OPW Guidelines for Coastal Erosion Risk Management Measures and Funding Applications under the Minor Works Scheme

Coastal Erosion Risk Management Studies

OPW requires that proposals and funding applications for structural measures to prevent or mitigate erosion should be done in conjunction with an appropriate **coastal erosion risk management study**, which fully investigates, substantiates and demonstrates the merits of any measures being proposed. Such measures, in general, require the investment of substantial amounts of public funding and in order to ensure value for money, it would be considered best practice that a study be undertaken in advance of undertaking any measures. In addition, a study will ensure all options are considered.

Applications for funding of such studies will also be considered by OPW under the Minor Works Scheme, up to a maximum of 90% of the cost.

The typical scope of such a study is outlined on the attached **Schedule A.**

Exceptions to undertaking a study

Whilst such studies are recommended by OPW in most cases, there are certain circumstances when these studies will not be insisted upon in order to qualify for funding and these exceptions are outlined below:-

1. Where minor erosion risk management works extending over a short length of coastline (not exceeding 75 metres) are proposed in non-sensitive environmental coastal locations (i.e. those which do not have / are not in close proximity to any existing or proposed areas with environmental designations e.g. NHAs, SAC's, SPA's) and provided such locations have had previous erosion protection works constructed at adjacent locations within the same coastal cell and within 3 km range.

2. Where minor erosion risk management works extending over a short length of coastline (not exceeding 75 metres) are proposed in coastal locations to either replace an existing erosion protection structure which has recently collapsed/failed or to provide additional protection to an existing erosion protection structure which would otherwise be at immediate risk of failure/collapse.

3. Emergency works where imminent and substantial risk to human life or health exists and can be demonstrated.

In all cases for which maximum funding (90%) is being sought a minimum benefit cost ratio of **1.5** will need to be demonstrated.

Where such studies are not required in the above circumstances any proposed erosion management measures or works for which funding is being sought from OPW will:

(i) require to be justified economically and will require a simplified benefits assessment to be undertaken as outlined on the attached **Schedule B**.

(ii) require to have been designed by a Chartered Engineer with prior experience (minimum of three years) in the design of such coastal erosion management works or measures.

Schedule B must be submitted in conjunction with the Coastal Erosion Application Form.

Schedule A :

Scope & Terms of Reference of Coastal Erosion Risk Management Study

Study Objectives

The study objectives are to undertake a detailed coastal erosion risk management investigation and to develop an appropriate plan to best manage the risks identified to human health and life (social), the environment, cultural heritage and economic activity and to further assess and investigate the feasibility of the management plan option(s) and measure(s) being recommended.

Study Scope and Terms of Reference

1. Review and Assess Existing Information

Undertake a detailed historical review and desk study of all available existing information relating to coastal erosion risk and accretion e.g. topographic and hydrographic surveys, airborne and terrestrial LiDAR surveys, related studies, current and historical maps, charts, aerial photography, databases, environmental designations etc. within and in the immediate vicinity of the coastal cell and study area.

Undertake a detailed review of relevant planning documents including e.g. the National Spatial Strategy, Regional Development, County Development and Town Plans and other Local Area plans related to the Study Area.

Collate, review and assess all such information.

2. Identify Information Gaps & Arrange for Necessary Field Surveys

Based on the review of all relevant existing and historical information any critical information gaps shall be identified and any necessary field surveys (excluding those outlined in section 3 below) required to address such information gaps shall be scoped and specified.

Estimated costs and timescales for acquiring any such critical surveys (e.g. topographic survey, bathymetric survey, trial pit site investigation, sediment sampling or other) shall be prepared together with the necessary contract/tender documentation if so required by the Employer.

Provision shall also be made for the tender evaluation and project management of any such critical surveys, which shall be commissioned by the Employer.

3. Surveys of Existing Coastal Protection Structures and Other Surveys

3.1 General

A walkover survey and inspection of all coastal protection structures and the coastline is to be undertaken along the study frontage by a coastal protection expert(s).

Additionally a geometric survey is to be undertaken of all coastal protection structures and the coastline.

A Visual inspection and assessment is to be made of the existing condition and integrity of these coastal protection structures and an assessment made of their standard of protection with respect to coastal erosion risk. All information recorded is to be entered into a defence asset database.

