Eastern & Midland
Regional Assembly

Draft Regional Spatial & Economic Strategy

Regional Flood Risk Appraisal Report

Tionscadal Éireann
Project Ireland
2040

Tionól Reigiúnach Oirthir agus Lár-Tíre
Eastern and Midland Regional Assembly

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1 INTRODUCTION

This Regional Flood Risk Appraisal (RFRA) has been prepared as part of the Strategic Environmental Assessment of the Eastern & Midland Regional Spatial and Economic Strategy (RSES) in accordance with national and EU legislation. This RFRA was prepared by considering the requirements of The Planning System and Flood Risk Assessment Guidelines for Planning Authorities (2009) and Circular PL02/2014 (August 2014).[1] The purpose of this RFRA is to ensure that the RSES follow the principles of the Guidelines and implements policies and development strategies that:

- Avoid inappropriate development in areas at risk of flooding, unless there are proven wider sustainability grounds that justify appropriate development and where the flood risk can be reduced or managed to an acceptable level;
- Avoid developments increasing flood risk elsewhere;
- Adopt a sequential approach to flood risk management when assessing the location for new development based on avoidance, reduction and mitigation of flood risk;
- Avoid unnecessary restriction of national, regional or local economic and social growth;
- Incorporate flood risk assessments into the planning process;
- Improve the understanding of flood risk among relevant stakeholders; and
- Ensure that the requirements of EU and national law in relation to the natural environment and nature conservation are complied with at all stages of flood risk management.

The Eastern and Midland Regional Assembly (EMRA) is currently preparing the Eastern and Midland RSES. The main statutory purpose of the RSES is to support the implementation of *Project Ireland 2040 – the National Planning Framework* (hereafter referred to as the NPF), and the economic policies and objectives of the Government by providing a long-term strategic planning and economic framework for the development of the region. The Eastern and Midland RSES is a strategic plan which identifies regional assets, opportunities and pressures and will provide appropriate policy, objective and target responses. It will put in place policies and recommendations that will better manage regional planning and economic development throughout the region.

1.1 BACKGROUND

Under the 2012 Government's policy paper "*Putting People First*", and the Local Government Reform Act 2014, the former two Regional Assemblies (RAs) and former eight Regional Authorities were reconfigured into three new RAs, namely the EMRA, the Southern Regional Assembly (SRA), and the Northern and Western Regional Assembly (NWRA). The main strategic planning functions of the RAs include the preparation and adoption of RSESs.

At a national level, the NPF replaces the National Spatial Strategy, first published in November 2002, and will form Ireland's long-term strategy for the next 20 years which will set the groundwork for the spatial and economic development of Ireland. The NPF lays the groundwork for a better quality of life for all and a basis for balanced and sustainable economic growth. It provides a focal point for spatial plans throughout the planning hierarchy, including the RSESs at the regional tier, and will assist in the achievement of more effective regional development. It will also coordinate the strategic planning of urban and rural areas in a regional development context to secure overall

[1] The Planning System and Flood Risk Assessment Guidelines for Planning Authorities (2009) and Circular PL02/2014 (August 2014) hereafter will be referred to as 'the Guidelines'

proper planning and development as well as co-ordination of the RSESs. **Figure 1-1** shows Ireland's planning hierarchy.

The current Regional Planning Guidelines (RPGs) have been a key aspect of the Government's programme for spatial planning to date. New planning legislation under the Planning and Development Act 2000 (as amended) allows for the RSESs to replace the RPGs. The regional planning function will therefore be enhanced under the new RSESs through the inclusion of a significant economic strategy. The combined spatial and economic elements will establish a broad framework to allow for integrated local authority policy development and associated actions, outline the roles of government departments and other agencies, and to strengthen and clarify the role of local authorities in economic development and enterprise support/ promotion.

The Eastern and Midland RSES shall be prepared and adopted in accordance with the provision of Chapter III of Part II of the Planning and Development Act, 2000 (as amended).

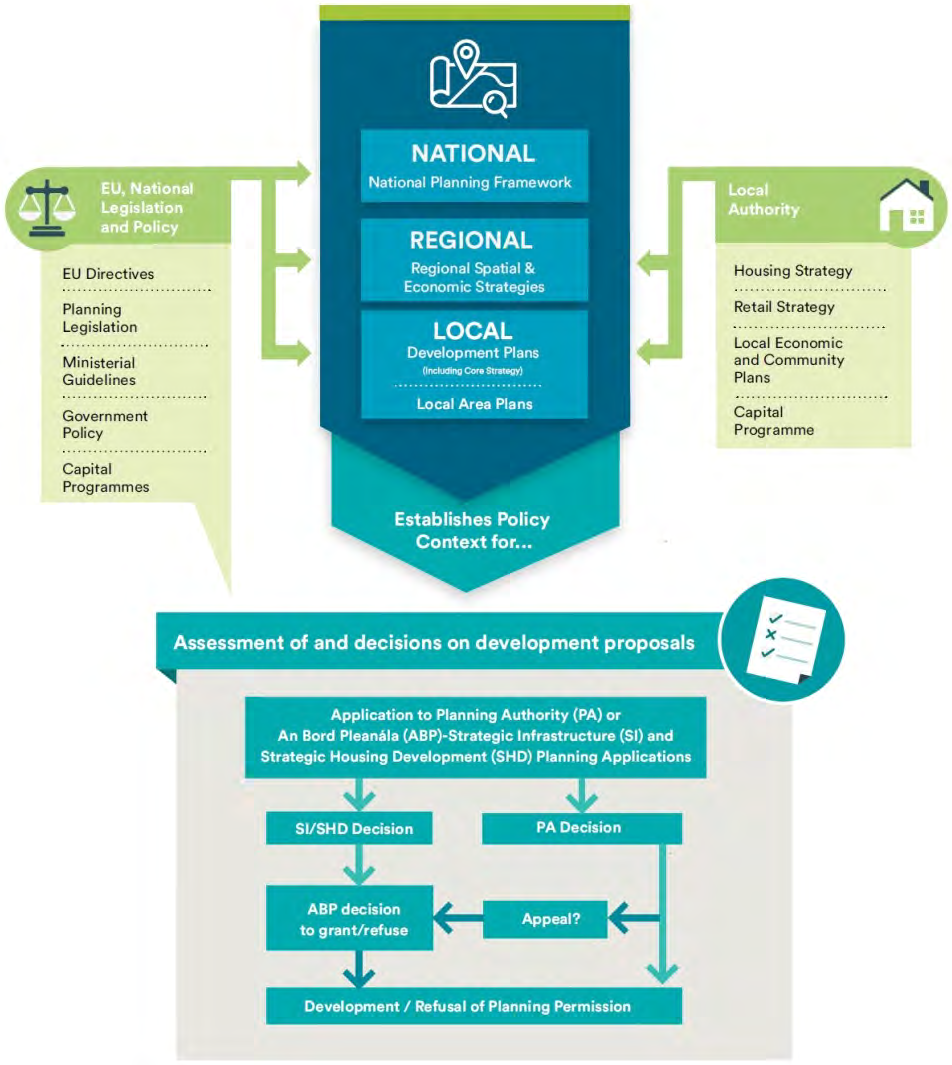


Figure 1-1 – Irish Planning System an Overview[2]

[2] DHPLG (February 2018) Project Ireland 2040 – National Planning Framework

1.2 RFRA INTEGRATION WITH THE RSES

Increased flood risk as a result of land use planning has, above all else been one of the most costly (environmental, social and economic) legacy issues of previous national, regional and local land use decisions. The policies being proposed in the RSES to the 2040 horizon envisage significant population and economic growth. Subsequently, the RFRA provides a high level review of the known existing flood risk to the growth settlements in the geographic area of EMRA as identified in **Table 4-1** (see **Chapter 4** below) and an assessment of the potential flood risk impacts associated with the key messages of the 10 Chapters of Ireland 2040 to ensure EMRA makes informed strategic planning decisions in respect of the RFRA.

1.3 POLICY BACKGROUND

1.3.1 Irish Legislation

In 2004 an Inter-Departmental Review Group, led by the Minister of State at the Dept. of Finance with special responsibility for the Office of Public Works (OPW), published a review of national flood policy. The scope of the review included a review of the roles and responsibilities of the different bodies with responsibilities for managing flood risk, and to set a new policy for flood risk management in Ireland into the future.

The adopted policy was accompanied by many specific recommendations, including:

- The Department will develop and implement policy and guidelines on the consideration of flood risk in planning and development control;
- The OPW should be the lead agency for implementing flood risk management policy in Ireland;
- Focus on managing flood risk, rather than relying only flood protection measures aimed at reducing flooding;
- Taking a catchment-based approach to assess and manage risks within the whole-catchment context; and
- Being proactive in assessing and managing flood risks, including the preparation of flood maps and flood risk management plans.

To meet the requirements of these recommendations the OPW published The Planning System and Flood Risk Assessment Guidelines for Planning Authorities (The Guidelines) in 2009 and developed the National Catchment Flood Risk Assessment and Management (CFRAM) Programme. The Guidelines were developed with the purpose of integrating flood risk assessment and management into spatial planning development plans and policies at all governmental levels. The CFRAM programme was developed to deliver on other core components of the national flood policy as well as the requirements of the 2011 EU Floods Directive (2007/60/EC) which were transposed into Irish Law under Statutory Instrument 122 of 2010.

In compliance with the Directive and the Planning and Development (Strategic Environmental Assessment) Regulations 2004, as amended, a Strategic Environmental Assessment (SEA) of the RSES has been carried out in parallel to this RFRA. The SEA has prepared an Environmental Report of the likely significant effects on the environment of implementing the strategy. A Natura Impact Report

has also been prepared as part of the Appropriate Assessment of the RSES, in compliance with the Birds and Natural Habitats Regulations 2011, as amended.

The Environmental Protection Agency (EPA) SEA Scoping Guidance Document outlines that the SEA should adopt policies to avoid and restrict the zoning of lands in flood prone areas. It should also adopt a policy that requires flood risk assessments, prepared in accordance with the Guidelines, to be undertaken for developments and zoning being proposed in flood prone areas. Additionally the SEA should promote the adaptation measures to account for the likely increased risk of flooding due to Climate Change and include measures to promote the implementation of appropriate Sustainable Urban Drainage Systems (SuDS).

1.3.2 European Legislation

Under the Floods Directive, the EU recognises the importance of land use management and spatial planning as a key tool in flood risk management. The Floods Directive requires Member States to prepare catchment-based Flood Risk Management Plans (FRMPs) that will set out flood risk management objectives, actions and measures. The OPW has developed six regional FRMPs which were approved and published in May 2018.

The delivery of the Floods Directive is being coordinated with the requirements of the EU Water Framework Directive (WFD) (2000/60/EC). The WFD aims to improve the overall quality of the water environment including rivers, groundwater and coastal waters. This process is being delivered through the development of River Basin Management Plans (RBMPs) to enable all rivers and coastal waters to achieve good ecological status. The delivery of the RBMPS will ultimately bring a sustainable integrated catchment management to the rivers of Ireland and across the EU.

Similarly the integration of the RFRA within the SEA for the RSES is derived from the EU SEA Directive (2001/42/EC) legislation.

1.4 DISCLAIMER

The RFRA has been prepared in compliance with the Guidelines. It should be noted that the RFRA is based on the best available data at the time of preparation.

All information in relation to flood risk is provided for general policy guidance only. All landowners and developers are instructed that EMRA and their consultants can accept no responsibility for losses or damages arising due to assessments of the vulnerability to flooding of lands, uses and developments. Furthermore owners, users and developers are advised to take all reasonable measures to assess the vulnerability to flooding of lands in which they have an interest prior to making planning or development decisions.

The flood maps used in the RFRA are ‘predictive’ flood maps, as they provide predicted flood extents and other information for flood events that has an estimated probability of occurrence rather than information on floods that have occurred in the past.

EMRA makes no representations, warranties or undertakings about any of the information provided on these maps including, without limitation, their accuracy, their completeness or their quality or fitness for any particular purpose. To the fullest extent permitted by applicable law, EMRA nor any

of its members, officers, associates, consultants, employees, affiliates, servants, agents or other representatives shall be liable for loss or damage arising out of, or in connection with, the use of, or the inability to use, the information provided on the flood maps including, but not limited to, indirect or consequential loss or damages, loss of data, income, profit, or opportunity, loss of, or damage to, property and claims of third parties, even if EMRA has been advised of the possibility of such loss or damages, or such loss or damages were reasonably foreseeable.

EMRA reserves the right to change the content and/ or presentation of any of the information provided on the flood maps at its sole discretion, including these notes and disclaimer. This disclaimer, guidance notes and conditions of use shall be governed by, and construed in accordance with, the laws of the Republic of Ireland. If any provision of these disclaimer, guidance notes and conditions of use shall be unlawful, void or for any reason unenforceable, that provision shall be deemed severable and shall not affect the validity and enforceability of the remaining provisions.

2 CONTENTS AND MAIN OBJECTIVES OF THE PLAN

2.1 RESPONSIBLE AUTHORITY FOR THE EMR

The lead authority for the preparation of the Eastern and Midland RSES is the EMRA. The Eastern and Midland RSES itself will cover the geographic area of the EMRA, which includes the administrative areas of twelve local authorities: Longford, Westmeath, Offaly, Laois, Louth, Meath, Kildare, Wicklow, Fingal, South Dublin and Dún Laoghaire-Rathdown County Councils and Dublin City Council. There are also sub-regional planning functions through three Strategic Planning Areas (SPA) namely the Midland, Eastern and Dublin SPAs; see **Figure 2-1**.

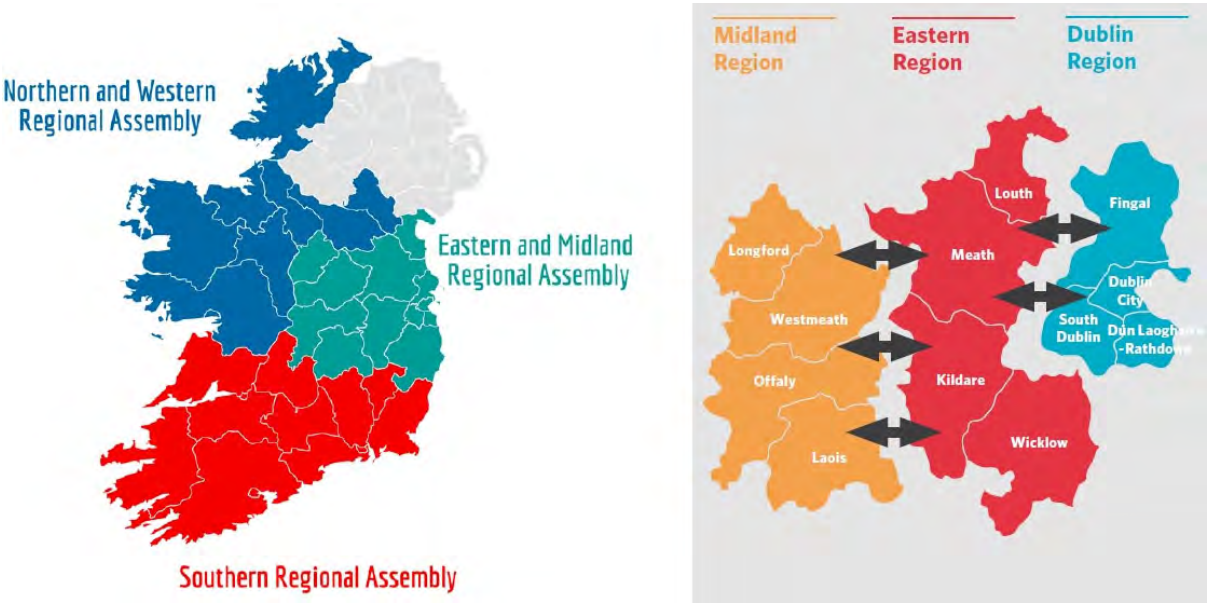


Figure 2-1 – Regional Assemblies and the Eastern and Midland Region[3]

2.2 REQUIREMENT FOR AN RSES

One of the principle functions of the Eastern and Midland RSES will be to practically support and advance the delivery of the national policy objectives contained in the NPF. The EMRA will bring forward the NPF in a manner which best reflects the challenges and opportunities of the region. It has been anticipated by the NPF that each of the three regional assemblies will begin to fill out the national policy objectives, in some cases giving them geographic or temporal context and in other cases elaborating on project concepts. The Eastern and Midland RSES will support the delivery of the NPF, removing the top-down perception and replacing it with a shared responsibility and understanding.

[3] EMRA (November 2017) Consultation Issues Paper

2.3 GEOGRAPHIC SCOPE

As one of the three Regional Assemblies in Ireland, the EMRA has a land area of almost 14,500 km^2 and contains almost half of the Ireland's 4.6 million inhabitants (approximately 816,000 households). The Irish Sea forms the eastern boundary of the area. To the south, Wicklow forms the border with Wexford and Carlow in the Southern Region; Laois, Offaly, Westmeath, Meath and Longford lie to the west, forming the boundary with the Northern &and Western Region and Louth forms the boundary with Northern Ireland to the north. **Figure 2-2** below shows EMRA settlement strategy map.

Figure 2-2 – EMRA Settlement Strategy Map

2.4 STRATEGIC VISION FOR THE EMR

The vision statement for the Eastern and Midlands RSES is to: "*create a sustainable and competitive region that supports the health and wellbeing of our people and places, from urban to rural, and ensures access to affordable housing, travel and employment opportunities for all* ".

The place or environment in which people live or work has a profound impact on the health of people. The region contains some of the fastest growing communities in the country and the long-term trend is for residential development moving further outwards from Dublin, with significant growth in many of the small towns and villages in the peri-urban area surrounding the city leading to an increase in car-based long-distance commuting. At the same time an overall lack of adequate housing supply to meet a growing population has resulted in affordability issues and increasing homelessness, with a resulting negative impact on quality of life and regional competitiveness.

One of the key challenges facing the region is the need for better alignment between population growth, location of residential development and employment to create healthy and attractive places, and this is reflected in the Vision Statement, which was developed in collaboration with elected member and regional stakeholders.

The Eastern and Midlands RSES is underpinned by key cross-cutting principles that reflect the three pillars of sustainability: Social, Environmental and Economic and expressed in a manner which best reflects the challenges and opportunities of the region through three key principles;

1. **Healthy Place making**

To promote people's quality of life through the creation of healthy and attractive places to live, work, visit and study in.

