



Decision Making and Coastal Risks: A Good Practice Guide

Atlantic Network for Coastal Risks Management



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INTRODUCTION

Context

Atlantic Europe is made up of 33 regions stretching across a coastline of 1,550 miles, home to around 70 million inhabitants. These regions are characterised by a strong identity, linked to their proximity to the ocean and displaying great natural and cultural diversity. They are also very vulnerable due to the pressure of human and natural origin that they are subjected to: for example, urbanisation or coastal erosion. The various risks are also potentially accentuated

Handbook objectives

The objective of this handbook is to provide a Good Practice Guide to facilitate the inclusion of coastal risk into decisions made in the coastal zone.

This handbook is aimed at those involved in coastal planning and decision making. It is designed to be used with the information available from the ANCORIM project on coastal risks. The handbook is also designed to be accessible to a wider audience who wish to improve their knowledge of coastal risks and how they relate to decision making in the coastal zone. The handbook

The coastal zone

A precise line that can be called a coastline cannot be determined due to the dynamic nature of tides (Hasslet, 2009). The term «coastal zone» can be used instead, which is a spatial zone where interaction of the sea and land processes occurs (Nelson, 2007). Scientifically, the various disciplines (ecological, geographical, hydrological etc) have similar or common definitions of the term «coast». However, administratively, delineation of the extents of a “coast” differ according to jurisdiction, with many scientific and government authorities in various countries considering significantly differing areas for economic and social policy reasons. These zones are important because a majority of the world’s population inhabit such zones.

by the effects of climate change with a possible increased number of storms and increased flooding events expected.

In this context, the ANCORIM project intends to strengthen the operational capacities of coastal decision-makers and managers in the Atlantic regions, with the aim of informing and supporting the consideration of coastal risks. To do this, it intends to create a network of the scientific and technical resources existing in the European

outlines the key coastal risks identified in the western coastal regions of Europe. It outlines the existing governance at international and national level and identifies regional models and best practice within and adjacent to the ANCORIM project members.

The handbook also identifies where coastal risk can be included within decision making, the obligations of coastal decision makers and the applicability of the handbook’s information to the day-to-day practices and requirements of coastal decision makers and planners.

Atlantic area, as well as to provide tools to aid decision-making, and to promote examples of good practices in the various areas concerned. The project does not involve developing scientific research work but rather intensifies operational exchanges between the scientific community and decision-makers, with a view to improving the prevention and management of coastal risks.



Coastal risks (Erosion and Flooding) in Europe

mud) and deposit sediment on a continuous basis, and rates of erosion and deposition vary considerably from day to day along such zones. The energy reaching the coast can become high during storms, and such high energies make coastal zones areas of high vulnerability to natural hazards. Thus, an understanding of the interactions of the oceans and the land is essential in understanding the hazards associated with coastal zones. The interaction is governed by coastal processes which are ‘powered’ by the tides, wind, currents and waves. Interruption or changing these processes can alter the nature of the coast locally or at some distance from the source. This is accessible via <http://ancorim.aquitaine.fr>



1 INTRODUCTION TO COASTAL RISKS

On a global level, coasts comprise 20 percent of the Earth's surface, yet they host a significant portion of the entire human population (approximately 50 percent of human population live within 200km of the coast (UN, 2002). Coastal ecosystems are highly productive containing high biological diversity, rich fishery resources and significant seabed minerals. Coasts also support a diverse array of related industries (e.g. fisheries and aquaculture, tourism, shipping, oil and gas industries), which provide enormous economic productivity. However, the shared demands placed by densely populated coastal regions impose stresses on finite coastal systems and resources. Economic activities, human settlement and natural environment are stakes which potentially may be threatened by coastal risks.

The risks are defined as the expected losses (of lives, persons injured, property damaged, economic activity disrupted and environmental degradation) due to a particular natural (e.g.,

a storm) or human-induced (e.g. an oil spill) hazard for a given area and reference period. The degree of vulnerability and exposure of socio-economic or environmental systems to the hazard are key elements when considering the severity of potential risks (Thierney et al, 2001).

Coastal systems are vulnerable to changes to coastal processes, causing alteration of coastal morphology, erosion, sedimentation and changes to water quality. Ecology and human infrastructure are at risk from erosion, flooding and storm events. The vulnerability of a given population, system, or place to harm from exposure to a hazard or a threatening event (e.g., a coastal flood; a pollution event from shipping of hazardous materials) or an ongoing process (e.g., wave action moving sand along a coast; excess fertiliser runoff from agricultural lands), directly affects the ability to prepare for, respond to, and recover from hazards and disasters. Social vulnerability focuses on those coastal com-

munities or demographics and socioeconomic factors that increase or attenuate the impacts of hazard events on local populations. (Thierney et al, 2001).

The ANCORIM partners reviewed the coastal risks or hazards that were considered most relevant within each of their regions. From this review, the following key coastal risk areas were identified and are detailed in this handbook:

- Coastal erosion,
- Wind damage,
- Coastal flooding,
- Water quality,
- Climate change,
- Sea level rise, and
- Natural disasters, including tsunami.

There are additional coastal risks that may be of importance at a local level that also need to be considered in decision making, for example, salinization of coastal aquifers or subsidence.



Coastal Risks and the Coastal Decision maker

Coastal planners and decision makers have an obligation to consider coastal risks in decision making. The drivers for these obligations are threefold:

- **Regulatory** – EU legislative requirements, include elements of coastal risks that must be integrated into legislation and decision making. Coastal risks such as water quality, flooding, climate change and changes to coastal morphology and hydrology are already identified under EU legislation.
- **Liability** – Under the Environmental Liability Directive, decision making that causes degradation to the environment without

proper mitigation can result in environmental liability. In addition, most coastal habitats are listed under the Habitats Directive and responsibilities for protection of these areas, especially when designated as being environmentally important, is required. Note that legislation expands beyond the immediate area and provable effects, even at significant distances, can be held accountable.

- **Responsibility** – Coastal decision makers are responsible for the consideration of coastal risks in coastal planning and decision making. This is a professional consideration, with a moral and ethical responsibility to ensure decisions are made correctly. In addition, should decisions be made that are determined not to be equitable or have health considerations, then the coastal decision maker can be held responsible.

Coastal erosion



Coastal erosion is the natural process of wearing away rocks and beaches from the shoreline, and shaping the coasts by wave action, tidal currents, wave currents, or drainage.. It takes place in the form of scouring in the foot of cliffs or dunes or on beaches and sediment shore where less material being brought onshore for other sources (sandbanks, other beaches etc) than is being removed. Coastal erosion takes place mainly during strong winds, high waves and high tides and especially where storm drive these energies at the coast in the form of storm surge (acute erosion). This may result in net coastline retreat over time (structural erosion). The rate of erosion is correctly expressed in volume/length/time, e.g. in m³/m/year, but erosion rate is often used synonymously with coastline retreat, and therefore expressed in m/year.

Human influence, particularly urbanisation and

economic activities, in the coastal zone has turned coastal erosion from a natural phenomenon into a problem of growing intensity. Coastal erosion is usually the result of a combination of factors - both natural and human induced - that operate on different scales. The most important natural factors are winds and storms, near shore currents, relative sea level rise (a combination of vertical land movement and sea level rise) and slope (weathering) processes. Human induced factors of coastal erosion include coastal engineering, land claim, river basin regulation works (especially construction of dams), dredging, vegetation clearing, gas mining and water extraction (EuroSION, 2004).

Coastal erosion is widespread in Europe. Erosion occurs when more sediment is removed than is replaced from inshore and offshore banks. These offshore banks were created by geological pro-

cesses and as such are not renewed. Activities such as extraction (from marine aggregates and shorelines) can put further pressure on these systems.

Directly after a storm surge, erosion is easily spotted, especially on coasts defended by dunes or where sea cliffs have collapsed. Over time, and without counter measures, gradual coastline retreat occurs. The rate of this retreat depends on factors like the type of coast and energy of waves and tides but may occur at a rate of centimetres to tens of metres per year, locally. It is important to remember that beaches and coastal dunes rely on coastal erosion to supply sand for their maintenance. Without this supply these landforms would themselves be prone to erosion. Beaches and dune systems provide a valuable natural defence against flooding from the sea. Additional information via <http://ancorim.aquitaine.fr>



The Holderness coast in England is one of the fastest eroding coasts in Europe retreating by around 2 km over the last 1000 years; at least 26 coastal villages were abandoned.

Case Study

Presqu'île de Gâvres Cap l'Orient agglomération (France)

Cap l'Orient agglomération committed since 1999 in the implementation of a monitoring programme of coastal erosion on its entire shoreline. This is part of the development of a coastal observatory, one of the actions validated by its Charter for the Environment and Sustainable Development. These programmes have identified major issues and identify areas of priority interventions, which are set specific tasks for the development and or management.



The peninsula of Gâvres has been identified as very sensitive area. Weakened by a gradual lowering of the level of its beaches and the power of waves, coastal defenses of the area suffer greatly. The storm of 10th



March, 2008 caused a lot of damage (tidal coefficient of 106) and caused the marine flooding of the urbanized area of the Great Beach Gâvres.

Following this storm, a scoping study of development mitigation against marine flooding was performed on the entire coastal area of the town.

The study has researched the sedimentary and hydrodynamic systems and identifies practical solutions to management aimed at limiting the effects of natural erosion and maintains protection against the sea areas of the beach and Great Beach Goërem. These studies were conducted with the cooperation of all actors Coastal Gâvres (state, local inhabitants etc) in the interests of consultation.

Case Study

Case study in Esmoriz-Cortegaça (Portugal)

Esmoriz and Cortegaça are two urban seafronts highly coastal protected with four groins and three seawalls (total length ca. 2km). In some areas of this coastal stretch erosion has reached as far as it can and is only separated from the first line of houses by the coastal structures. There are



even a few houses advanced seaward, as a cape, when compared to the actual shoreline alignment which is basically the alignment of the existent seawalls. It is an edge situation of coastal protection, highly vulnerable and with some areas at high risk. There is, outside the urban area, a Pine forest subject to ongoing erosion that is resulting in the drop of several hundreds of trees.

The case study aims at defining prospective scenario concerning the shoreline mobility, as well as coastal protection strategies.



Coastal planners and decision makers have an obligation to consider erosion when evaluating the siting of housing, industry or licensing coastal activities, particularly where these may affect erosion such as aggregate extraction or developments such as coastal defence or beach nourishment.

Wind Damage



Wind damages properties and infrastructure in the coastal zone. Due to the location of coastal infrastructure, it is more exposed to winds and the elements than inshore locations. As well as driving waves and storms, wind can be a coastal risk in its own right. Coastal environments are less suited to the woodland, bordering trees etc. Therefore properties and infrastructure can be in the direct path of high winds and gales and susceptible to damage.

The prevalence of strong winds may be linked to climate change, where factors such as changes

to weather systems and ocean currents increase the likelihood for storms. Warming of seas also increases not only the likelihood of storms, but also the possibility of tropical storm events and hurricanes crossing the Atlantic to the Irish, UK and French coasts.

Coastal planners and decision makers have an obligation to consider the exposure of areas to wind damage when evaluating the siting of housing or infrastructure, the location and nature of landscaping and trees planting and be aware of potential amplification of coastal wind effects.

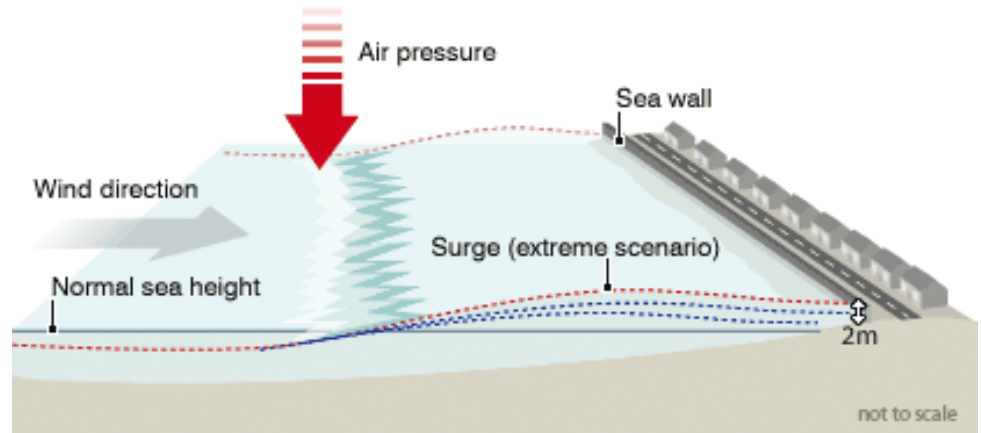
The remnants of Hurricane Katrina (2005) and Hurricane Gordon (2006) caused significant wind damage. A tropical cyclone that hit Europe in 1987 caused the deaths of over 30 people and millions of euros of damage from wind damage alone.



Coastal Flooding



Flooding from the sea can be caused by overflow, overtopping and breaching of flood defences like dykes and breaching of natural barriers, like coastal dunes. Land behind the coastal defences may be flooded and experience damage. A flood from sea may be caused by a heavy storm (storm surge or tidal flood), a spring tide, or a combination of both. In addition, flooding from the sea may be exacerbated if it coincides with high river discharges. This is especially evident during the winter storm seas when low pressure weather systems are the norm. The reduced air pressure during these storms allows higher water levels – there is less pressure pushing the water down. Where flood waters from inland sources meet elevated water levels at the sea, the water cannot drain from land leading to extensive flooding in coastal locations.



A timely reminder of this ever present risk was the storm surge on 9th November 2007 which resulted in the highest water levels for 50 years along parts European coastlines especially in areas such as the North and Irish Seas. In the Netherlands this event led to the operation of a full scale dyke watch for the first time in 30 years. The surge also caused considerable erosion at some Wadden Islands and minor flooding in certain harbour areas. Storm surge barriers like the Thames barrier and Maeslant barrier were closed and hundreds of people were evacuated. The Xynthia storm in February 2010 caused large scale flooding damage due to storm surge in France and Portugal resulting in millions of euros of damage and a number of deaths.

Under European Legislation (see Section 2) and responsible planning practices coastal planners and decision makers are obligated to consider coastal flooding when considering applications for coastal development and activities.



Images from France, and Spain of the Xynthia Storm flooding



OSPAR assessment of European coastal eutrophication problem areas (2001 – 2005)



An estuary in Northern Spain with evidence of eutrophication

Direct discharges into coastal waters include urban wastewater, domestic sewage and industrial effluent - inputs can affect water quality. Discharges such as agricultural run-off discharges or changes to riverine inputs are also known to have a detrimental effect on water quality.

Good water quality is essential for the aquacul-

ture industry and fisheries. It is also important for amenity use - beaches, swimming, surfing etc. and is critical for many coastal habitats.

Poor water quality is considered a coastal risk as place these socio-economic and environmental elements at risk. Coastal planners and decision

Case Study

Adaptability of the shellfish activities to the modifications of their environment : scenarios and solutions – The case of Marennes-Oleron bay (France)



Within the framework of a partnership between the CREEA and IFREMER, this case study relates to the adaptability of the shellfish activities to the variations of the environment which are the climate change and the risks of deterioration of the water quality. The case study presents a method of identification of these risks and proposes the installation of solutions in the development of the activities, which minimize the socio-economic impacts of the degradation of the water conditions and protects the aquaculture operations.

Marennes-Oleron Bay and the shores of Poitou-Charentes, is one of the most important oysters production areas in Europe. Although historically profiting from natural conditions preferential for the breeding of molluscs, the large scale shellfish activity today is threatened by risks from deterioration of the water quality, rarefaction of fresh water from rivers and the increase in the frequency of the violent climatic phenomena.

