work item.
15.	**ISO 14040** Life Cycle Assessment – Principles and Framework.	Principles for carrying out and reporting of LCA studies.	**SC 5/WG 1** International standard. Published as BS EN ISO 14040 in June 1997.
16.	**ISO 14041** Life Cycle Assessment – Life Cycle Inventory Analysis.	Methodology for definition of goal and scope, performance of LCA, interpretation and reporting.	**SC 5/WGs 2 & 3** Final Draft International Standard. Publication due 1999.
17.	**ISO 14042** Life Cycle Assessment – Impact Assessment.	General framework and key aspects relevant to different methods of impact assessment.	**SC 5/WG 4** Working Draft. Due to be published early 1999.
18.	**ISO 14043** Life Cycle Assessment – Interpretation.	-	**SC 5/WG 5** Working Draft. Due to be published 1999.
19.	**ISO 14050** Environmental Management – Terms & Definitions.	Contains the terms and definitions used in ISO 14001, 4, 10, 11, 12.	**SC 6/WG 1** International Standard. Published May 1996.
20.	**ISO Guide 64** Environmental Aspects in Product Standards.	Intended for standard writers, this guide sets out the environmental effects that should be considered when developing standards.	**WG 1** International Guide published in March 1997.

WG – working group
SC – subcommittee

SOURCE: CRONERS ENVIRONMENTAL POLICY AND PROCEDURES 1999

Appendix 2

Environmental Audit Checklist

Appendix 2 Environmental audit checklist

The following checklist is a practical example of selected items which may be examined during an environmental audit. Clearly the requirements for the audit will depend upon the type of organisation and the terms of reference of the audit. It may be an audit which looks at systems, or one which checks generally against different objectives.

POLICY
Is top management seen to be committed to environmental protection as a high priority?
Do all employees understand the Environmental Policy?
Is a realistic budget allocated to environmental matters?
Is adequate training on environmental issues provided throughout the workforce?
Is the workforce fully involved in environmental improvement programmes?

LEGISLATION
Is there an inventory of all legislation affecting the operation?
Are all legal requirements being complied with?

PREMISES
Are the past uses of the land known?
Has the environmental impact of past and current land usage been assessed (especially regarding contamination of land)?
Does this inventory include or refer to any licences, regulations or presentation orders which might affect buildings?

WASTE
Is there an inventory of all wastes normally generated?
Are wastes properly labelled?
Are wastes transported by licences carriers?
Are adequate records kept for the storage and disposal of wastes?

OPERATIONS
Is there a system for controlling the use of raw materials?
Is there a system for keeping the inventory of raw materials up-to-date?
Are all raw materials, supplies, packaging materials and products stored in facilities appropriate to their nature?
Are all storage facilities designed to isolate leakage or spillages?

EMISSIONS AND DISCHARGES
Is there an inventory of all emissions or discharges?
Have all release points been identified?
Have all appropriate consents been obtained for all emissions and discharges that May require them?
Are all leaks, spills and accidental discharges investigated in detail?

PRODUCTS
Do any products have an environmental impact in their use?
Do products conform to environmental standards or legislation, where these exist?

TRANSPORT
Is there an inventory of all transportation under the organisation's control?
Have all foreseeable environmental consequences of sills and leaks during transport been identified?

Adapted from source: CRONERS ENVIRONMENTAL POLICY AND PRODCURES

Appendix 3

Extracts from the 1998 Self Diagnosis Methodology (SDM98)
of the ECO-Information project

Courtesy of Cardiff University

ECO information in European Ports

Self Diagnosis Method

1998

Strategic Analysis Questionnaire for the (Environmental) Port Manager

Strategic Issue Overview

This table provides an overview of the main environmental **issues** in European Ports. Please tick the **reasons for interest** (see left column) that apply to each issue. The completed table will give a strategic overview of the **key issues** in your Port!!

	Air Quality	Dredging	Dust	Energy use	Habitat Loss	Health & Safety	Noise	Soil Contamination	Waste	Water Quality
Regulation										
• International conventions / legislation										
• European legislation										
• National legislation										
Policy										
• Own port environmental policy										
• European / international policy										
• National / local policy										
Public and Employee Health										
• Public health										
• Employee health & safety										
Port Image and Public Relations										
• Port image (general)										
• Marketing of the port										
Complaints from External Parties										
• Local communities										
• Action groups										
• Port users										
• Governmental organisations										
Financial										
• Financial costs										
• Financial benefits										
• Investments										
• New business opportunities (e.g. recycling)										
Port Development										
• Short term (1-2 years)										
• Long term (3-10 years)										
Natural Environment										
• Nature conservation / protected areas										
• Landscape										
Tourism & Recreational Use										
• Tourism										
• Recreational use										
Others (please specify:)										
Importance of Issue on a scale of 1 to 10*										

* Assess for your Port the importance of each issue, independent from other environmental issues, on a scale of 1 to 10 (e.g. air quality: 5, dredging: 5, dust: 8, etc.):

not important	1	2	3	4	5	6	7	8	9	10	very important

Soil Contamination

Introduction

This **issue** refers to pollution of soil, ground or land by current or past industrial activities. Contaminants can include underground storage tanks, chemical drums, heavy metals, scrap metals, discarded machinery, organic chemicals or pathogens. Contaminants may affect surrounding land, ground water or water courses due leaching. Land contamination may reduce land value, prevent future development and be an environmental or health hazard.

A. Current Situation

A1 Which organisation(s) is/are legally responsible for enforcement of soil (contamination) regulations?

❑ Port Authority ❑ Others: .... ❑ None ❑ Don't know	Specify / further detail:

A2 Does the Port Authority have any difficulties complying with soil contamination regulations?

❑ Yes, because of: ❑ Cost ❑ Lack of information ❑ Lack of appropriate technology ❑ Lack of in-house expertise ❑ Involvement of multiple organisations ❑ Changes in legislation ❑ Other priorities ❑ Other: ..... ❑ No ❑ Don't know	Specify / further detail:

A3 Do soil contamination regulations affect current port operations

❑ Yes ❑ Partial ❑ No ❑ Don't know	Specify / further detail:

A4 Do soil contamination regulations affect the development plans of the port?

❑ Yes ❑ Partial ❑ No ❑ Don't know	Specify / further detail:

M8.5 How was the Audit conducted?

• By Local Government	Y	N
• By own staff	Y	N
• By external consultants	Y	N
• By Environmental Enforcement Agency	Y	N
• According to ISO 14000 or EMAS Standards	Y	N

Further details/ Notes

Section M9: Emergency Planning

M9.0 Does your Emergency and Incident Plan include the following?