2. **Climate Action**

The need to enhance climate resilience and to accelerate a transition to a low carbon economy recognising the role of natural capital and ecosystem services in achieving this.

3. **Economic Opportunity**

To create the right conditions and opportunities for the region to realise sustained economic growth and employment that ensures good living standards for all.

2.5 KEY ASPECTS OF THE DRAFT EMR RSES

The RSES seeks to determine at regional scale how best to achieve the shared goals set out in the National Strategic Outcomes (NSOs) of the NPF. To this end, the draft Strategy sets out 16 Regional Strategic Outcomes (RSOs), which are aligned with international, EU and national policy and which in turn set the framework for City and County Development Plans, in turn the RSES can assist Local Authorities in aligning with EU priorities to leverage funding and partnership opportunities. The 15 RSO's are also cross referenced and aligned with the 3 key principles of the RSES and have been developed in iteration with the Strategic Environmental Objectives of the parallel Environmental Assessment processes.

1. **Sustainable settlement patterns**
   Better manage the sustainable and compact growth of Dublin as a city of international scale and develop Athlone, Dundalk-Drogheda and a number of key complementary growth settlements of sufficient scale to be drivers of regional growth. (NSO 1, 7, 10)

2. **Compact Growth and Urban Regeneration**
   Promote the regeneration of our cities, towns and villages by making better use of under-used land and buildings within the existing built-up urban footprint and to drive the delivery of quality housing and employment choice for the Region's citizens. (NSO 1)

3. **Rural communities**
   Support sustainable rural development by managing urban generated growth in areas under strong urban influence and by encouraging sustainable growth in areas that have experienced decline or stagnation. (NSO 1, 3)

4. **Healthy Communities**
   Support the protection of the healthy natural environment to ensure clean air and water for all, and the provision of quality healthcare and services that support human health. (NSO 10)

5. **Creative places**
   Enhance, integrate and protect our arts, culture and heritage assets to promote creative places and heritage led regeneration. (NSO 5, 7)

6. **Integrated Transport and Land Use**
   Promote best use of Transport Infrastructure, existing and planned and promote sustainable and active modes of travel to ensure the proper integration of transportation and land use planning. (NSO 2, 6, 8, 9)

7. **Sustainable Management of Water, Waste and other environmental resources**
   Conserve and enhance our water resources to ensure clean water supply, adequate waste water treatment and greater resource efficiency to realise the benefits of the circular economy. (NSO 8, 9)

8. **Build Climate Resilience**
   Ensure the long-term management of flood risk and build resilience to increased risks of extreme weather events, changes in sea level and patterns of coastal erosion to protect property, critical infrastructure and food security in the Region. (NSO 8, 9)

9. **Support the Transition to Low Carbon and Clean Energy**
   Pursue climate mitigation in line with global and national targets and harness the potential for a more distributed renewables-focussed energy system to support the transition to a low carbon economy by 2050. (NSO 8, 9)

10. **Enhanced Green Infrastructure**
    Identify, protect and enhance Green Infrastructure and ecosystem services in the Region and promote the sustainable management of strategic natural assets such as our coastlines, farmlands, peatlands, uplands woodlands and wetlands. (NSO 8, 9)

11. **Biodiversity and Natural Heritage**
    Promote co-ordinated spatial planning to conserve and enhance the biodiversity of our protected habitats and species including landscape and heritage protection. (NSO 7, 8)

12. **A Strong Economy supported by Enterprise and Innovation**
    To build a resilient economic base and promote innovation and entrepreneurship ecosystems that support smart specialisation, cluster development and sustained economic growth. (NSO 5,10)

13. **Improve Education Skills and Social Inclusion**
    To improve education and develop the right skills to attract employers, retain talent and promote social inclusion to ensure opportunities for quality jobs across the Region. (NSO 5, 10)

14. **Global City Region**
    Promote Dublin as a global city region and protect and enhance international connectivity, including ports and airports and promote the Region as a gateway to Ireland. (NSO 6)

15. **Enhanced Regional Connectivity**
    Develop and enhance regional accessibility between key regional growth centres to build economic resilience and support strengthened rural communities and economies including the blue-green economy and tourism. (NSO 2, 3, 6)

16. **Collaboration Platform**
    Provide a regional framework for collaboration and partnerships and to support local and regional bodies in leveraging funding and partnership opportunities. (NSO 2, 3, 5)

3 THE PLANNING SYSTEM AND FLOOD RISK ASSESSMENT GUIDELINES FOR PLANNING AUTHORITIES

3.1 PURPOSE OF THE GUIDELINES

In 2009 the Department in conjunction with the OPW published The Guidelines with the purpose of ensuring that flood risk is considered by all levels of government when preparing development plans and planning guidelines. The Guidelines are the key document in the integration of the flood risk management best practice and land use planning decisions. They are required to be used at all levels of the planning process from national level strategic assessments to individual planning applications being brought forward. The Guidelines require the planning system at all governance levels to:

- Avoid development in areas at risk of flooding, unless there are proven wider sustainability grounds that justify appropriate development and where the flood risk can be reduced or managed to an acceptable level without increasing flood risk elsewhere;
- Adopt a sequential approach to flood risk management when assessing the location for new development based on avoidance, reduction and mitigation of flood risk; and
- Incorporate flood risk assessment into the process of making decisions on planning applications and planning appeals.

Therefore it is incumbent on the Regional Assemblies to introduce strategies and polices that implement the Guidelines and follow the core principles of avoidance in so far as possible without hindering justifiable development and to the adopt the sequential approach when identifying development areas for growth. The Guidelines are not in place to stunt or limit development strategies but to ensure that they are sustainable and limit the exposure of communities and businesses to flood risk.

3.2 OBJECTIVES OF THE GUIDELINES

The objectives of the Guidelines are implemented by undertaking Flood Risk Appraisals / Assessments (FRA) to identify the risk of flooding to land, property and people. The Guidelines state that FRAs should be carried out at different scales by government organisations, local authorities and for proposed developments appropriate to the level of information required to implement the core objectives of the Guidelines. The FRA scales are:

- National Flood Risk Appraisal (NFRA) – There is no specific guidance in the Guidelines for a NFRA, however it must ensure the Guidelines are applied to policies, strategies and objectives and that flood risk is addressed in a national context
- Regional Flood Risk Appraisal (RFRA) – a broad overview of flood risk issues across a region to influence spatial allocations for growth in housing and employment as well as to identify where flood risk management measures may be required at a regional level to support the proposed growth. This should be based on readily derivable information (in particular the CFRAM Studies) and undertaken to inform the Regional Spatial and Economic Strategies.
- Strategic Flood Risk Assessment (SFRA) – an assessment of all types of flood risk informing land use planning decisions. This will enable the Planning Authority to allocate appropriate sites for development, whilst identifying opportunities for reducing flood risk. The SFRA will

revisit and develop the flood risk identification undertaken in the RFRA, and give consideration to a range of potential sources of flooding. An initial flood risk assessment, based on the identification of Flood Zones, will also be carried out for those areas, which will be zoned for development. Where the initial flood risk assessment highlights the potential for a significant level of flood risk, or there is conflict with the proposed vulnerability of development, then a site specific FRA will be recommended, which will necessitate a detailed flood risk assessment.

- Site Specific Flood Risk Assessment (SSFRA) – site or project specific flood risk assessment to consider all types of flood risk associated with the site and propose appropriate site management and mitigation measures to reduce flood risk to and from the site to an acceptable level. If the previous tiers of study have been undertaken to appropriate levels of detail, it is highly likely that the site specific FRA will require, detailed channel and site survey, and hydraulic modelling.

Figure 3-1 below shows Figure 1.1 of the Guidelines which summarises the levels of FRAs and how they integrate into the planning process. For the purposed of this assessment which is a RFRA the main decision making tool is the sequential approach.

Policy Documents / Instruments	Flood Risk Assessment Technique	Decision-making Tools
National Spatial Strategy, National Planning Guidelines	Flood Risk Management Guidelines	n/a
Regional planning guidelines	Regional Flood Risk Appraisal, Catchment Flood Risk Management Plans	Sequential approach, Strategic Environmental Assessment
City / county development plan	Strategic Flood Risk Assessment, Catchment Flood Risk Management Plans	Sequential approach, dev. plan Justification Test, SEA
Local area plan	Strategic Flood Risk Assessment	Sequential approach, dev. plan Justification Test, SEA
Master plan, non-statutory plan, site brief	Site-specific Flood Risk Assessment	Sequential approach, dev. plan Justification Test, SEA / Env. Impact Assessment
Planning application	Site-specific Flood Risk Assessment	Sequential approach, dev. management Justification Test, EIA

Figure 3-1 – Flood risk management and the planning system

3.3 FLOOD RISK ASSESSMENT APPROACH

The Guidelines recommend that Flood Risk Assessments (FRA) be carried out to identify the risk of flooding to land, property and people. FRAs should use the Source-Pathway-Receptor (S-P-R) Model to identify the sources of flooding, the flow paths of the floodwaters and the people and assets impacted by the flooding. **Figure 3-2** shows the SPR model that should be adopted in FRAs.

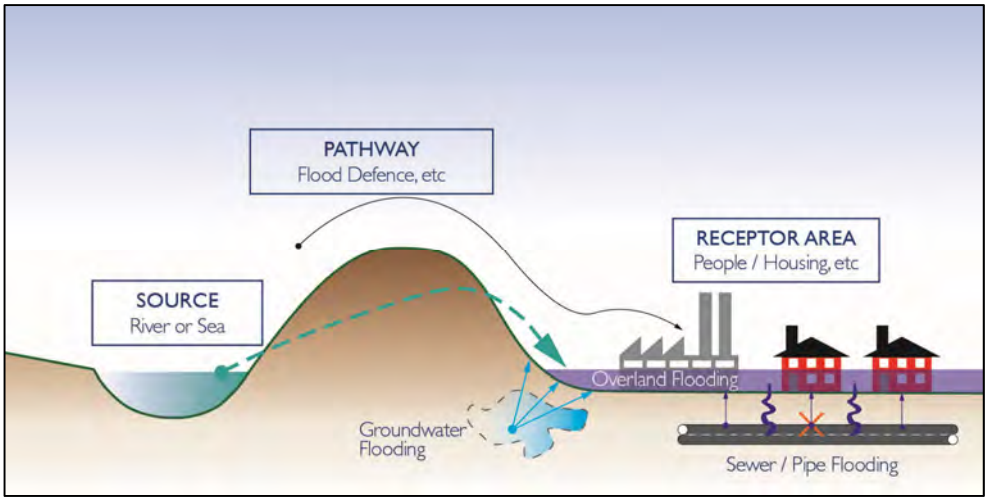


Figure 3-2 – Flood Risk Assessment Source - Pathway - Receptor Model

FRAs in general terms are carried out using a staged approach, an appraisal and / or assessment is carried out as is needed for the purposes of decision-making at the appropriate governance level. The stages of appraisal and assessment are:

Stage 1 Flood risk identification – to identify whether there may be any flooding or surface water management issues related to either the area of RPGs, development plans and LAP's or a proposed development site that may warrant further investigation at the appropriate lower level plan or planning application levels;

Stage 2 Initial flood risk assessment – to confirm sources of flooding that may affect a plan area or proposed development site, to appraise the adequacy of existing information and to scope the extent of the risk of flooding which may involve preparing indicative flood zone maps. Where hydraulic models exist the potential impact of a development on flooding elsewhere and of the scope of possible mitigation measures can be assessed. In addition, the requirements of the detailed assessment should be scoped; and

Stage 3 Detailed flood risk assessment – to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development or land to be zoned, of its potential impact on flood risk elsewhere and of the effectiveness of any proposed mitigation measures.

3.4 SEQUENTIAL APPROACH

A key aspect of ensuring the Guidelines are applied to all levels of the planning process is the Sequential Approach. As outlined in **Figure 3-3**, the approach recommends the principle of "Avoid" areas of flood risk as a first consideration but if not possible then "Substitute" a different land use that is less vulnerable to the effects of flooding. When both avoidance or substitution are not a practical approach then a robust Justification Test (refer to the Guidelines for a more detailed description on the Justification Test) should be undertaken to quantify and mitigate any potential increase in risk and facilitate the development of the area. The Sequential Approach is required to be applied at all levels of the planning process including the development of the RSES.

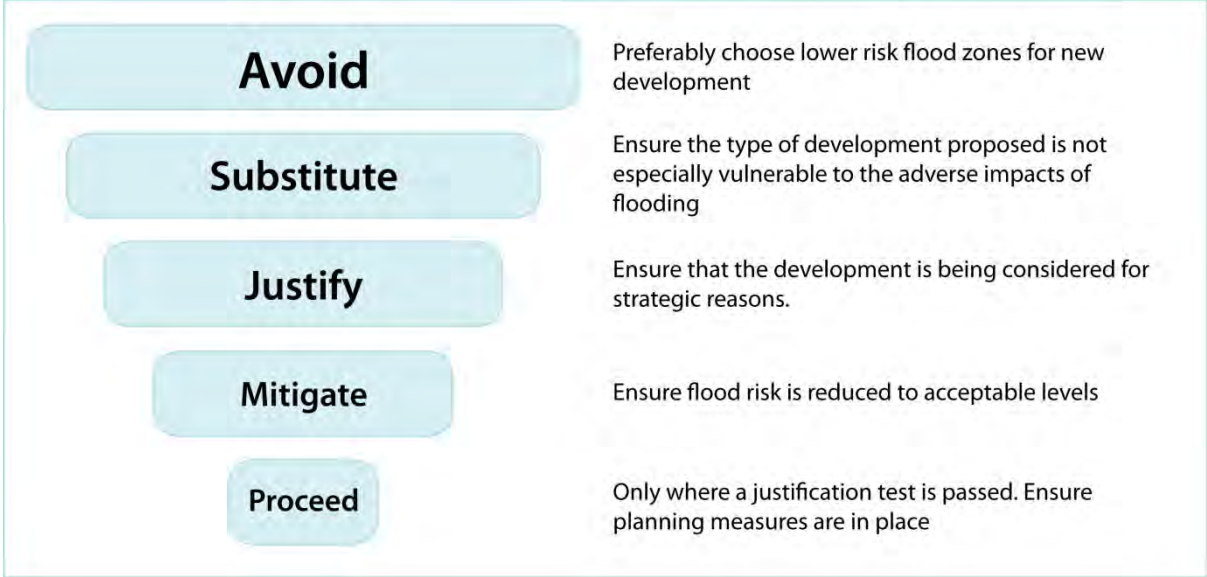


Figure 3-3 – Sequential approach principles in flood risk management

3.5 TYPES OF FLOODING

Flooding can occur from a range of sources, individually or in combination, as described below.

- Fluvial flooding occurs when rivers and streams break their banks and water flows out onto the adjacent low-lying areas (the natural floodplains). This can arise where the runoff from heavy rain exceeds the natural capacity of the river channel, and can be exacerbated where a channel is blocked or constrained or, in estuarine areas, where high tide levels impede the flow of the river out into the sea. While there is a lot of uncertainty on the impacts of climate change on rainfall patterns, there is a clear potential that fluvial flood risk could increase into the future.
- Pluvial flooding occurs when the amount of rainfall exceeds the capacity of urban storm water drainage systems or the infiltration capacity of the ground to absorb it. This excess water flows overland, ponding in natural or man-made hollows and low-lying areas or behind obstructions. This occurs as a rapid response to intense rainfall before the flood waters eventually enter a piped or natural drainage system. This type of flooding is driven in particular by short, intense rain storms.
- Groundwater flooding occurs when the level of water stored in the ground rises as a result of prolonged rainfall, to meet the ground surface and flows out over it, i.e. when the capacity of this underground reservoir is exceeded. Groundwater flooding results from the interaction of site-specific factors such as local geology, rainfall infiltration routes and tidal variations. While the water level may rise slowly, it may cause flooding for extended periods of time. Hence, such flooding may often result in significant damage to property or disruption to transport. In Ireland, groundwater flooding is most commonly related to turloughs in the karstic limestone areas prevalent in particular in the west of Ireland
- Coastal flooding occurs when sea levels along the coast or in estuaries exceed neighbouring land levels, or overcome coastal defences where these exist, or when waves overtop the coastline or coastal defences.

- Failure of infrastructure can lead to flooding whether it is the catastrophic failure of a dam or flood defence, the blockage of culvert or a watermain burst.

The wide range of flooding types described indicates that, not only our urban areas, but also our rural and coastal environments are also susceptible to flood risk. The Guidelines acknowledge this fully, recognising the potential detrimental impacts on people, communities, the economy and the environment should consideration of the recommendations for land use and infrastructure planning in the Guidelines not be incorporated into national, regional, and local development plans.

3.6 FLOOD RISK

Guidelines state flood risk is a combination of the likelihood of flooding and the potential consequences arising. Flood risk is expressed as:

Flood risk = Likelihood of flooding x Consequences of flooding

The Guidelines define the likelihood of flooding as the percentage probability of a flood of a given magnitude as occurring or being exceeded in any given year. A 1% probability indicates the severity of a flood that is expected to be exceeded on average once in 100 years, i.e. it has a 1 in 100 (1%) chance of occurring in any one year.

The consequences of flooding depend on the hazards associated with the flooding (e.g. depth of water, speed of flow, rate of onset, duration, wave action effects, water quality), and the vulnerability of people, property and the environment potentially affected by a flood (e.g. the age profile of the population, the type of development, presence and reliability of mitigation measures etc.).

3.7 FLOOD ZONES

The Guidelines recommend identifying flood zones which show the extent of flooding for a range flood event probabilities. The Guidelines identify three levels of flood zones:

- Flood Zone A – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding).
- Flood Zone B – where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding).
- Flood Zone C – where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas of the plan which are not in zones A or B.

The flood zones are generated without the inclusion of climate change factors. The flood zones only account for inland and coastal flooding. They should not be used to suggest that any areas are free from flood risk as they do not account for potential flooding from pluvial and groundwater flooding. Similarly flood defences should be ignored in determining flood zones as defended areas are still carry a residual risk of flooding from overtopping, failure of the defences and deterioration due to lack of maintenance.