In order to safeguard the shellfish activities and their sustainable development, the partners have proposed:

- A method of identification of the risks, based on the use of a _ model of dispersion (Mars 2D) developed by IFREMER: The effects of the risks which threaten the shellfish farming are simulated. The risks sensitivity of the shellfish zones of Marennes-Oleron bay is analyzed.
- The study of a solution for the adaptation of the shellfish farming to the modifications of its environment. Applied initially to the case of Marennes-Oleron bay, the study may be applicable to other European bays. That consists in using the space-time model of integration of environmental variables to the establishment of zones of vulnerability and to the testing of a model for off-shore production as an instrument for better spatial assessment and planning of breeding areas and the risks dispersion.

makers must protect coastal water quality, and have obligations under a number of European instruments to prevent deterioration.

The flow of nutrients into coastal waters from land-based sources has seen a European and worldwide increase over the last decades. The resulting change in water quality has many po-

tential impacts on coastal and marine ecosystems. Phosphorus and nitrogen contribute to enhanced algae growth, and subsequent decomposition reduces oxygen availability to sea creatures like fish, shellfish and crustaceans. Changes to nutrient loadings can also change the phytoplankton species composition and di-

versity. In extreme cases, this algal growth bloom or eutrophication can lead to oxygen-depleted “dead zones” once the algae clogs an area and then dies. It can also cause harmful algal blooms. Other more direct water quality issues may include direct contamination of recreational waters by raw sewage or spills of chemicals or oil.

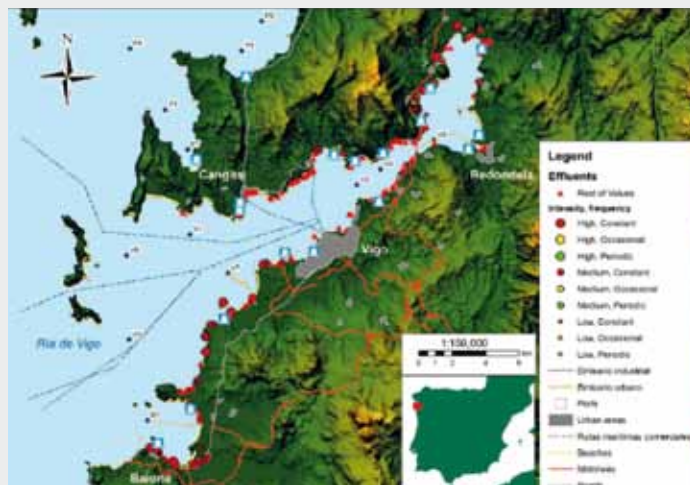
Case Study

Management and prevention of risks affecting the quality of coastal waters in relation to aquaculture – The Rías Baixas Case Study: GIS analysis (Spain)



The Ría de Vigo is located in the southernmost part of Rías Baixas, in Galicia, in the northwest coast of the Iberian Peninsula. The coastal area of the Ría de Vigo concentrates a high number of social and economic activities: port activities, aquaculture (inland and floating structures), shellfisheries (in intertidal and subtidal areas), fishing, fish and shellfish processing industry, maritime transport, tourism, recreational sports, location of urban areas, sewage plants and waste collectors (urban and industrial), etc.

As a result of this intense overlapping of coastal activities, the management of the coastal zone is highly complex. The objective of this case study is to identify potential sources of risks that may affect aquaculture floating facilities in the Ría de Vigo and calculate suitability indexes for their current location. A hierarchical weighted model for suitability analysis is applied in order to analyze the compatibility of the different activities. The tool is based on GIS analysis and considers the distance from the aquaculture sites to potential sources of risk - maritime transport routes, urban areas, port activities, waste collectors, etc - and shows the most suitable areas for the predefined cultivation sites in the Ría.



Climate Change



Whether naturally occurring or human-induced, climate change is a global issue and is the primary environmental challenge of this century. Increased levels of greenhouse gases, such as carbon dioxide and methane, act to enhance the natural greenhouse effect and accelerate irreversible changes in the climate.

The changing climate of Europe's Atlantic regions is not expected to be uniform, with some regions expected to experience longer drier periods, strong rainfall concentrated on short periods leading to flooding in some coastal areas while others experience increased numbers of storm events. The significance of climate change for coastal risks and planning is great. If the effects of climate change are to be reduced proper planning now is essential.

The implications of climate change for coastal erosion and flooding are quite obvious, with any increases in storm activity (frequency, duration or intensity) leading directly to increases in shoreline mobility and flooding events. The implications for water quality are less obvious, for example predicted increases in water temperature will result in lower oxygen levels in the water and a lowered capacity to absorb carbon dioxide, or increased storm activity would lead to more fine sediments running off the land, decreasing the clarity of the near shore coastal waters – both of these factors are critical to the ability of shellfish to survive and have clear socio-economic consequences.



Sea level rise



The map of Europe at 60m sea level rise (inundate areas depicted in light blue)

Coupled with climate change, global sea levels are rising; a 2.5 cm of sea level rise occurred during the second half of the 20th century (IPCC, 2007). Sea levels will not rise uniformly on the Atlantic coast, as regional effects are important in relative sea level rise.

For example, areas covered by ice during the last glaciation may still be experiencing a rebound of the land surface – with no ice mass pressing down on the land, it rises over time. If the rebound is greater than global sea level rise the relative sea level falls. This is the case in the northern half of Ireland. On the contrary if, regionally or locally, the land was subsiding relative sea level rise might be greater than the global rate. It is important for planning reasons to be aware of regional rates of sea level rise or fall.

The implications of sea level rise for coastal risks are mostly concerned with shoreline mobility and flooding. If decisions are to be genuinely sustainable they need to consider future scena-

rios of sea-level. If, for example, a flood study is carried out for a coastal development and considers only contemporary coastal processes it may be at considerable risk when these contemporary process are operating closer to the development as sea levels rise in the future.

In Europe it is estimated that up to 26,000 km² of land would be lost should sea level rise by 0.66 m, while the IPCC notes that as much as 33 percent of coastal land and wetland habitats are likely to be lost in the next hundred years, if the level of the ocean continues to rise at its present rate. Even more land would be lost if the increase is significantly greater, and this is quite possible (IPCC, 2007).

Sea level rise increases the risk of coastal inundation, flooding and erosion. Coastal planners and decision makers should be aware of, and have an obligation to, take account of climate change and sea level rise when making decision sin the coastal zone.

Natural Disaster



In addition to storm and other events, ANCO-RIM project partners identified major natural disaster as a significant coastal risk, and specifically tsunamis.

A tsunami is a giant sea wave generated by earthquakes, volcanic eruptions, or landslides. Such waves can have wave heights up to 30 m, and have great potential for coastal property and infrastructure damage, as well as the risk of loss of life. The tsunami in Japan in 2011 and the 2004 tsunami in the Indian Ocean are stark reminders of how deadly these occurrences are. In Europe, such events are less frequent, however, there have been a number of tsunamis within the last 50 years causing damage to coastal settlements:

- 28th February 1969 - A submarine earthquake measuring 7.3 on the Richter Scale, with its epicentre of the coast of Portugal, caused a tsunami that hit Northern Portugal, parts of Spain, and Morocco. No lives were lost but there was extensive damage caused to property and infrastructure.
- 16th October 1979 - 23 people died when the coast of Nice, France, was hit by a tsunami, caused by an undersea landslide. The sea suddenly receded from the shore and returned in two huge waves, hitting a 58

km long coastal stretch. Hundreds of boats were overturned, and 11 people working in a shipyard were drowned.

- 13th December 1990 - 6 people died when an undersea earthquake in Italy caused a tsunami.
- 17th August 1999 - The 1999 Izmit earthquake in NW Turkey triggered a 2 m high tsunami in the Sea of Marmara which contributed to the damage to the metropolitan area of Izmit

Tsunamis can also be caused by large landslides, and scientists have theorised that if an eruption occurred in the Cumbre Vieja volcano in the Canary Islands the volcano could collapse causing up to 20 cubic kilometres of rock, weighing 500 billion tonnes to fall into water almost 6.5 km deep and could create an undersea wave up to 600 m tall. This so-called mega-tsunami could cause a wave of up to 100m high, travelling up to 800 kph and could strike the western Sahara in less than an hour and could travel across the Atlantic to the US. Europe would be protected from the fiercest force by the position of the other Canary Islands, but the tsunami could still bring up to 10 m high waves to Lisbon and La Coruña within three hours.



In 1755 a Tsunami engulfed the city of Lisbon following a severe offshore earthquake. The earthquake itself caused extensive damage, however the Tsunami and fires destroyed much of the city and also destroyed most of the Portuguese fleet impacting Portuguese power in Europe and the colonial aspirations.

Coastal Activities and Pressures

There are a number of reviews of coastal activities, from a legislative, management, socio-economic or environmental perspective within each of the regional and local areas of the European west coast. Coastal decision makers must consider and balance these demands with maintaining coastal zone integrity. A summary of the main pressures that are both potential contributors to coastal risk and at risk from coastal processes are as follows:

Coastal Development

Development pressure in coastal area is particularly driven by urban expansion, retirement, second homes and the tourism industry e.g. the development of marinas, golf courses and residential buildings in coastal regions. Coastal development may be a risk to coastal processes and can result in increased coastal erosion and flooding by the removal of 'natural defences' such as wetlands. If poorly sited, coastal developments are at risk from coastal erosion, coastal flooding, wind damage and sea level rise. Poorly designed

coastal development can also contribute to poor water quality and may require coastal defences.

Coastal Industry, Ports and Harbours

Many industries and especially chemical and pharmaceutical are based on the coast, particularly along this west coast of Europe which provides interconnectivity with major shipping routes and transatlantic routes. Demand for port expansion has resulted in loss of various habitats in harbours along the western European coast.

There is increased competition between leisure activities and commercial shipping in ports. Maintenance dredging in ports can also lead to disturbance and dispersal of contaminated sediments. Coastal industry is at risk from, and a risk to, the same processes and receptors as coastal development. In addition, coastal industry can impact water quality either through discharges (regulated and accidental), or water abstraction or thermal discharges in the case of cooling waters. In addition, port and harbours must maintain access via dredging which changes the channels and depth of the seabed. This material is also disposed at sea.



Carnota, Galice (Spain)

Coastal Agriculture

Agriculture has been identified as the biggest source of pollution in rivers and lakes, which has implications for coastal water quality (McGarrigle, 1999). Intensive agriculture in some areas has also led to a reduction in semi-natural habitats and to a decrease in biological diversity (Lee, 1999). Coastal agriculture is also at risk from coastal erosion and flooding.

Tourism and Recreational Use

Coastal tourism depends on the quality and diversity of the coastal environment; Increases in tourist numbers have been shown to threaten areas of high ecological and resource value in our coastal marine environment. Furthermore, promotion of tourist developments by a number of European governments with measures such as tax relief on property investment schemes aimed at generating economic activity in seaside resorts has resulted in increased ad hoc development without significantly boosting tourism revenues in coastal locations. Tourism development pressure is often focused in the coastal zone. Coastal development pressures and risks are particularly key in tourism development. In addition, tourism and recreation are dependant of good water quality, and often impact upon it. Tourism and recreation are also dependant on coastal beaches which can be at risk from erosion and coastal processes.

Fishing and Aquaculture Industry

Serious concerns exist regarding the sustainability of our fisheries. Some fish stocks have been seriously over-fished, such as cod and whiting. Some coastal communities have diversified by developing aquaculture industries. Aquaculture activities are set to increase by 300 percent from 2000 to 2015 (EU, 2000). Developments in aquaculture need to be balanced with the requi-



rements for protecting coastal habitats. Loss of seascape due to the siting of aquaculture installations can cause potential conflict with the tourism industry. Fishing and aquaculture are dependant on good water quality and at risk from deterioration of water quality. In addition to pollution, aquaculture and fishing are also at risk from other changes to water quality such as changes in temperature, salinity, turbidity etc, that can all effect these industries, the siting of aquaculture, and the distribution of fish and their prey.

Offshore Resources

If not carefully managed, exploitation of our offshore oil and gas reserves can have negative impacts on the coastal regions where the reserves are brought ashore, through loss of landscape and seascape because of terminal developments

and the potential for pollution as a result of accidental spills. In addition, exploitation of marine renewable energies can put pressure on the coastal zone. Demands for sand and gravel for the construction industry have extended to offshore resources. The potential impacts of such offshore developments may include impacts on coastal sediment processes, herring spawning grounds, fish migratory routes, migratory birds and cetaceans. Offshore facilities are at risk from changes in coastal processes, flooding and sea level rise and storm events.



Galice (Spain)

2 GOVERNANCE OF COASTAL RISKS

Decisions affecting and influenced by coastal risks and the coastal zone are made at International, European, National, Regional and Local levels. Predominantly most decision making is relating to the evaluation of development (either existing or proposed).

In general, the principles and regulations are interpreted and enacted from international to local level. Assessment of governance is increasingly applied to the development sector. Good governance has eight major characteristics; it should be participatory, consensus oriented, accountable, transparent, responsive,

effective and efficient, equitable and inclusive and follows the rule of law. In the case of coastal risks, governance should be advised and include consideration of the risks identified. Where the legislation is relevant to the consideration of coastal risk, the icon indicates the relevant risk that legislations implementation should consider or can provide information to the coastal decision maker with regard to that risk.

International and EU Directives are implemented by the transposition into national legislation and govern much of the activities

and planning in the coastal zone. The Water Framework Directive and Marine Spatial Planning Directives both refer to a review of coastal legislation and a streamlining of the process for effective management. These processes are still ongoing, and as a result in most European countries the coastal governance is in a period of change. The following section reviews the current situation of governance of coastal risk and where, and to what extent, coastal risk is considered in planning and decision making.



International Governance

The oceans had long been subject to the freedom-of-the-seas doctrine - a principle put forth in the seventeenth century essentially limiting national rights and jurisdiction over the oceans to a narrow belt of sea surrounding a nation's coastline. The remainder of the seas was proclaimed to be free to all and belonging to none.

> UNCLOS – Law of the Sea

Following the extension of a number of countries from the 3 mile limit to the 12 mile limit, in 1945 the US, under intense internal pressure following the discovery of oil and gas resources offshore, extended their sovereign limit to the continental shelf. As a result in 1956, the UN called the first Conference on the Law of the Sea, passing a

number of treaties on the rights in international waters but failing to agree on territorial limits. While this situation prevailed into the twentieth century, by mid-century there was increasing pressure to extend national claims over newly discovered offshore resources. The traditional 3 nautical mile (“cannon-shot” established in the 18th century) and 12 nautical mile were seen as insufficient. As pressure from the identification

of cross boundary pollution (oil spill) and fishing right conflict increased, this led to the recognition that international laws of the sea needed to be implemented through international conventions on aspects of marine industries and standards.

In 1970, the UN adopted a resolution of the principles of governing the seabed and ocean floor, and in 1973, a conference was initiated to determine the equitable implementation of marine regimes – the (third) UN Convention of the

Law of the Sea (UNCLOS) defined the territorial (12 n mile) limits and the Exclusive Economic Zones on which marine governance is determined. Since that date there have been 12 sessions to refine this governance. UNCLOS protects a number of rights including right of access and transit and the right to lay cables for telecoms.

> RAMSAR



The RAMSAR Convention on Wetlands of International Importance helps promote the wise and sustainable use of wetland resources. This Convention came into force in March 1985 and lists wetlands of good quality which are characteristic of their region. Most RAMSAR

sites are legally protected as Special Areas of Conservation (SACs) and / or Special Protection Areas (SPAs) or local designations.

This EU and national protection of RAMSAR sites provides appropriate tools for the assessment and management of

these sites. In relation to coastal risks, this convention and designation includes the protection of ecology supported by coastal processes, and enforces the maintenance of important wetlands for ecology purposes, and therefore protects areas of natural coastal protection.