3.2 Coastal Protection Structures (Defence Asset) Condition Survey

The Consultant shall undertake a condition survey of all coastal protection structures (defence assets) within the Study Area. This survey will include the identification, inspection, photographing and assessment of all coastal erosion defence assets and the entry of all relevant data into the Defence Asset Database.

3.3 Coastal Protection Structures and Coastline Geometric Survey

The Consultant shall specify and manage the procurement, execution, delivery and quality control of a geometric and geo-referenced survey of the coastline in plan and cross-sections and of coastal protection structures that are in, over or adjacent to the Study Area.

The detailed requirements of the coastal protection structures condition and coastline geometric survey including Health & Safety requirements are provided.

4. Assessment of Existing Coastal Processes and Coastline Evolution

Identify and model the typical current scenario (seasonal, annual and extreme) wind, wave and tidal conditions and climates throughout the study area having regard to the existence of some of this information at a strategic level from previous studies (refer ICPSS and related studies).

Identify and model the typical current scenario (seasonal, annual and extreme) sediment transport processes and sediment budget throughout the study area including long-shore, cross-shore and aeolian sediment transport. Identify any natural sediment sources or strategic sediment reservoirs together with sediment transport pathways and sediment sinks.

Identify and model climate change impacts, associated primarily with sea level rise and based on mid range and high end future scenarios (MRFS and HEFS) for each of the above cases including wind, wave, tide and sediment transport.

5. Prepare Detailed Current & Future Scenario Coastal Change Maps

Map in detail the existing and future areas of coastal erosion and accretion (coastal change) throughout the study area based on the existing and future scenario assessments referred to above. These coastal change maps should identify areas of existing erosion and accretion together with areas of anticipated future (mid range and high end) erosion and accretion.

Primary existing and future scenario sediment pathways should also be identified and mapped in each case together with any potential sediment reservoirs.

These maps shall be prepared for two timescales or epochs including 2050 and 2100.

6. Detailed Risk Assessment

A detailed risk assessment of the current and anticipated future vulnerability (for the MRFS & HEFS) of the study area to coastal erosion and accretion shall be undertaken over two timescales including 2050 and 2100.

Based on the extent of areas at risk from coastal change as shown on the coastal change maps, the risk assessments shall quantify the risk in terms of human health and life (social), environment, cultural heritage, economics and infrastructure.

The risk assessment shall have regard to the presence and condition of any existing coastal protection structures.

7. Preliminary Environmental Assessment & Consultation

Undertake a **preliminary environmental assessment** within the study area and of adjacent coastal areas likely to be impacted upon by any proposed measures or options. This preliminary assessment should be sufficient to describe the existing environment, and furthermore assess in a preliminary way the likely impact of any proposed plan or coastal protection measures within and without the study area. It should include the identification of any important or significant environmental designations, habitats, cultural heritage or issues. It should also identify any environmental opportunities or constraints.

It should identify the need for any further environmental assessments or impact statements e,g. Strategic Environmental Assessment (SEA) in accordance with the SEA Directive 2001/42/EC, Environmental Impact Assessment (EIA) in accordance with EIA Directive 85/337/EEC, Appropriate Assessment (AA) in accordance with Habitats Directive 92/43/EEC and in accordance with their associated Amendments and Irish Regulations. If so required it shall also include for undertaking a screening and scoping of any such further assessments

Preliminary consultation with relevant stakeholders who are likely to have an interest in the proposals arising out of the study or who might be impacted upon by the recommendations of the study should be undertaken.

8. Options & Feasibility Assessment

Based on the outcome of the above elements of the study, a detailed options assessment shall be undertaken to investigate appropriate and alternative options and measures to best manage the risks associated with coastal erosion and accretion. Options and measures for short (year 2020), medium (year 2050) and long-term (year 2100) management should be considered.

All possible options and measures (both structural and non-structural) shall be considered together with the associated policy implications. In particular the 'Do nothing' and 'Do minimum' options should be fully investigated together with their implications.

Thereafter, further policy options and associated measures should be fully investigated including 'Hold the line', 'Advance the line' and 'Managed re-alignment' together with their implications.

All options shall be assessed and scored on a Multi-Criteria Analysis (MCA) basis, which shall include the following criteria: human health and life (social), the environment, including cultural heritage, economic activity and infrastructure.

The feasibility of all options and measures shall be assessed and outlined in detail having regard to the above MCA and all other considerations.