3.8 CLIMATE CHANGE

Climate Change is expected to increase flood risk. It could lead to more frequent flooding and increase the depth and extent of flooding. Due to the uncertainty surrounding the potential effects of climate change a precautionary approach is recommended in the Guidelines:

- Recognise that significant changes in the flood extent may result from an increase in rainfall or tide events and accordingly adopt a cautious approach to zoning land in these potential transitional areas.
- Ensure that the levels of structures designed to protect against flooding, such as flood defences, land-raising or raised floor levels are sufficient to cope with the effects of climate change over the lifetime of the development they are designed to protect.
- Ensure that structures to protect against flooding and the development protected are capable of adaptation to the effects of climate change when there is more certainty about the effects and still time for such adaptation to be effective.

The RESES sets a new strategic planning and development framework up to the year 2040 when the initial predicted effects of climate change may have to be realised. It is imperative therefore that the predicted effects of climate change on flooding are considered in this process.

3.9 RFRA METHODOLOGY

The Guidelines recommend that due to the scale of flood risk at a regional level the emphasis of the appraisal should primarily follow a Stage 1 flood risk identification approach that will detect areas of future growth conflicting with flood risk, it will promote the sequential approach, and help flag the need for more detailed FRAs at lower level development plans. As recommended by the Guidelines the RFRA should address the following:

- Summary plans/figures and statement showing the broad spatial distribution of flood risk and any potential conflicts with growth/ development areas (Shown in Figures in **Section 4**);
- Supplementary description of any areas of a region where addressing flood risk is especially important – e.g. central urban areas in Gateways or areas of development pressure, with a view to highlighting these as priority locations for further assessment of flood risk, and / or the need for coordinated action at development plan level (Described in **Section 4** for the growth settlements);
- Suggested policies for sustainable flood risk management for incorporation into the RPGs (**Section 5**); and
- Guidance on the preparation of city and county level SFRAs and the management of surface water run-off within new development, highlighting significant flood risk issues, potential infrastructure investment requirements and the need for co-operation between planning authorities and identifying any need for more detailed assessment (Discussed in **Section 4** for the growth settlements and **Section 6**).

4 HIGH LEVEL FLOOD RISK APPRAISAL

4.1 INTRODUCTION

The principal of the RFRA is to ensure the correct and appropriate application of The Guidelines to the RSES in accordance with the Sequential Approach and to highlight areas of potential flood risk that could impact on the growth strategies for development areas. The appraisal identifies the broad nature of flooding that may affect the primary growth settlements identified in **Figure 2-2** and **Table 4-1** below. The moderate growth settlements identified in the RSES are not included in the assessment as it would be more appropriate for these settlements to be assessed at County Development Plan level.

Table 4-1 – Primary Growth Settlements

Settlement Typology	Settlements		
Metro City and Suburbs	Dublin Metropolitan Area		
Regional Growth Centres	Athlone	Drogheda	Dundalk
Key Growth Settlements	Bray	Graiguecullen (Carlow)	Longford
	Maynooth	Mullingar	Naas
	Navan	Portlaoise	Swords
	Tullamore	Wicklow-Rathnew	

There are several sources of relevant flood risk information available for the EMRA geographical region however the main source used for this appraisal are the flood zones and flood extents generated as part of the CFRAM studies. These maps form part of the most comprehensive flood risk assessment ever undertaken in Ireland. They have been generated using expert hydrological and hydraulic assessments which have been calibrated against actual measured data insofar as possible. While the CFRAM studies are comprehensive they only focused on areas of significant risk, there are numerous other areas within settlements within the EMRA geographic area which have local scale flooding issues and these need to be captured in SFRAs accompanying County/ City Development plans and LAPs. For this assessment where CFRAM flood zones and flood extents are not available information has been supplemented by other sources such as the OPW Preliminary Flood Risk Assessment (PFRA), and information from SFRAs for existing development plans. However caution is advised when using flood risk indicators based on existing conditions (such as that portrayed by the PFRA) while such information is useful it should primarily be used to identify where further more detailed FRAs may be required for areas already at risk.

4.2 CFRAM STUDIES

The OPW has led the development of CFRAM Studies. The aim of these studies was to assess flood risk, through the identification of flood hazard areas and the associated impacts of flooding. The flood hazard areas have been identified as being potentially at risk from significant flooding, including areas that have experienced significant flooding in the past. These studies have been developed to meet the requirements of the EU Directive on the assessment and management of flood risks (the Floods Directive). The Floods Directive was transposed into Irish law by SI 122 of 2010 "European Communities (Assessment and Management of Flood Risks) Regulations 2010".

The CFRAM Studies generated several outputs which have been utilised in the RFRA including:

- Flood maps indicating modelled flood extents and flood zones for a range of flood events of annual exceedance probability (AEP).
- FRMPs to manage flood risk within the relevant river catchment.

4.3 FLOOD ZONE MAPPING

Following the approach from the Guidelines the flood zone mapping developed for the CFRAM studies has been utilised for the RFRA. Where flood zones have been not generated as part of the CFRAM process the OPW PFRA Study flood extents or information from development plan SFRAs have been utilised as supplementary information. Due to the scale of this regional assessment it was deemed appropriate to use the aforementioned data and where non flood zone information has been used it has been highlighted in the assessments. Lower level development plans should identify flood zones where appropriate to identify areas of potential residual risk. The flood mapping has been used to enable EMRA to apply 'The Guidelines' sequential approach to appraise lands for development.

The Guidelines state that the effect of flood defences should be ignored when determining flood zones, as defended areas still carry a residual risk from overtopping and failure of the defences. Because this residual risk of flooding remains, the sequential approach and the Justification Test apply to such defended locations. Under the Guidelines, from a planning perspective, to be considered a defended area the design standard of the scheme must protect that area for a 1% AEP flood event. Lower level plans should clearly identified defended areas as it can influence the sequential approach and flood risk assessment process.

4.4 CLIMATE CHANGE FLOOD MAPPING

The CFRAM studies have been developed flood maps for the current scenario, and also for two potential future scenarios; the Mid-Range Future Scenario (MRFS) and the High-End Future Scenario (HEFS), taking into account the potential impacts of climate change and other possible future changes. These scenarios include for changes as set out in **Table 4-2** below.

Table 4-2 – Allowances in Flood Parameters for the Mid-Range and High-End Future Scenarios

Parameter	MRFS	HEFS
Extreme Rainfall Depths	+ 20%	+ 30%
Peak Flood Flows	+ 20%	+ 30%
Mean Sea Level Rise	+ 500 mm	+ 1000 mm
Land Movement	- 0.5 mm / year[1]	- 0.5 mm / year[1]
Urbanisation	Reviewed on Case-by-Case Basis	Reviewed on Case-by-Case Basis
Forestation	- 1/6 Tp[2]	- 1/3 Tp[2] + 10% SPR[3]

Note 1: Applicable to the southern part of the country only (Dublin – Galway and south of this)
Note 2: Reduction in the time to peak (Tp) to allow for potential accelerated runoff that may arise as a result of drainage of afforested land
Note 3: Add 10% to the Standard Percentage Runoff (SPR) rate: This allows for temporary increased runoff rates that may arise following felling of forestry

The MRFS flood extents have been assessed to identify lands that may be at risk of flooding in the future and these have used by EMRA to apply 'The Guidelines' sequential approach to appraise lands for future development.

4.5 FLUVIAL FLOOD ZONE MAPPING REVIEW

These maps are the most comprehensive flood maps produced for Ireland since the introduction of the Guidelines and the Floods Directive. Confidence in the accuracy of the maps is considered to be high due to the robust nature of the CFRAM flood mapping process however where there are uncertainties recommendations for further studies have been identified in the FRMPs. These studies will inform future revisions of the RSES.

4.6 FLOOD RISK MANAGEMENT PLANS

The CFRAM FRMPs have identified a range flood risk management objectives, options and plans for various settlements in the EMRA geographic region. The OPW and local authorities have committed to implementing any recommendations from the FRMPs and will work in conjunction with each other to deliver any proposed flood alleviation schemes that are deemed appropriate and viable.

The FRMPs were published in May 2018 and outlined a series of proposed flood risk policy measures for the EMRA region but also specific measures for each settlement that was within the scope of the CFRAM studies. The list of measures applicable to each settlement are outlined in their assessments and also there are certain prevention and preparedness measures related to flood risk management that form part of wider Government policy. These measures, summarised below and included in **Appendix A** should be applied as appropriate and as applicable across all areas of the EMRA geographic area and included in development policies and regulations. For a full set of measures local authorities should refer the relevant FRMP(s) for their area. These can be found at Floodinfo.ie.

- Sustainable Planning and Development Management - Application of the Guidelines on the Planning System and Flood Risk Management (DHPLG/OPW, 2009)
- Implementation of SuDS
- Local Adaptation Planning - Consideration of Flood Risk in local climate adaptation planning

- Land Use Management and Natural Flood Risk Management Measures - Natural water retention measures where possible.
- Minor Works Scheme - continue the Minor Works Scheme subject to the availability of funding
- Ongoing Appraisal of Flood Event Emergency Response Plans

CFRAM studies also identified FRMPs and flood risk management measures for settlements not identified in the RSES and the RFRA, lower level developments plans should consult the FRMPs to ascertain if there are any proposed measures applicable to the development plan study area.

4.7 OTHER SOURCES OF FLOODING

4.7.1 Overview

The flood zones only account for inland and coastal flooding (where applicable). However they should not be used to suggest that any areas are free from flood risk as they do not account for potential flooding from other sources.

4.7.2 Groundwater Flooding

The OPW PFRA also carried out a national scale a Groundwater Flooding Report which concludes that ground water flooding is largely confined to the West Coast of Ireland due to the hydrogeology of the area. Therefore ground water flooding is not addressed further in this RFRA due to the scale of the assessment but it should still be examined at further detailed in lower level development plans.

4.7.3 Pluvial Flooding

The OPW PFRA study also provides a national level screening of areas that are at potential risk of pluvial flooding. This is a very indicative study and is not addressed further in this RFRA due to the scale of the assessment but it should still be examined at further detailed in lower level development plans. Dublin City Council is the only local authority which has undertaken a more detailed pluvial flooding assessment. DCC has already undertaken a pluvial assessment of its key development sites; please refer to the DCC SFRA for 2016 -2022 for more detail. A brief commentary on pluvial flooding is provided in **Section 4.8** for the growth settlements that fall within the DCC pluvial flooding assessment study boundary.

4.8 CONSIDERATION OF FLOOD RISK IMPACT AND SPATIAL PLANNING

The RSES proposes sustainable growth and development of the primary growth settlements. Regional Policy Objectives (RPOs) outlined in the RSES address proposed development that will help achieve the 3 key principles and the 15 RSO's. This section assesses the RPOs for each settlement and proposed development that will influence the RSO's from a flood risk perspective. The key development strategies in the following areas have been reviewed against the key flood risk information outlined previously in this section.

This region is affected by fluvial flooding along its major rivers and their tributaries including the Liffey, Boyne, Broadmeadow, Barrow and Shannon. Several towns across the region have been impacted by fluvial flooding including Athy, Celbridge, Leixlip, Bray, Ashbourne, Athlone, Drogheda and several areas within Dublin City. Due the vast areas of hardstanding in Dublin several areas have been impacted by combinations of fluvial and pluvial flooding where the capacity of storm water drainage networks have been exceeded. Agricultural land along the main rivers has also been impacted by flooding most notably along the banks of the Shannon where due to the flat terrain flooding can propagate inland up to 1km in some locations. Coastal settlements along the Irish Sea have also been impacted by tidal flooding and wave overtopping including Dublin City Quays, Clontarf, Skerries, Drogheda, Blackrock and Dundalk.

4.8.1 Dublin Metropolitan Area Strategic Plan (MASP)

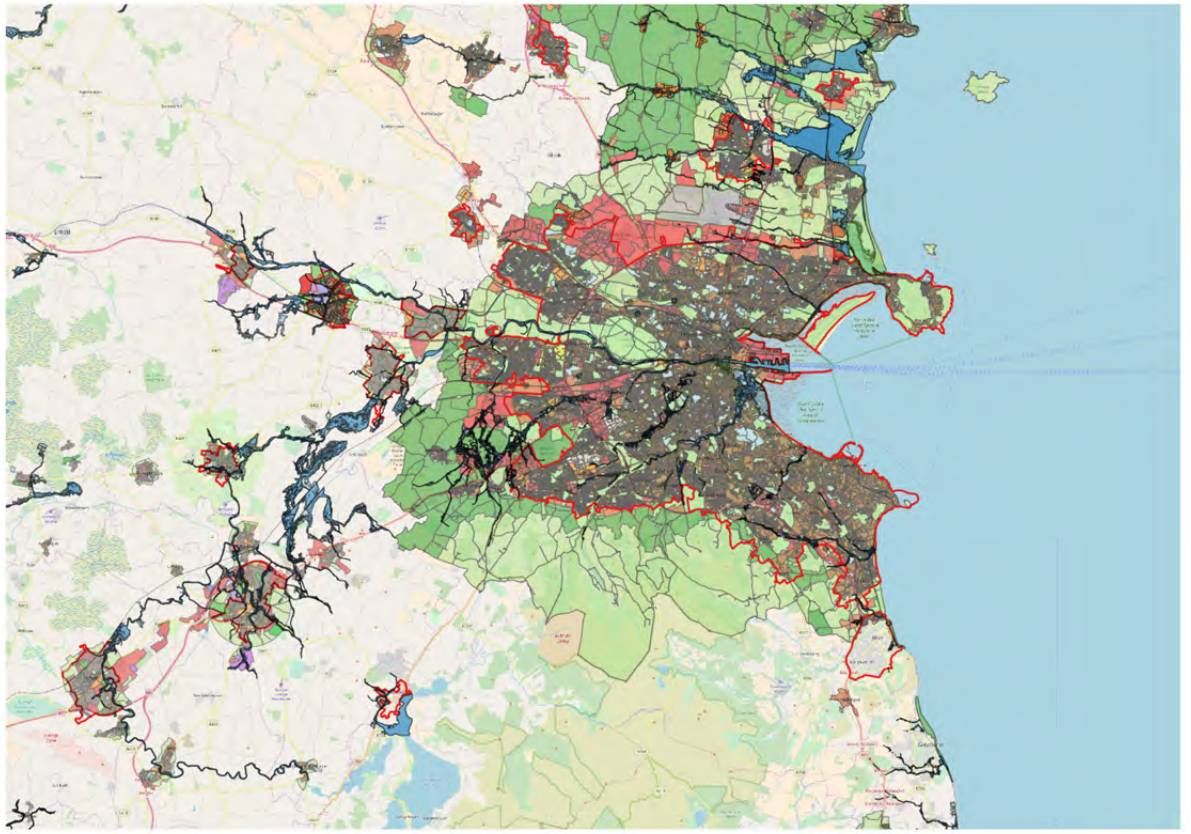
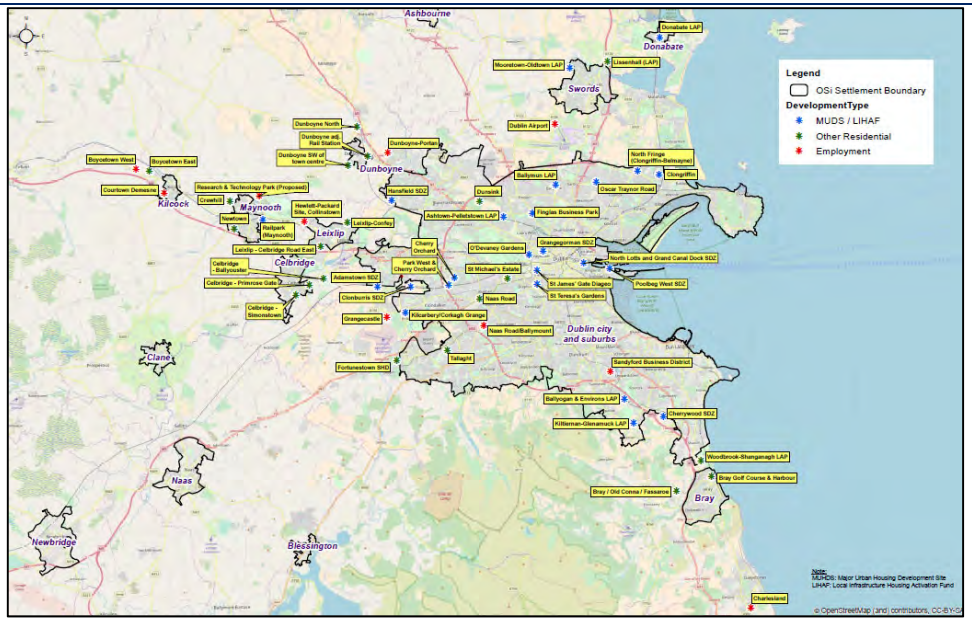


Figure 4-1 – Broad spatial distribution of flood risk in the Dublin Metropolitan Area

Flood Zone Mapping	CFRAM Flood Zones and Flood Extent mapping
Commentary	Dublin City has, like other settlements in the Eastern Region, geographical constraints which limit its spatial growth. Growth of the capital is dictated to go West and North due the Dublin / Wicklow Mountains and the Irish Sea to the south and east respectively. The river Liffey and its tributaries already influence the development patterns in the City Centre and South Dublin. As the city progresses west it will further encounter flood risk issues

	associated with the River Liffey. Lucan and towns in Kildare such as Leixlip and Celbridge are already influenced by flooding along the banks of the river. The development of the larger Blanchardstown area is influenced by the River Tolka and its extents with less vulnerable and flood compatible zonings prevalent along the river's route. In North Dublin the Broadmeadow River is influencing the spatial growth of Swords with coastal communities such as Skerries, Rush and Malahide influenced by both fluvial and tidal extents. Dublin City itself is constrained by the fact that is has largely already full developed. The urban rivers (Poddle, Dodder, Santry, Camac, Tolka) traversing the city have caused significant flooding as the city has grown radially from the banks of the Liffey. The principle of avoidance is difficult adjacent to these rivers as there is not always alternative flood free land to develop on, therefore the local authorities have built or are exploring flood risk management measures along these urban rivers to reduce the flood risk to surrounding areas and allow infill and regeneration projects adjacent to these rivers.
RPOs – Future Residential Development and Renewal of Strategic Development Areas	 **Figure 4-2 – Key Residential and Commercial Development Areas in the Dublin Metropolitan Area** In collaboration with local authorities, the MASP identifies 43 strategic residential development sites, along with the key infrastructure needed to unlock their growth potential. These are mixture of greenfield sites for development, brownfield sites for regeneration or existing residential areas for infill and consolidation development. These sites (if not already done so) should be assessed in accordance with the Guidelines and circular PL02/2014 (August 2014). Some of these sites have fluvial and / or coastal flooding associated with them or lie within defended areas. Development should follow the sequential approach and address the site layouts with respect to vulnerability of the proposed development types, finished floor levels should be

above the 1% and 0.1% AEP levels where appropriate and flood resilient construction materials and fittings may need to be considered. These developments should not impede existing flow paths or cause flood risk impacts to the surrounding areas. Following a broad assessment of the sites using CFRAM datasets and SFRAs by the local authorities, below is a summary of the fluvial flood risk associated with the sites:

Settlement Typology	Development Sites	Flood Risk Summary	FRA Status
Dublin city and suburbs (within or contiguous to)	Docklands -Poolbeg West	Low Risk of Fluvial and Coastal Flooding	SFRA Completed by DCC, DCC specified that a site specific FRA is required.
	Clongriffin-Belmayne	Flood Risk from the River Mayne. Also risk within the development from pluvial (rainfall) surface water flooding.	Assessed in the DCC and FCC SFRAs. Future development can use the principle of avoidance to allow sustainable development.
	St Teresa's Gardens	Risk of overland flow paths from fluvial flooding associated with River Poddle. Also risk within the development from pluvial (rainfall) surface water flooding.	Assessed in the DCC SFRA. DCC specified that a site specific FRA is required.
	Parkwest-Cherry Orchard	Very low risk of fluvial flooding. The primary flood risk within the development is from pluvial (rainfall) surface water flooding	Assessed in the DCC SFRA.
	Oscar Traynor Road	Very low risk of fluvial flooding. The primary flood risk within the development is from pluvial (rainfall) surface water flooding.	Assessed in the DCC SFRA.
	O'Devaney Gardens	Very low risk of fluvial flooding. The primary flood risk within the development is from pluvial (rainfall) surface water flooding	Assessed in the DCC SFRA.
	Ashtown-Pelletstown	Very low risk of fluvial flooding. The primary flood risk within the development is from pluvial (rainfall) surface water flooding.	Assessed in the DCC SFRA. Future development can use the principle of avoidance to allow sustainable development.