> OSPAR



The Convention for the Protection of the Marine Environment of the North-East Atlantic or OSPAR Convention is the current legislative instrument regulating international cooperation on environmental protection in the North-East Atlantic. It combines and up-dates the 1972 Oslo Convention on dumping waste at sea and the

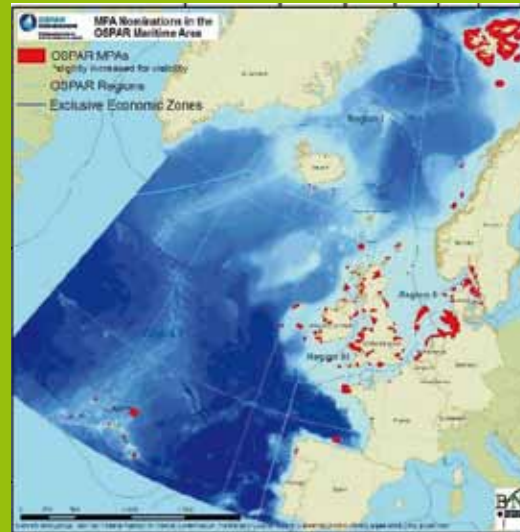
1974 Paris Convention on land-based sources of marine pollution. Work carried out under the convention is managed by the OSPAR Commission, which is made up of representatives of the Governments of the fifteen signatory nations and representatives of the European Commission, representing the European Community.



The OSPAR convention has been updated a number of times with amendments and limit changes, however, **it primarily covers the pollution into the marine envi-**

ronment from land based sources, dumping at sea or incineration and from offshore sources and activities.

Via the OSPAR Commission, it has allowed the combined and standardise assessment of European seas, as well as promoting collaborative research and assessment. Most notably, water quality and sediment quality limits as well as dumping at sea material assessment guidance have been implemented across Europe, and formed the basis of the national reporting of the State of the Sea and national monitoring programmes.



As well as the OSPAR Working Groups and Committees, the standardized approach to reporting means that the OSPAR commission issues Quality of the Seas reports, contributed to by each signatory country. In addition, there are a series of OSPAR Marine Protected Areas (MPAs) which whilst not statutory in many administrative regions are reported on in terms of status.



> UNECE Convention on Environmental Impact Assessment



The Protocol on Strategic Environmental Assessment (SEA) supplements the United Nations Economic Commission for Europe (UNECE) Convention on Environmental Impact Assessment (EIA) in a Trans-boundary Context. It was adopted and signed in Kiev in 2003 and entered into force on 11th July 2010. **It requires its parties to evaluate the environmental consequences of their official draft plans and programmes.** The Protocol also addresses policies and legislation,

although the application of SEA to these is not mandatory and applies the principles beyond those that transposed the EU Directive. Although negotiated under UNECE, the Protocol is open to all UN Member States. Application of the Protocol is being supported by a number of measures including a Resource Manual and the Belgrade Initiative on SEA (started under the UNECE «Environment for Europe» process).

The Protocol provides for extensive pu-

blic participation in government decision-making in numerous development sectors. The public not only has the right to know about plans and programmes, but also the right to comment, to have their comments taken into account, and to be told of the final decision and why it was taken. Besides considering the typical environmental effects of plans and programmes, the Protocol places a special emphasis on the consideration of human health.

> UNESCO designations



The United Nations Educational, Scientific and Cultural Organisation (UNESCO) is a specialized agency of the United Nations. Amongst the organisations remit is the **designating of projects and places of cultural and scientific significance**, which include a International Network of Geoparks or sites of geological interest, 'Biosphere Reserves', which are sites of sustainable development and biodiversity, especially promoting innovative ap-

proaches, water resources management sites which are International Hydrological Programme recognised sites of sustainable water use and management and World Heritage Sites of special cultural or physical significance.

A large number of these sites are coastal and are internationally recognised for protection. The sites remain part of the legal territory of the state wherein the site

is located and subject to local governance and often protection, UNESCO considers it in the interest of the international community to preserve each site.



European Governance

The main legal acts of the European Union come in three forms: regulations, directives, and decisions. Regulations become law in all member states the moment they come into force, without the requirement for any implementing measures, and automatically override conflicting

domestic provisions. Directives require member states to achieve a certain result while leaving them discretion as to how to achieve the result. The details of how they are to be implemented are left to member states. When the time limit for implementing directives passes, they may,

under certain conditions, have direct effect in national law against member states. Directives are the most common form of implementation of governance relevant to the coastal zone and decision making.

> The Floods Directive (2007/60/EC)



The Directive on the assessment and management of flood risks entered into force on 26th November 2007. This Directive now requires Member States to assess

if all watercourses and coastlines are at risk from flooding, to map the flood extent and assets and humans at risk in these areas and to take adequate and coordinated measures to reduce this flood risk. This Directive also reinforces the rights of the public to access this information and to have a say in the planning process.



The Floods Directive aims to reduce and manage the risks that floods pose to human health, the environment, cultural heritage and economic activity.

The Directive requires Member States to first carry out a Preliminary Flood Risk Assessment by 2011 and to identify the river basins and associated coastal areas at risk of flooding. For such zones Member States are required to draw up Flood Risk Maps by 2013 and establish Flood Risk Management Plans to focus on prevention, protection and preparedness by 2015. This is

designed to be integrated with the second RBMP in 2015. The Directive applies to inland waters as well as all coastal waters across the whole territory of the EU and to all forms of flooding.

The Floods Directive introduces three categories in Article 6.3 for the purposes of mapping floods:

- floods with a low probability, or extreme events scenarios;
- floods with a medium probability (likely return period > 100 years); and
- floods with a high probability, where appropriate.

THE FLOODS DIRECTIVE AND COASTAL RISKS

Measures designed to alleviate flooding or provide flood protection may have a significant impact on coastal areas. It is considered that any flood risk management plans will be subject to SEA and EIA evaluation of the potential significant environmental and cumulative effects, and therefore adequately consider the potential for ecological deterioration associated with alterations to coastal processes.

The Directive states that Preliminary Flood Risk Assessments (PFRA) should be completed (as of 2011) and these can be used to provide some initial assessment of potential flooding risk, and identify proposals, developments or plans where additional assessment may be required.

Integrated flood planning may be required in the future due to the complexity of the issues involved. In addition the possible cumulative interactions of neighbouring programmes on coastal processes are

also to be considered by the identification of trans-boundary (both local and national) effects.

In addition, the Directive calls for Strategic Flood Risk Assessment (SFRA) to be completed by 2013. These assessments of Development Plans and other Regional or County or Town Plans (which would include development, maintaining or upgrading of any coastal defences, planned managed realignments, changes in designations etc) will assess coastal processes related to flooding.

The requirement for these plans to be accompanied by a Strategic Impact Assessment (SEA) and that any proposed developments are likely to require an Environmental Impact Assessment (EIA), means that coastal processes and therefore risks should be considered as part of this process – however, coastal risks (other than flooding) are not directly identified in any of these legislative articles.



> Water Framework Directive (2000/60/EC)

The fundamental aim of the Water Framework Directive (WFD) is to maintain high ecological status (HES) of waters where it exists, prevent any deterioration in the existing ecological status of waters and achieve at least 'good' ecological status (GES) for all waters by 2015.

Annex V of the Directive describes the quality elements that must be used for the classification of ecological status/potential for all surface water categories, and sub-divides these quality elements into the following three groups:

1. Biological elements.
2. Hydro-morphological elements supporting the biological elements.
3. Chemical and physio-chemical elements supporting the biological elements.



Article 4 (7) of the WFD sets out the conditions under which a Member State will not be in breach of the Directive when, inter alia, failure to achieve GES/GEP or prevent

the deterioration in the status of a water body is the result of “new modifications to the physical characteristics of a water body” or when failure to prevent deterioration between high and good status is the result of “new sustainable human development activities”.

Where waterbodies have extensive existing development (major ports etc) there are some exceptions to the requirements, however, these water bodies known as 'Heavily Modified Water bodies' must still strive to implement the biological and chemical elements of the WFD and obtain GES, where possible.


The Water Framework Directive is implemented by the delineation of waterbodies based on catchments for aquatic systems, and as transitional and coastal waters in the marine. The marine areas are delineated with reference to physical processes but are limited by administrative boundaries.



Water Framework Directive and Coastal Risk

The WFD does consider a ‘source to sea’ management approach for rivers and estuaries, identifying sources and management of water quality, biology, designated areas and the river morphology.

Annex V of the Directive further defines the hydro-morphological quality elements for transitional and coastal waterbodies:

ANNEX V 1.1.3 TRANSITIONAL WATERS	ANNEX V 1.1.4 COASTAL WATERS
<p>Tidal Regime</p> <ul style="list-style-type: none"> • Freshwater flow • Wave exposure 	<p>Tidal Regime</p> <ul style="list-style-type: none"> • Direction of dominate currents • Wave exposure 
<p>Morphological Condition</p> <ul style="list-style-type: none"> • Depth variation • Quantity, structure and substrate of the seabed • Structure of the intertidal zone 	<p>Morphological Condition</p> <ul style="list-style-type: none"> • Depth variation • Structure and substrate of the seabed • Structure of the intertidal zone

The Directive therefore does recognise the preservation of natural coastal systems. The Directive only identifies anthropogenic influence in this area. It does not consider coastal processes or natural processes, but considers the waterbody as a management unit, which is often attributed a maximum capacity for modifications. In many of the tools developed for the WFD, this is mainly assessed by area and impact on the waterbody

as a unit, without localised assessment at the River Basin Management level. Any anthropogenic activity that potentially affects the ecological quality element of coastal habitat such as salt marshes, dune systems etc. is assessed by risk under the WFD assessments of that waterbody, and the Directive specifically highlights water dependant Natura 2000 sites within its measures.

> The Strategic Environmental Assessment (SEA) Directive (2001/42/EC)

The SEA Directive ensures that environmental consequences of certain plans and programmes are identified and assessed during their preparation and before their adoption.

SEA also ensures that the public and other relevant bodies have an opportunity to participate in the planning process (in accordance with the Public Participation Directive (2003/35/EC)). The SEA Directive also includes requirements for environmental reporting, broad-scale assessment of cumulative effects, and requirements of monitoring and appropriate assessment. Plans and programmes are local or government development or management plans or programmes, implementing local or national government policy. The SEA Directive only applies to plans and programmes, not policies, although policies within plans are likely to be assessed and SEA can be applied to policies if needed, and in the UK certainly, this is very much the case.

The structure of SEA (under the Directive) is based on the following phases:

- «Screening», investigation of whether the plan or programme falls under the SEA legislation,
- «Scoping», defining the boundaries of investigation, assessment and assumptions required,
- «Documentation of the state of the environment», effectively a baseline on which to base judgments,
- «Determination of the likely (non-marginal) environmental impacts», usually in terms of Direction of Change rather than firm figures,
- Informing and consulting the public,
- Influencing «Decision taking» based on the assessment, and
- Monitoring of the effects of plans and programmes after their implementation.

The EU Directive also includes other impacts besides the environmental, such as material assets and archaeological sites. In most western European states this has been broadened further to include economic and social aspects of sustainability.

SEA should ensure that plans and programmes take into consideration the environmental effects they cause. If those environmental effects are part of the overall decision taking it is called Strategic Impact Assessment.

SEA and Coastal Risk

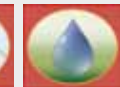
The SEA guidance identifies a number of topics under which strategic assessment should be conducted. These directly include the assessment of baseline environment, including assessment of:



Biodiversity



Fauna and Flora



Population



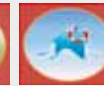
Human health



Soil including Geology



Water including quality



Air including quality



Climatic factors including climate change



Material assets



Cultural heritage and Landscape

The key coastal risks identified in the ANCORIM region; water quality, climate change and sea level rise, should, therefore, be included within SEAs. Of particular importance is the cumulative considerations SEA must take into account of other relevant plans and programmes. SEAs' are required for the Management Plans required under the other relevant Directives as well as national, regional and local development plans.

Coastal processes and therefore erosion may be considered under geology, however these are only likely to be identified where there are existing measures or issues. Natural coastal defence habitats, such as dunes and wetlands should be identified in biodiversity.



> Environmental Impact Assessment Directive (85/337/EEC as amended by 97/11/EC and 2003/35/EC)



The Directive specifies which projects require an Environmental Impact Statement (EIS) or Environmental Impact Assessment Report in Annexes I and II of the Directive. Mandatory thresholds are provided for Annex I projects only. However, in transposing Annex II Ireland specified thresholds for these projects within the regulations. Projects are specific developments, planning or licensing applications. The requirements for the content of an EIS or EIA report are outlined in the national legislation as implemented in each country as well as the requirements for 'sub-threshold' development.



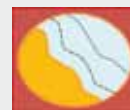
The EIA procedure should ensure that environmental consequences of projects are identified and assessed before authorisation is given.

Many large scale coastal developments require EIA, providing an opportunity for coastal risk and impacts to be considered within this framework. For those developments which fall below the specified thresholds, national planning legislation provides for the consideration of significant environmental effects and potential direction for the preparation of an EIA or impact assessment (triggered by sites of conservation sensitivity and / or planning appeals).

EIA and Coastal Risk

As with the SEA, the EIA is required to consider any significant environmental effects of proposed developments and activities. To ensure compliance with the WFD and Floods Directive, this should now include an assessment of coastal morphology. At present coastal risks are not specifically required to be examined within the EIA framework.

A brief review of publically available EIA reports and EIS's along the western European seaboard has confirmed that coastal risks are considered in many shoreline developments where an impact is expected. However, this assessment can range from desk-based reviews to extensive estuarine or coastal modelling, and is dependent on the issues identified by the scoping stage and / or consultation.



> The Environmental Liability Directive (2004/35/EC)

The Directive is directed at preventing environmental damage to water resources, soil, fauna, flora and natural habitats in accordance with the 'polluter pays' principle. The Directive introduces a liability scheme which aims to:



- hold operators whose activities have caused environmental damage financially liable for remedying this damage; and



- hold those whose activities have caused an imminent threat of environmental damage liable for taking preventive actions.



Under the Environmental Liability Directive (ELD) 'environmental damage' includes damage to protected species and natural habitats, water damage and land damage. Of potential relevance to morphology 'environmental damage' can include damage:

- which has significant adverse effects on reaching or maintaining favourable conservation status of species and natural habitats protected under EU legislation;
- that significantly adversely affects the ecological status and/or ecological potential of waters falling within the scope of the Water Framework Directive.

The ELD also includes an optional provision for the extension of the protection of habitats and species beyond those listed in the Birds and Habitats Directives (Article 2(3)(c)).

The Environmental Liability Directive and Coastal Risk



This Directive will help support the protection and restoration of coastal processes or coastal environments by allowing specific detrimental effects to be appraised. Where remediation is required for 'environmental damage', the developer of a physical modification, and / or the regulator which approved such a development, could be held liable for the costs of rectifying, remediating or mitigating the situation. Unlike impact assessments, any actions (intervention measures) required are determined retrospectively, after the incident or development has occurred, and funded based on the polluter pays principle.

The appraisal of detrimental effects relating to coastal impacts, and allocation of responsibility for this 'environmental damage' will require extensive evidence of the baseline conditions prior to any impacts and a full evaluation of the effects.

Of particular note is the fact that the responsible authority can be challenged and prosecuted under the Directive if damage is caused by permitting operations or developments to occur. In the absence of a polluter, the state can be challenged to rectify the impacts.

> The Birds and Habitats Directives (79/409/EEC and 92/43/EEC)

The Birds and Habitats Directives require Member States to provide for the preservation, protection and improvement of the quality of important, rare, and threatened natural habitats and specific species of plants, birds and animals, as a contribution to the general objective of sustainable development.



Existing measures include consideration of the protected sites in local and regional land use plans (e.g. regional or local development plans), special assessments of the impacts of certain activities on the conservation status of designated habitat types and species within the site (via the EIA process.)