M9.1	• Possible environmental consequences of likely incidents	Y	P	N
M9.2	• Responsibility and role of Port Authority personnel	Y	P	N
M9.3	• Responsibility and role of land private operators	Y	P	N
M9.4	• Responsibility and role of ship agents	Y	P	N
M9.7	• Responsibility and role of external agencies	Y	P	N
M9.8	• Communication procedures (who to call and when)	Y	P	N
M9.9	• Control and containment procedures	Y	P	N
M9.10	• Remediation* and clean up procedures	Y	P	N
M9.11	• Location and type of equipment (on and off site)	Y	P	N
M9.12	• Location and skills of trained personnel (on and off site)	Y	P	N
M9.13	• Communication procedures with neighbouring industry, public and media	Y	P	N
M9.14	• Responsibility for follow-up and reporting	Y	P	N
M9.15	• Other(specify).....	Y	P	N

Further details/ Notes

- Remedial action to correct or compensate for the effect of the incident.

Section M5: Inventories

M5A: Inventory of Environmental Regulations

M5.0 **Does the Port authority have an inventory of relevant environmental regulations and their requirements for all Port activities?***

Y	P	N

If **No**; Proceed to section **M5B**

M5.1	Have you specified procedures to collate and update your inventory(ies)?	Y	N
M5.2	Is the information readily available?	Y	N
M5.3	Is the information distributed to relevant personnel?	Y	N

Further details/ Notes

* Each department may keep a record or inventory of relevant environmental regulations and their requirements. However, this may be regarded as an inventory if the information is accessible and available to all other departments and senior management.

M5B: Inventory of the Environmental Effects[63-65] of Port activities

M5.4 **Have you prepared an inventory of the environmental effects[63,67] of Port activities?**

Y	P	N

If **No**; Proceed to section **6**

Does the Environmental Effects Inventory[65] consider effects from the following:

M5.5 **Port Activities**

M5.5.1 Port Operations

• Bunkering	Y	P	N
• Dredging	Y	P	N
• Marine engineering/ Ship repair	Y	P	N
• Petroleum terminals[179]	Y	P	N
• Shipping & Navigation[158]	Y	P	N
• Terminals[179] (non petroleum)	Y	P	N
• Vehicular Management Terminal Traffic	Y	P	N
• Waste Management	Y	P	N
• Other (specify).....	Y	P	N

Further details/ Notes

Section M4: Environmental Training*

M4.0	**Are all Port employees aware of the following?**			
M4.0.1	• Importance of compliance with environmental policy	Y	P	N
M4.0.2	• Potential environmental effects[63,67] of their work activities	Y	P	N
M4.0.3	• Their responsibility to conform to the environmental policy[80] and management objectives[78]	Y	P	N
M4.0.4	• Consequences of non-compliance**	Y	P	N
M4.0.5	• Environmental benefits of improved performance	Y	P	N
M4.0.6	• Economic benefits of improved performance	Y	P	N

M4.1	**Have the environmental training requirements of employees been identified?**	Y	N

M4.2	**Are relevant Port personnel trained in?**			
M4.2.1	• Standard environmental operating procedures***	Y	P	N
M4.2.2	• Pollution prevention and reduction equipment use	Y	P	N

M4.3	**Does the Port authority have an environmental training program for its employees**	Y	N
M4.4	**Do you maintain a full record of environmental training for each employee?**	Y	N

M4.5	**Does this record include:**		
M4.5.1	• Trainees name, location and job description	Y	N
M4.5.2	• Nature and date of training course	Y	N
M4.5.3	• Trainee feedback	Y	N
M4.5.4	• Effectiveness of training	Y	N

Further details/ Notes

* Environmental management guidance recommends that employees should not take on unfamiliar tasks, involving systems, machinery or substances with which they have no experience. Training is recommended to do their job safely with the minimum risk to the environment. Employees may be monitored to ensure that environmental training is applied effectively.

** Consequences of non-compliance with Port environmental policy or environmental regulations

*** Standard operating procedures are written protocols or working instructions that specify how a task will be carried out.

Appendix 4

Glossary: Courtesy of Cardiff University

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Self Diagnosis Method Glossary

1. **Abatement:** Method used to reduce, diminish or mitigate an effect or impact. (See **mitigation)**

2. **Abundance:** See **species abundance.**

3. **Acid deposition:** Deposition on vegetation soils and waters of acid substances such as sulphuric acid; can be divided into dry deposition (gravitational settling of particulates) and wet deposition/ acid precipitation (sulphur dioxide and nitrogen oxides scavenged by precipitation).

4. **Action Plan:** A statement or statements in a management program of what will be done to achieve a management aim, objective or target. The action plan would include what was to be done, how, by whom, when (or how often) and for how long.

5. **Activated carbon adsorption:** A secondary waste treatment process in which activated charcoal adsorbs organic components of the waste stream.

6. **Age structur**e: The structure of a plant or animal community in terms of the proportions of individuals of different stages of maturity, e.g. seedlings, saplings and adults of trees in a woodland; can provide an estimation of regenerative success of different species and hence permit prediction of likely changes in species composition.

7. **Air pollutants:** Substances or energy (e.g. waste heat) released into the atmosphere in such quantities and of such duration likely to cause harm to plants or animals (including people); damage to materials (e.g. fabrics) and structures (e.g. buildings); changes in weather and climate; or interference with the enjoyment of life or property (e.g. as a result of odours or noise). Air pollutants include; nitrogen oxides, sulphur oxides, ozone, smoke, suspended particulates, carbon monoxide, carbon dioxide, polyaromatic hydrocarbons, benzene, volatile organic compounds, poly-chlorinated biphenyls, dioxins, chlorine, fluorides, halogen compounds, methane, asbestos, glass and mineral fibre particulates and toxic volatile metals and their compounds (lead, cadmium, arsenic, nickel and mercury).

8. **Air quality standard:** The concentration of a pollutant over a specified period above which adverse effects on health or the environment may occur, and which should not be exceeded. Health-based standards (often called primary standards) are usually legally enforceable; environment-based standards (often called secondary standards) may be long-term objectives that are not legally binding.

9. **Alternative:** A possible course of action, in place of another that would meet the same purpose and need of the proposal.

10. **Ameliorative measures:** See **mitigation**

11. **Animal community:** An assemblage of animal species populations living together in a given location at a given time; usually associated with a particular vegetation type or complex; part of the total community of the location.

12. **Anthropogenic:** Generated and maintained, or at least strongly influenced, by human activities.

13. **Aquifer:** A rock stratum that contains groundwater and allows this to flow through. Depending on its geological composition, an aquifer will have a given porosity (and hence water-holding capacity) and permeability (which affects the potential rate of groundwater flow).

14. **Attribute:** A characteristic or parameter of your objective that can be used to measure achievement of the objective. These can be quantitative, qualitative parameters or indicators. For example, tonnes of SO_2 emitted per year, volume of Annex II wastes landed per month, number of cargo spillage's in warehouses per year, complaints about noise, type of habitat.

15. **Baseline studies:** Work done to collect and interpret information on the condition and trends of the existing environment.

16. **Biodegradability:** Any substance or item that is capable of being broken down into harmless constituents, such as water, carbon dioxide, or individual elements by the action of living organisms is biodegradable. Organisms, including bacteria, in detritus ecosystems are particularly involved in such breakdown. However, biodegradable substances or items are not always broken down into their constituents when released into the environment. This is frequently the case where the environment is swamped by excessive amounts of materials, or where local conditions - for example, lack of sufficient oxygen in municipal refuse disposal sites prevent biodegradation.