			Grangegorman	Very low risk of fluvial flooding. The primary flood risk within the development is from pluvial (rainfall) surface water flooding	Assessed in the DCC SFRA.	
			St James'	Risk of overland flow paths from fluvial flooding associated with River Poddle. Also flood risk within the development from pluvial (rainfall) surface water flooding	Assessed in the DCC SFRA. DCC specified that a site specific FRA for certain areas of development.	
			Ballymun	Very low risk of fluvial flooding. The primary flood risk within the Ballymun LAP is from pluvial (rainfall) surface water flooding	Assessed in the DCC SFRA and Ballymun LAP SFRA	
			Woodbrook- Shanganagh	Risk of fluvial flooding to some sites but can be avoided through site layout and development	SFRA undertaken by DLRCC and site specific FRAs required for parts of the development.	
			Kiltiernan-Glenamuck	Low risk of fluvial flooding.	Assessed in the DLRCC SFRA.	
			Ballyogan Environs	Risk of fluvial flooding in some areas but can be avoided through site layout and development	SFRA undertaken by DLRCC and site specific FRAs required for parts of the development.	
			Cherrywood	Low risk of fluvial flooding except for the Priorsland site. Avoidance is used to maintain floodplains in greenspace.	Assessed in the DLRCC SFRA and site specific FRAs required for parts of the SDZ.	
			Baldoyle-Stapolin	Risk of coastal / fluvial flooding to some sites but can be avoided through site layout and development	Assessed in the FCC SFRA.	
			Hansfield	Low risk of fluvial flooding.	Assessed in the FCC SFRA.	
			Adamstown	Flood risk from the Griffen River	Assessed in the SDCC SFRA and site specific FRAs required for parts of the SDZ.	
			Clonburris	Low risk of fluvial flooding.	Assessed in the SDCC SFRA.	

			Kilcarbery	Low risk of fluvial flooding.	Assessed in the SDCC SFRA.	
			St Michaels Estate	Very low risk of fluvial flooding. The primary flood risk within the development is from pluvial (rainfall) surface water flooding.	Assessed in the DCC SFRA.	
			Naas Road	Risk of flooding to some sites from the Camac River. Also flood risk within the development from pluvial (rainfall) surface water flooding.	Assessed in the SDCC SFRA and site specific FRAs required for parts of the development areas specifically for regeneration areas	
			Old Conna-Fassaroe	Refer to Bray Assessment		
			Dunsink	Low risk of fluvial flooding. The primary flood risk within the development is from pluvial (rainfall) surface water flooding.	Assessed in the FCC SFRA.	
			Tallaght	Low risk of fluvial flooding.	Assessed in the SDCC SFRA.	
			Fortunestown	Risk of flooding to some sites from the Fortunestown Stream	Assessed in the SDCC SFRA and site specific FRAs required for parts of the development area	
		Key Metropolitan Growth Settlements				
		Bray	Bray Golf Course & Harbour	Refer to Bray Assessment in **Section 4.8.5**		
			Bray Fassaroe	Refer to Bray Assessment in **Section 4.8.5**		
		Maynooth	Maynooth Railpark	Refer to Maynooth Assessment in **Section 4.8.8**		
			Newtown	Refer to Maynooth Assessment in **Section 4.8.8**		
			Crewhill	Refer to Maynooth Assessment in **Section 4.8.8**		
		Swords	Oldtown-Mooretown	Refer to Swords Assessment in **Section 4.8.13**		
			Lissenhall	Refer to Swords Assessment in		

			Section 4.8.13		
		Moderate Metropolitan Growth Settlements			
		Dunboyne	Dunboyne North	Fluvial Flood Risk from the Tolka River and its tributaries.	Assessed in the MCC SFRA and specified a SFRA required for LAP Stage.
			Dunboyne adj rail station	Fluvial Flood Risk from the Tolka River and its tributaries.	Assessed in the MCC SFRA and specified a SFRA required for LAP Stage.
			Dunboyne SW town centre	Fluvial Flood Risk from the Tolka River and its tributaries.	Assessed in the MCC SFRA and specified a SFRA required for LAP Stage.
		Donabate	Donabate LAP	Low risk of fluvial flooding.	Assessed in the FCC SFRA.
		Kilcock	Boycetown East	Very low risk of fluvial flooding	Assessed in the KCC SFRA.
		Leixlip	Leixlip - Confey	Fluvial risk to some lands in the Confey Area.	Assessed in the KCC SFRA and site specific FRAs required for parts of the development area.
			Leixlip – Celbridge Rd E	Low risk of fluvial flooding.	Assessed in the KCC SFRA.
		Celbridge	Celbridge -Ballyoulster	Low risk of fluvial flooding.	Assessed in the KCC SFRA.
			Celbridge -Simmonstown	Fluvial risk to some lands in the Simmonstown area.	Assessed in the KCC SFRA and lands zoned using the sequential approach. Site specific FRAs required for parts of the development area.
			Celbridge -Primrose Gate	Fluvial risk to some lands in the Primrose Gate Area as they lie Flood Zones B.	Assessed in the KCC SFRA and lands zoned using the sequential approach. Site specific FRAs required for parts of the development area.
RPO – Key Public Transport	Development of major infrastructural projects such as airports, roads, train lines and ports should implement the Guidelines and a FRA to an appropriate level of detail should be carried out for each of these projects to ensure development is avoided in flood risk areas in so far as possible. These projects should also include flood risk management measures and SuDs infrastructure to ensure greenfield runoff rates are maintained and that the infrastructure does not increase flood risk downstream or in the surrounding areas.				
RPO – Future Employment Lands	The MASP identified 17 strategic employment development areas with an overall stated capacity of strategic sites to provide well over 120,000 additional jobs in the Dublin Metropolitan Area when built out. These are mixture of greenfield sites for development, brownfield sites for regeneration or existing serviced sites for infill and consolidation development. These sites (if not already done so) should be assessed in accordance with the				

Guidelines and circular PL02/2014 (August 2014). Some of these sites have fluvial and / or coastal flooding associated with them or lie within defended areas. Development should follow the sequential approach and address the site layouts with respect to vulnerability of the proposed development types, finished floor levels should be above the 1% and 0.1% AEP levels where appropriate and flood resilient construction materials and fittings may need to be considered. These developments should not impede existing flow paths or cause flood risk impacts to the surrounding areas. Following a broad assessment of the sites using CFRAM datasets and SFRAs by the local authorities, below is a summary of some of the flood risk associated with some of the sites:

Settlement Typology	Development Sites	Flood Risk Summary	FRA Status
Dublin city and suburbs (within or contiguous to)	Sandyford Bus. District	Low Risk of Fluvial and Coastal Flooding	SFRA Completed by DCC, DCC specified that a site specific FRA is required.
	Naas Road/ Ballymount	Risk of flooding to some sites from the Camac River. Also flood risk within the development from pluvial (rainfall) surface water flooding	Assessed in the SDCC SFRA and site specific FRAs required for parts of the development areas
	Grangecastle	Risk of flooding to some sites from the Camac River and Griffeen River.	Assessed in the SDCC SFRA and site specific FRAs required for parts of the development areas
	Dublin Docklands	Risk of coastal flooding to some sites. Also flood risk within the development from pluvial (rainfall) surface water flooding	SFRA Completed by DCC, DCC specified that site specific FRAs are required for some development
	Cherrywood	Low risk of fluvial flooding except for the Priorsland site. Avoidance is used to maintain floodplains in greenspace	Assessed in the DLRCC SFRA and site specific FRAs required for parts of the SDZ.
	Dublin Enterprise Zone, Blanchardstown	Risk of flooding to some sites from the Tolka River.	Assessed in the SDCC SFRA and site specific FRAs required for parts of the development areas
	Grangegorgan	Low risk of fluvial flooding. Also flood risk within the development from pluvial (rainfall) surface water flooding	Assessed in the DCC SFRA.
Maynooth	Research & Technology Park	Refer to Maynooth Assessment in **Section 4.8.8**	

	Swords	Dublin Airport	Risk of flooding to some sites from the River Mayne.	Assessed in the FCC SFRA and site specific FRAs required for parts of the development area
	Moderate Metropolitan Growth Settlements			
	Dunboyne	Dunboyne-Portan	Low fluvial flood risk from the Tolka River and its tributaries.	Assessed in the MCC SFRA and specified a SFRA required for LAP Stage.
	Kilcock	Boycetown West	Very low risk of fluvial flooding	Assessed in the KCC SFRA.
		Courttown Demesne	Very low risk of fluvial flooding	Assessed in the KCC SFRA.
	Leixlip	Hewlett Packard site	Low risk of fluvial flooding.	Assessed in the KCC SFRA.
		Collinstown	Low risk of fluvial flooding.	Assessed in the KCC SFRA.
	Metropolitan Consolidation Settlements			
	Greystones	Charlesland	Risk of fluvial flooding to the development lands.	SFRA was completed prior to the publication of the CFRAM flood maps. The LAP is due to be renewed in 2019. The SFRA should be updated using CFRAM flood zone mapping.
RPO - Further development of the Dublin metropolitan area greenbelt	Integration and development of greenbelts will reduce runoff rates therefore reducing flood risk. Implementation of the Guidelines will help achieve these policies by maintaining green spaces and reducing urban sprawl thus avoiding new development in potential flood risk areas. This will also maintain natural flood management features which help to reduce downstream flooding in urban areas. Natural floodplains and natural flood management measures should be maintained and encouraged specifically along the w**atercourse corridors including** Rivers Liffey, Tolka, Santry, Mayne, Poddle, Camac, Griffeen, Dodder, Ward and Broadmeadow.			
Existing - Flood Risk Management Measures	A number of existing flood risk management schemes have been built in the Dublin Metropolitan Area. For a more detailed description of the works carried out and standard of protection refer to the FRMP for the Liffey & Dublin Bay River Basin. The schemes include: ▪ Clonee (Co. Meath) - Tolka Flood Relief Scheme ▪ Dublin City - Tolka Flood Relief Scheme ▪ Dublin City - River Dodder (Tidal) Flood Relief Scheme ▪ Dublin City - River Wad (Phase 1) Flood Relief Scheme ▪ Dublin City - South Campshires Flood Relief Scheme ▪ Dublin City - Spencer Dock Flood Relief Scheme			

	▪ Dunboyne, Co. Meath - Tolka Flood Relief Scheme ▪ Hazelhatch (Co. Kildare / Co. Dublin) - Shinkeen Stream Flood Relief Scheme ▪ Leixlip, Co. Kildare - Leixlip Flood Relief Scheme ▪ Lucan to Chapelizod, Co. Dublin - River Griffeen Flood Relief Scheme ▪ Mulhuddart, Co. Dublin - Tolka Flood Relief Scheme ▪ Johnstown, Co. Kildare - Johnstown Flood Relief Scheme ▪ Santry - Raheny Dublin City, Santry River Phase I Flood Relief Scheme ▪ Swords, Co. Dublin - Aspen Road Flood Relief Scheme ▪ Dun Laoghaire Rathdown, Co. Dublin - Carysfort Maretimo Flood Relief Scheme
Proposed - Flood Risk Management Measures	There are also a number of flood relief schemes being proposed or already in design or construction for the following communities, which will continue to be progressed ▪ Balgriffin, Dublin City - Balgriffin Flood Relief Scheme ▪ Dublin City - Flood Resilient City Pluvial Flood Study Options ▪ Dublin City - Camac River Flood Relief Scheme ▪ Dublin City - Poddle River Flood Relief Scheme ▪ Dublin City - Lower Dodder (Fluvial) Flood Relief Scheme ▪ Dublin City - Dodder (Whitechurch Stream) Flood Relief Scheme ▪ Dublin City - Dodder (Little Dargle) Flood Relief Scheme ▪ Dublin City - Clontarf Promenade Flood Relief Scheme ▪ Dublin City - Dollymount Flood Relief Scheme ▪ Dublin City - River Wad Phase II Flood Relief Scheme (subject to planning and funding) ▪ Dublin City - Sandymount Flood Protection Project ▪ Dublin City - North City Pluvial Flood Alleviation Project ▪ Dublin City - North City Drainage Network Upgrade Project ▪ Malahide - Portmarnock (Strand Road) and the Malahide Flood Relief Schemes ▪ Santry - Raheny (Santry River) - Phases II and III Flood Relief Scheme (subject to planning and funding) ▪ Turnings – Morell River Flood Management Scheme
Flood Risk Summary	**Existing Flood Risk** The CFRAM study provides the best source of existing fluvial and coastal flooding information for the MASP area. This mapping is presented in **Figure 4-**

	1. As discussed in **section 4.7.3** DCC carried out a pluvial flooding study which has been reviewed as part of the RFRA and highlights that some of the areas are at risk from pluvial flooding. This does not provide a complete assessment of flood risk to the MASP area nor does it assess flood risk from all sources. This must be covered in all SFRAs informing County and City Development Plans and Local Area Plans. The primary flood risk to the MASP area is fluvial flooding along the numerous rivers that traverse the region. Settlements along the Irish Sea are at risk from coastal flooding. **Flood Risk Impact and Spatial Planning Integration** The 43 strategic residential development sites and 17 strategic employment development areas for the most part have a low risk of fluvial flooding. Some development areas lie within Flood Zones A and B but implementation of the Guidelines and the sequential approach should be able to cater for these sites to be developed in a sustainable manner and avoid flood risk. Many of them already have had a SFRA completed addressing flood risk. Development should be avoided within natural floodplains and along riparian zones of the regions watercourse corridors to provide natural flood risk management. **Recommendations For Flood Risk Management** As detailed above the CFRAM FRMP has outlined various proposed flood risk management schemes that should be reviewed by the planning authorities in conjunction with the OPW to deliver any proposed flood alleviation schemes that are deemed appropriate and viable. Planning authorities should also review and implement where appropriate the suggested CFRAM flood risk management policy measures as outlined in Appendix B and the FRMP. SFRAs should be undertaken for all development plans and existing SFRAs should be updated and reviewed in line with statutory timelines for development plans. Existing schemes, proposed schemes and currently on going schemes (at various stages of the planning and construction process) will influence the ability to develop land and this should be considered in accordance with The Guidelines at SFRA stage. **Opportunities for Joint Studies** Planning authorities that share administrative boundaries should identify areas where there is potential for joint studies e.g. Clongriffin-Belmayne, Naas Road, Bray and Dunboyne-Portan to ensure that all flood risk issues are captured to inform their preparation of spatial plans. Where it is found to be necessary the planning authorities should prepare joint studies to address flood risk issues.