The objective of the Habitats

Directive is to conserve natural habitats and wild fauna and flora in the EU. To attain this, the Directive requires the establishment of a network of Special Areas of Conservation (SACs). The Birds Directive requires the protection of all wild birds and their habitats, and to realise this, the Directive requires Special Protection Areas (SPAs) to be designated for wetlands which attract large numbers of migratory birds as well as the listed bird species. These sites of community importance are known collectively as the Natura 2000 network.

The Directive calls for conservation objectives and management plans to be put in place for the Natura 2000 site network and status monitoring to be carried out.

Habitats and Birds Directives and Coastal Risks



The Directive requires an assessment of any development which may impact on Natura 2000 sites in the vicinity. This should include an assessment of potential impacts to any coastal designated habitats (wetlands, dunes etc) that fall within Natura 2000 sites. Most critically for coastal risk assessment, assessments must specifically refer to other plans and programmes that may cumulatively contribute to effects on these areas. Some jurisdictions

require that this assessment be carried out for Annex 1 habitats occurring outside designated areas as well. The Directive also calls for assessment of Annex IV species (European Protected Species) wherever they occur. Both of these assessments include cumulative impact analysis and should identify any potential coastal process effects from proposed plans or developments, although only in relation to Natura 2000 sites.

> The Marine Strategy Framework Directive (2008/56/EC)



The Marine Strategy Framework Directive (MSFD) aims to achieve good environmental status of the EU's marine waters by 2021 and to protect the resource base upon which marine-related economic and social activities depend. It will establish European Marine 'Regions' on the basis of geographical and environmental criteria which will be assessed and managed by Marine Strategies.

The Marine Strategies, similar to the Water Framework Directive's RBMPs, will contain a detailed assessment of the state of the environment, a definition of «good environmental status» at regional level, and the establishment of clear environmental targets and monitoring programmes.



The Marine Strategy Directive Qualitative descriptors for determining Good Ecological Status (GES) (Annex I) of marine waters are:

- Descriptor 1: Biological diversity
- Descriptor 2: Non-indigenous species
- Descriptor 3: Population of commercial fish / shell fish
- Descriptor 4: Elements of marine food webs
- Descriptor 5: Eutrophication
- Descriptor 6: Sea floor integrity
- Descriptor 7: Alteration of hydrographical conditions
- Descriptor 8: Contaminants

- Descriptor 9: Contaminants in fish and seafood for human consumption
- Descriptor 10: Marine litter
- Descriptor 11: Introduction of energy, including underwater noise.

The MSFD also calls for the establishment of Marine Protected Areas or MPAs, most likely to provide regulatory protection for areas already identified by OSPAR criteria but currently not covered under the Habitats Directive.

The Marine Strategy Directive and Coastal Risks



The MSFD clearly identifies water quality and eutrophication, sea floor integrity and hydrodynamic conditions as indicators of Good Ecological Status (GES). It is likely that similar implementation and carrying capacity assessment for marine areas will be undertaken as implemented under the WFD. This means that whilst anthropogenic influence and impact will be assessed and mitigated there will be no consideration of natural process risks. The legislation is aimed at sustainable management of human activities within delineated marine areas.



> Other Relevant Directives



Linked to the WFD and MSFD there are a number of existing and 'daughter' Directives relevant to coastal risk, especially water quality. Each is specific to an area of water management and they are briefly outlined below. All of these Directives and regulations are aimed at improving water quality and controlling the use of substances.

The Shellfish Waters Directive (2006/113/EC)

The Shellfish Waters Directive objective is to protect or improve shellfish waters in order to support shellfish life and growth.

It is designed to protect the aquatic habitat of bivalve and gastropod molluscs, which include oysters, mussels, cockles, scallops and clams. The Directive requires Member States to desi-

gnate waters that need protection in order to support shellfish life and growth.

The Directive sets physical, chemical and microbiological requirements that designated shellfish waters must either comply with or endeavour to improve. The Directive also provides for the establishment of pollution reduction programmes for the designated waters. These pollution reduction plans provide water quality management in areas where there is aquaculture production.

The Bathing Water Directive (76/160/EEC) and (2006/7/EC)

The Bathing Water Directive is to ensure that the quality of bathing water is maintained and, where necessary, improved so that it complies with specified standards designed to protect public health and the environment. A new Bathing Water Directive (2006/7/EC) entered into force in March 2006.

The Blue Flag Scheme is a voluntary scheme to identify high-quality bathing water areas, administered at European level by the Foundation for Environmental Education in Europe (FEEE). To receive a blue flag, a bathing site, in addition to maintaining a high standard of water quality, must meet specified objectives with regard to the provision of safety services and facilities, environmental management of the beach area and environmental education.

The Drinking Water Directive (80/778/EEC)

The Directive is intended to protect human health by laying down healthiness and purity requirements which must be met by drinking water within the EC (microbiological and chemical parameters and those relating to radioactivity). It applies to all water intended for human consumption apart from natural mineral waters and waters which are medicinal products.

The Major Accidents (Seveso) Directive (96/82/EC) as amended (2003/105/EC)

The Seveso (II) Directive in relation to the Dangerous Substances from the WFD is intended to prevent major accidents involving dangerous substances (The Seveso Directive was first rati-





fied in 1982 named after the Italian town which suffered exposure to an accidental release of dioxin in 1976). It sets out the controls and responsibilities for preventing major accidents.

The Sewage Sludge Directive (86/278/EEC)

The Directive seeks to encourage the use of sewage sludge in agriculture. Treated sludge is defined as having undergone «biological, chemical or heat treatment, long-term storage or any other appropriate process so as significantly to reduce its fermentability and the health hazards resulting from its use». The Directive also requires that sludge should be used in such a way that account is taken of the nutrient requirements of plants and that the quality of the soil and of the surface and groundwater is not impaired. The Directive specifies rules for the sampling and analysis of sludges and soils and their uses.

The Urban Waste-Water Treatment Directive (91/271/EEC)

The Directives objective is to protect the environment from the adverse effects of urban waste water discharges and discharges from certain industrial sectors (see Annex III of the Directive) and concerns the collection, treatment and discharge of:

- Domestic waste water,
- Mixture of waste water, and



- Wastewater from certain industrial sectors (see Annex III of the Directive).
- The Urban Waste Water Treatment Directive (91/271/EEC) in all Member States is increasing the quantities of sewage sludge requiring disposal (see Sewage Sludge Directive).

The Nitrates Directive (91/676/EEC)

The Directive (91/676/EEC) objective is the protection of waters against pollution by nitrates from agricultural sources and reducing water pollution caused or induced by nitrates from agricultural sources.

The Integrated Pollution Control Directive (96/61/EC)

The Directive requires industrial and agricultural activities with a high pollution potential to have a permit. This permit can only be issued if certain environmental conditions are met, so that the companies themselves bear responsibility for preventing and reducing any pollution they may cause.

Integrated pollution prevention and control concerns new or existing industrial and agricultural activities with a high pollution potential, as defined in Annex I to the Directive (energy industries, production and processing of metals, mineral industry, chemical industry, waste management, livestock farming, etc.). It is designed to provide integrate emission control (air, water,



waste, etc) for industrial emissions and permitting requirements.

The Plant Protection Directive (91/414/EEC)

Plant protection products on the market lays down rules and procedures for approval of the active substances at EU level and for the authorisation at Member State level of plant protection products (PPPs) containing these substances. Pesticides residues in food are regulated by Regulation (EC) No 396/2005. The legislation covers the setting, monitoring and control of pesticides residues in products of plant and animal origin that may arise from their use in plant protection.

Both Directive 91/414 on the placing on the market of plant protection products and Regulation 396/2005 on pesticide residues in food and feed aim at a high level of protection of human health and the environment.

Other Human Health Regulations and Directives

In addition to Regulation (EC) No 396/2005 there are a number of regulations related to contaminants in food. These are relevant as they are of concern to fisheries and aquaculture industries and often inform the monitoring programmes for water quality. Regulation (EEC) No 315/93 lays down community procedures for contaminants in food, and the maximum levels for certain contaminants in food are set in Commission Regulation (EC) No 1881/2006.

> Other EU Policies and Strategies

Integrated Maritime Strategy

The prime objective of an integrated maritime policy for the EU is to maximise sustainable use of the oceans and seas while enabling growth of the maritime economy and coastal regions. The second key objective is building a knowledge and innovation base for the maritime policy. Marine science, technology and research enable analysis of the effects of human activity on marine systems and put forward solutions to alleviate environmental degradation and the effects of climate change.

Based on the development of an European Integrated Maritime Policy, the EU has delivered the WFD and MSFD, both of which are part of a EU Marine Package that includes Marine Strategy Directive - COM(2005)505, Communication – COM(2005)504 and Impact Assessment - SEC(2005)1290. The EU is implementing this strategy by implementation of Marine Spatial Planning, Integrated Coastal Zone Management and related data sources and information to inform marine management. This is coupled with a European network for maritime surveillance to ensure the safe use of the sea and the security of the EU's maritime borders.

Marine Spatial Planning

The EU Marine Strategies apply an ecosystem-based approach to the management of human activities designed to ensure that the collective pressure of such activities is kept within levels compatible with the achievement of good environmental status and that the capacity of marine ecosystems to respond to human-induced changes is not compromised, while enabling the sustainable use of marine goods and services by present and future generations.

In November 2008, the European Commission adopted a roadmap for maritime spatial planning entitled 'Achieving Common Principles in the EU'. The roadmap identifies 10 key principles for maritime spatial planning, all firmly based on the ecosystem approach. Since then the European Commission has encouraged implementation of maritime spatial planning at national and European level and carried out research for a common approach to MSP in the EU. The adoption of the Marine Strategy Framework Directive is the most significant move to this approach to date.

The Strategy is designed to adopt a marine ecosystem approach to consider European marine waters as a whole regardless of administrative boundaries, but defined by the processes and biological systems within them and manage the

cumulative impacts of human activities accordingly in a sustainable way.

This strategy has influenced recent legislation, and also the supporting tools and research development within Europe, for example:

- EMMA (European Marine Monitoring and Assessment): Objective A.4.1 of roadmap "Convergence of assessment methods and presentation of status of biodiversity".
- EMODNET an end-to-end, integrated and inter-operable EU network, linking Sensors & Platforms, Surveys, Communication Systems, Data Management and Information Tools.
- EUrosion a European assessment of erosion pressures and issues with case studies and best practise assessment.



Carnota, Galice (Spain)

Integrated Coastal Zone Management in Europe (2002/413/EC)

In 2000 the EU announced a European Strategy for Integrated Coastal Zone Management (ICZM), which was announced in September 2000 (EC, 2000) and implemented in 2002'. Following the EU review of Coastal Zone Management in 2004, the EU provided further information on the policy of ICZM. An expert group was established for ICZM implementation and monitoring of ICZM indicators across Europe. As part of the review member states were asked to report on the implementation of ICZM in



2010. In general, whilst stakeholder and actor groups had been established in most regions, implementation was limited to a number of pilot schemes only.



Following the adoption of the Protocol on Integrated Coastal Zone Management in the Mediterranean to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean, which came into force on 24th March 2011, a revised ICZM policy paper



has been issued for consultation (July 2011). The EC has expressed the view of attempting to prepare legislation with regard to ICZM implementation in the future.

This action and the recommendations include the implementation of the recommendations of the EUrosion project (2004).

* European Union (EU), 2002. Recommendation of the European Parliament and of the Council concerning the implementation of Integrated Coastal Zone Management in Europe (2002/413/EC).

National Governance of Coastal Risks

This section briefly reviews and compares the national regional and local governance and practices in coastal risk integration into decision making of each country and their respective jurisdictions.

Coastal management and Integrated Coastal Zone Management (ICZM) are guiding principles initiated at an EU level. Their application varies at country and regional level. Each

country has produced a national policy for ICZM and there are a number of reviews at national and regional level within each jurisdiction. These are referenced below, however, the focus of this handbook is the practices concerning the consideration of coastal risks in planning and decision making.

Throughout history, citizens and their governments have struggled with the challenges pre-

sented by the risk of coastal flooding and coastal erosion. Their methods have varied in time and place from dwelling mounds, land reclamation, hard and soft engineering measures to zoning and planning policy, evacuation planning and combinations thereof. The objectives served by these methods are not static and trade-offs were often made between economy, flood safety and, later, environment.

> Spain

Spain has a coastline of approximately 7883km, which is characterized by highly variable physical, climatic and ecological conditions. Human pressure on the coast has been increasing during the past decades with the intensification of uses such as tourism, agriculture, industry, transportation, fisheries, aquaculture, etc.

The law that governs coastal areas in Spain is the Law of the Coast 22/1988 of 23 July, (BOE 19/07/1988) which includes the European recommendations for the protection of coastal areas. This allocates the responsibilities of coastal management among public administrations, which are mainly shared between the central

and the regional governments of the autonomous regions. This leads to a relatively complex division of the various coastal responsibilities between the national, regional and local administrations and is one of the main difficulties in implementing a coherent coastal management system. Therefore, the development of an effective ICZM Strategy is dependent upon the cooperation and coordination of the different administrations and the collaboration with the private sector.

A Spanish national coastal management strategy has been developed with clear strategic and specific objectives that conform to the principles of

good coastal zone management and identification and mitigation of coastal risk. Convincing initiatives, measures and activities are proposed that take account of the highly decentralized governmental structure of Spain and the need for new multi-level governance instruments concerned with coastal management. There is no uniform structure for different autonomous regions, but coastal zone guidelines for the development of regional coastal management plans have been developed by the Spanish government (General Directorate of Sustainability of the Coast and the Sea, Ministry of Environment, Rural and Marine Affairs, 2009).

> France

The coastal territories of mainland France constitute a prime example of an at-risk territory, with their growing concentrations of people and economic activities located mostly on a coastal fringe that is subject to shoreline retreat and coastal flooding. The prospect of higher sea levels due to climate changes, exacerbates the risk that these territories will be exposed to natural coastal hazards. The littoral zone has been managed mainly by controlling the hazards; this control is coordinated by the national government, which initiated coastal defence practices.

At the beginning of the 1980s, natural risk prevention policies were directed at managing the consequences of natural disasters, with the creation of the CatNat insurance regime to indemnify

natural disaster victims. As part of the emerging philosophy of ICZM, the French government encouraged the development of natural risk prevention policies by establishing Natural Risk Prevention Plans (PPRn) in the late 1990s. These PPRn were a new approach to shoreline management that favoured controlling development in coastal communities. As of 2008, PPRn had been approved in 270 coastal communities and required in 149.

National government, public institutions and the territorial and local authorities together developed risk management policies involving regional or local implementation of the strategic orientations of shoreline management, respecting the general principles defined by the nation-

al government. The development of natural coastal risk prevention policies is reinforced by the Grenelle Bill of the Environment. These policies are mainly financed by the Barnier Fund for major natural risk prevention, which is in turn funded by an obligatory contribution based on the CatNat insurance premiums. This type of financing raises the question of the relationship between risk prevention strategies and natural disaster management (UNEP MAP PAP RAC and Deboudt, P. (2010)').

The 1986 Coastal Law lays down the principles of the development of coastal zones. It highlights the importance of coordination between the state and public bodies. The principles of coastal zone management emerged from this. The law lays down four goals:

- the research and innovation of the resources and characteristics of the coastlines,
- the protection of biological and ecological balances, the fight against erosion, the preservation of heritage sites and landscapes,
- the preservation and development of economic activities linked to water (fishing, marine culture, naval and port activities), and
- the maintenance or the development in the coastal zone of agricultural, forestry, industrial, artisan and tourist activities.