9. Preparation of Coastal Erosion Risk Management Plan

Based on the above risk, options, feasibility and environmental assessments an appropriate **coastal erosion risk management plan** shall be developed which shall identify the preferred option(s) and measure(s) to best manage the risks identified to human health and life (social), the environment, cultural heritage, economic activity and infrastructure.

The plan should establish appropriate objectives for the management of coastal erosion and accretion risk and focus on the reduction of the potential adverse consequences of coastal erosion and accretion for human health and life (social), the environment, cultural heritage, economic activity and infrastructure. Detailed consideration should also be given to non-structural and risk reduction measures.

The plan shall include outline drawings in respect of the proposed preferred coastal erosion and accretion risk management option(s) and measure(s) sufficient to support application for statutory consents or any necessary consultation. The plan shall also identify the required statutory consents and processes that apply to the preferred option(s) and measure(s) having regard to title and ownership of lands and all relevant legislation.

The feasibility of the preferred option(s) and measure(s) shall be investigated and their selection shall be based on a Multi-Criteria Analysis.

Following preparation of the coastal erosion risk management plan, an assessment shall be made of any potential conflicts between this plan and that of any existing strategy documents and plans including the National Spatial Strategy, Regional Development, County Development and Local Town or Area Plans. Any such conflicts shall be clearly highlighted.

10. Economic Assessment of Benefits & Costs

A detailed assessment of the economic benefits associated with the preferred option(s) and measure(s) shall be undertaken. This shall be based on the methodology outlined in the current Flood Hazard Research Centre (FHRC) publication The Benefits of Flood & Coastal Risk Management: A Manual of Assessment Techniques and associated Handbook or an equivalent methodology.

A detailed assessment of the costs associated with the preferred option(s) and measure(s) shall also be undertaken and shall include both initial capital and future maintenance costs over the design life of the preferred option(s) or scheme.

11. Reporting

Submit early project inception report based on outcome of sections 1 and 2 work.

Submit survey report following completion of section 3 work.

Submit interim report 1 following completion of section 4 to 6 work.

Submit interim report 2 following completion of section 7 & 8 work.

Submit draft final report following completion of remaining work section.

All such reports to be issued in final form following incorporation of Employer or Steering Group comments, which shall be issued within 3 weeks of receipt of draft reports.

All final reports to be issued in both hard copy and digital formats.

Schedule B:

Simplified Method for Calculation of Benefits associated with Minor Erosion Risk Management Schemes, where no Coastal Erosion Risk Management Study is being undertaken.

Key Points to Note

(iii) Erosion (in contrast to flooding) is effectively irreversible and therefore results in the permanent loss of use of affected property, land and/or assets.

(iv) Erosion prevention measures in the form of coastal protection works normally have a finite life and therefore the benefit from such schemes should be seen as a temporary (albeit often lengthy) extension of the useful life of the affected property, land and/or assets.

(v) Decisions about investment in erosion prevention measures should start with a realistic evaluation of the 'do nothing' option and also consideration of the long-term sustainability of any proposed erosion prevention measures or schemes.

(vi) For scheme benefit assessment estimates are needed of **annual average erosion rates** and **coastline recession** (erosion contours) projected for typically 50 years into the future or for the anticipated design life of the scheme if different. Additional required information includes the market freehold value (exclusive of erosion risk) of the property/land/assets at risk and current discount rate. The discount rate is subject to change but is presently 4%.

(vii) The principal benefits arise by delaying the loss of property, land and/or assets due to erosion for the duration of the life of the proposed scheme. The method of benefit calculation is generally referred to as the discounted erosion delay factor method.

(viii) The benefits associated with any future or planned development or possible regeneration of sea frontages should be excluded from the assessment. Only existing property, land and/or assets at risk should be taken into account in the benefits assessment.

(ix) It is important to note that existing coastal protection works, which are proposed to be replaced by new works, should not be included as a benefit although any assets being protected by existing works or scheme, e.g. a promenade, may be included as a benefit.

(x) The loss of infrastructure integral to the properties at risk from erosion e.g. power, phone, gas utilities and local access roads should not be included as an additional benefit. Where infrastructure is providing a service to an area free from erosion, but is itself threatened by erosion, then it should be included as a benefit in the form of provision of a least cost alternative.

(xi) In respect of the loss of agricultural land, the current market value should be used together with a multiplier to capture the subsidy value of the land. A multiplier of 65% should thus be used.