4.8.2 Regional Growth Centre – Athlone

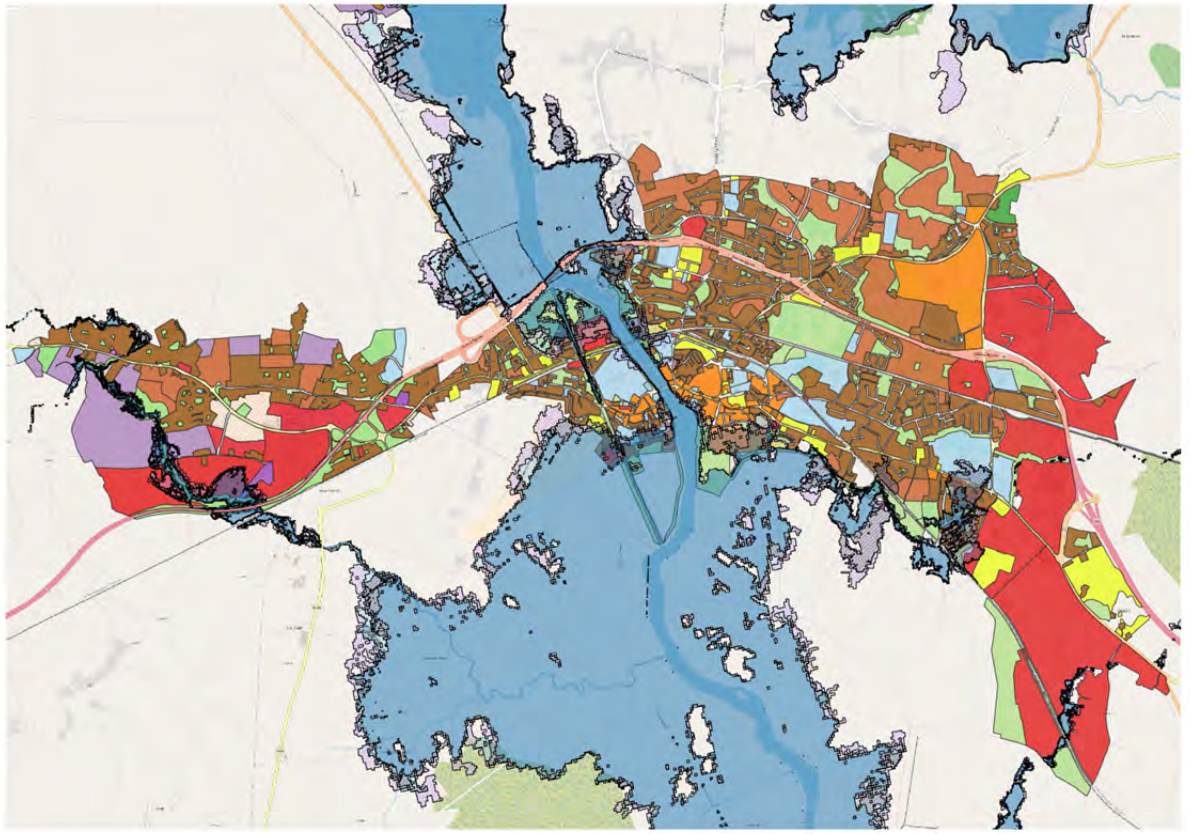


Figure 4-3 – Broad spatial distribution of flood risk in Athlone

Flood Zone Mapping	CFRAM Flood Zone mapping
Commentary	The spatial growth of Athlone is dominated by the River Shannon and Lough Ree to the north of the town. The lands to the south of the town are dramatically impacted by extreme flooding from the River Shannon. This influences the town to grown spatially to the east and west which is already prevalent from an aerial view of the town. The principal of avoidance is particularly important along the banks of the Shannon as inappropriate development could potentially put more lives at risk

	of flooding. Design of the Athlone flood relief scheme is underway with construction of the scheme set to take place in the next two to three years.
RPO - Joint Urban Area Plan Monksland/Bealnamulla	The flood zones for Monksland/Bealnamulla are largely confined to existing greenfield areas. Some of these lands are zoned for industrial development. The central area zoned for future industrial development at Monksland is inundated with the predicted Flood Zone A & B extents. A SFRA was previously carried out for Monksland/Bealnamulla which was informed by the CFRAM mapping. Any future development should adhere to the recommendations and flood risk management policies contained within the SFRA. Any proposal for development/land use which is inappropriate within the Flood Zone must be accompanied by a Development Management Justification Test and site-specific FRA.
RPO – Joint Urban Area Plan Strategic Regeneration Athlone	Identification of strategic sites for regeneration to ensure Athlone achieves targeted compact growth of 30% should be carried out in accordance with the Guidelines specifically circular PL02/2014 (August 2014). The circular specifically addresses regeneration areas and flood risk management of their development. The sites identified can be cognisant of the development of the Athlone Flood Alleviation Scheme which is currently ongoing. This will lead to areas of the town being protected for the 1% AEP event and development should be appropriate to level of residual risk post the scheme.
RPO – Expansion of Enterprise lands	The lands zoned for expanded industrial development are outside the predicted Flood Zone A & B extents with the exception for Creggan and Monksland. The predicted flood extents encroaches the development boundary at Creggan and is not extensive. The central area zoned for future industrial development at Monksland is inundated with the predicted Flood Zone A & B extents and should follow the recommendations of the SFRA for the Monksland/Bealnamulla LAP.
RPO – Future Residential Development	The RPO identifies new residential and existing residential lands for future development and infill. The sites outside of the town centre (e.g Loughanaskin, Lissywollen, Cornamag) lie outside the Flood Zones of the River Shannon and are suitable for development. However the existing residential properties located within Athlone Town Centre at close proximity to the River Shannon, particularly at Priory Park, Abbey Road, Deerpark Road, The Strand and Willow Residential Development are inundated with the predicted Flood Zone A & B extents. Regeneration of these areas should be carried out in accordance with the Guidelines specifically circular PL02/2014 (August 2014).
Existing - Flood Risk Management Measures	The Al River Athlone Works were initiated in 2002 and constructed from 2002 to 2003. The works comprise of the following: ▪ Channel and culvert improvements along the Al River downstream of the culvert in the Technology Park to improve capacity to at least $2m^3/sec$ ▪ Construction of a penstock to attenuate the flow Athlone Weir was constructed in the 1840s, with sluices being installed in the 1880s to provide the facility for drawing down the level of Lough Ree below the fixed weir crest, potentially providing some flood storage.
Proposed - Flood Risk Management Measures	Flood defences measures were proposed for Athlone, as part of the OPW FRMP for the Shannon Upper & Lower Catchment, to provide protection for up to a 1 in 100 year event. The flood defences measures proposed for Athlone consist of the following; ▪ Construction of 1.038km of new flood defence walls, 2.29km of embankments, and a 16m floodgate; ▪ Installation of a simple flood-forecasting unit, which includes the addition of telemetry to an existing hydrometric

	gauge to send warning messages when water level reaches a specified trigger point. ▪ Introduction of a storage area. ▪ Targeted public awareness will be introduced for properties affected by the various floodgates throughout the town. The FRMP outlined that a detailed study is required to investigate non-fluvial flooding sources in the vicinity of a proposed development.
Flood Risk Summary	**Existing Flood Risk** The CFRAM study provides the best source of existing fluvial flooding information for Athlone. This mapping is presented in **Figure 4-3**. This does not provide a complete assessment of flood risk to the area nor does it assess flood risk from all sources. This must be covered in the SFRA informing the LAP and FRAs for any other development plans in the town. **Flood Risk Impact and Spatial Planning Integration** Existing residential and mixed use developments in Athlone Town Centre zoned for future regeneration are located within the predicted Flood Zone A. Applications for major development within these areas required a site specific flood risk assessment to ensure no increase in flood risk to the development and surrounding areas. The areas within lands zoned for future residential and commercial developments identified within the predicted Flood Zone A & B require site specific flood risk assessments to ensure no adverse flood risk impacts. FRAs should be carried out in accordance with the Guidelines and the sequential approach for these sites to be developed in a sustainable manner and avoid flood risk. The CFRAM MRFS flood extents show an increase in predicted flood extents within the town. Future development plans and flood risk assessments should consider the potential of climate change influence on flood extents in accordance with the Guidelines. **Recommendations For Flood Risk Management** As detailed above the CFRAM FRMP has outlined a flood alleviation scheme for Athlone which is currently on going. Completion of the scheme will aid spatial planning within the town. The planning authorities should also review and implement where appropriate the suggested CFRAM flood risk management policy measures as outlined in Appendix B and the FRMP. SFRAs should be undertaken for all development plans and existing SFRAs should be updated and reviewed in line with statutory timelines for development plans. The existing scheme will influence the ability to develop land and this should be considered in accordance with The Guidelines at SFRA stage **Opportunities for Joint Studies** Westmeath and Roscommon county councils should collaborate on future SFRAs for the Athlone area to ensure that all flood risk issues are captured to inform their preparation of spatial plans.

4.8.3 Regional Growth Centre – Drogheda

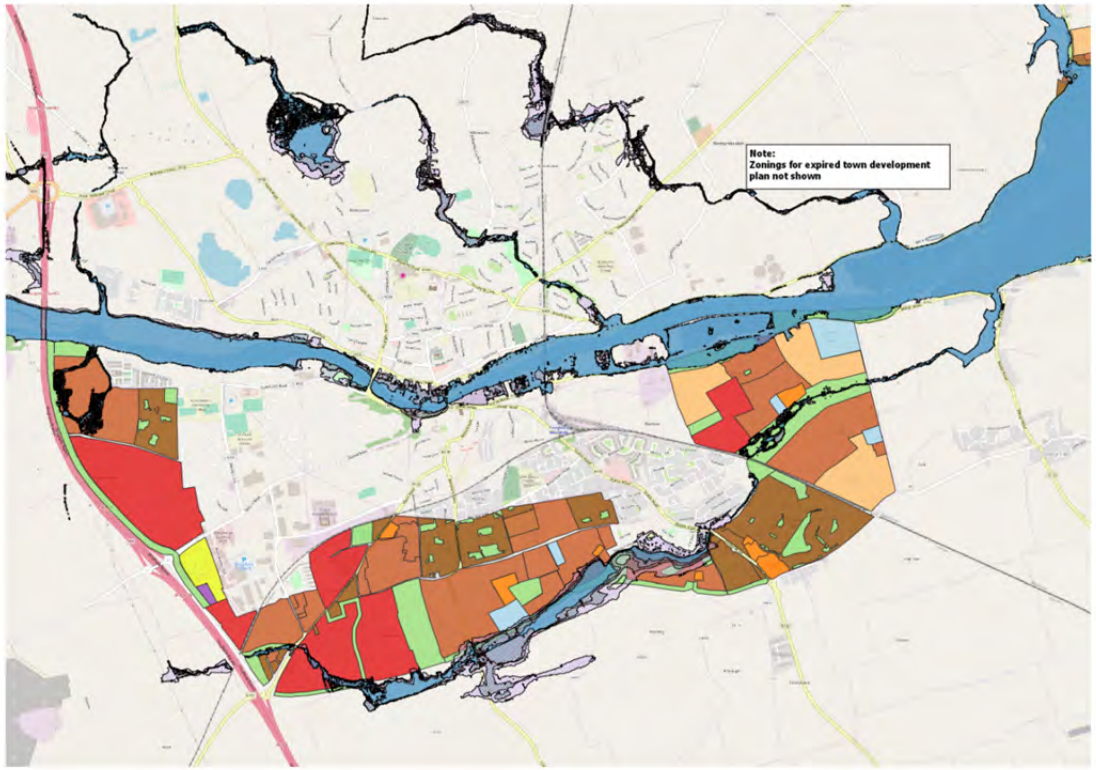


Figure 4-4 – Broad spatial distribution of flood risk in Drogheda

Flood Zone Mapping	CFRAM Flood Zone mapping
Commentary	Drogheda sits at the mouth of the River Boyne discharging into the Irish Sea. Aerial photography would indicate the town will expand to the north and south. There is partial flooding in these areas and the principle of avoidance should be implemented to avoid flood risk areas. Fluvial and tidal flooding from banks the River Boyne affects the quays of the town as well as partially propagating inland in areas between St. Marys Bridge and St. Dominick's Bridge for higher return periods. Development in this area should follow the sequential approach and appropriate land use types adopted.

RPO – Regeneration of Westgate	Sections of the existing Westgate area zoned for future regeneration is inundated within the predicted Flood Zone A and B extents. The low lying areas adjacent to the bank of the River Boyne are the worst affected. Development and regeneration in this area should be carried out in accordance with the Guidelines specifically circular PL02/2014 (August 2014). The circular specifically addresses regeneration areas and flood risk management of their development. The sites identified can be cognisant of the progression and implementation of the Drogheda Flood Alleviation Scheme as identified as a measure in the FRMP. The scheme could protect parts of the town centre for the 1% AEP event.
RPO – Regeneration of lands at McBride Station	The predicted Flood Zone A & B extents encroaches the land between the River Boyne and the Marsh Road zoned for future employment use. The extent of the flooding is limited the lands north of Marsh Road and does not extend to the remaining land zoned adjacent to McBride Station for future employment and residential use south of Marsh Road. An open space has been zoned to maintain the floodplain along the Silverstream watercourse.
RPO – Drogheda Docklands and Port	The lands within Drogheda Docklands and Port zoned for future expansion is within the predicted Flood Zone A and B extents. Water compatible development is appropriate in this area. However flood risk assessments for development in the port should still be carried out to ensure that there is no residual flood risk to the surroundings areas (upstream and downstream) due to development on these floodplains.
RPO – Regeneration and redevelopment of areas near Mell/ North Road and the town centre	There is no predicted fluvial or coastal flooding in the Mell / North Road areas and regeneration of these should not be hindered from a flood risk perspective. The existing mixed use developments located on low lying lands within Drogheda Town Centre from Wellington Quay to West Street are inundated with the predicted Flood Zone A and B extents. Development and regeneration in this area should be carried out in accordance with the Guidelines specifically circular PL02/2014 (August 2014).
RPO: Support the proposed Drogheda Flood Relief Scheme	This will aid in protecting existing development and reduce the flood risk. It will also enable further sustainable development of at risk undeveloped land.
Existing - Flood Risk Management Measures	No current existing flood risk management measures.
Proposed - Flood Risk Management Measures	Flood defences measures were proposed for Drogheda, as part of the OPW FRMP for the Boyne Catchment, to provide protection for up to a 1 in 100 year fluvial event and also a 1 in 200 year coastal event. The flood relief works proposed for Drogheda include a series of hard defences along the River Boyne and improvement of conveyance and a flow diversion channel on various tributaries. There may be some sealing of manholes, localised raising of roads and automated defences to allow continued operation of port activities. The hard defences consist of an average height of 1.95m and a total length of 4.3km. The improvement of channel conveyance consists of 215m of additional 1.5m diameter twin culvert within the vicinity of the old Usher's Mill at Greenhills and 91m of dredged and widened channel. The FRMP outlined that a detailed study is required to investigate non-fluvial flooding sources in the vicinity of a proposed development.
Flood Risk Summary	**Existing Flood Risk** The CFRAM study provides the best source of existing fluvial and coastal flooding information for Drogheda. This mapping

	is presented in **Figure 4-4**. This does not provide a complete assessment of flood risk to the area nor does it assess flood risk from all sources. This must be covered in the SFRA informing the LAP and FRAs for any other development plans in the town. **Flood Risk Impact and Spatial Planning Integration** The areas within lands zoned future residential and employment hubs identified within the predicted Flood Zone A & B require site specific flood risk assessments to no adverse flood risk impacts. Existing residential and mixed use developments at Drogheda Town Centre zoned for future regeneration located within the predicted Flood Zone A & B require flood risk management to ensure flood risk is mitigated and does not have an adverse impact elsewhere. Applications for major development within these areas required a site specific flood risk assessment to ensure no increase in flood risk to the development and surrounding areas. The areas within lands zoned for future residential and commercial developments identified within the predicted Flood Zone A & B require site specific flood risk assessments to ensure no adverse flood risk impacts. FRAs should be carried out in accordance with the Guidelines and the sequential approach for these sites to be developed in a sustainable manner and avoid flood risk. An assessment of climate and catchment changes shows Drogheda to be vulnerable to the increases as modelled in the mid-range and high end future scenarios. Future development plans and flood risk assessments should consider the potential of climate change influence on flood extents in accordance with the Guidelines. **Recommendations For Flood Risk Management** As detailed above the CFRAM FRMP has outlined a flood alleviation scheme for the town that should be reviewed by the planning authorities in conjunction with the OPW to deliver a flood alleviation scheme if it is deemed appropriate and viable. The planning authority should also review and implement where appropriate the suggested CFRAM flood risk management policy measures as outlined in Appendix B and the FRMP. SFRAs should be undertaken for all development plans and existing SFRAs should be updated and reviewed in line with statutory timelines for development plans. An assessment of climate and catchment changes shows Drogheda to be vulnerable to the increases as modelled in the mid-range and high end future scenarios. The proposed flood alleviation scheme should be designed to incorporate the potential impacts of climate change or be adaptable to increase the height of defences to provide the required standard of protection (SoP), or other measures including Natural Flood Risk Management Measures may be adopted to monitor and/or adapt the scheme. **Opportunities for Joint Studies** Meath and Louth county councils should collaborate on future SFRAs for the Drogheda area to ensure that all flood risk issues are captured to inform their preparation of spatial plans.