This law therefore applies to all regulations concerning planning and urbanism by putting into place characteristics for the coastlines. At the same time, the state applies Directives for Territorial Development (DTD). These are strategic urban and long term planning documents with which the local planning documents must be compatible. The DTD cover only strategic areas. Among the seven DTD in progress, four are coastal areas (the Loire Estuary, the Seine Estuary, Maritime Alps and Bouches du Rhone).



* Deboudt, P. (2010), "Towards coastal risk management in France", *Ocean & Coastal Management*; 27 April 2010.

The fundamental position of the State concerning planning and the balance between development, protection and enhancement are specified within the DTD. The DTD documents are drawn up in association with public bodies and arbitrate between territorial development, large infrastructure projects and the preservation of coastal areas. This reinforces the management policies of coastal zones even if these documents are mainly land dominated in content. Finally, these documents specify the methods for applying the Coastal Law according to the local geographic characteristics.

Sea Enhancement Schematics (SES) can also be put into place by state services. The SES aims for a better integration and enhancement of coastlines through a sustainable development approach. This planning document determines the general use of different zones. Hence, the SES deals with planning areas that constitute a geographic unity and have complimentary or conflicting interests, regarding the protection, exploitation and development of the coastline. The portion of the coastline can include an estuary, a lagoon, wetland or rear-coastal areas, a port etc., however, these must be considered as forming a geographic entity and marine area or waterbody (a bay, basin or harbours, for example).

The above documents are aimed at coastal conservation and planning of the coastal and maritime areas however, better management of the maritime public domain is required. The general use of different maritime sectors and of different coastal zones, are assessed on a generalised cumulative basis.

City Planning Documents are also applicable to a commune from a simple Communal Map to a planning document such as a Local Urban Plan (LUP), formerly Land Use Plan. The State makes planning decisions for communes not equipped with urban planning documents. The Communal Map contains development zones, natural areas, activity zones and zones where reconstruction is prohibited due to a natural disaster. The LUP document comprises a sustainable development project and sets guidelines for development, making it a genuine tool for urban

planning. The LUP is formulated and approved by the commune or a group of communes.

These planning tools must be compatible with the Coherent Territorial Schematics (CTS). These schematics are developed by several communes or their representative groups, e.g. commune associations. They define a planning and sustainable development project and implementation guidelines. As an urban planning document, the CTS also influence Local Habitat Programs, Urban Travel Plans and Commercial Development Schematics. With this planning tool the issues of an area from the coast to the inland can be addressed. Consequently, travel, habitat and infrastructure needs are anticipated. These Schematics are subject to Environmental Impact Assessment, and the national policies are subject to Regulatory and Strategic Environmental Assessment (SEA). Between national strategy and local level, there is potential for coastal risks to be overlooked in this process, especially where one coastal risk in particular (for example erosion or flooding) is being addressed.

In addition to the aforementioned documents, plans and schematics, the Conservatory of Coastal Space and Lakeside Shores also operates to safeguard the coastal zone. This public body was established in 1975 and was placed under the care of the Minister in charge of sustainable development. The Conservatory acquires fragile or threatened habitats through either a pre-emptive agreement or in certain exceptions, by expropriation. The Conservatory remediates these lands and then it entrusts their management to communes, local authorities or associations, while experts assist in defining management plans for the sites. As of 1st January, 2011, it has 600 sites in its care, covering approximately 138,000 hectares and over 1200 km of shoreline.



> Ireland*

Ireland has a majority coastal population, with most of the largest population aggregations (both in Northern Ireland and the Republic of Ireland) occurring in the coastal zone. Despite this only around 4 percent of the coastline of Ireland is modified.

Ireland has little integrated coastal management practice, and coastal risks are often not adequately identified through the planning process. This is despite the land/sea divide being reflected in planning and legislation. Within this land/sea divide there is the further complication of legislation structured sectorally. There is a need for integration between landward and seaward authorities. There are also problems with defining the extent of the coastal zone, and the responsible agencies (Cummins et al., 2004³).

Coastal industries such as fishing, aquaculture, tourism and shipping, with an embryonic oil and gas industry, play significant roles in the support of the large Irish coastal population. However, the multitude of activities associated with these industries can also have a detrimental effect on coastal habitat and water quality, in addition to creating conflicts of use among stakeholders (Connolly et al., 2002⁴). Development pressures on the coastal area continues as a result of social and economic driving forces such as urban expansion, retirement, second homes and the tourism industry. For example, coastal tourism has led to increases in the numbers of marinas, golf courses and residential buildings near the coast (EPA, 2000) (Cummins et al., 2004)

Agriculture is a significant factor and has been identified as the biggest source of pollution in Irish rivers and lakes, which has implications for coastal water quality (McGarrigle, 1999). Intensive agriculture in Ireland has also led to a reduction in semi-natural habitats and to a decrease in biological diversity (Lee, 1999). As yet the authorities have not fully implemented the Water Framework Directive (WFD) recommendations and to date Ireland has not transposed the Marine Strategy Directive into national legislation. (Cummins et al., 2004)

Following the dissolution of the Department of the Marine in 2007, responsibility for coastal

developments in Ireland has been devolved to a number of government departments and local authorities including the Department of the Environment, Heritage and Local Government (DoEHLG); the Department of Agriculture, Fisheries and Food (DAFF); and the Department of Communications, Energy and Natural Resources (DCENR). Within the DoEHLG the Licensing Unit is currently being redefined, with the Nature Conservation responsibilities being devolved into the Department of Arts, Heritage and the Gaeltacht. During this transition period the Marine Licence Vetting Committee, a multi-departmental steering group responsible for foreshore decision making, has been maintained to allow decision making.

As of 2011, the DoEHLG is undertaking a process of modernization of the foreshore consent process for certain developments in the offshore environment, including offshore renewable energy projects such as wave, wind and tidal technologies. In association with this process and uncertainty of responsibility, Ireland transposed the Marine Strategy Framework Directive (MSFD) in July 2011, appointing the DoEHLG as the regulatory body responsible for its implementation.

Following the devolvement of Department of the Marine powers to the DoEHLG, and in anticipation of the transfer of the foreshore functions, officials from the DoEHLG informally met with



key stakeholders during 2009 to hear first-hand their views. Feedback from this process reinforced the following issues:

- Legacy legislation not suited to the needs of the 21st century,
- The lack of a “plan-led” policy framework for the marine environment,
- A reactive regulatory regime with no statutory objectives/timeframes,
- The absence of mandatory pre-application consultations,
- The lack of openness, transparency and public participation in the consent process, and
- The lack of available on-line baseline data etc. to inform the application process.

The modernization and streamlining of the consent process for certain development in the offshore environment will be introduced on a phased development and is envisaged to include inter alia measures to fully integrate and streamline estate management on the State owned foreshore with the strategic and wider planning consent processes. The following strategic objectives are understood to underpin the modernization and streamlining process:

- To integrate the foreshore consenting process for Strategic Infrastructure Development (SID),
- To provide for a plan led approach to the foreshore through the development of integrated coastal zone management objectives within the existing planning hierarchy to manage the interface between terrestrial

* Situation updated in September 2011

** Cummins, V., O’Mahony, C., and Connolly, N. (2004). Review of Integrated Coastal Zone Management and Principles of Best Practice, The Heritage Council.

*** Connolly N Cummins C Integrated Coastal Zone Management (ICZM) in Ireland, with particular reference to the use of Geographic Information Systems (GIS) . EU ICZM Demonstration Programme, 2002



and coastal and underwater archaeology) have been further devolved into a different government department (Department of Arts, Heritage and the Gaeltacht) from the DoEHLG (renamed as Department of Environment, Community and Local Government).

IRISH PLANNING SYSTEM

The Planning System does not identify coastal risks as part of its process. County Development Plans should be subject to SEA and will be subject to Strategic Flood Risk Assessments (see SEA Directive and Flooding Directive). The DEHLG is primarily responsible for national planning policy and the legislative framework, and also provides an expert advisory service on heritage and conservation issues to planning authorities and to An Bord Pleanála, an independent, third-party planning appeals body. Ireland is one of only a few European countries that have this type of independent planning appeals system in operation (Bannon, 1989). The planning system is operated on the ground by eighty eight local planning authorities (twenty nine County Councils, five County Borough Corporations, five Borough Corporations and forty nine Town Councils).

Both the National Spatial Strategy and the National Development Plan highlight the need for coastal infrastructure. The various programmes include development of coastal tourism, sea transport, security of oil and gas supplies, renewable energy and a range of other objectives that will entail coastal development and therefore morphological pressure. However, the programmes also identify the need for ICZM, cross sectoral management based on the management of areas by catchment (RBMP areas) and physical processes, and outlines needs for research and implementation programmes. ICZM is an important measure highlighted in many European and National strategies and legislation. It provides a significant management measure for coastal risk and cumulative coastal risk assessment integrating the existing mechanisms to provide effective management. However, ICZM in Ireland has not progressed past the pilot project stage and there is no legislative driver or framework for its implementation.

planning and foreshore development, and

- To establish a new statutory marine planning spatial framework (with the OREDP being regarded as a first step in providing a policy context for this framework i.e. providing background information for consenting authorities).

More specifically, it is understood:

- A Planning and Foreshore (Planning) Bill to amend the Planning and Foreshore Acts has been drafted and will be introduced before the end of 2011. The key provisions of this Bill include:

> The Department will be introducing a priority scheme for foreshore applications. This would include:

- *Priority 1 Applications* – to include all energy related projects; those time critical, or those applications for site investigations relating to either of these kinds of projects,

- *Priority 2 Applications* – to include marinas etc, and

- *Priority 3 Applications* – to include outfall pipes etc (not comprising SID applications).

> Pre-application consultation will become mandatory for all foreshore consent applications (similar to the SID application for approval process). Indeed, it is understood that this requirement has already come into force as a matter of good practice, and

> Regulations will set the time-limits for consultation with Prescribed Bodies. In due course there will also be a move to set time-limits for the foreshore decision making process.

The new architecture for consent is to be managed within an overall spatial plan for Ireland's marine environment and while it is acknowledged that this will take time as an interim measure the OREDP (to be adopted before the end of 2011) will provide an initial policy framework and background information for consenting authorities). However, since this process has been underway, natural and cultural heritage responsibilities (including marine conservation

> Portugal*

The national ICZM strategy of Portugal is comprised of nine primary principles, eight principal objectives, and thirty seven strategic options (Velooso Gomes et al., 2008)**. Based on the EU ICZM recommendations (EU 2004), this strategy provides a big-picture coastal risk management strategy for Portugal, which does not address comprehensively the unique problems and needs pertaining to island territories, but provides a national framework on which to assess coastal decision making. Portugal is comprised of mainland Portugal, the autonomous region of Azores and the autonomous region of Madeira.

Whilst this approach provides a coherent national level approach, at local levels coastal risks are often not properly addressed due to the deferral to the national level strategy. The island regions in particular have specific coastal risk issues that are identified at a local level, however, these may not be adequately addressed in decision making processes at higher levels.

The governance of the coastal zone is complex and overlapping, consisting of the jurisdictions of a number of authorities without clear connectivity. Decree laws, often with overlapping remits and differing responsible organisations and having been passed over a period of time, including attempts to incorporate current European

Regional Plans

Objectives

At a regional level, implement the options and guidelines of the National Management Territory Programme, and the Sector Plans.

In spatial terms, translate the main objectives of economic and social sustainable development of the Regional Development Plan, thereby minimizing ecological loading.

Take measures that can lead to the reduction of intra regional development inequalities.

regulate the development of the territory. under this plan, other special and municipal plans have to be implemented.

Define a model for regional territory organization.

Municipal Plans

Objectives at municipality level:

To institute a regulatory planning tool, approved by the municipalities.

Establish land use management by zoning, propose models of human occupation, urban and transport organization, physical infrastructure locations and parameters of land use and environmental quality.

Establish the carrying capacity of the territory.

Support the social and economic development policy.

Coastal Zone Management Plans

SPECIAL PLANS

Objectives:

regulatory planning tool, elaborated by the government.

Establishes different uses and specific activities to be developed on the coast.

Classifies beaches and regulates bathing use.

Coordinates coastal development and resource conservation, ensuring public access to the coast.

Regulates nature conservation and shore protection.

legislation, have left a complicated and slightly unwieldy system of governance at the national level. At a regional level a number of the municipality associations have regional coastal plans and governance organisations. At a local level there are a number of coastal municipalities and harbour authorities. There are a number of national plans and laws and decrees concerned with plans and management, including a series of decree laws on various aspects of shoreline management and coastal flooding and defence.

The schematic above shows the overlap of national and local planning and the management plans. As with many jurisdictions, these are hierarchical and adhere to the strategic level above. However, the plans are not intercomparable and there is no structured assessment of policy integration as SEAs or Regulatory Impacts Assessments are initiated in this process, but are not as robust as those carried out in other regions.

The most important instruments of planning for the coastal zone are the Shoreline Management Plans (Planos de Ordenamento da Orla Costeira,

also known as POOCs). It is in these plans that the areas at risk of erosion and cliff instability are identified. Currently all the POOCs are being revised or scheduled to be revised, after an average of 10 years of implementation.

In addition, the National Water Plan (Plano Nacional da Água) is being revised and will include aspects about risks related to water resources. One of the six themes addressed is that related to risks in coastal areas. For that, a characterization of the risks in coastal areas was made, which includes a “map of risks” and a set of measures and project proposals incorporated in the integrated frame at the level of the water resources. The revised technical document of the National Water Plan has been completed and is currently awaiting public discussion and formal approval.

* Situation updated in September 2011

**Velooso-Gomes E; Barrocco A.; Ramos A.; Sousa Reis C.; Calado H.; Gomes Ferreria J.; Frietas M., and Biscoito M., 2008. Basis for a national strategy for integrated coastal zone management – in Portugal. Journal of Coastal Conservation, Vol. 12, No. 1, pp. 3-9.



> Galicia (Spain)

In Galicia, the Regional Directorate of Civil Protection (Dirección Xeral de Protección Civil), within the Regional Ministry of Presidency, Public Administration and Justice (Consellería de Presidencia, Administracións Públicas e Xustiza) is the competent body for the coordination of Civil Protection in the Galician Region. The system to prevent, respond to and mitigate any risk or emergency situation, and the actions for the protection of people, goods and the environment is regulated by the Law 5/2007 of emergencies in The Autonomous Community of Galicia. This law dictates the structure and organization of responsibilities for managing and preventing risks of any kind and the creation of the Galician Agency of Emergencies (AXEGA) for the implementation of regional policy on civil protection, emergency management, and the management of facilities and services for responding to emergencies. The AXEGA is responsible for the analysis of risks and producing risk maps and inventories of risks and resources.

The levels of responsibilities considered by the law are:

- Xunta de Galicia (regional government) is responsible for the regional coordination and management of the support and services, and the management of emergencies that exceed the response capabilities of local authorities.
- The Regional Directorate of Civil Protection, from the Regional Ministry of Presidency, Public Administration and Justice, is the body responsible for the coordination of the actions of the regional government and other public authorities in civil protection and emergency management in the region.
- The other Regional Ministries of the Xunta de Galicia participate in the functions of forecasting, assessment and prevention of

risks likely to generate emergencies, participate in civil defence plans and manage the specific emergencies under their competence in collaboration with the Directorate of Civil Protection.

- The governing bodies of the provincial authorities ensure compliance of the responsibilities of local authorities regarding this issue, and activate the public plans of civil protection in the province. They are in charge of the development of risk and resources inventories for the province.
- The municipalities and local authorities are in charge of the provision of civil protection services and the initial response to any emergency situation. They are responsible for the implementation of the municipal plans of civil protection and emergencies, and develop municipal inventories of risks and resources.