17. **Biogeochemical cycles:** The flow of elements such as calcium, carbon, nitrogen, phosphorus, potassium or sulphur, through the physical and biological components of the biosphere. The operation of biogeochemical cycles is strongly dependent on the actions of living organisms. At different stages in the cycles, these elements are combined with other elements in a variety of chemical forms at some stages in biogeochemical cycles, some elements accumulate in large amounts, the seizes of which are far in excess of annual flows into or out of those stages. Those stages are often referred to as environmental sinks.

18. **Biological diversity** *or* **biodiversity:** The totality of genes, species and ecosystems in a region or in the world. It includes genetic diversity (the variation in the genetic composition of individuals within or among species), species diversity (the variety and frequency of different species) and ecosystem diversity (the variety and frequency of different ecosystems).

19. **Biological treatment:** A tertiary waste treatment process involving the degradation to organic materials including oils by microorganisms. This process requires aeration and is sensitive to the composition of the effluent, especially its chemical content.

20. **Biomass:** (of vegetation) the mass of plant material (and the energy this contains) present in a community at a given time; usually measured as dry weight per unit area, e.g. dry gm.

21. **Biophysical:** That part of the environment that does not originate with human activities (e.g. biological, physical and chemical processes).

22. **Biosphere**: The thin covering of the planet that contains and sustains life. The biosphere (life) includes the hydrosphere (water), atmosphere (air) and lithosphere (rock, the crust of the earth) as well as ecosystems and living organisms.

23. **Biota:** All the organisms, including animals, plants, fungi and microorganisms in a community or area.

24. **Buffer zones:** Vegetated strips of land that are intended to screen ecosystems from impacts such as pollution or disturbance, and/or to reduce the area restrictions of protected sites; can be located (a) adjacent to developments or components of these, usually with the aim of filtering out pollutants (b) around protected sites, with aims such as providing additional habitat for some animals, protecting the site from pollutants and disturbance, and perhaps encouraging expansion through species dispersal, or (c) within sites, usually with the aim or permitting their use for both amenity purposes and conservation.

25. **Buffering and equalizing:** Primary waste treatment process. A mixing tank that acts as a buffer for incoming waste streams to ensure continuous flow rates. The tank also equalizes the composition of waste streams by mixing several batches of oily waste.

26. **Bulk Carrier Vessel:** Single deck ship designed to carry homogeneous unpacked dry cargo.

27. **Cargo Handling:** Environmental risks may result from spillage's or incidents during the handling of cargo. The nature of the environmental risk is dependent on the cargo handled. Cargo types include:

- **Aggregates:** For example, sand (coarse & fine), gravel and crushed rock often used in the construction industry.
- **Grains:** For example wheat, flour, soya, oil seeds and other cereals.
- **Minerals:** For example, cement, sulphur, potash, alumina, nitrates, and phosphates. These have been separated from unrefined mineral ores.
- **Ores:** For example, pyrites, bauxite and iron ore.
- **Other Dry Bulk:** A general category for all bulk that does not fall into the above sections, for example, sugar and fertilizers.
- **Perishable Goods:** Any cargo that is liable to decay or deteriorate in transport or storage if conditions are not strictly controlled; for example, foodstuffs such as fruit, bananas, vegetables,
- **Wood (forest) products:** For example, paper, newsprint, woodchip, woodpulp, pallets.

28. **Cargo Storage:** On site storage activities within the Port area**.** Different types of storage facility may result if a variety of environmental risks as a result on accidental spillage's, runoff or drainage. Alternatively, incompatible chemicals may result in health & safety risks if stored in the same vicinity.

29. **Carrying capacity:** The capacity of an ecosystem to support healthy organisms while maintaining its productivity, adaptability and capability of renewal. Continued use of an ecosystem in excess of its carrying capacity will ultimately result in ecosystem degradation.

30. **Centrifuges:** A secondary waste treatment process. Consists of a rotor containing the components to be separated which is then spun at high speeds. The resultant centrifugal force separates components on the basis of density but can separate multiple phases, for example oil, water and solids.

31. **Chemical emulsion breaking/ Flocculation:** A secondary waste treatment process for oil/ water emulsions. Coagulants (for example, iron slats, aluminium slats or charges polymers) are added under rapid mixing. Heating may be used to improve coagulation. Flocculants are added to this mixture in another tank under gentle mixing to allow the emulsion components to agglomerate to form larger 'flocs' which can be separated. Often used as a pre-treatment for **Flotation.**

32. **Cleaner production:** Cleaner production is an operational approach to the development of production and consumption. It is based on addressing all phases of life cycle and a product or process in order to prevent or minimise short and long-term risks to human health and to the environment.

33. **Climate:** (at a given place) The totality of the weather experienced; not simply average weather since climate includes extremes or deviations from the mean state of the atmosphere, e.g. fogs, frosts, and storms; the behaviour of the atmosphere over periods of weeks, months, seasons, years and decades, i.e. the integration of weather over long periods; usually characterised using long-term records, e.g. 30 years.

34. **Climate change**: A change in climate resulting primarily from human activities, and their direct or indirect effects on the climate system which comprises the atmosphere, biosphere, oceans, water resources, soils and geological processes. Human activities affect these components and their interactions through releases of gases such as carbon dioxide, CFCs, nitrogen oxides, sulphur dioxide and water vapour directly into the atmosphere, desertification, or the draining of wetlands; and through the knock-on effects that these and similar changes cause to other components.

35. **Coastal defence:** Structures to protect the coastline from storm damage and erosion by the sea. These defences also include mudflat, salt marsh and sand dune systems.

36. **Coastal Engineering:** Activities and structures related to the operation of the Port (for examples docks and quaysides, piers and breakwaters), and its immediate surroundings (for example tidal barrages, coastal and flood defence).

37. **Coastal Industry:** Types of industry often associated with a coastal location. These industries may operate within the Port boundary or in its immediate surroundings.

38. **Conservation Designations:** Protected areas of unique or rare species, communities and habitats. For example, RAMSAR wetlands, Biosphere reserves, Special Protection Areas, and Special Areas of Conservation. There are numerous examples of National designations. Some sites may be voluntary protected areas of importance to the local community.

39. **Community:** (biotic) An assemblage of plant, animal and microbial species populations living in a given location at a given time; involves inter-relationships between the species and is considered to constitute a functional system.

40. **Company:** the organisation which has overall management control over activities at a given site.

41. **Continual improvement:** Process of enhancing the environmental management system, with the purpose of achieving improvements in overall environmental performance, not necessarily in all areas of activity simultaneously, resulting from continuous efforts to improve in line with the organisation's environmental policy.