4.8.4 Regional Growth Centre – Dundalk

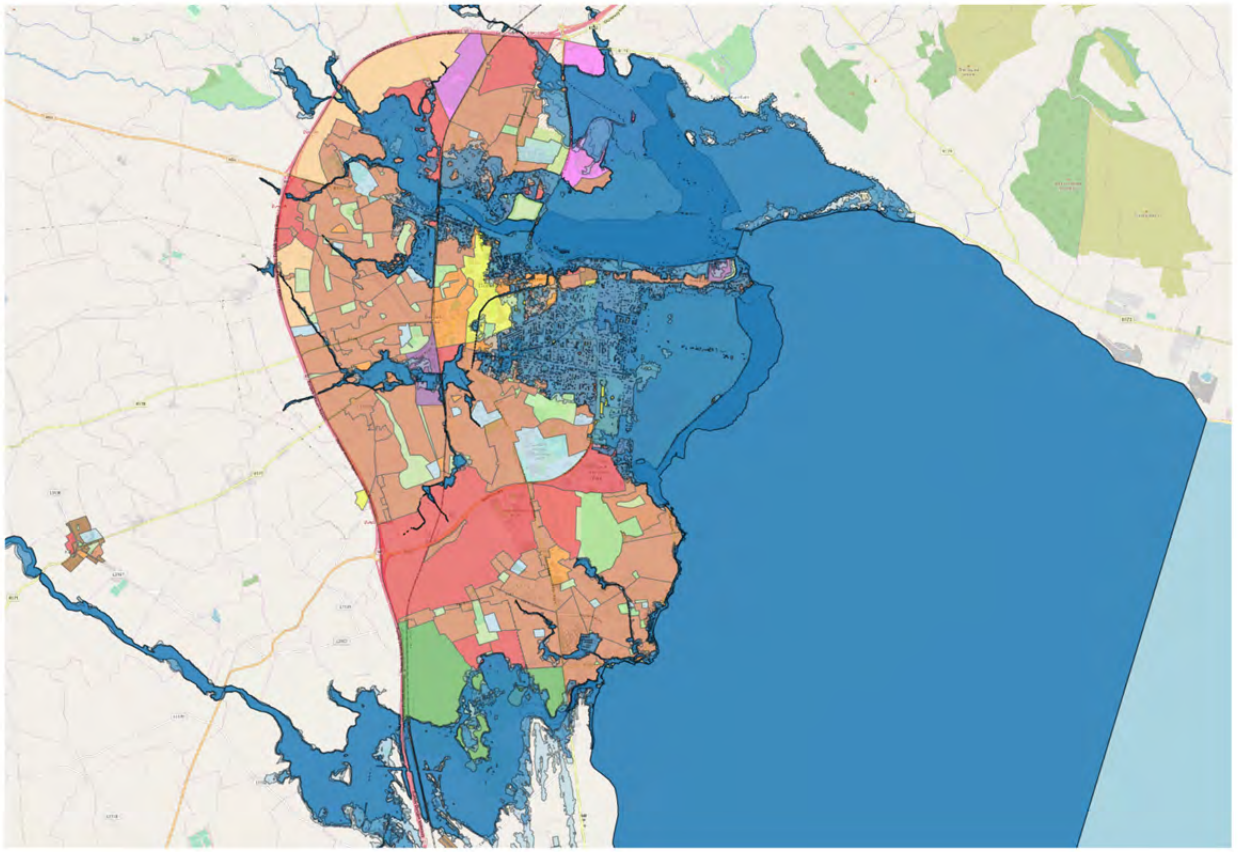


Figure 4-5 – Broad spatial distribution of flood risk in Dundalk

Flood Zone Mapping	CFRAM Flood Zone mapping
Commentary	Dundalk town centre is susceptible to fluvial flooding along the Castletown River but also from tidal flooding propagating inland from the Irish Sea. The Cooley Mountains to the north of the town and hilly terrain to the west with the Irish Sea to the east has seen the town grow south towards the village of Blackrock. The M1 circumnavigates the town which will

	consolidate growth of the development to the south of the town centre. The extent of the CFRAM mapping would indicate that the growth of Dundalk will largely be comprised of infill development between the boundary of the existing town and the M1.
RPO – Town Centre Regeneration	Current Scenario flooding is not a significant risk to the regeneration of the town centre areas such as Clanbrassil Street / St. Nicholas Quarter and infill/brownfield sites include Long Walk Shopping Centre, Carroll's Village Shopping Centre, Williamson's Mall, and Dunne's Park Street. However there is some potential for climate change influences to expand flood extents towards Clanbrassil Street and Seatown place. Development and regeneration in this area should be carried out in accordance with the Guidelines specifically circular PL02/2014 (August 2014).
RPO – Regeneration of Port Harbour	The lands within the Port area zoned for future expansion is within the predicted Flood Zone A and B extents. Water compatible development is appropriate in this area. However flood risk assessments for development in the port should still be carried out to ensure that there is no residual flood risk to the surroundings areas (upstream and downstream) due to development on these floodplains.
RPO – Development of Mount Avenue Masterplan Lands	Some lands within the Mount Avenue masterplan area are inundated with Flood Zone A and B. As the development area is currently largely greenfield the sequential approach of the Guidelines should be applied to develop a sustainable growth area of Dundalk.
RPO – Identification of suitable sites for industry to support Dublin-Belfast Economic Corridor	Several greenfield sites identified for industrial expansions on the periphery of the town have Flood Zone A and B extents. Any development in these areas should include a site specific FRA and follow the Guidelines sequential approach.
RPO: Support the proposed Dundalk Flood Relief Scheme	This will aid in protecting existing development and reduce the flood risk. It will also enable further sustainable development of at risk undeveloped land.
Existing - Flood Risk Management Measures	There are embankments protecting parts of the Point Road but they are only effective up to the 10% AEP coastal event Louth County Council is also progressing extension of an existing 1350mm surface drainage pipe as an interim flood relief method in the Balmers Bog area. The pipe will provide additional flow capacity which may be significant during high frequency events and affords partial upstream flood mitigation during a 1% AEP event, however alternative FRM methods would still require to be added to provide the preferred SoP under CFRAM for Dundalk AFA.
Existing Residential Areas	There is a fluvial flood risk to existing residential areas in the Upper and Lower Marshes areas as well as the Demesne area. There is a coastal flooding risk to St. Marys, Seatown and to large parts of eastern part of the town between St Alphonsus Road and Red Barns Road. Applications for minor development to these existing buildings in areas of flood risk such as small extensions and most changes of use must include a flood risk assessment of appropriate detail to demonstrate that they would not have adverse flood risk impacts and employ flood resilient construction. Large scale developments for regeneration or infill development for these areas will require a site-specific FRA.
Proposed - Flood Risk Management Measures	Flood defences measures were proposed for Dundalk and Blackrock South AFA, as part of the OPW FRMP to provide protection for up to a 1 in 100 year fluvial event and also a 1 in 200 year coastal event. Two proposed measures were identified that could be implemented after project-level assessment and planning. The preferred solutions are alternate routes for hard defences, combined with improvement of channel conveyance which would provide the required

	standard of protection. Both measures consists of a series of hard defences, including flood embankments and walls, rock armour coastal protection, demountable barriers, road raising, a sluice gate and tanking of two properties. These defences would be required along with improvement of channel conveyance on the Blackrock River and Dundalk Blackwater River, along with Storage on the Castletown River. The conveyance requires a 430m length of the Blackrock River to be lowered, along with the replacement of two undersized culverts. On the Dundalk Blackwater, two undersized parallel culverts should be replaced. The storage area to be created is located upstream of the Castletown River, allowing a volume of 84,329m3 to be stored during the 1% AEP fluvial flood event. This requires a short 15m embankment, along with a culvert and weir in order to retain flow at the 10% AEP event. The two proposed measures have alternate routes with hard defences either following the existing line of coastal embankments protecting all properties or a new line of coastal defences set back.
Climate Change Adaptability	Dundalk and Blackrock South AFA is considered to be at high vulnerability from the mid-range and high end future scenarios. This should be reflected in the future development plans for the town. A large portion of the eastern edge of the town is susceptible to future coastal flooding if climate change predictions are accurate. Areas from Avenue Road to the coastline have the potential to be inundated in Flood Zone A and B. The CFRAM FRMP outlined that any proposed flood risk management proposals for the Dundalk and Blackrock South AFA should be adaptable to climate change. The hard defences method could be adapted by increasing the height of the walls, embankments, demountables and road raises along with extending the lengths. Existing defences would need to be altered, with rock armour needing widened and sea walls requiring additional length. Additional lengths of hard defences would also be required where properties were not at risk under the present day. A sluice would need to be replaced. The storage area does not have any more capacity to store water for future scenarios. The improvement of channel conveyance method could be adapted by increasing channel capacity size and upgrading culverts. Other measures including Natural Flood Risk Management Measures may be adopted to monitor and/or adapt the scheme.
Flood Risk Summary	**Existing Flood Risk** The CFRAM study provides the best source of existing fluvial and coastal flooding information for Dundalk. This mapping is presented in **Figure 4-5**. This does not provide a complete assessment of flood risk to the area nor does it assess flood risk from all sources. This must be covered in the SFRA informing the LAP and FRAs for any other development plans in the town. **Flood Risk Impact and Spatial Planning Integration** The areas within lands zoned future residential and employment hubs identified within the predicted Flood Zone A & B require site specific flood risk assessments to no ensure no adverse flood risk impacts. The Justification Test applies to applications within these areas. Existing residential and mixed use developments at Dundalk Town Centre zoned for future regeneration located within the predicted Flood Zone A & B require flood risk management to ensure flood risk is

	mitigated and does not have an adverse impact elsewhere. Applications for major development within these areas required a site specific flood risk assessment to ensure no increase in flood risk to the development and surrounding areas. FRAs should be carried out in accordance with the Guidelines and the sequential approach for these sites to be developed in a sustainable manner and avoid flood risk. An assessment of climate and catchment changes shows Dundalk has been identified as being particularly susceptible to flooding from climate change scenarios. Future land zone planning for the town should incorporate this into their FRA and development policies. Future development plans and flood risk assessments should consider the potential of climate change influence on flood extents in accordance with the Guidelines. **Recommendations For Flood Risk Management** As detailed above the CFRAM FRMP has outlined a flood alleviation scheme for the town that should be reviewed by the planning authorities in conjunction with the OPW to deliver a flood alleviation scheme if it is deemed appropriate and viable. The planning authority should also review and implement where appropriate the suggested CFRAM flood risk management policy measures as outlined in Appendix B and the FRMP. SFRAs should be undertaken for all development plans and existing SFRAs should be updated and reviewed in line with statutory timelines for development plans. An assessment of climate and catchment changes shows Dundalk has been identified as being particularly susceptible to flooding from climate change scenarios. The proposed flood alleviation scheme should be designed to incorporate the potential impacts of climate change or be adaptable to increase the height of defences to provide the required SoP, or other measures including Natural Flood Risk Management Measures may be adopted to monitor and/or adapt the scheme. **Opportunities for Joint Studies** N/A

4.8.5 Growth Settlement - Bray

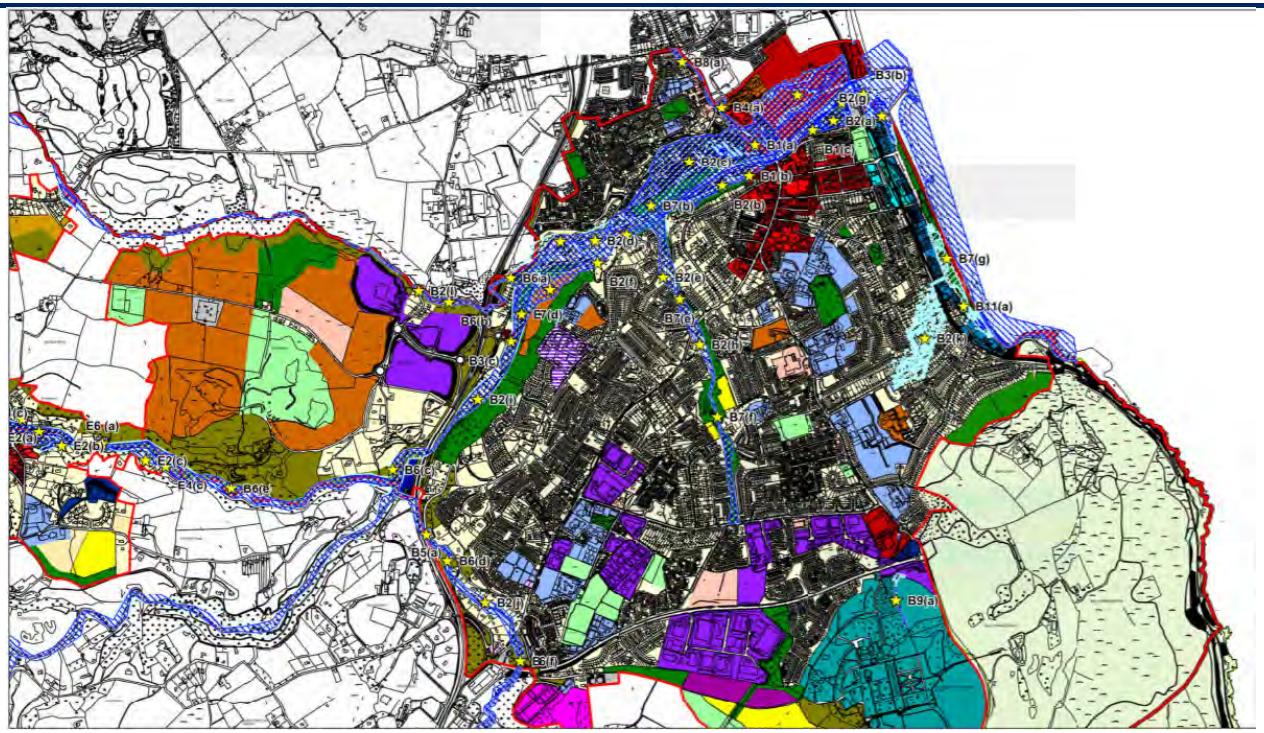


Figure 4-6 – Broad spatial distribution of flood risk in Bray

Flood Zone Mapping	Flood Zones from SFRA Bray Development Plan
Commentary	Flood Zones from the SFRA Bray Development Plan were reviewed as part of the RFRA. Flood extents for Bray are only partially included on floodinfo.ie due to the ongoing flood defence works. The remaining flood extents for Bray along the river Dargle are currently being updated and will be added to the website when completed. Bray historically has experience coastal and fluvial flooding. Beach nourishment in the early 2000s has been extremely effective to protect the seafront area and there is only limited predicted flooding in the MRFS scenario. The main source of fluvial flooding is the River Dargle with some low probability flooding along the Newcourt Stream. Wicklow County Council has already undertaken a comprehensive SFRA and recognises the risk of flooding in low lying areas of the River Dargle valley. Zonings and Justification Tests have been carried out where appropriate. The SFRA should be reviewed following completion of the flood zone mapping recognising the residual to zonings that are defended from the 1% AEP event. Development in

	Bray town will largely be confined to infill development as it is already well developed and constrained geographically by the hills surrounding it. The main focus of future development will be in the Fassaroe area which is situated on a hill side and is free from any fluvial flooding.
Urban Regeneration	Identification of strategic sites for regeneration to ensure Bray achieves growth targets should be carried out in accordance with the Guidelines specifically circular PL02/2014 (August 2014). The circular specifically addresses regeneration areas and flood risk management of their development. The town centre areas are not at risk from fluvial flooding but an assessment of pluvial flooding should still be undertaken. Any urban regeneration in the defended area of the River Dargle (e.g. Golf Course and Harbour area) should still set minimum finished floor levels above the 1% and 0.1% AEP levels depending on the type of property and its flood risk category.
Future Residential Development	AS discussed previously most of the future residential development is located in Fassaroe where flood risk is low. Development should undertake a FRA of appropriate detail to assess all types of flooding sources. There a few new residential sites adjacent to the River Dargle which was assessed as part of the SFRA Bray Development Plan and passed Justification Tests. A site specific FRA for these sites should still be considered to ensure that the sequential approach is followed and any residual risk of flooding is addressed.
Existing - Flood Risk Management Measures	The River Dargle (Bray) Drainage Scheme commenced construction in May 2012, and was completed in 2017. The Scheme, that comprises widening and deepening of the river channel, the construction of walls, embankments and culverts, underpinning of Bray Bridge, river regrading, soil nailing and erosion protection, provides protection against a 100-Year flood (1% Annual Exceedance Probability) for fluvial flooding and a 200-Year flood (0.5% Annual Exceedance Probability) against tidal flooding for 658 properties. The Old Connaught scheme was constructed in 2015. The scheme, that comprised a new culvert bypass, provides protection against a 1:100 year flood event (1% Annual Exceedance Probability) for 10 plus properties, against flooding from the Old Connaught Stream.
Proposed - Flood Risk Management Measures	No additional measures specific to Bray AFA are proposed.
Flood Risk Summary	**Existing Flood Risk** The Bray SFRA provides the best source of existing fluvial and coastal flooding information for Bray. This mapping is presented in **Figure 4-6**. This does not provide a complete assessment of flood risk to the area nor does it assess flood risk from all sources. This must be covered in the SFRA informing the LAP and FRAs for any other development plans in the town. **Flood Risk Impact and Spatial Planning Integration** The areas within lands zoned future residential and commercial developments identified within the predicted Flood Zone A & B require site specific flood risk assessments to ensure no adverse flood risk impacts. Existing residential and mixed use developments adjacent to the River Dargle are zoned within the predicted Flood Zones A and B. The flood relief has been completed but a residual risk of flooding should still be considered for FRAs and planning in this area. Hydraulic modelling for the final flood zones are still being undertaken. Future SFRAs and developments should take into account the flood zones when completed. FRAs should be carried out in accordance with the Guidelines and the sequential approach for these sites to be developed in a sustainable manner and avoid flood risk. Future

	development plans and flood risk assessments should consider the potential of climate change influence on flood extents in accordance with the Guidelines. **Recommendations For Flood Risk Management** As detailed above the Bray Flood Alleviation Scheme has been completed and there are no further works planned for Bray. The planning authority should review and implement where appropriate the suggested CFRAM flood risk management policy measures as outlined in Appendix B and the FRMP. SFRAs should be undertaken for all development plans and existing SFRAs should be updated and reviewed in line with statutory timelines for development plans **Opportunities for Joint Studies** As Bray expands there is an opportunity for Dun Laoghaire Rathdown County Council and Wicklow County Council to collaborate on future SFRAs for Bray to ensure that all flood risk issues are captured to inform their preparation of spatial plans.

4.8.6 Growth Settlement – Graiguecullen (Carlow)

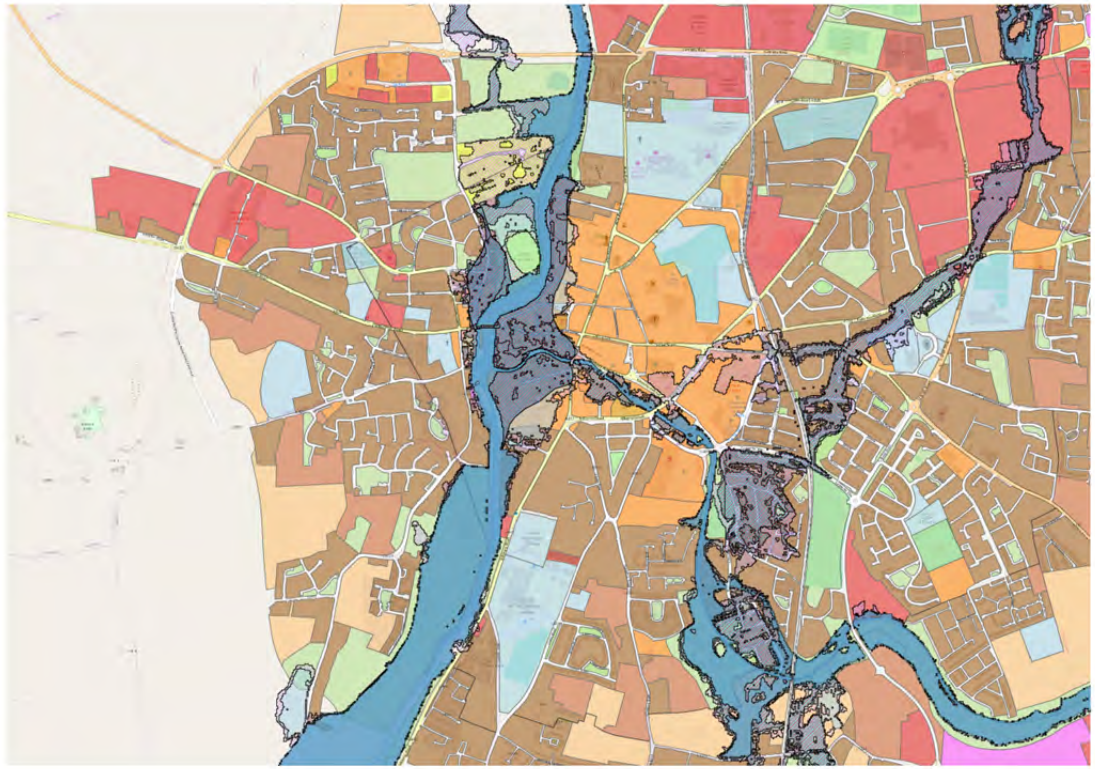


Figure 4-7 – Broad spatial distribution of flood risk in Graiguecullen (Carlow)

Flood Zone Mapping	CFRAM Flood Zone mapping
Commentary	Graiguecullen has no significant residential development lying within Flood Zones. The main flood risk for Carlow town lies within the Carlow County Council administrative area. A SFRA has already been undertaken for the Carlow Town LAP and sites at risk of flooding were assessed and passed Justification Tests where appropriate. Graiguecullen can develop spatially westwards to avoid any fluvial flood risk issues. Any undeveloped sites adjacent to the River Barrow have been zoned for green space and this should be maintained to retain existing floodplain areas. Carlow town centre development will be addressed in the SRA RSES.