Following the criteria and guidelines of the basic regulation of civil protection regarding management of emergencies, the Regional Directorate of Civil Protection developed the Regional Emergencies Plan in Galicia (PLATERGA, Plan Territorial de Emergencias de Galicia). The PLATERGA is a technical instrument comprising a set of rules and procedures that constitutes the system of the response to any emergency situation occurring in the territory of Galicia. It includes several Special Plans approved for Civil Protection: Forest Fire (INCENDIO), Flood (INUNDACIONES), Transport of Dangerous Goods by Road and Rail (Plantransgal), Snowfall (NEGA), Drought (SECA), Storms (TEMPORAIS), Seismic Risk, Beach Rescue (SAPRAGA) are integrated within the Territorial Plan and follow its guidelines.

The main objective of the PLATERGA is to obtain maximum protection for people, environment and property that are or may be affected by any risk and plan the actions to respond quickly and

effectively against any emergency related to natural, technical or anthropogenic risks. The risks under consideration in this territorial plan that would affect coastal areas are:

- Natural hazards: rain, frost, floods, storms, heavy rains, earthquakes, landslides and droughts,
- Anthropogenic hazards,
- Technology: associated with chemical industries, transport of dangerous goods, radioactive facilities, energy supply plants, landslides, civil engineering construction, bacteriological, fire, and
- Others: sporting activities, fairs, traffic accidents (terrestrial, air or maritime), terrorism, domestic risk, etc.

The PLATERGA establishes the protocols for each of the groups involved in the emergency response taking into account the degree to which the risk is classified. It integrates the provincial and the local plans.

Concerning the management of coastal areas, the autonomous region of Galicia has jurisdiction over the authorization of uses in the Easement protection (transferred from the administration). The Law 9/2002 of urban planning and rural environmental protection in Galicia, amended by Law 2/2010 on urgent measures and local regulations on urban planning, establishes the coordination mechanisms of the administrations that share competences in the planning of coastal actions in the region. Any action or urban planning performed on the coast has to be consistent with its content.

As regards spatial planning and management of coastal areas, water resources and landscape, the competences are shared between the central government and the Regional Ministry of Environment, land and infrastructure (Consellería de Medio Ambiente, Territorio e Infraestruturas). It corresponds to the Regional Ministry the development of some of the planning instruments to

promote integrated land management, such as the Coastal Management Plan (Plan de Ordenación del Litoral), which provides a comprehensive and effective protection for coastal areas, and establishes the criteria for planning of the coastal municipalities of Galicia. The approval procedure of the Coastal Management Plan will comply with Article 5 and 15 of Law 10/1995 of 23 November, about land planning in Galicia, in accordance with Article 2.3 of Law 6/2007, of urgent measures in the management of land planning and coastal management in Galicia. Specifically, within the Regional Ministry of Environment, Territory and Infrastructure, the responsibilities in the field of quality of coas-

tal, continental and transitional waters in the Galicia Catchment area are developed by the autonomous entity «Augas de Galicia» (Decree 316/2009 and 108/1996). One of the main activities of “Augas de Galicia” is the implementation of the WFD. The main fundamental step in the implementation of the WFD is the development of Hydrological Plans, which must balance the needs of different sectors with impact on the use of water resources, taking into account the protection and conservation of the environmental resources. Augas de Galicia is the responsible body for the development of the Hydrological Plan of the Galician Coast (Plan Hidrológico de Galicia-Costa) which takes into account the

assessment, monitoring and management of continental (fluvial), transitional and coastal waters in Galicia.

The management of coastal areas at local level is shared with the local municipalities. In Galicia, the 74 coastal municipalities are governed by the law 5/1997 of 2 July, of the Local Government of Galicia. Urban issues in the Area of Influence are the responsibility of municipalities. They are also in charge of the provision of parking areas and adequate access to the sea (except in areas of special protection). The municipalities also assume the responsibility over the control and maintenance of bathing areas and bathing water quality.

> Aquitaine (France)

The Aquitaine Region is the first French Region to bring together coastal factors for a regional coastal management project based on the principles of the ICZM. Three main themes have been the priority:

- research: knowledge is the essential prerequisite for the efficient management of issues linked to the coast (reliable and joint technical and scientific propositions);
- expertise within development projects: providing contractors with the support of a technical team is important before any development intervention;
- governance: the creation of an authority for global exchange and organisation unites the various levels of competent public authorities concerned by the subject,

This partnership enables the roles and missions of each of those involved to be set out in a clear and organised manner:

- The **Observatoire de la Côte Aquitaine** (Aquitaine coast observatory) is a platform created in collaboration with the State, the coastal departments of the Landes, Pyrénées-Atlantiques and Gironde, and the operational intervention of BRGM and the ONF (Office national des forêts, the French National Forests Office). Their remit is to

monitor the coast, especially for mobility and erosion, develop a GIS system and co-ordinate research and information. They are studying coastal mobility and erosion on a regional scale, on the longest sandy beach in Europe (approximately 200 miles).

- The **Réseau de Recherche Littorale Aquitaine** (Aquitaine Coast Research Network, or RRLA) co-ordinates research work on coastal systems and particularly interface environments (estuaries and lagoons), to encourage links between researchers, administrators and users, and to communicate the results of this research work. This group of researchers is an important contact for administrators and decision-makers, and reinforces governance decisions made across the entire coastline: oyster farming, water quality, biodiversity, etc.
- In terms of governance, the Aquitaine

regional council is the founding member, together with the French government, of the **Coastal Public Interest Group** (GIP) which includes the three existing coastal Departments, coastal communes and their associations. GIPs primary role is to co-ordinate with the Observatoire and RRLA to produce a sustainable coastal development strategy to be shared by the various stakeholders: this authority constitutes an interface between societal requirements and the propositions of the scientific community.

The GIP is putting in place an “Aquitaine coast sustainable development plan” in order to facilitate all aspects of integrated coastal management. This is based on the Regional Coastal Management Strategy which is a regional scale assessment of coastal erosion, co-ordinating all the potential industries and partners in the area.



> Marennes-Oléron (Poitou-Charentes, France)

In Marennes-Oléron County, coastal management is carried out by a Syndicat Mixte on behalf of coastal townships and Oléron island. This ICZM initiative has instigated a consultation process and ensures that a connection was established between scientists and managers on erosion and sustainable coastal management

issues. The approach has been largely adopted by coastal stakeholders. Scientific studies were also implemented, necessary to the County's development projects. In particular, a Geographical Information System (GIS) has been developed, with the contribution of the actors involved in this consultation pro-

cess. The GIS was initially aimed at assisting in management issues and assessing coastal erosion, however, after the damage of the Xynthia storm in 2010, the system has been used for planning and decision making during coastal and oyster industry restoration works.



> Brittany (France)

Brittany is a peninsula of over 27,000 square kilometres with approximately 1,700 kilometres of ragged coasts representing about a third of the French coastline. It is therefore a territory marked by a very strong diversity of maritime activities (fishing and aquaculture, port activities, water sports, shipbuilding, etc.) and one which is classed as one of the leading French tourist regions.

The Conseil Régional de Bretagne has promoted a Regional development plan with the aim of consolidating the maritime dimension of Brit-

tany and to ensure a sustainable development of its territory, by the end of 2015. As part of this plan, a “Coastal Charter” has emerged during the works preparation. Although it does not have a statutory scope, the Breton coastal area charter does set out the objectives to be achieved, instigates the principles of ICZM, strengthens a number of existing initiatives and launches its own key projects.

The charter has set up a regional conference on marine and coastal issues, the development of discussion forums at local level, and the creation

of maritime coastal basins for assessment and management (ahead of the MSFD requirements) and has developed a data exchange platform and GIS system (GeoBretagne) to aid coastal management.

Although the Charter's status is voluntary, it has over 160 participants including government, research, industry and management organisations and representatives. The charter also strengthens the network of ICZM projects in Brittany and has identified and supported a number of key projects.

> Cap l'Orient agglomeration (Brittany, France)

The Scheme for Prevention of Risk Coastlines (SPRC) is a new tool for risk prevention introduced by Act No. 2033-699 of 30 July 2003 on the prevention of technological and natural risks and the allocation of damages.

This document, prepared by the prefect and in consultation with all stakeholders can:

- conduct an inventory of the context and the nature and risk
- develop the diagnosis of the actions already

undertaken and to measure the level of risk acceptance and constraints,

- propose an action plan, policy paper, five-year global risk management that operates in the five areas of prevention: knowledge of risks, prevention information, control urbanization, reduction of vulnerability and crisis management.

This tool was presented as an initial response to the issues of common Gâvres allowing collegial work between the different actors.

Gâvres territory is considered a pilot site before a generalization of the entire coast of Morbihan. The SPRC was superceded by decree dated August 3, 2009.

A committee comprising state, local governments, scientists in charge of protection studies and the population has been created. This committee aims to be a place of consultation with all stakeholders concerned with the protection of the peninsula. It is above all a practical working group which consists of meetings and an opportunity for everyone to contribute in discussions and respond to the proposals. The aim is to strive for a consensus of people and organizations involved. Various coastal protection works Gâvres have been presented, discussed and validated at meetings of the steering committee and helped clarify the actions to take regard of planning, protection, knowledge of risk information and return of experience.

A real tool for consultation, the SPRC has promoted a common vision among all stakeholders in the territory. Gâvres Peninsula has been studied comprehensively and the recommendations and management solutions have been studied in university.

This operational tool has enabled the:

- bringing together of all stakeholders to work together to reduce coastal risks.
- defining of a prevention policy based on the level of risk acceptance, and the production of tools, and
- acceptance of the dynamic nature of the coast and learning to live with risk.





> Central Portugal*

The Administrations of the Hydrographic Region are a newly created public institute, among a set of five similar institutes covering Portuguese Hydrographic Regions. Their mission is to protect and enhance the environmental components of water and to ensure the sustainable management of water resources within the hydrographical region.

For example, the Administration of the Hydrographic Region of the Centre includes Rivers Vouga, Mondego and Lis. This equates to an area of approximately 1200 km² and 1.5 million inhabitants. They aim to be an innovative organization committed to ensuring the sustainable management of natural resources in each water basin and an integrated management of interior and coastal water resources, fostering a culture of joint responsibility among water users and the

society as a whole. The Administrations key responsibilities include:

- preparing and implementing management plans for hydrographical basins and specific plans for water management,
- establishing and implementing a water quality and quantity monitoring network and programme in the hydrographic region,
- deciding on permits for water resources use and supervising compliance,
- analysing the features of the hydrographic region and the impacts of human activity on the state of the water, as well as the economic dimension of water use,
- maintaining a register of protected and

catchment areas for water for human consumption,

- promoting the regeneration of water resources and fluvial systematisation, as well as coastal protection, and
- applying the economic and financial instruments on hydrographic basins, collecting taxes and investing them on the management of the hydrographic basin water.

The direct beneficiaries of the services provided by the Administration of the Hydrographic Regional are the municipalities, the central and local public administration, private entities and individuals, associations and regional/local development agencies, etc.

* Situation updated in September 2011



3 INTEGRATION OF COASTAL RISK INTO DECISION-MAKING

The potential coastal risks have been outlined in Section 1. Section 2 has outlined the legislative drivers and consideration of coastal risk at a EU level, reviewed the application of coastal risk assessment within the ANCORIM partner countries

and highlighted regional consideration of risk in coastal decision making. This section outlines potential methods for coastal planners and decision makers to incorporate the consideration of coastal risk at planning and development assessment

stages. The approach utilises the existing regulatory and statutory requirements to allow coastal decision makers to achieve their obligations in considering these risks.

Coastal Planning System

Planning and decision making in the coastal zone across all jurisdictions, is formulated with

in a framework from international and national policy to local implementation. This occurs in a

hierarchy as outlined in Figure 3.1.

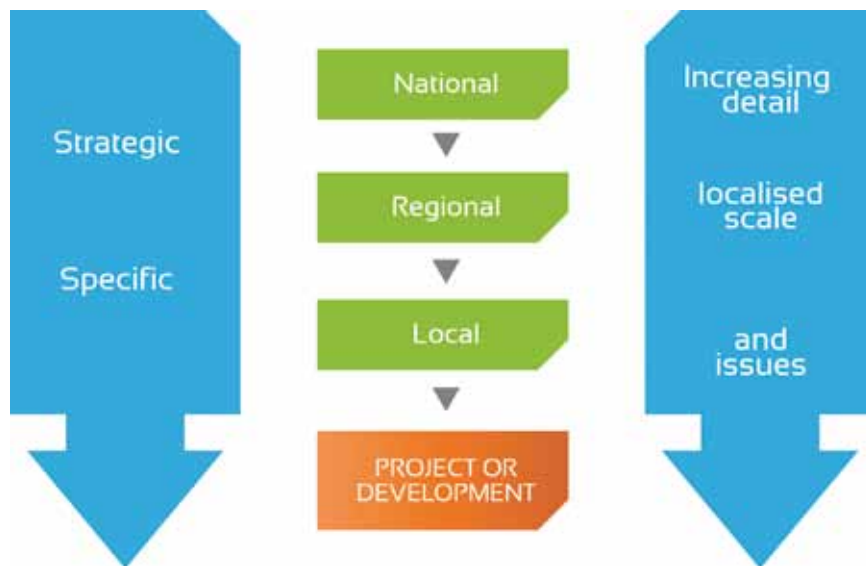


Figure 3-1 Spatial Hierarchy of Planning

As a result, national policies and legislation feed to local planning decisions and licensing of activities. There is a requirement for coastal decision makers to consider coastal risks when considering applications to develop housing or industry in the coastal zone, develop ports of tourism, or when licensing aquaculture or other activities. In the existing system coastal risks are taken into account in the following way:

- Principles, policies and regulations from an EU level are implemented in National Development Plans (laws and regulations). Most national plans include elements of ICZM principles, however these are currently often lost at local level. These influence National and Regional Plans whilst acknowledging regional variation and policy,
- At a local level, local area plans should include the specifics of zoning, development assessment, and local issues relating to coastal risks. These local area plans are

the lowest local scale at which a plan is presented, these may be county, town or regional plans;

- Individual projects, planning or permitting applications should then be assessed against the local plans, such as developments in the coastal zone, planning permission assessments, aquaculture licence applications etc; and
- At a site specific level, planning or permitting applications (such as planning applications or licenses for coastal developments or activities) are assessed against the local planning conditions and guidance and against local policy and national legislation.

The planning system should nest together in a structured hierarchy from international and national policy to regional assessment and local implementation. The level to which policy is adopted at local level is determined by a wide

range of factors.

Throughout the planning system, legal adherence is the predominant driving force. At a national level, legislature and national development plans are implemented adhering to EU requirements and to national specific issues. At a regional and local level plans are developed from the guidance from the national plan, national regulators and government organisations.

All plans are required under the SEA Directive (see Section 2.3.3) to be subject to a Strategic Environmental Assessment (SEA). National, Regional, Local Development Plans are subject to assessment prior to implementation. In some jurisdictions, government policy and strategy may also be subject to SEA. The SEA is usually informed by expertise in specialist areas, as required under the SEA Guidance (see Section 2.3.3). The additional requirement of SEA for consultation, cumulative and sustainable assessment means that this is the appropriate legislative instrument and process within which to include coastal risk.



Figure 3-2 Development and Management Plans

In addition to these development plans, there are a series of management plans (Figure 3.2). In the coastal and marine environment these are generally determined by adherence to EU Directives as transposed into national legislation. There may also be a wide range of other relevant plans and policies (energy, waste, housing, equality, etc) that influence the development of national, regional and local plans. Management plans are implemented at regional or area specific scale, though are not subject to administrative boundaries. They deal with a specific issue (water quality, conservation management, renewable energy development etc) and are created predominantly from the requirement of EU Directives as a method of implementing regulatory require-

ments.

In jurisdictions where Shoreline Management Plans, Coastal Sediment Management Plan (EUrosion, 2004) PPRns, PLANTERGA Special Plans, etc exist, these further highlighting erosion and natural processes. These should be considered when developing plans and assessing developments, which is a potential oversight in the existing legislative and planning structure.