42. **Controlled waters:** Defined by the UK Environment Agency to include all groundwater, rivers, streams, canals, lakes and reservoirs, the only exclusions being landlocked water bodies that do not drain into other controlled waters (e.g. clay-lined ponds) (see also designated waters)

43. **CORINE biotope**: A site defined in CEC (1991a) as "an area of land or a body of water which forms an ecological unit of Community significance for nature conservation" in terms of the presence of threatened species (listed CED 1991b) the presence of sensitive/threatened habitat types, and the site's richness for a taxonomic group or a collection of habitats. To qualify as an important site at the Community level, a biotope must satisfy specific conditions relating to the rarity of threatened species or habitats. However, these conditions are likely to be modified to conform with the criteria set out in the Habitats Directive (92/43/EEC) and thus enhance the use of the CORINE biotopes database as a database of SACs. CORINE biotopes are categorised using an hierarchical habitat classification (set out in CEC 1991b) in which major habitat classification), and sub-divisions are characterised in terms of the plant communities except where a biotope lacking vegetation is an important habitat for animals, e.g. tidal mudflats

44. **Cumulative effects assessment:** The assessment of the impact on the environment which results from the incremental impact of an action when added to other past, present or reasonably foreseeable actions regardless of what agency or person undertakes such actions. Cumulative impact can result from individually minor but collectively significant actions taking place over a period of time.

45. **Design storm:** A rainstorm of given magnitude and probability; usually derived from existing rainfall data as the maximum rainfall likely to occur (during a given period, such as 1 hour) within a specified recurrence interval (return period) that is measured in years; e.g. a 50-year, 1-hour design storm is the probable maximum rainfall in a 1-hour period within any 50-year interval. Design storms are used for various purposes, including the design of flood-protection structures and they may be selected in relation to the type of planned structure. For example, recurrence intervals of 10 years are often considered adequate for storm sewers or vegetated flood-control structures, but intervals of 100 years may be stipulated for large structures such as dams, or where towns are threatened by major rivers.

46. **Designated waters:** Water bodies or sections of a river designated by the relevant water authority under one or more EU Directives, e.g. a river with an important salmon fisher could be designated under the Fisheries Directive and would have to comply with the water quality standards set in this directive.

47. **Determinant**: A catch-all term for any chemical or associated parameter that is measured, e.g. biological oxygen demand (BOD), nitrate, aluminium, turgidity, etc.

48. **Duty of care:** The Duty of Care is a legal approach in pollution control and environmental legislation applying to people who handle or control to environmentally harmful substances or processes. It includes the duty to prevent anyone else contravening legislation; to prevent escape of potentially damaging substances and waters; and to transfer potentially damaging substances and wastes to individuals or organisations which satisfy legislation for dealing with such materials. Duty of care also covers responsibility to ensure that legal and technical requirements are fulfilled.

49. **Eco-efficiency:** The re-focusing of goals and assumptions that drive corporate activity in such a way that they play a major role in reducing the environmental and human impacts of competitive and successful companies. Improvements in technological 'hardware' - the development and use of new equipment - and 'software' - the management practices of business - are central to eco-efficiency. Increasingly efficient use of raw materials is a feature of industrial activity, due largely to improved technology and processes. It is driven by pressures to reduce costs and enhance competitive positioning, especially among market leaders. Reducing inputs of raw materials in relation to profit generation also leads to a reduction kin waste and pollution. However, such against in efficient use of energy and materials, while valuable in themselves can ultimately be outpaced by growth in the scale of economic and industrial activity. The environment responds to absolute levels of use and consumption, and cumulative impacts, rather than to relative improvements in materials use and pollution intensities.

50. **Ecological footprint:** the overall environmental impact of a country, region, community or individual on both the immediate territory and areas elsewhere in the world from which they obtain resources, or which they pollute, directly or indirectly. To understand the concept of an ecological footprint, imagine a farmer with one cow. The cow needs about half a hectare of grassland to feed it during a year, and the farmer either supplies this on the farm, or keeps the cow in a stall, buying in feed from elsewhere. That feed has to be grown somewhere, so the cow still consumes the produce of half a hectare of grassland, or the equivalent, whether it is kept in a field or a stall.

51. **Ecological processes:** Ecological processes sustain the Earth's life-support systems. They involve continuous actions or series of actions that are governed or strongly influenced by one or more ecosystems. They sustain the productivity, adaptability, diversity and capacity for renewal of the biosphere as a whole and of its components, including ecosystems and living organisms.

52. **Ecology:** The branch of science concerned with the relation of living things, including human beings, to each other and to their living and non-living surroundings, among them those created by humans. It is concerned with the study of the distribution and abundance of plants, animals and other living organisms and the factors that influence this and their interactions.

53. **Ecosystem:** A dynamic system of plants, animals or other living organisms together with the non-living components of their environment. Natural ecosystems are those which (apart from global influences) are unaffected by human activity. Other ecosystems are modified by human activity to varying extents and include those that are built or cultivated. Ecosystems that have been so damaged that they are unlikely to recover without help, are termed degraded ecosystems.

54. **Eco-tourism:** Tourism dependant on an area's ecology (rare and unique species) and landscape. For example; coastal paths and coastal national parks, whale and dolphin watching, bird watching and wreck or reef diving.

55. **Emergency situations**: can arise for many reasons, for example fire, explosion, collision, flooding, spillage, leakage and uncontrolled development in the course of an operation or activity. An emergency response plan should identify potential emergencies, assess their likely effects and determine procedures to be followed for all emergencies.

56. **Emission standard:** The maximum amount or concentration of a pollutant allowed to be emitted from a specified source.

57. **Emissions inventory:** List of the location and type of pollutant sources in the area under study, together with the amount of pollutant discharged in a specified period.

58. **Energy Flow:** The flow of energy through ecosystems and the biosphere. Energy (apart from geothermal and nuclear energy) is ultimately derived from sunlight through photosynthesis by green plants, and through direct warming of the Earth's surface.

59. **Environment:** Surroundings in which an organisation operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelation. The environment in this context extends from within an organisation to the global system or biosphere.

60. **Environmental aspect:** Element of an organisation's activities, products or services which can interact with the environment.

61. **Environmental assessment:** A process that assesses and predicts the environmental impact of a proposal for example, a road scheme or new development - that is subject to a decision by a competent national authority. It identifies alternatives and presents its findings in such a way that decision-makers can be informed of what needs to be done. Environmental assessment is equally applicable to policy proposals.

62. **Environmental audit:** shall mean a management tool comprising a systematic, documented, periodic and objective evaluation of the performance of the organisation, management system and processes designed to protect the environment with the aim of
    (i) facilitating management control of practices which may have impact on the environment;
    ii) assessing compliance with company environmental policies;
    It covers specific audits of health, safety, waste prevention and other matters and focused on environmental issues of key concern - the organisation's impact on ozone depletion, pollution control, contamination of land or water, noise and odour pollution and waste minimisation, for example. It also takes into account the environmental performance of suppliers of raw materials, goods and services.

63. **Environmental effect:** Any direct or indirect impingement to the activities, products and services of the organisation upon the environment, whether adverse or beneficial. A **Direct** effect occurs when an activity affects the environment directly, for example; oiling of seabirds after an oil spill. An **Indirect** effect may occur when the effect of an activity on the environment occurs at a distance (in time or space) from the source of the effect. For example; the use of pesticides in agriculture that eventually accumulate in the tissues of seabirds and affect their reproduction and population size.(See **secondary impact**).