Methodology

The simple methodology for calculating the economic benefits or Nett Present Value of Benefits for minor coastal erosion prevention schemes are outlined below in 3 steps.

Step 1: Collect Relevant Data, Estimate Erosion Rates and Contours
Identify and outline the extent of coastline affected by erosion from a site inspection and careful review of all relevant available information (historical aerial photography, beach photographic and topographic surveys, maps, charts etc). Estimate the annual average rate(s) of erosion. Prepare erosion contours at regular time intervals, typically 5 years, for a period of at least the expected design life of the scheme. Use smaller time intervals for high erosion rates (> 1.5 m/year).

Step 2: Collect Valuation Data for Properties and Assets at Risk
Identify and tabulate all erosion prone property, land and/or assets in the erosion prone area over the design life of the scheme.

Determine or estimate the current erosion-free market value (MV) of each erosion-prone property, land area and/or assets and their expected year of loss to erosion both with and without the proposed scheme. Allow a safety margin of typically 2 years to determine the time of loss (year) of the particular property, land and/or assets.

In the case where a property or asset is not accessible or useable due to prior loss of access or utilities from erosion then the time of loss of this property or asset may be thus brought forward.

Step 3: Calculate the Nett Present Value of Scheme Benefits
The methodology involves the calculation of the discounted value of property, land and/or asset losses with erosion protection less those without a protection scheme. The result is a Nett Present Value of Benefits associated with the proposed scheme.

The calculation of such benefits may be carried out using the equations and method shown on Table 1 and as outlined below. The greater the life of the scheme, the greater the benefit, although losses further into the future are discounted more so than those in the shorter term.

The properties, land and/or assets at risk from erosion identified in Step 2 are listed in column 1 of Table 1, together with their current market value (column 2) and estimated time to loss, in years, both with and without erosion protection scheme (columns 4 and 3 respectively). Once this information (shown green on Table 1) is available, the calculation of benefits is easily carried out using equations 1 to 3 shown below.

Equation 1 is used to calculate the Present Value of Benefits without a scheme (PVb1) whilst equation 2 allows the Present Value of Benefits with a scheme (PVb2) to be calculated. The difference between these two benefits is the resultant Nett Present Value of Benefits (NPVb).

The NPVb may be used to compare directly with the estimated scheme costs (both capital and maintenance) to derive an overall project Benefit /Cost ratio.

Table 1: Sample of Benefit Assessment Tabulation & Calculation
(An Excel version of this table is available to facilitate calculations)

	1	2	3	4	5	6	7	8
Ref	Property/Asset	Current Market Value of Property/Asset	Time to Loss in years (p)	Time to Loss in years (p + s)	Present Value of Benefits (PVb 1)	Present Value of Benefits (PVb 2)	Equation 1 Multiplier 1 - 1 / ((1+ r)^ p))	Equation 2 Multiplier 1 - 1 / ((1+ r)^ (p + s)))
		(MV)	(No Scheme)	(Scheme)	(No Scheme)	(Scheme)	(No Scheme)	(Scheme)
1	House A	220,000	4	54	31,943	193,538	0.145	0.880
2	House B	200,000	7	57	48,016	178,614	0.240	0.893
3	Mobile Homes	10,000	10	60	3,244	9,049	0.324	0.905
4	Public House	800,000	15	65	355,788	737,494	0.445	0.922
5	Asset A	220,000	25	75	137,474	208,388	0.625	0.947
6	Asset B	190,000	45	95	157,472	185,423	0.829	0.976
7	Other							
8	Other							
	PVb 1 (No Scheme)				733,939			
	PVb 2 (With Scheme)					1,512,506		
	NPVb (PVb 2 minus PVb 1)					778,567		

Notes:
1. ' p ' = Time to loss of Property/Asset (years)
2. ' s ' = Scheme Design Life (years)
3. ' r ' = Discount Rate
4. MV = Current Market Value of Property / Asset at risk
5. PVb 1 = Present Value of Benefits (No Scheme)
6. PVb 2 = Present Value of Benefits (Scheme)
7. NPVb = Nett Present Value of Benefits

Equations:
Equation 1 : PVb 1 = MV * (1 - (1 / (1 + r) ^ p))
Equation 2 : PVb 2 = MV * (1 - (1 / (1 + r) ^ (p + s)))
Equation 3 : NPVb = PVb 2 - PVb 1

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