RPO – Cross-boundary joint Urban Area Plan (UAP)	A joint SFRA by Carlow County Council and Laois County Council was already undertaken to support the existing development plan. When the plan is up for renewal this collaborative approach should be adopted again in line with the Guidelines. The SFRA should consider the recommendations and outputs from the Carlow CFRAM FRMP.
Urban Regeneration	Most sites in the town centre in Flood Zones A and B are in the defended area of the flood protection scheme. This shall allow continued regeneration of the town centre but it should still be carried out in accordance with the Guidelines specifically circular PL02/2014 (August 2014).
Future Residential Development	Future residential sites identified for Carlow town lie within Flood Zone C. These sites should still be assessed at lower level development plan scale to assess if they are risk from other sources of flooding.
Existing - Flood Risk Management Measures	The Carlow Flood Relief Scheme was initiated in 1996 following severe flooding in 1995 and was constructed from 2010 to 2013. The Scheme, which comprises flood defence walls and embankments along the River Barrow and Burren Stream with a pumping station at their confluence, provides protection against a 100-Year flood (1% Annual Exceedance Probability) for 185 properties.
Proposed - Flood Risk Management Measures	In addition to the maintenance and upkeep of the existing scheme, additional measures were identified in the FRMP for the Castle Oaks area (Carlow County Council administrative area). The proposed measure consists of building a series of flood embankments on the Burrin River and on the Knocknagee Stream. These hard defences would protect to the 1% AEP fluvial flood event with an estimated average height of 1.1m and a total length of 276m.
Flood Risk Summary	**Existing Flood Risk** The CFRAM study provides the best source of existing fluvial flooding information for Carlow. This mapping is presented in **Figure 4-7**. This does not provide a complete assessment of flood risk to the area nor does it assess flood risk from all sources. This must be covered in the SFRA informing the LAP and FRAs for any other development plans in the town. **Flood Risk Impact and Spatial Planning Integration** The areas within lands zoned future residential and commercial developments identified within the predicted Flood Zone A & B require site specific flood risk assessments to ensure no adverse flood risk impacts. FRAs should be carried out in accordance with the Guidelines and the sequential approach for these sites to be developed in a sustainable manner and avoid flood risk. Flood extents for the Mid-Range and High-End Future Climate Change scenarios show a number of additional properties likely to be impacted. Adaptation of proposed FRMP measures would require additional lengths and heights of hard defences to provide the required Standard of Protection. Whilst the proposed measure has moderate adaptability other measures including Natural Flood Risk Management Measures may be adopted to monitor and adapt the scheme. Future development plans and flood risk assessments should consider the potential of climate change influence on flood extents in accordance with the Guidelines. **Recommendations For Flood Risk Management** As detailed above the CFRAM FRMP has outlined additional flood alleviation measures for the town that should be reviewed by the

	planning authorities in conjunction with the OPW to deliver a flood alleviation scheme if it is deemed appropriate and viable. The planning authority should also review and implement where appropriate the suggested CFRAM flood risk management policy measures as outlined in Appendix B and the FRMP. SFRAs should be undertaken for all development plans and existing SFRAs should be updated and reviewed in line with statutory timelines for development plans. An assessment of climate and catchment changes shows Carlow has been identified as being susceptible to flooding from climate change scenarios. The proposed flood alleviation measures should be designed to incorporate the potential impacts of climate change or be adaptable to increase the height of defences to provide the required SoP, or other measures including Natural Flood Risk Management Measures may be adopted to monitor and/or adapt the scheme. **Opportunities for Joint Studies** Laois County Council and Carlow County Council have previously collaborated on the Graiguecullen SFRA and should continue this approach for future expansion of Carlow town to ensure that all flood risk issues are captured to inform their preparation of spatial plans.

4.8.7 Growth Settlement - Longford

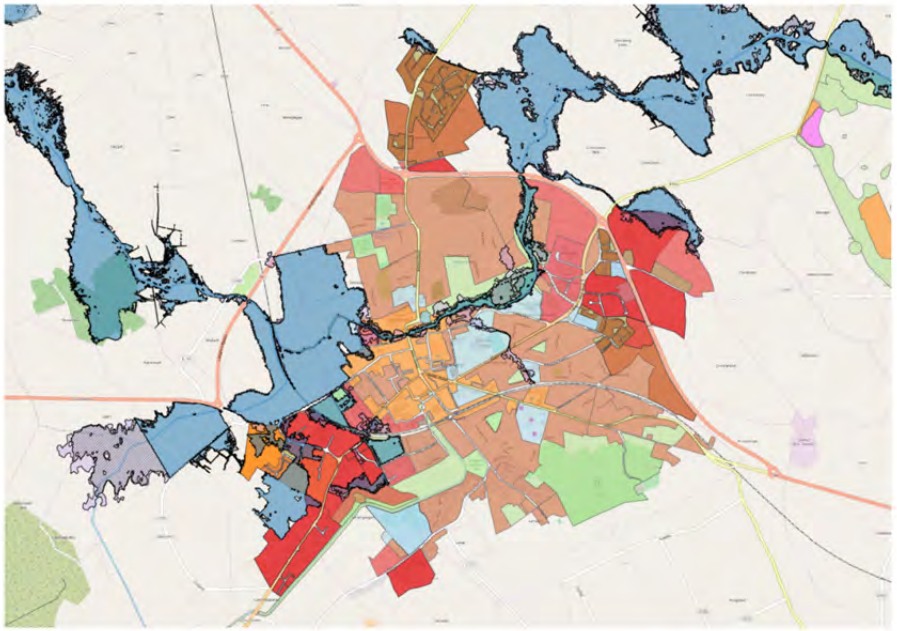


Figure 4-8 – Broad spatial distribution of flood risk in Longford

Flood Zone Mapping	CFRAM Flood Zone mapping
Commentary	Longford town spatially can expand to the south, east and north west. The other areas of the town have large flood floodplains on the outskirts which would limit expansion to the north east and west. The largest flood risk on currently zoned land is located in the south west on lands identified for strategic development including the Ballyminion Neighbourhood centre and industrial development zones. Masterplans are proposed for these areas and should include a SFRA to assess the flood risk.
RPO: Support the proposed Longford Flood Relief Scheme	This will aid in protecting existing development and reduce the flood risk. It will also enable further sustainable development of at risk undeveloped land.
Urban Regeneration	Identification of strategic sites for regeneration for Longford should be carried out in accordance with the Guidelines specifically circular PL02/2014 (August 2014). Parts of the town centre lie within Flood Zone B and regeneration in this area most take that into consideration in terms of the sequential approach and FFLs.

Future Residential Development	Future residential sites identified for Longford town lie within Flood Zone C with the exception of the Ballyminion Neighbourhood Centre. A site specific FRA should be carried out for the Ballyminion Masterplan to assess if it is appropriate for this land to be zoned for residential development. The principle of avoidance and the sequential approach should be followed to ensure flood risk is minimised in this area.
Existing - Flood Risk Management Measures	There are no existing flood risk measures in Longford town.
Proposed - Flood Risk Management Measures	FRMP identified potential flood relief works for Longford that could include: ▪ Construction of a 30m new flood defence wall to reduce risk to town centre areas. ▪ Removal of the existing footbridge on the Camlin River upstream of the N63 Bridge to reduce risk to town centre areas.
Flood Risk Summary	**Existing Flood Risk** The CFRAM study provides the best source of existing fluvial flooding information for Longford town. This mapping is presented in **Figure 4-8**. This does not provide a complete assessment of flood risk to the area nor does it assess flood risk from all sources. This must be covered in the SFRA informing the LAP and FRAs for any other development plans in the town. **Flood Risk Impact and Spatial Planning Integration** The areas within lands zoned future residential and commercial developments identified within the predicted Flood Zone A & B require site specific flood risk assessments to ensure no adverse flood risk impacts. At regional scale no significant climate change impact on the fluvial extents was identified however future development plans and flood risk assessments should still consider the potential of climate change influence on flood extents in accordance with the Guidelines. The height of the walls and embankments of the proposed FRMP measures can be increased to facilitate increases in flood risk due to climate change. The increase conveyance measures will not be easily adaptable to potential future changes. **Recommendations For Flood Risk Management** As detailed above the CFRAM FRMP has not outlined additional flood alleviation measures for the town. However the planning authority should still review and implement where appropriate the suggested CFRAM flood risk management policy measures as outlined in Appendix B and the FRMP. SFRAs should be undertaken for all development plans and existing SFRAs should be updated and reviewed in line with statutory timelines for development plans. **Opportunities for Joint Studies** N/A

4.8.8 Growth Settlement – Maynooth

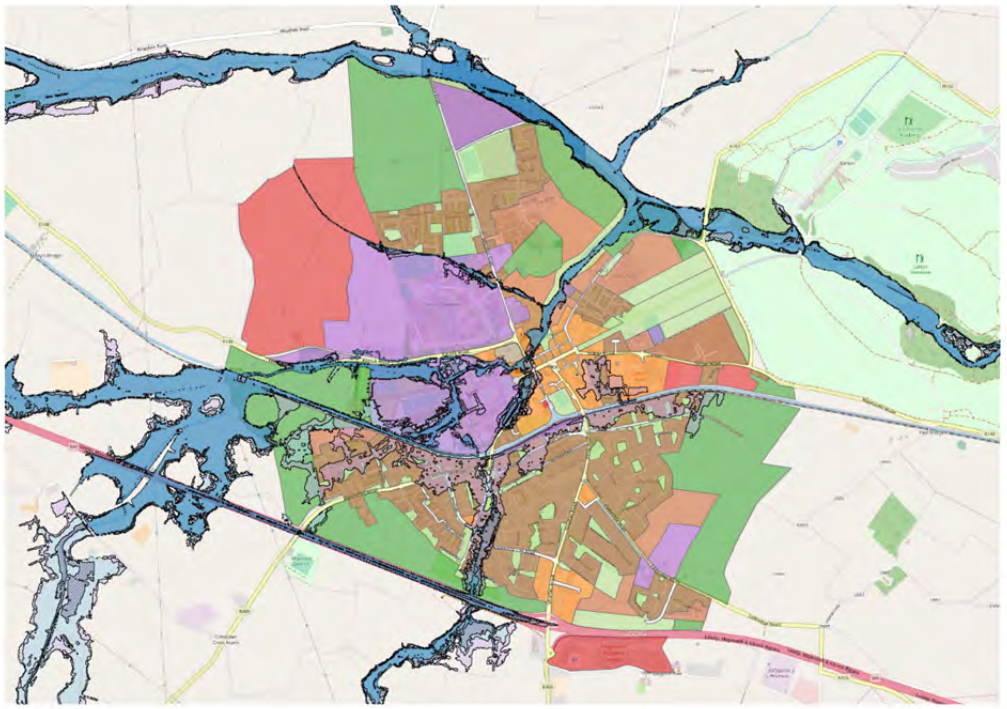


Figure 4-9 – Broad spatial distribution of flood risk in Maynooth

Flood Zone Mapping	Flood Zones from SFRA Bray Development Plan
Commentary	Flood zones would indicate that Maynooth can expand to the North West and West. It is naturally constrained to the north and south by the motorway and the River Ryewater respectively. Maynooth town centre properties along the banks of the Lyreen river are susceptible to flooding. Zoning in the town centre should take this into consideration and carry out Justification Tests where appropriate.
Urban Regeneration	Identification of strategic sites for regeneration in the town centre should be carried out in accordance with the Guidelines specifically circular PL02/2014 (August 2014). The southern part of the town lies within the defended area of the Meadowbrook Stream and this should be considered if any regeneration projects are identified in this area.
Future Residential	The identified sites Crewhill and Rail Park in Maynooth lie within Flood Zone C, while two parts of sites adjacent to the Maws Stream and

Development	at the confluence of the stream and Lyreen River lie in Flood Zones A and B. Parts of a potential site in Netwon lie in Flood Zone B. Site specific FRAs should be carried out to ensure the principle of avoidance and the sequential approach is should followed.
Community Infrastructure	Areas of the Maynooth University Campus lie within Flood Zones A and B. Future expansion of the university should consider flood risk and FRAs should be carried out to an appropriate level of detail. The proposed FRMP measures could help reduce the risk to the university and any FRAs should be cognisant of the measures.
Existing - Flood Risk Management Measures	The Lyreen and Meadowbrook Flood Relief Scheme was initiated in 2001 following major flooding in November 2000 and was constructed from 2002 to 2003. The scheme works, included cleaning 4 kilometres of the Lyreen River channel and 1.6 kilometres of the Meadowbrook River channel, cleaning / repairing / replacing culverts, together with cleaning out aqueducts at Bond Bridge and Jackson's Bridge. The scheme also provided trash screens and flap valves on channels, where appropriate, and repairing a damaged wall at Parsons Lane. The scheme provides increased flood protection for 30 properties against flooding from the Meadowbrook and Lyreen Rivers.
Proposed - Flood Risk Management Measures	The FRMP identified a series of hard defences (flood embankments and walls) and an overland flow route. The hard defences will provide a SoP of 1% AEP for fluvial flood events with an average and maximum height of 1.6m and 2.0m respectively and a total length of 350m. The overland flow route will be defined by 375m of hard defences with an average height of 0.8m.
Flood Risk Summary	**Existing Flood Risk** The CFRAM study provides the best source of existing fluvial flooding information for Maynooth. This mapping is presented in **Figure 4-9**. This does not provide a complete assessment of flood risk to the area nor does it assess flood risk from all sources. This must be covered in the SFRA informing the LAP and FRAs for any other development plans in the town. **Flood Risk Impact and Spatial Planning Integration** The areas within lands zoned future residential, educational and commercial developments identified within the predicted Flood Zone A & B require site specific flood risk assessments to ensure no adverse flood risk impacts. FRAs should be carried out in accordance with the Guidelines and the sequential approach for these sites to be developed in a sustainable manner and avoid flood risk. Future development plans and flood risk assessments should consider the potential of climate change influence on flood extents in accordance with the Guidelines. An assessment of climate and catchment changes shows Maynooth to be moderately vulnerable to the increases as modelled in the mid-range future scenario and highly vulnerable to the increases as modelled in the high end future scenarios. **Recommendations For Flood Risk Management** As detailed above the CFRAM FRMP has outlined flood alleviation measures for the town that should be reviewed by the planning authorities in conjunction with the OPW to deliver a flood alleviation scheme if it is deemed appropriate and viable. The planning authority should also review and implement where appropriate the suggested CFRAM flood risk management policy measures as outlined in Appendix B and the FRMP. SFRAs should be undertaken for all development plans and existing SFRAs should be updated and reviewed in line with statutory timelines for development plans. An assessment of climate and catchment changes shows Maynooth to be moderately vulnerable to the increases as modelled in the mid-range future scenario and highly vulnerable to the increases as modelled in

	the high end future scenarios. Adaptation of the proposed measure would require significant additional length and height (by circa 0.5m) of hard defences to maintain the level of protection as provided by the proposed measure. Future monitoring, and subsequent implementation of other measures such as Natural Flood Risk Management Measures, may be adopted to assist in identifying and off-setting the impacts of climate change. **Opportunities for Joint Studies** N/A

4.8.9 Growth Settlement – Mullingar

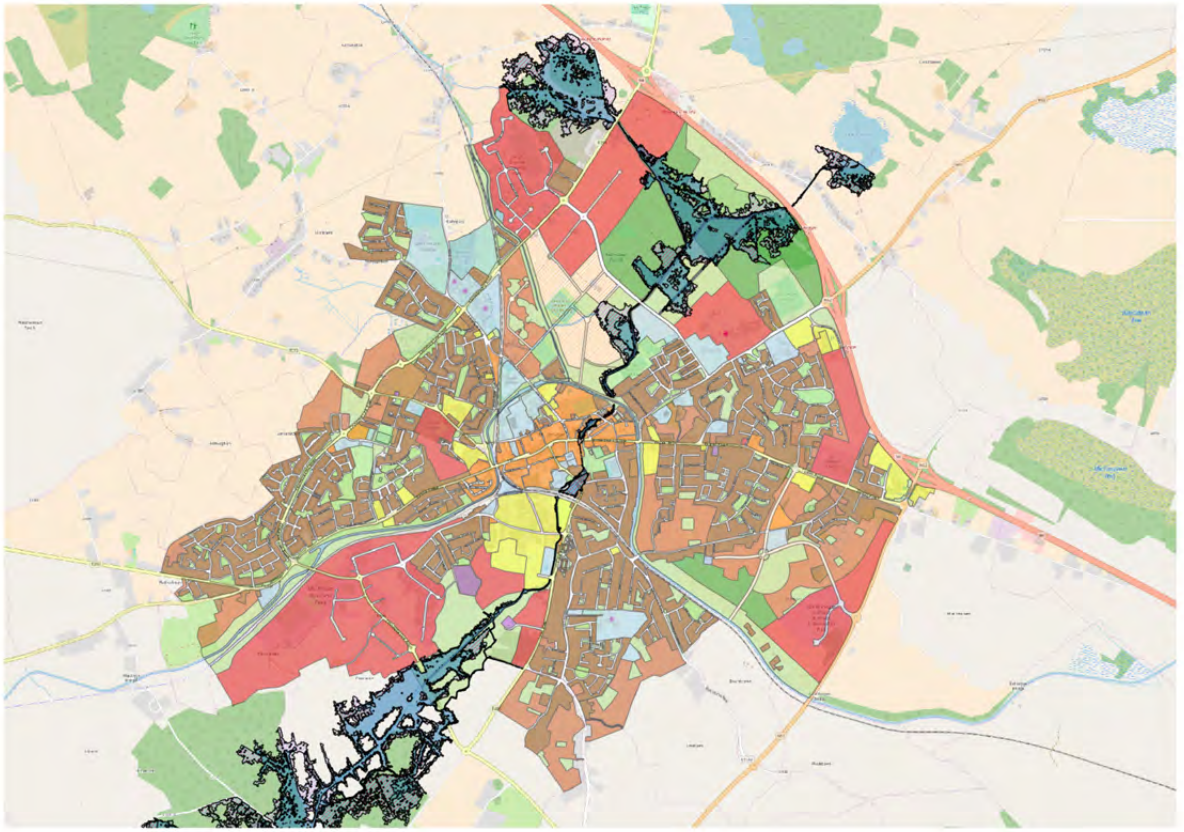


Figure 4-10 – Broad spatial distribution of flood risk in Mullingar

Flood Zone Mapping	CFRAM Flood Zone mapping
Commentary	The spatial growth of Mullingar expands predominantly in all directions from the centre of the town. Open space to the northeast and south of Mullingar and agricultural, sporting recreational and business/technology park lands to the northeast of Mullingar are within the extents of Flood Zones A and B. It is indicated thus far that future residential and commercial growth is continuing around these locations.