64. Environmental effects evaluation: **A documented evaluation of the environmental significance of the effects of the organisation's activities, products and services (existing and planned) upon the environment. An assessment to decide whether the environmental effects are significant or important and may need to be managed. This evaluation may examine the scale, location, type, duration and frequency of an effect. For example; an occasional oil spill within an enclosed dock *may* not be as significant as frequent small oil discharges in the vicinity of a bathing area.**

65. **Environmental effects inventory:** A list of the significant Environmental effects, known or suspected, of the activities, products and services of the organisation upon the environment.

66. **Environmental factors**: All environmental variables that are know to affect organisms; can be divided into abiotic factors, which involve physical and chemical environmental components (e.g. water, temperature, light, oxygen, nutrients, pH and toxins), and biotic factors, which involve interactions between organisms (e.g. competition, predation, parasitism and mutually beneficial relationships such as pollination).

67. **Environmental impact:** Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services. (See **Environmental effect**).

68. **Environmental impact assessment (EIA):** The systematic, reproducible and interdisciplinary identification, prediction and evaluation, mitigation and management of impacts from a proposed development and its reasonable alternatives. Sometimes known as environmental assessment.

69. **Environmental impact report/statement (EIS):**Document in which the results of an EIA are presented to decision-makers and, usually, the public.

70. **Environmental investing:** Environmental investing is practised by funds which seek to invest in companies providing environment technologies and services. Environmental companies re defined in terms of the products and/or services they provide or the proportion of turnover from a particular product or service. A sound environmental performance track record is not a necessary criterion for investment.

71. **Environmental management:** Management that enables an organisation to establish an environmental policy and objectives, comply with them and demonstrate them to the outside world. The policy must be relevant to the organisation's activities, products, services and their environmental effects. It should also be understood, implemented and maintained at all staff levels.

72. **Environmental management audit:** A systematic evaluation to determine whether or not the environmental management system and environmental performance comply with planned arrangements, and whether or not the system is implemented effectively, and is suitable to fulfil the organisation's environmental policy. (See **Environmental audit**).

73. **Environmental management manual:** The documentation describing the procedures for implementing the organisation's environmental programme.

74. **Environmental management programme:** A description of the means of achieving environmental objectives and targets.

75. **Environmental management review:** The formal evaluation by management of the status and adequacy of systems and procedures in relation to the environmental issues, policy and regulations as well as new objectives resulting from changing circumstances.

76. **Environmental management system**: This covers the organisational structure, responsibilities, ways and means of implementing environmental management. It ensures that the activities of an organisation, and their effects, conform with environmental policy and associated objectives and targets. It includes the preparation and implementation of a documented system of procedures and instructions providing the basis for a programme of continuous environmental improvement.

77. **Environmental management system audit:** Systematic and documented verification process to objectively obtain and evaluate evidence to determine whether an organisation's environmental management system conforms to the environmental management system audit criteria set by the organisation, and communication of the results of this process management. (See **Environmental audit**).

78. **Environmental objective:** Overall environmental goal, arising from the environmental policy and significant environmental aspects, that an organisation sets itself to achieve, and which is quantified where practicable.

79. **Environmental performance:** Measurable outputs of the environmental management system, relating to an organisation's control of the impacts of its activities, products or services on the environment, based on its environmental policy, objectives and targets.

80. **Environmental policy:** Statement by the organisation of its intentions and principles in relation got its overall environmental performance which provides a framework for action and for the setting of its environmental objectives and targets.

81. **Environmental programme:** shall mean a description of the company's specific objectives and activities to ensure great protection of the environment at a given site, including a description of the measures taken or envisaged to achieve such objectives and where appropriate the deadlines set for implementation of such measures;

82. **Environmental review:** an initial comprehensive analysis of the environmental issues, impact and performance related to activities at a site.

83. **Environmental statement: 1)** shall mean a statement prepared by the company in line with requirements of the EMAS Regulations. The statement should address the activities at the site, significant environmental issues and effects, the environmental policy, objectives, environmental program, emissions data, review procedure and specify the date of the next environmental statement. **2)** An environmental impact assessment report.

84. **Environmental targets:** Detailed performance requirements, quantified wherever practicable, applicable to the organisation or parts thereof, which arise from the environmental objectives and which need to be met in order to achieve those objectives.

85. **Ethical investing:** An ethical fund is defined by the Ethical Investment Research Service (UK) as any fund which restricts its choice of shares according to at least one ethical criterion and whose portfolio is published. Many ethical funds include environmental factors and exclude, for example, companies engaged in trade in tropical hardwoods or the manufacture of CFCs

86. **Eutrophic:** Nutrient-rich (referring to soils, peat's, waters, or whole ecosystems).

87. **Eutrophication:** Process or trend of nutrient enrichment, especially by nitrogen and phosphorus; may occur naturally, but usually refers to anthropogenic nutrient enrichment which often leads to ecosystem degradation through excessive nutrient loading.

88. **Evaporation: 1.** Vaporisation of liquid phase to leave a more concentrated residue. **2.** Secondary waste treatment process when the chemical concentration of noxious liquid waste streams are increased by evaporation of water.

89. **Fauna:** All of the animals found in a given area

90. **Filtration:** A secondary waste treatment process to remove solids and emulsified oils.

91. **Fisheries & Aquaculture:** Traditional fishing fleets and fish processing activities based within the Port or its surrounding area. For example;
    - **Aquaculture:** Shrimp ponds, freshwater fish farms and fresh water mussel farms.
    - **Mariculture:** Salmon and sea trout farms, mussel and oyster beds, and seaweed farming (for example kelps).
    - **Fixed Net Fishing:** The use of nets fixed to the shore, for example gill nets, herring nets and tangle netting.
    - **Seaweed collection**: Collection of edible species of seaweed or for use as fertilizer.

92. **Flood defence:** Structures designed to avoid or prevent flooding o f the land by river flooding and tidal or storm surges. These defences also include mudflat, salt marsh and sand dune systems.

93. **Flora:** All of the plants found in a given area

94. **Flotation:** A secondary waste treatment process that uses air bubbles to separate flocculated oil particles. Air bubbles stick to the oil particles and increase their buoyancy. Floating particles are collected by skimmers.

95. **Gaia hypothesis:** The Gaia hypothesis proposes that the global environment is maintained within the narrow 'window of opportunity' necessary for the existence of life, by a self-balancing feedback mechanism. This functions through the interactions of the world's biological and physical systems. The Gaia hypothesis highlights continual interactions between the biological and physical worlds. The atmosphere - a physical resource - has been generated by biological activity. So have coal, chalk, certain types of metal-rich ores and many other types of rock. Fertile soil is created by the interaction between mineral rocks and physical weathering, plants and soil-dwelling organisms. Interactions of this sort are pervasive and essential to the functioning of biogeochemical cycles, and to the health of the planet.