In assessing an application at a local level, whether for a house, commercial or industrial property, infrastructure or activity, the local planner or decision maker refers to the local area plan. This plan is the guidance and zoning available at the lowest spatial scale available to the decision maker. This Local Area Plan could be a town plan,

county plan, distinct provinces, metropolitan departments or regional plan dependant on the area.

As with the development plans, management plans are also subject SEA. As a result, SEA is an appropriate level to consider coastal risks and ensure assessment at a local level for coastal planners and decision makers.

Under this approach, water quality, flooding, natural disaster, climate change and sea level rise can be considered within the existing process. Development affecting coastal hydrology is assessed under the River Basin Management Plans and the MSFD, when implemented, however, these only assess the cumulative impacts of anthropogenic activities and do not include natural processes.



Coastal Planning and Decision Making Obligations and Responsibilities

Under EU and national legislations, and now emphasised by the Environmental Liability Directive, decision makers in the coastal zone (planners, permit evaluations, management plan developers, regulators etc) have a responsibility to ensure licensed activities and develop-

ment do not have a detrimental effect on the environment or other industries and that decisions are well informed of all the potential risks.

As discussed in Section 1 coastal risks can have a detrimental effect to coastal environments,

developments and industries. These can affect economic activity, cultural heritage, biodiversity and in extreme cases, whole communities may be at risk. Coastal planners and decision makers have an obligation to consider coastal risks when drawing up plans in coastal areas.

Methods of Incorporating Coastal Risk

> Additional legislative drivers

An EU Directive or amendment identifying coastal risks would ensure coastal risk assessment is included and considered. However, this is a significant step and potentially would take years to implement. Therefore, utilising the current responsibilities and systems of coastal decision

makers and providing guidance can allow for coastal risk to be recognised in the short term is the preferred approach. This section outlines the obligations of the coastal decision maker and how coastal risks can be considered within the current systems. As decisions in the coastal zone

are based on applications for coastal developments and activities, these existing systems have been evaluated to identify where coastal risk can be incorporated.

> Considerations of risks whilst developing plans: coastal zoning

When developing a plan, coastal decision makers should give consideration to coastal regions as areas where additional risks may need to be considered. In order to ensure this is considered, zoning of the coastal zone as a separate entity, or a series of zones from the low shore should be considered within development plans. By including this zonation as part of planning, it is easier to consider coastal risks effectively and implement conditions on planning and development in these areas.

Regional examples of this approach are evident in the Aquitaine case studies and a number of French, Spanish and UK jurisdictions. The consideration of the coastal zone as a different entity can assist planning decisions and allow

coastal risk to be properly considered, as well as risks identified through the SEA or other plans and legislation to be implemented effectively. The zoning of this area as a different classification also allows for due consideration of coastal management plans in areas where they may not currently be considered.

Zoning in this way allows coastal planners to consider additional conditions or considerations when evaluating plans in this region, such as set back to take account of future sea level rise, considerations of erosion or coastal defence need, or potential offset to existing areas of coastal erosion or flooding prevention. This zoning can also assist potential developers or applicants to consider these factors in design and planning at an early stage.

In all regions however, there are divides between the planner, especially at regional or local level and the technical expertise and information to assess coastal risks within an area. Specific risks highlighted by historical problems are sometimes identified, however, not consistently. Even where management plans or initiatives address a specific coastal risk, the other potential risks are often overlooked. Within the various regulatory and planning approaches across the ANCORIM and EU area, there are consistent points at which coastal risks could be considered.

In addition, this handbook includes ideas for coastal risk checklists for planners and site assessment tools that can be adapted to assist decision makers to identify and include coastal risk.



> Considerations of risks whilst developing plans: plan assessment

In addition to coastal zoning, Figure 3.3 below highlights how considering a plan through the SEA process links to other plans and programmes and therefore can include coastal risk. In some regions marine and coastal planning requires that SEA includes equality and health impact assessment. This approach further reinforces the assessment of areas such as water quality impacts and the socio-economic assessment of proposed plans, making the considera-

tion of coastal risk, coastal process and far-field effect assessment more robust. Within the SEA process, consultation is an important component. In coastal areas, consultation can be targeted at the coastal 'actors' as identified through the ANCORIM project to ensure coastal risks are identified, and enable links between the scientific community and knowledge and planners in a coastal region. The SEA informs the Plan as both are dependant on reviewing the higher

level Plans and SEAs within the hierarchy, the Management Plans and their SEAs and is informed by policy, socio-economic requirements and objectives and the plan proposal (as well as assessment of alternatives).

Figure 3.3 highlights the elements that inform the Plan and SEA process and where coastal risks are, or should be highlighted to assist in informing the process.

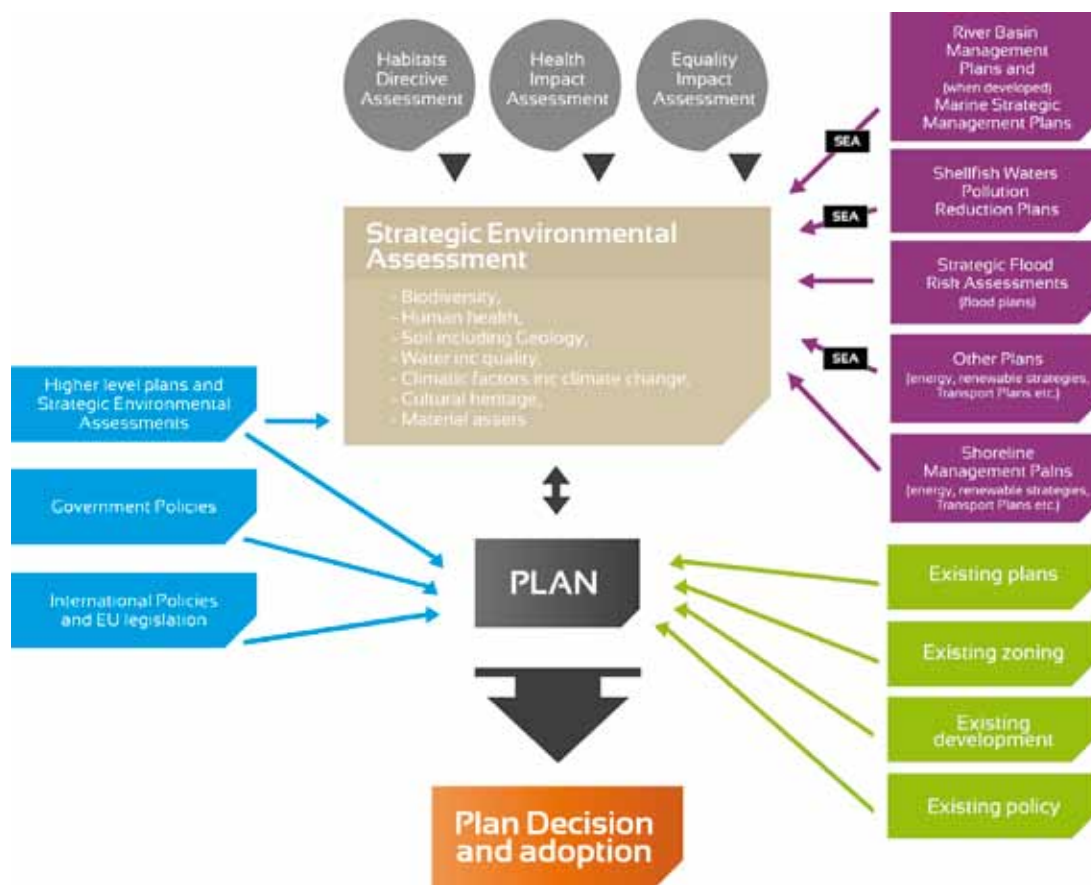


Figure 3-3 Considering the Plan and How SEA can include Coastal Risks.

> Considerations of risks in evaluating a project

When assessing a project or development, therefore, under this system coastal risks should be highlighted and incorporated.

Firstly, should coastal areas be zoned and identified in local development plans, projects will be identified to the coastal decision maker where coastal risks should be considered.

Secondly, potential local risks should be identified, via SEA, will feed into Local Area Plans (LAP) as they are updated and ensure coastal risks are highlighted to the decision maker at project evaluation level. These will reinforce the considerations of National Policy, which in all jurisdictions

acknowledged the six principles of ICZM.

Until these plans are revised with coastal risks integrated within them, the handbook identifies the legislative requirements where coastal risks should be identified in decision making. By including these requirements, the corresponding regulators of each of these pieces of legislation will be included in decision making process and be able to inform the planner or decision maker of potential risks or hazards.

Figure 3.4 shows how coastal risk will be considered as it is informed by the Local Area Plan

and Management Plans within a region. If the development requires an Environmental Impact Assessment, then consideration of coastal risk should be further investigated via consideration of the Local Plan, consideration of the management Plans and potential impacts evaluation as part of the EIA process.

Where decisions or developments do not require an EIA, the zoning of coastal regions can trigger assessment of these management plans and coastal risks to the developer and / or decision maker.

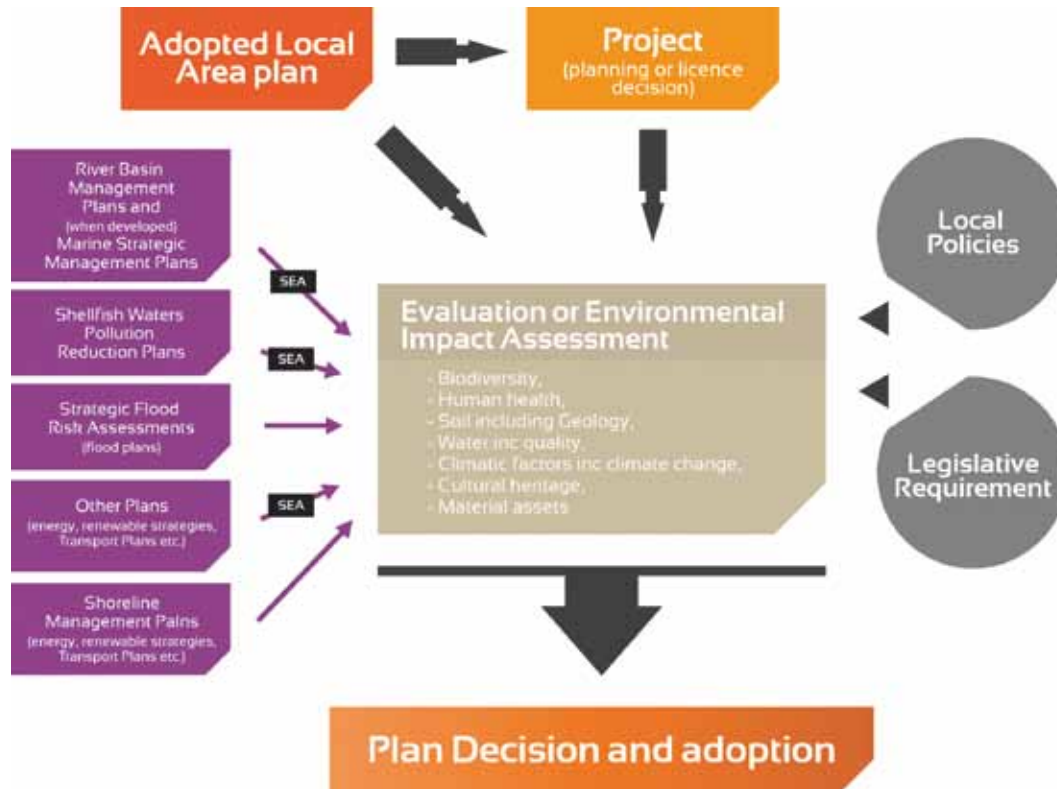


Figure 3-4 Incorporating Coastal Risk into Project or Site Specific Decisions.

> Considerations of risks in site assessment

At a site specific level, Appendix outlines two tools that can be used or developed by a coastal decision maker.

The first is a check list, based on the legislative responsibilities highlighted in Section 2 (Appendix 1), with additional considerations of coastal risk to ensure responsible decision making. It is often not the responsibility of the coastal

decision maker to identify or provide answers to these issues, however, the decision maker is responsible to identify, and take due consideration of, coastal risks when making decisions.

The second is a tool developed from the Mayo Case Study (see Appendix 2). This gives pointers on rapid visual assessment of sites to potential coastal risk issues. The tool is designed to enable

a coastal decision maker to gain information on the type of coast and potential coastal risk hazards from a site visit to be able to raise these issues to a potential developer or in consideration of a plan. The tool is designed as a prompt that coastal risk may be an issue, and that further information is required prior to decision making.

Case Study

Building planning capacity to combat coastal risks and the impacts of climate change a field evaluation from County Mayo (Ireland)

County Mayo has the longest coastline of any county in Ireland (1168 km). Its coastal zone incorporates great natural diversity, including estuaries, tidal flats, extensive stretches of soft erodible coastline (802 km), rocky coast, beach-dune systems and urban areas. Coastal activities of economic importance include aquaculture, fisheries, shellfish farming and tourism. Rural housing in the coastal zone is also common in County Mayo. The county has a rich cultural history with many coastal sites of significance.

The coastal communities, economic activities and natural and cultural heritage have to cope with numerous threats e.g active coastal processes affecting the stability of soft coastlines and threatening coastal defenses; seasonal pressures linked to tourism, increasing pressure from urbanisation and urban expansion; risks from extreme climatic events; threats to water quality resulting from agricultural and industrial discharge or acci-



dental spills. These different types of pressures are potentially heightened by the effects of climate change with, for example, a possible increase in the number of storms having considerable impact on the coastline and the coastal defences of urban coastlines.

As it stands planning in the coastal zone, with so many competing environmental and socio-economic factors to be taken into consideration, is a challenging task. The additional consideration of how coastal risks, and particularly those linked with climate change, should be incorporated into the decision-making process adds to the complexity of this task. This case study is designed to elucidate how coastal risks are - if at all - incorporated into coastal land planning decisions. In addition the study will assess ways of increasing decision-making capacity through an exchange of good practices and testing of innovative approaches. More specifically the case study aims to:

1. Assess current planning policy and practice, from national to project scale,
2. Assess natural risks and implications of climate change at micro scale sites (as exemplars of problems and imperatives in the county),
3. Critically analyse planning policy and practice, with specific reference to the incorporation of natural risks and climate change, and
4. Produce recommendations (integrating international best practice).

HOW TO CONSIDER COASTAL RISKS IN DECISION MAKING

Coastal decision makers have an obligation and a responsibility to consider all coastal risks when making decisions in the coastal zone. There are requirements under current European legislation to consider a number

of coastal risks at various stages in decision making. However, there are still shortfalls in understanding and inclusion of natural coastal processes and particularly risks from natural processes and coastal erosion.

When considering coastal planning and decisions, the coastal decision makers need to be aware of the following coastal risks:



Coastal erosion



Wind damage



Coastal flooding



Water quality



Climate change



Sea level rise



Natural disaster,
e.g. tsunami

The decision maker needs to ensure that all these priority risks are assessed. There may be additional coastal risks of importance at a local level which are not covered in the handbook. From the guidance in the handbook there are a number of methods that can be employed to assist in this process.

- **Awareness: decision-makers have to be aware of coastal risks and the necessity of taking them into account in their planning and management practices.**
- **Coastal Zoning:** Coastal planning and zoning should consider the coastal zone as a category and delineated area. This allows for consideration of coastal risk and specific conditions to be developed in the coastal zone to ensure responsible decision making.
- **Use of the SEA to include coastal risk consideration within plans.** This en-

sure legislative compliance and that many of the coastal risks are considered. By the awareness of coastal risks in the drafting of Strategic Environmental Assessments and informing national and local plans, many of the coastal risks can be highlighted and identified for inclusion in coastal decision making.