96. **General Cargo Vessel**: Multiple deck ship designed to carry goods shipped unpacked or packed in cartons, crates, bags or bales but not shipped in bulk.

97. **Green consumer:** A green consumer is a person who buys goods or services which are (or claim to be) less harmful to the environment and/or human health than alternatives. Increased environmental awareness of consumers in the developed world, linked with important issues of public concern such as global warming or standards of food safety, has had a significant impact on retailing in many industrial countries.

98. **Green investing:** This is a similar term to socially responsible investment (SRI) covering a wide range of styles and types of investment vehicles. What distinguishes it from SIR is the greater emphasis it places on environmental considerations. Green investment takes as its guide the principles of sustainable development as defined and expanded upon at the United Nations Conference on Environment and Development at Rio de Janeiro in June 1992.

99. **Groundwater:** Water in a saturated zone beneath the Earth's surface (see **aquifer**)

100. **Habitat:** A place where an organism lives; a type of environment inhabited by particular species and/or communities; often characterised by dominant plant forms, physical characters or a combination of these, e.g. forest, grassland, marsh and stream habitats.

101. **Hazardous & Dangerous Cargo:** Storage of hazardous & dangerous cargo may result in specific environmental risks dependant on the physical- chemical characteristics of the chemicals stored; the method of storage, the location, size and management of the storage site. Dangerous cargo, their properties, stowage and storage requirements are given in the 'International Maritime Dangerous Goods Code' (IMDG) published by the IMO.

102. **Health impact assessment (HIA)**: Component of EIA which focuses on health impacts of development actions. Most attention is concentrated on morbidity and mortality, but increasingly, the World Health Organisation (WHO) definition of health as being a state of 'social, physical and psychological well-being and not just the absence of disease' is being used to guide this type of assessment work. Often termed **Environmental health impact assessment (EHIA).**

103. **Hydrocyclone.** A separation technique that relies of the differences in density in the components of a water mixture, for example, oil and water or sludges. The water mixture is fed, under pressure, through a tangential inlet into the largest diameter part of the hydrocyclone. In the resultant vortex the highest density components (silts) travel to the outside while low density components concentrate at the centre of the vortex. The free vortex created by the motion of the liquids in the hydrocyclone causes that liquid core to flow in the opposite direct to the liquid around the core.

104. **Hydrological:** Concerning water in the environment, including surface water (lakes, rivers, etc.,) subsurface water (soil water and groundwater) and atmospheric water.

105. **Impact management plan:** A structured management plan that outlines the mitigation, monitoring and management requirements arising from an environmental impact assessment.

106. **Impact monitoring:** of environmental/social/health variables, which are expected to change after a project has been constructed and is operational, to test whether any observed changes are due to the project alone and not to any other external influences.

107. **Indicator species:** Species indicative of (a) some environmental or historical influence (e.g. lichens can be atmospheric pollution indicators, and woodland ground-flora species can be indicative of ancient woodland), or (b) a community or habitat type (e.g. some species can be used to classify invertebrate communities, or are indicative of particular habitats).

108. **Industrial activity:** shall mean any activity listed under sections C and D of the classification of economic activities in the European Community (NACE rev.1) as established by Council Regulation (EEC), No. 3037/90, with the addition of electricity, gas, steam, and hot water production and the recycling treatment, destruction or disposal of solid or liquid waste;

109. **Industrial systems:** Dynamic networks of industries and the associated environments, infrastructure, social and economic organisation, communities and institutions with which they interact. Industrial systems are dependent on these interactions for their inputs of materials, energy and labour, for their markets and for the disposal, recycling or re-use of waste materials.

110. **Initial environmental evaluation / examination***:* A report containing a brief, preliminary evaluation of the types of impacts that would result from an action. Often used as a screening process to assess whether or not proposals should undergo full scale EIA.

111. **Integrated pollution control (IPC):** A method of handling pollutants and connected aspects of environmental problems. IPC seeks to reduce impacts of pollution on the environment to an overall minimum and emphasises 'at source' rather than 'end of pipe' pollution control measures. IPC recognises that if pollution control is dealt with by separate arrangements covering emissions of pollutants to land, air or water, there is a high risk of reducing one problem and causing another. For example, technology used in power stations to remove sulphur dioxide (SO_2) reduces acid emissions but creates additional solid and liquid wastes.

112. **Interested parties:** Those with an interest in the environmental effects of an organisation's activities, products and services. These include those exercising statutory environmental control over the organisation, local residents, the organisation's investors, insurers and workforce, customers and consumers, environmental interest groups and the general public.

113. **Issue:** A generic term for all natural and commercial resources, environmental impact or effects and user /operator conflicts relevant to management.

114. **Key species:** (or keystone species) A species on which several other species, or the functioning of an ecosystem,

115. **Labile organics:** Organic compounds such as carbohydrates and proteins that are easily degraded in the aquatic environment, as opposed to non-labile (or refractory) compounds (such as many of those in wood) that are resistant to decay.

116. **Life-cycle assessment (LCA):** The evaluation of a particular material or activity from generation to final disposal. This is also known as 'cradle-to-grave' or 'earth-to-earth' analysis. The underlying concept is to address environmental degradation before it occurs, rather than wait until problems have been created. By understanding the fundamental systems that impact on the environment, LCA provides an aid to the design of new and less harmful business methods. Life-cycle assessment accounts for all inputs to, and outputs from, a system and understanding of the system itself.

117. Linear industrial systems: These convert raw materials into wastes via a series of different processes and industrial activities. These wastes include the final disposal of goods or wastes arising either directly from production processes or from the use and disposal of products and services. While within linear industrial systems, some processes may be 'closed loops - for example, the recycling of water at a particular site. Across their entire set of industrial processes, linear industrial systems have only poorly developed means of recycling or utilising wastes in further productive industrial activities.

118. Marine Engineering & Repair: Ship repair, maintenance, shipbuilding and construction of other maritime structures, for example, oil and gas rigs.

119. Membrane filtration: A secondary wastewater treatment process for oil/water mixtures. The physical and chemical properties of the membrane determine the components of the waste stream that can pass through. The remaining components are, therefore, concentrated in the waste stream.

120. Mineral Extraction: The extraction of natural, non-renewable, resources with vicinity of the Port may constitute an environmental risk (for example, habitat loss, pollution and increased erosion), a navigation hazard, or reduce landscape value and visual amenity.

121. Mitigation: The purposeful implementation of decisions or activities that are designed to reduce the undesirable impacts of a proposed action on the affected environment.

122. Molecular coalescence separator: A secondary waste treatment process used to separate oil/water mixtures. The tank is separated into two chambers by a weir. In first chamber allows any sludge to sink out of suspension. As the liquid phase crosses the weir it passes from a low to high energy phase and back again. This increase the probability of like molecules coagulating. Coagulated oil is removed in the second chamber by a skimmer. The remaining water and any suspended oil particles (or oil adsorbed onto suspended solids) pass through a 'bio-pack where they are biologically degraded.

123. Monitoring: Activity involving repeated observation, according to a pre-determined schedule, of one or more elements of the environment to detect their characteristics (status and trends)

124. 'Moving baseline': Existing state of the environment projected into the future assuming no development proceeds. The projected baseline situation, rather than that existing at the time of EIA work, is theoretically the one to be compared with the state of the environment predicted in the event of a development action proceeding.

125. Natural resource accounting: Transformation of data, on environmental features (components and processes) and renewable/non-renewable resources, into a form that is comparable with data on the economy. Incorporation of the environmental data into the standard set of economic accounts (e.g. gross national product) used in government policy-making.

126. Natural resources: Features that have ecological, economic, recreational, educational, or aesthetic value.

127. Net primary production: The surplus energy when that needed by plants is subtracted from the amount they assimilate by photosynthesis (gross primary production); hence the energy available for other trophic levels in communities (see food chain); usually expressed as the increase in plant biomass during a growing season or year (see primary production)

128. No regrets policy: This concept applies in areas where there is uncertainty as to future developments. It identifies policy actions designed to address unexpected changes, but where (even if there is no anticipated change) the policy is desirable in itself. Energy efficiency is an example.

129. Non-renewable resources: which, once used, can never be renewed. Fossil fuel energy such as coal, oil or minerals are examples.

130. Objective: an explicit statement of what management hopes to achieve. For example, to improve harbour air quality, to reduce the environmental effect of ship wastes.

131. Organisation: Any organised body or establishment, for example, a business, company, government department, charity or society. For bodies or establishments with more than one site, a single site may be defined as an organisation.

132. Oxidation: 1. To undergo a reaction with oxygen. **2.** A waste treatment process for noxious liquids in which the effluent is oxidised by Ozone; Ozone and Ultra Violet light or by Hydrogen peroxide. This process can be referred to as ozonation when ozone is used.

133. Ozonation: See oxidation.

134. pH Scale of 0-14 defining the acidity/alkalinity of solutions including those in soils and water bodies : 0= extremely acid, 14= extremely alkaline, and 7 = neutral (although soils and waters with pHs between c.6.5. and c.7.5 are often referred to as neutral)

135. Performance criteria: The condition or value of each parameter or attribute used to judge the achievement of an objective. The value or condition of a parameter, attribute or environmental quality used to judge performance. Alternatively the condition, status or value of a parameter or attribute at which management action is initiated or required. (see **attribute**).

136. Pipelines: Transhipment pipelines or 'Trans-pipeline' movement of chemical cargo out of the Port and/or between Chemical plants. Avoids the risk of road tanker spillage's.

137. Plant community An assemblage of plant species populations living together and constituting the vegetation in a given location at a given time' part of the total community of the location.

138. Plate separators: Primary waste treatment process. Inlcined plates accelerate the oil water separation process by increasing the surface area. Oil droplets move along the underside of the plate and sediments settle on the top of the plate. The use of corrugated plates promotes the coalescence of oil droplets and hence separation. (see **Separation tanks)**

139. Polluter pays principle: The principle that those who cause pollution should bear the costs not only of damage caused by pollution, but also of measures necessary to reduce pollution.

140. Pollution prevention pays (PPP): This concept is based on the fact that pollution prevention reduces costs incurred by an enterprise, and that integrated action to prevent pollution often leads to cost savings generally. PPP originates from the pollution reduction strategy pioneered by the 3M Corporation in the United States.

141. Potable water: Water intended for human consumption

142. Precautionary principle/precautionary approach: Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation. If there is any uncertainty about the effect that an action may have, the environment must be given the benefit of the doubt. Prevention is better than cure, so release should be prevented even before there is evidence of damage. The precautionary principle is part of a policy of risk prevention to reduce emission levels of all human-introduced substances.

143. Prevention of pollution: Use of processes, practices, materials, products or energy that avoid or reduce the creation of pollution and waste.

144. Primary producers: Green plants (including phytoplankton) that utilise light energy to synthesise organic compounds (by photosynthesis) and form the basis of food chains, because they produce more organic material than they require.

145. Primary production: The process of light-energy assimilation by primary producers, and hence of energy fixation by a plant community; can be divided into gross primary production (the total amount of energy assimilated) and net primary production; can be expressed in terms of energy or, since this is incorporated in the plants' organic compounds, in terms of biomass; often expressed as the amount fixed per unit area per year (e.g. $gm^2\ yr^1$) which is strictly a measure of rate and hence of productivity.

146. Protected area: An area dedicated primarily to protection and enjoyment of natural or cultural heritage, to maintenance of biodiversity, and/or to maintenance of the Earth's life-support systems, within their environments.

147. Recreational Use: The Port area and its surroundings may attract a variety of recreational activities that may need to be considered in the management of the Port and its environment. For example; bird watching, wildfowling, horse riding, bathing, angling, power boating, jet skiing, surfing and SCUBA diving,

148. Rectification at source: The prevention of environmental or other problems through the fundamental redesign of processes, operating facilities and techniques, products, working practices, etc., so as inherently to prevent or minimise production of effluent and wastes which would otherwise impact on the environment. This contrasts with measures implemented to treat effluents and wastes immediately prior to their discharge into the environment - an approach often referred to as 'end of pipe' (from the practice of building treatment plants at the end of discharge pipes).

149. Recycling: The process by which waste or used materials are put back into productive use. Efficiently operate recycling systems can reduce pollution problems caused by waste disposal. In addition, some recycling schemes may provide alternative sources of energy, and all help conserve energy and natural resources.

150. Renewable resources: Resources that can be harvested or extracted regularly without diminishing its yield. All biological resources are renewable if used sustainably, as are some physical resources such as power derived from wind, water flow or waves. In many cases, however, potentially renewable biological resources are harvested in excess of their capacity to regenerate. This leads to declines in yield over time. In agriculture, this decline may be compensated by the use of fertilisers and pesticides which are not in themselves renewable resources, and which through their use cause other problems.

151. Resource: Anything that is used directly by people. A renewable resource can renew itself or be renewed at a constant level. A non-renewable resource is one whose consumption necessarily involves its depletion.

152. Risk analysis (Risk assessment, RA): Technique used to determine the likelihood or chance of hazardous events occurring (such as release of a certain quantity of a toxic gas) and the likely consequences. Originally developed for use in nuclear and chemical industry where certain possible events, of low probability, could have extremely serious results. Attempts are being made to use concepts from probabilistic risk analysis to characterise environmental impacts, worse occurrence and nature are not easy to predict with any degree of accuracy.

153. Runoff: Usually defined as channel flow (stream flow) from a site or catchment; but variously used by different authors, e.g. to include (a) overland flow (and hence all surface flow), (b) overland flow and inter-flow, or (c) all flows (including groundwater flow)

154. Scoping: An early and open activity to identify the impacts that are most likely to be significant and require investigation during the EIA work. The results of scoping are frequently used to prepare a 'Terms of Reference' (TOR) for the EIA.

155. Secondary impact*:* Indirect or induced changes in the environment, population, economic growth and land use and other environmental effects resulting from these changes in land use, population and economic growth. The potential effects of additional changes that are likely to occur later in time or at a different place as a result of the implementation of a particular action.