- Due to the requirement of SEA to consider other plans and programmes, other legislative management instruments, such as those in the Water Framework Directive, Floods Directive and Shellfish Water Directive can be incorporated into planning assessment and coastal decision making to ensure coastal risks are considered and decisions are legislatively compliant. In areas where SEA is not carried out for local plans, an EIA is still required which covers these issues and is informed by the SEA of the Regional or National Plan.

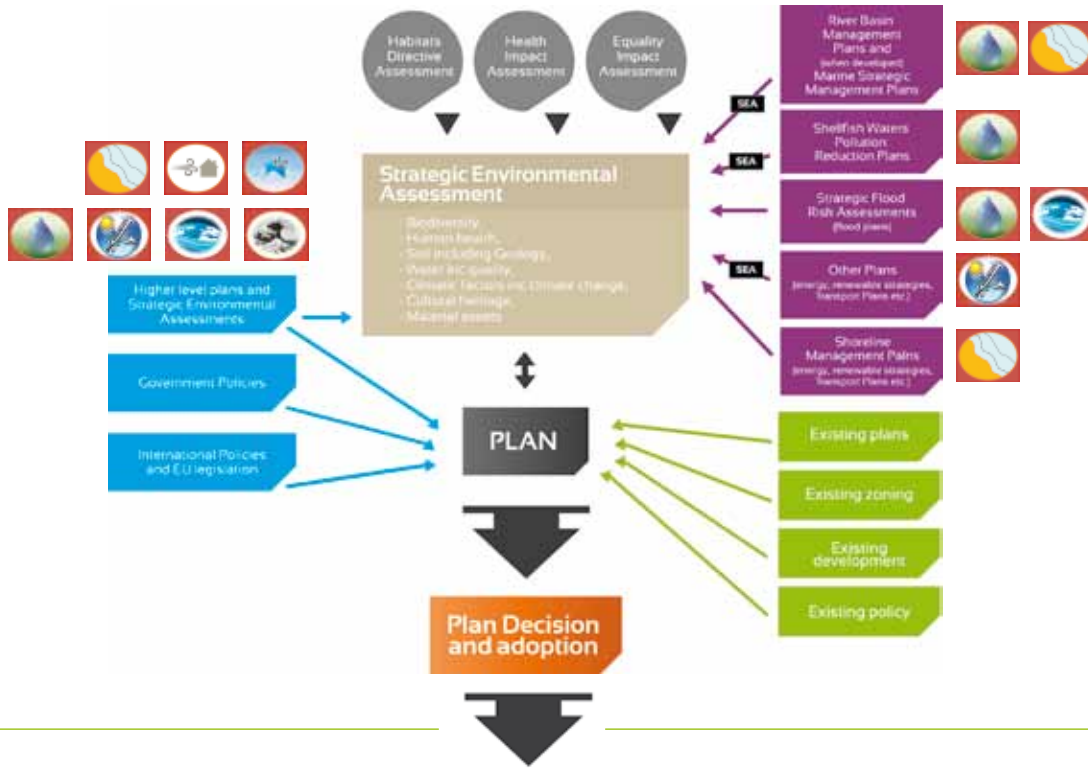
- **At a project level** there are a number of methods that can be used to prompt coastal risk consideration. Appendix 1 and 2 include two such examples –

> a decision making check list of coastal risks based on legislative compliance, and

> a rapid visual identification tool that can be used as an indicator of coastal change and potential coastal risk.

- **Examples of good practices** from the ANCORIM project and other EU cases are available on the ANCORIM website in the section “case studies” or “promotional tools” (including awareness toolkit on “Coastal risks: better comprehension for better management”).

PLAN DEVELOPMENT



PROJECT EVALUATION

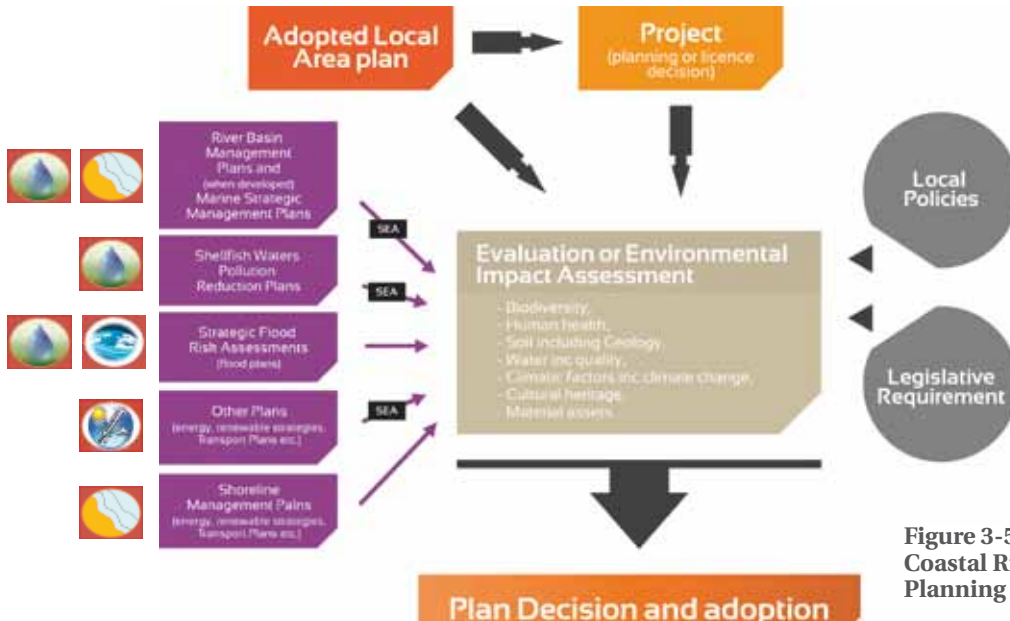


Figure 3-5 Outline of the Process to include Coastal Risk consideration in coastal Planning and Decision Making via SEA.



Appendix 1 : Legislative and risk checklist tools




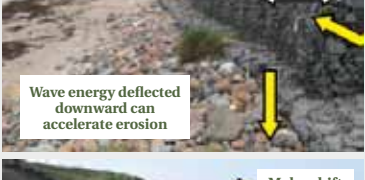
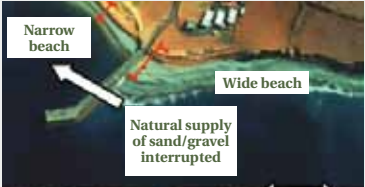





QUESTIONS	KEY EU LEGISLATION	COASTAL RISK ASSESSMENT
<p>Is the plan or project in an area of historical coastal flooding? Is the plan or project in an area of risk under the Preliminary or Strategic Flood Risk Mapping? Is the proposal in relation to flood defence or alleviation works?</p>	<p>The Floods Directive (2007/60/EC)</p>	<p>Is the proposal at risk of coastal flooding (historical, SFRA, sea level rise (see below)? Has coastal flooding been considered in the application? Is the proposal related to coastal flooding and defence, and if so could it influence flooding in other areas?</p>
<p>Is the related to water? i.e. abstraction, treatment, discharge etc. Is the plan to project related to works that may alter the hydro-morphology? Is the proposal adjacent to a water body that is at risk or will it have any effects on the water body that may affect the water body status? Is the proposal in relation to flood defence or alleviation works?</p>	<p>Water Framework Directive (2000/60/EC)</p>	<p>Will the proposed development or plan have any effects on water quality (either extraction or discharge)? Will the plan or project have any effects on the hydro-morphological aspects of a water body? Is the plan or project within or adjacent to a water body at risk from human activities – review River Basin Management Plan? Cumulative carrying capacity assessment of the area in relation to water quality and hydrology modifications?</p>
<p>Is the proposal a plan? Does it require an SEA and has an SEA been screened? If an SEA assessment has / is being conducted, are all the guidance topics being considered? If not have they been suitably screened out? Has the SEA referred to other plans and programmes in the area, including Management Plans?</p>	<p>The Strategic Environmental Assessment (SEA) Directive (2001/42/EC)</p>	<p>Refer to Section 2.2 (or Figure 3.4) have the SEA topics considered coastal risks? Have these risks been assessed? Biodiversity – wetlands, dunes, Habitats Directive assessments (see below) Fauna and Flora – coastal habitats, especially natural defenses, wetlands dunes etc Population – water quality, health and disaster risk, including flooding Human health - water quality Soils – Geology, coastal processes erosion assessment Water – water quality, and other relevant parameters such as salinity Air including quality, Climatic factors – climate change and sea level rise, is the the plan or project sites in an area at risk Material asset – infrastructure, ports navigation and flood defences etc Has the plan or project been cumulatively assessed in relation to other activities?</p>
<p>Does the plan or programme require an EIA under the national legislation? If sub threshold does it require an assessment? Does the EIA cover the relevant themes?</p>	<p>Environmental Impact Assessment Directive (85/337/EEC as amended by 97/11/EC and 2003/35/EC)</p>	<p>Under the themes to be considered in EIA coastal risks should be considered (see SEA chapter guidance in Section 2.2 for more information) Does the EIA consider coastal risks under the theme relevant headings? Does the EIA consider other plans and management plans?</p>

QUESTIONS	KEY EU LEGISLATION	COASTAL RISK ASSESSMENT
Is the plan or programme likely to cause irrevocable impact on environmental habitats or systems as a result of decision making.	The Environmental Liability Directive (2004/35/EC)	Under this Directive the allowing of development or projects that cause environmental damage can result in liability by the relevant authority
Is the plan or development likely to cause any effects to nearby Natura 2000 sites? Are these sites designated for any coastal habitats or species? If so has Appropriate Assessment Screening or Stage 2 Assessment been undertaken?	The Birds and Habitats Directives (79/409/EEC and 92/43/EEC)	Any plan or project that could affects a Natura 2000 site must be assessed. Assess for erosion, disruption of coastal processes, water quality, direct damage (including site access) etc
Is the related to marine areas or connected to them via a water body? i.e. abstraction, treatment, discharge, etc. Is the plan to project related to works that may alter the hydro-morphology?e.e dredging aquaculture marine development Is the proposal adjacent to a water body that is at risk or will it have any effects on the water body that may affect the water body status? Is the proposal in relation to coastal / flood defence or alleviation works?	The Marine Strategy Framework Directive (2008/56/EC)	Will the proposed development or plan have any effects on water quality (either extraction or discharge)? Will the plan or project have any effects on the hydro-morphological aspects of a marine area? Is the plan or project within or adjacent to a marine area at risk from human activities? Is the plan or project in the vicinity of a proposed or enacted Marine protected Area? Cumulative carrying capacity assessment of the area in relation to water quality and hydrology modifications?
Is the related to water? i.e. abstraction, treatment, discharge etc. Is the Plan or development near or connected to an area designated for Shellfish Production Waters?	The Shellfish Waters Directive (2006/113/EC)	Will the proposed development or plan have any effects on water quality (either extraction development or discharge)?
Is the development or plan coastal, and is it in the vicinity of a designated Bathing Water REA?	The Bathing Water Directive (76/160/EEC) and (2006/7/EC)	Will the proposed development or plan have any effects on water quality (either extraction development or discharge)? Will the plan or project have any impact of the access or facilities at a bathing water beach?

This list is not exhaustive please refer to Section 2 of the ANCORIM Handbook. A check list should be developed that includes National and regional legislation and identified places for Coastal Risk to be assessed for each area to assist planner and decision makers.



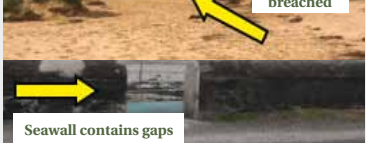
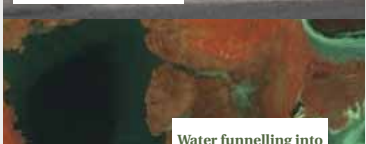




If risks are identified, further advice should be sought by a suitably qualified professional. This document was produced by James Massey of RPS Group, Galway as part of the Atlantic Network for Coastal Risks Management (ANCORIM) project.

Appendix 2: Visual site assessment tool

SHORELINE EROSION MAY BE AN ISSUE IF...		TICK IF APPLIES		
CLIFFED COAST		<p>Soft erodible cliffs are present Cliffs formed from sand and gravel are more erodible than hard rock cliffs.</p>		
		<p>Unvegetated slopes are present Cliff faces which are unvegetated or have a sharp vertical slope.</p>		
		<p>There is evidence of active cliff erosion Evidence of fences, walls (see photo above), vegetation or roads being lost to the sea are a good indication of active erosion.</p>		
		<p>The beach is absent at high tide Beaches that are mobile absorb wave energy acting as a natural barrier.</p>		
SAND OR GRAVEL BEACH		<p>There are structures perpendicular to the shore Engineered structures (e.g., groynes) that run perpendicular to the shore may interfere with the natural supply of sand/gravel along the shore. This can result in one side of the structure trapping sand/gravel while the other side is starved of sand/gravel, which can lead to erosion. Picture Source: Marine Institute</p>		
		<p>There are structures parallel to the shore Engineered structures running parallel to the coast (e.g., seawall or gabions) may interfere with the natural movement of sand/gravel between the land and sea. Wave energy is deflected downward off the structure and may result in moving sand/gravel offshore (i.e., beach erosion). Erosion is also expected to increase at either end of the structure.</p>		
		<p>There is make-shift shore protection Make-shift shore protection can be a good indication that there has been erosion in the area in the past.</p>		
		<p>There is evidence of active erosion Severe slopes and slumping vegetation at front of dunes may indicate active erosion.</p>		
		<p>The area is an open coast An open coast has no landforms seaward (e.g., islands) to offer protection from incoming wave energy.</p>		
		<p>There is evidence of beach material being removed Evidence of beach material such as sand/gravel/cobbles being removed from the beach (e.g., tractor tracks). This removal results in a permanent loss to the beach system, leading to accelerated erosion of the land behind the beach (and may reduce protection from flooding).</p>		

FLOODING MAY BE AN ISSUE IF...

TICK IF APPLIES

 <p>Low lying</p> <p>Gentle beach slope</p>	<p>The shore parallel barrier is absent No natural (e.g., sand dune system) or engineered shore parallel (e.g., seawall) barrier to water movement onshore from the sea.</p>	
 <p>Dune is breached</p>	<p>The area is low lying Area is low lying and is close to mean sea level, as opposed to elevated land – see cliffed coast pictures from page one.</p>	
 <p>Seawall contains gaps</p>	<p>The coastal barrier is breached Coastal barrier (e.g., sand dune or seawall) is breached (e.g., contains pathways/roads). That is, the barrier contains gaps through which flood waters may enter from the sea during stormy conditions or extreme high tides. <small>(Picture Source: www.geography.org.uk)</small></p>	
 <p>Water funnelling into constrained area</p>	<p>The area is a semi-enclosed bay <small>(Picture Source: Marine Institute)</small> Semi-enclosed bays can have a funnelling effect when subjected to storm surges. As water enters the confined space it is forced upward, elevating it above normal levels.</p>	
 <p>Lagoon landward of coastal barrier</p>	<p>The area is an open coast An open coast has no surrounding landforms (e.g., islands) to offer protection from incoming wave energy – see picture in shoreline erosion section.</p>	
 <p>Floodwaters from sea may travel landward into lagoon</p>	<p>The area is adjacent to a lagoon with an opening to the sea Flood waters from storm surge may enter lagoon, increasing water levels.</p>	
 <p>Road/house close to high tide line</p>	<p>There is a river mouth present River waters are prevented from discharging to the sea by elevated sea levels (i.e., high tides or storm surges), greatly increasing local water levels at river mouth.</p>	
	<p>The high tide line is close to infrastructure A high tide line (of seaweed or other flotsam debris) is a good indication of possible water levels. Note: storm levels are usually elevated above this level.</p>	



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