156. Sediment: Organic or inorganic material that has precipitated from water to accumulate on the floor of a water-body; commonly consists of fine particular matter (silt) that was previously suspended in the water, but can include (a) coarser materials including sands and gravel's, and (b) material such as calcium carbonate that was present in the water as dissolved chemicals and has precipitated through chemical reaction; sometimes incorrectly used to include particulate matter that is still suspended in water (suspended sediment/solids).

157. Settling tanks: A primary waste treatment process. Allow oil and water mixtures to separate under gravity. However, this takes time (dependant on the flow rate, turbulence, and oil concentration) so that continuous waste processing will require several tanks operated batch-wise. The speed and efficiency of separation may be improved by the addition of **plate separators.**

158. Shipping & Navigation: Those activities and structures required for the safe passage of shipping into, within and out of the Port and its harbour(s).

159. Silt: Fine particulate organic and inorganic material; strictly confined to material with an average particle size intermediate between those of sands and clays, but often taken to include all material finer than sands.

160. Siochrone: A map showing equal travel times to a given site.

161. Skimmers: A device to remove or skim the oil layer from a water surface as part of a separation installation. Consist of a moving device (plate, drum or belt) to which the oil sticks as it passes through the oil layer. The oil is removed by scraping and passed to the next phase in the process.

162. Social impact assessment (SIA): The component of EIA concerned with changes in the structure and functioning of social orderings. In particular the changes that a development would create in: social relationships; community (population, structure, stability etc.); people's quality and way of life; language; ritual; political/economic processes; attitudes/values. Can sometimes include health impacts.

163. Species abundance: Strictly the number of individuals of species in an area, often expressed as density; in community studies, e.g. of species composition, more usually (and usefully) the amount of the species as a function of both numbers and size, estimated in terms of frequency, cover or biomass

164. Species composition: In simple terms the species comprising a community as indicated by a species list; more usually includes a measure of the importance of each species in terms of its abundance (see species importance and species abundance)

165. Species diversity: The structure of a community in terms of the number of species present and the relative abundance or importance of each consists of two components, species richness and evenness (which is the degree to which the sum of all abundance's is distributed between the constituent species). Two communities with the same number of species can have different species diversities, e.g. a community with one or two very abundant species and low amounts of all other species has low evenness and lower species diversity than one with the same number of species but grater evenness.

166. Species importance: Strictly a species' role in the community (see dominance and key species) but usually estimated in terms of it s abundance or relative abundance, i.e. its abundance expressed as a percentage of the sum of the abundance of values of all species resent in the community; can also be composite value derived from two or more abundance measures.

167. Species richness: Can refer simply to the number of species in a community or area, but is also a component of species diversity, when it is defined as the ratio of the number of species to the sum of (a) all individuals or (b) all species' importance values.

168. State of the Environment reports**:** Reports that provide an assessment of the conditions of the environment, pressures on the environment and the responses of the environment to those pressures

169. **Strategic environmental assessment (SEA):** An EIA-like appraisal procedure that examines the likely environmental impacts of proposed policies, programmes and plans.

170. **Stripping:** A secondary waste treatment process. Volatile components are removed from a waste stream by counter-flow with a gas stream. The volatile components dissolve in the gas stream and are removed.

171. **Suction elevator:** A pneumatic device used to 'suck' dry cargo (for example grain) through pipes to its storage silo.

172. **Sustainable development:** Sustainable development is defined in the Brundtland Report as '*development that* meets *the needs of the present without compromising the ability of future generations to meet their own needs'*. The aim of sustainable development is 'improving the quality of human life within the carrying capacity of supporting ecosystems' a definition used in the joint IUCN, UNEP and WWF report entitled 'Caring for the Earth: A Strategy for Sustainable Living' Sustainable development emphasises the need for a balanced relationship between environmental, social and economic factors. Any industrial or other development will only be sustainable when it sustains the communities and environments on which it depends both now and in the future.

173. **Sustainable resource use (SRU):** The wise and controlled use of natural resources, including wildlife, so that it always remains within the limits of environmental capacity and can renew itself.: SRU is one component of sustainable development and must meet the needs of the present generation, particularly the poor, without compromising the ability of future generations to meet their own needs.

174. **Synergistic:** By acting together, separate elements produce a greater effect than would be produced if they acted separately.

175. **Tankers (Petroleum):** Tankers that carry crude oil; fuel oils, Liquefied Natural Gas (LNG), Liquefied Petroleum Gas (LPG), motor sprit, kerosene.

176. **Tankers (Chemical):** Includes liquid chemicals and liquefied gases, for example, acids, ammonia, methanol, butadiene, asphalt, and bitumen

177. **Tankers (liquid bulk):** Includes other bulk cargo in liquid form, for example, fruit juices, wine, molasses and edible oils.

178. **Target:** A detailed statement, usually quantified within a defined time frame, of management's intended changes in an attribute to achieve an objective. For example, to comply with water quality standards by the year 2000, to reduce SO_x emissions from ferries by 20% in five years.

179. **Terminals:** Area set aside for the transhipment of specific items. This includes the dock, berthing facilities, cargo handling facilities, storage and transport infrastructure required for safe operation of the terminal.

180. **Trans-boundary impacts:** Any impact, not exclusively of a global nature, within an area under the jurisdiction of a Party caused by proposed activity the physical origin of which is situated wholly or in part within the area under the jurisdiction of another Party.

181. **Traffic Capacity:** Traffic flows that a road or junction can accommodate; used as a starting point for the design of roads and junctions, but does not specify ultimate traffic flows.

182. **Visual amenity:** The popularity of an area, site or view, in terms of visual perception

183. **Visual envelope:** The extent of visibility to and from a point or site.

184. **Waste Disposal, Effluent Discharges & Emissions:** Activities that may have a direct effect on water, air and soil quality of the Port and its surroundings**.** For example, industrial emissions, industrial

effluent, runoff, ship discharges, ship and vehicle exhausts, thermal discharges, sewage and marine litter.

185. Waste Reception Facilities: Include reception facilities for shipboard waste, for example, chemical wastes, oily wastes, oily bilge water, ballast water, tanker & hull washings, shipboard sewage, and garbage whether they are fixed, mobile or contractor operated.

186. Water budget: The balance between water inputs to and outputs from a system, affecting the amount of water stored in the system at a given time

187. Water cycle: The flow of water through the biosphere and its various physical and biological components.

188. Weather: *(*in a given place) The condition of the atmosphere at a given time with respect to the various elements, e.g. temperature, sunshine, wind, precipitation; refers to the behaviour of the atmosphere over a few hours or at most over a few days (see climate)

189. Wildlife corridors: Linear vegetated features, such as hedgerows or roadside verges, that are linked to other wildlife areas and may act as interconnecting routes for the movement of animals between different areas needed during life, or facilitate dispersal of animals and plants by providing access to new or replacement sites. They may also increase the overall extent of habitat for animals with large range requirements and in urban and agricultural areas may constitute the main remaining wildlife habitats.

190. Zone of intrusion**:** See visual envelope.

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