Urban Regeneration	Identification of strategic sites for regeneration to ensure Mullingar achieves growth targets should be carried out in accordance with the Guidance specifically circular PL02/2014 (august 2014). The circular specifically addresses regeneration areas and flood risk management of their development. The sites identified can be cognisant of the development of the Mullingar Flood Alleviation Scheme which was completed in 2010. This lead to areas of the town being protected for the 1% AEP event and development should be appropriate to level of residual risk post the scheme.
Future Residential Development	Petiswood, Lakepoint Park, Mount Lynn, Rathcolman and Sarsanstown all lay outside the Flood Zones northeast and southwest of Mullingar. However, existing residential and town centre properties located within Mullingar Town Centre at close proximity to the River Bosna, particularly at Supervalu shopping centre between Pearse Street and Fiars Mill Road are within Zone A and B extents. Regeneration of these areas should be carried out in accordance with the Guidelines specifically circular PL02/2014 (August 2014)
Existing - Flood Risk Management Measures	The Mullingar Flood Relief Scheme was initiated in 2002 and was constructed from 2005 to 2010. The Scheme comprises of flood defence walls and embankments along the Brosna River and provides protection against a 1% AER (100 year) fluvial event from the Brosna River for 20 properties.
Proposed - Flood Risk Management Measures	No additional measures specific to Mullingar are proposed.
Flood Risk Summary	**Existing Flood Risk** The CFRAM study provides the best source of existing fluvial flooding information for Mullingar. This mapping is presented in **Figure 4-10**. This does not provide a complete assessment of flood risk to the area nor does it assess flood risk from all sources. This must be covered in the SFRA informing the LAP and FRAs for any other development plans in the town. **Flood Risk Impact and Spatial Planning Integration** The areas within lands zoned future residential and commercial developments are outside of the predicted Flood Zone A and B extents. Existing open space, agricultural and sporting recreational zoned lands in Mullingar are located within predicted Flood Zones A and B. Applications for major development within these areas required a site specific flood risk assessment to ensure no increase in flood risk to the development and surrounding areas. The CFRAM MRFS food extents show an increase in predicted flood extents within the town centre between Pearse Street and Friars Mill Road. Future development plans and flood risk assessments should consider the potential of climate change on flood extents in accordance with the Guidelines. **Recommendations For Flood Risk Management** As detailed above the CFRAM FRMP has not outlined flood alleviation measures for the town. However the planning authority should still review and implement where appropriate the suggested CFRAM flood risk management policy measures as outlined in Appendix B and the FRMP. SFRAs should be undertaken for all development plans and existing SFRAs should be updated and reviewed in line with statutory timelines for development plans.

	Opportunities for Joint Studies N/A

4.8.10 Growth Settlement – Naas

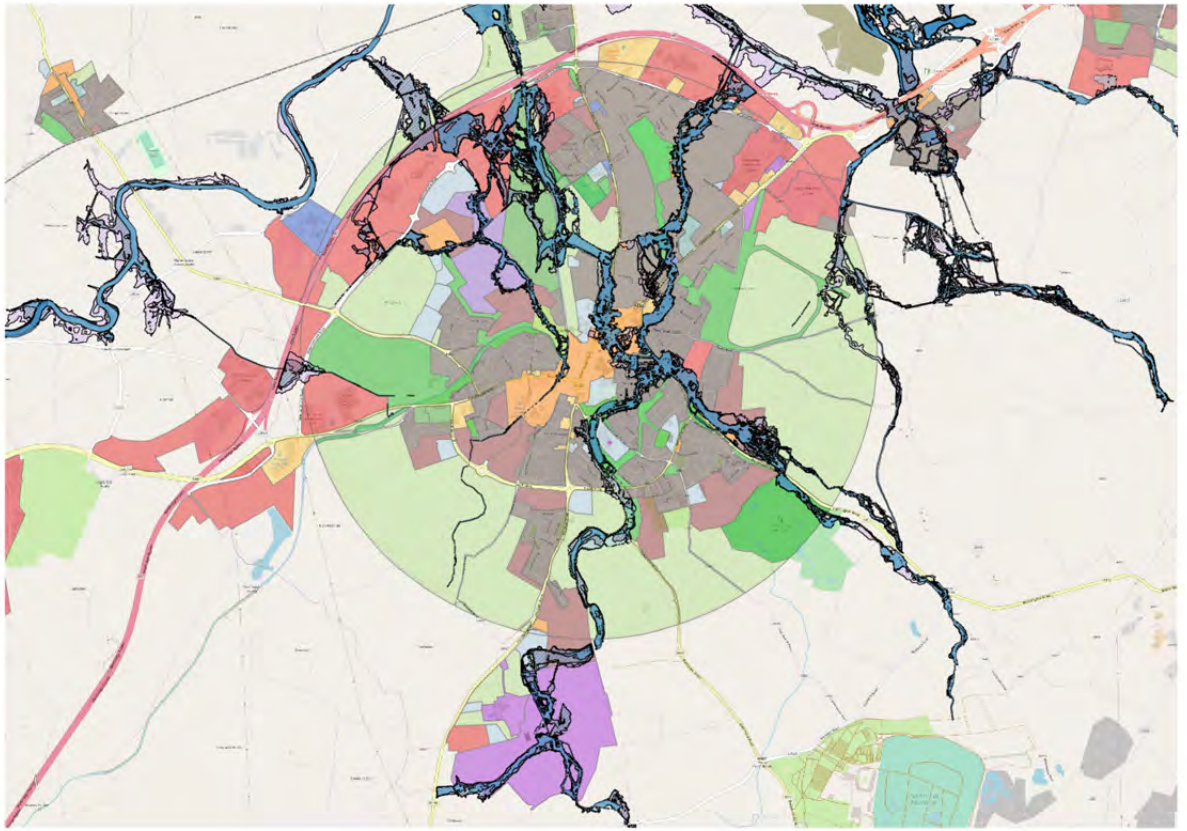


Figure 4-11 – Broad spatial distribution of flood risk in Naas

Flood Zone Mapping	CFRAM Flood Zone mapping
Commentary	The flood zones and constraints of the M7 motorway indicate that Naas can expand predominantly to the south west. Flood Zones indicate that areas of the town centre and existing residential areas adjacent the Blessington and Dublin Road are at risk from flooding. Industrial zone areas on the outskirts of the town also fall within Flood Zones A and B. A revised Naas LAP is currently ongoing which is assessing the appropriate of these zones. It should be noted that as acknowledged in the FRMP there is high uncertainty regarding the

	flood risk in relation to Naas due to poor availability of model calibration events and possible interconnection between fluvial and surface water drainage and canal systems. Prior to the development of this model a cautionary approach should be taken with regards to flood risk and zoning in Naas.
Urban Regeneration	Regeneration of existing residential and town centre zonings within Flood Zones A and B should be carried out in accordance with the Guidance specifically circular PL02/2014 (august 2014). Consideration should be given the sequential approach, FFLs and flood resilient construction
Future Residential Development	Some proposed residential areas in the southern part (Blessington Road and Kilcullen Road) of Naas lie within Flood Zones A and B. A revised Naas LAP is currently ongoing which is assessing the appropriate of these zones
Existing - Flood Risk Management Measures	There is no existing flood scheme in place for Naas
Proposed - Flood Risk Management Measures	The Eastern CFRAM FRMP identified a flood relief scheme for Naas. The proposed scheme comprises of hard defences (flood walls and embankments), formalisation of an existing flow path to create a flow diversion channel, improvement of channel conveyance and potential storage options. This scheme will also be subject to further hydraulic analysis as discussed above due to uncertainty associated with the flood zones.
Flood Risk Summary	**Existing Flood Risk** The CFRAM study provides the best source of existing fluvial flooding information for Naas. This mapping is presented in **Figure 4-11**. This does not provide a complete assessment of flood risk to the area nor does it assess flood risk from all sources. This must be covered in the SFRA informing the LAP and FRAs for any other development plans in the town. It should be noted that as acknowledged in the FRMP there is high uncertainty regarding the flood risk in relation to Naas due to poor availability of model calibration events and possible interconnection between fluvial and surface water drainage and canal systems. Prior to the development of this model a cautionary approach should be taken with regards to flood risk and zoning in Naas. **Flood Risk Impact and Spatial Planning Integration** Some proposed residential areas in the southern part (Blessington Road and Kilcullen Road) of Naas lie within Flood Zones A and B. A revised Naas LAP is currently ongoing which is assessing the appropriate of these zones An assessment of climate and catchment changes shows Naas to be highly vulnerable to the increases as modelled in the mid-range and high end future scenarios. Future development plans and flood risk assessments should consider the potential of climate change influence on flood extents in accordance with the Guidelines. **Recommendations For Flood Risk Management** As detailed above the CFRAM FRMP has outlined flood alleviation measures for the town that should be reviewed by the planning authorities in conjunction with the OPW to deliver a flood alleviation scheme if it is deemed appropriate and viable. The proposed

	scheme comprises of hard defences (flood walls and embankments), formalisation of an existing flow path to create a flow diversion channel, improvement of channel conveyance and potential storage options. This scheme will also be subject to further hydraulic analysis as discussed above due to uncertainty associated with the flood zones. The planning authority should also review and implement where appropriate the suggested CFRAM flood risk management policy measures as outlined in Appendix B and the FRMP. SFRAs should be undertaken for all development plans and existing SFRAs should be updated and reviewed in line with statutory timelines for development plans. An assessment of climate and catchment changes shows Naas to be highly vulnerable to the increases as modelled in the mid-range and high end future scenarios. Adaptation of the proposed measure would require additional lengths and heights of hard defences and the height of the storage structure would need to be increased (by over 1.5m in some parts) to maintain the level of protection as provided by the proposed measure. Future monitoring, and subsequent implementation of other measures such as Natural Flood Risk Management Measures, may be adopted to assist in identifying and off-setting the impacts of climate change. **Opportunities for Joint Studies** N/A

4.8.11 Growth Settlement – Navan

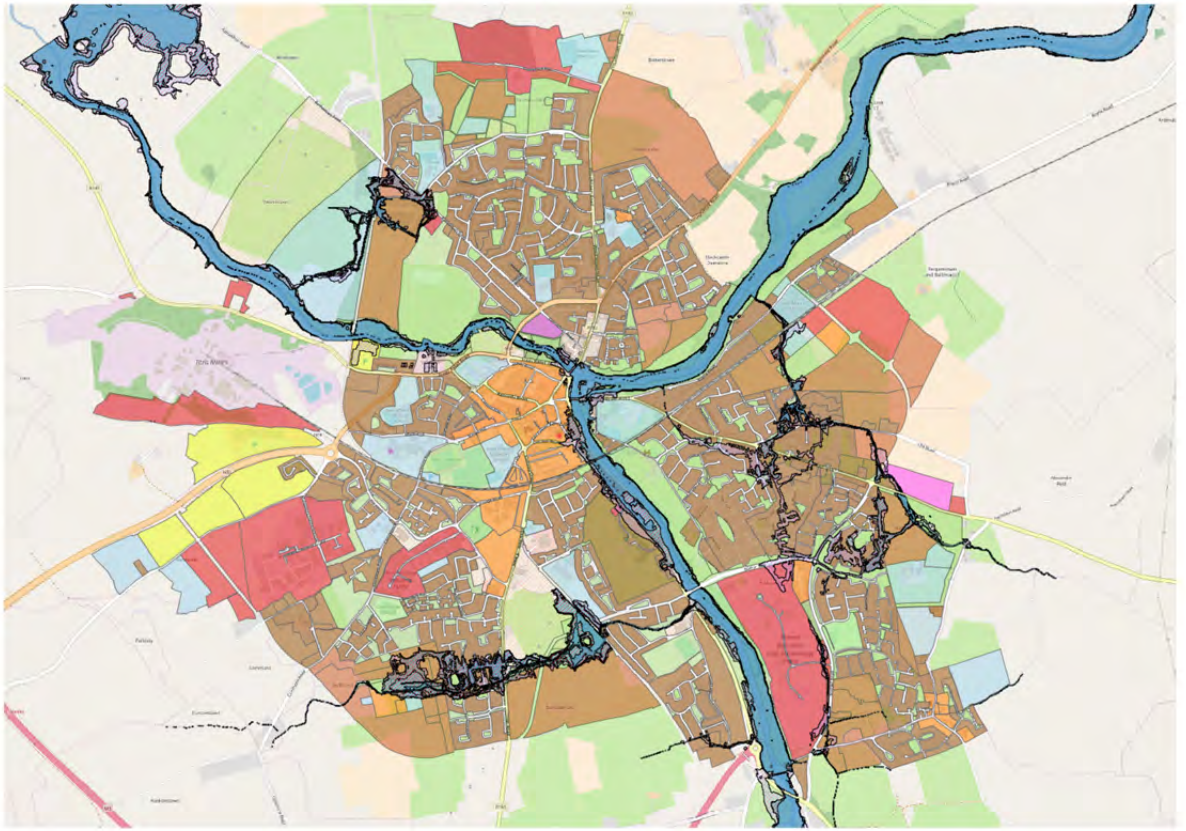


Figure 4-12 – Broad spatial distribution of flood risk in Navan

Flood Zone Mapping	CFRAM Flood Zone mapping
Commentary	Navan town is built on the banks if the River Boyne. The flood risk from the Boyne affects low lying properties within Flood Zones A and B along the Dublin Road. The flood plains of the River Boyne have been zoned as green space and this should be maintained to provide natural flood management for the area. There is additional flood risk in Navan along minor tributaries of the Boyne including the Robinrath, Windtown and Ferganstown streams. These streams have some existing residential and proposed zonings within Flood

	Zones A and B. Navan can expand to the west and north with limited risk of fluvial flooding. Navan is built on hilly terrain so FRAs should consider potential overland flow as a potential sauce of flooding.
Urban Regeneration	Regeneration of existing residential within Flood Zones A and B should be carried out in accordance with the Guidance specifically circular PL02/2014 (august 2014). Consideration should be given the sequential approach, FFLs and flood resilient construction. The town centre lies in Flood Zone C and regeneration projects should not be hindered by flooding issues.
Future Residential Development	Some proposed residential areas in the southern part of the within Flood Zones A and B. Any development in these areas should follow the sequential approach and should be accompanied by a Justification Test.
Existing - Flood Risk Management Measures	There is no existing flood scheme in place for Navan.
Proposed - Flood Risk Management Measures	The Eastern CFRAM FRMP identified a flood relief scheme for Navan. The proposed scheme might include physical works such as a series of hard defences (flood embankments and walls), road raising and clearance of a 750m reach of the Abbeylands Tributary. The hard defences would protect to the 1% AEP fluvial flood event with a total wall length of 889m, a total embankment length of 340m and a total length of 986m of road to be raised.
Flood Risk Summary	**Existing Flood Risk** The CFRAM study provides the best source of existing fluvial flooding information for Navan. This mapping is presented in **Figure 4-12**. This does not provide a complete assessment of flood risk to the area nor does it assess flood risk from all sources. This must be covered in the SFRA informing the LAP and FRAs for any other development plans in the town. **Flood Risk Impact and Spatial Planning Integration** The areas within lands zoned future residential and commercial developments identified within the predicted Flood Zone A & B require site specific flood risk assessments to ensure no adverse flood risk impacts. Applications for major development within these areas required a site specific flood risk assessment to ensure no increase in flood risk to the development and surrounding areas. Future development plans and flood risk assessments should consider the potential of climate change influence on flood extents in accordance with the Guidelines. An assessment of climate and catchment changes shows Navan to be highly vulnerable to the increases as modelled in the mid-range and high end future scenarios. **Recommendations For Flood Risk Management** As detailed above the CFRAM FRMP has outlined flood alleviation measures for the town that should be reviewed by the planning authorities in conjunction with the OPW to deliver a flood alleviation scheme if it is deemed appropriate and viable. The planning authority should also review and implement where appropriate the suggested CFRAM flood risk management policy measures as outlined in Appendix B and the FRMP. SFRAs should be undertaken for all development plans and existing SFRAs should be updated and reviewed in line with statutory timelines for development plans. An assessment of climate and catchment changes shows Navan to be

	highly vulnerable to the increases as modelled in the mid-range and high end future scenarios. Adaptation of the proposed measure would require significant additional lengths and heights (circa 1m) of hard defences to maintain the level of protection as provided by the proposed measure. Future monitoring, and subsequent implementation of other measures such as Natural Flood Risk Management Measures, may be adopted to assist in identifying and off-setting the impacts of climate change. **Opportunities for Joint Studies** N/A

4.8.12 Growth Settlement – Portlaoise

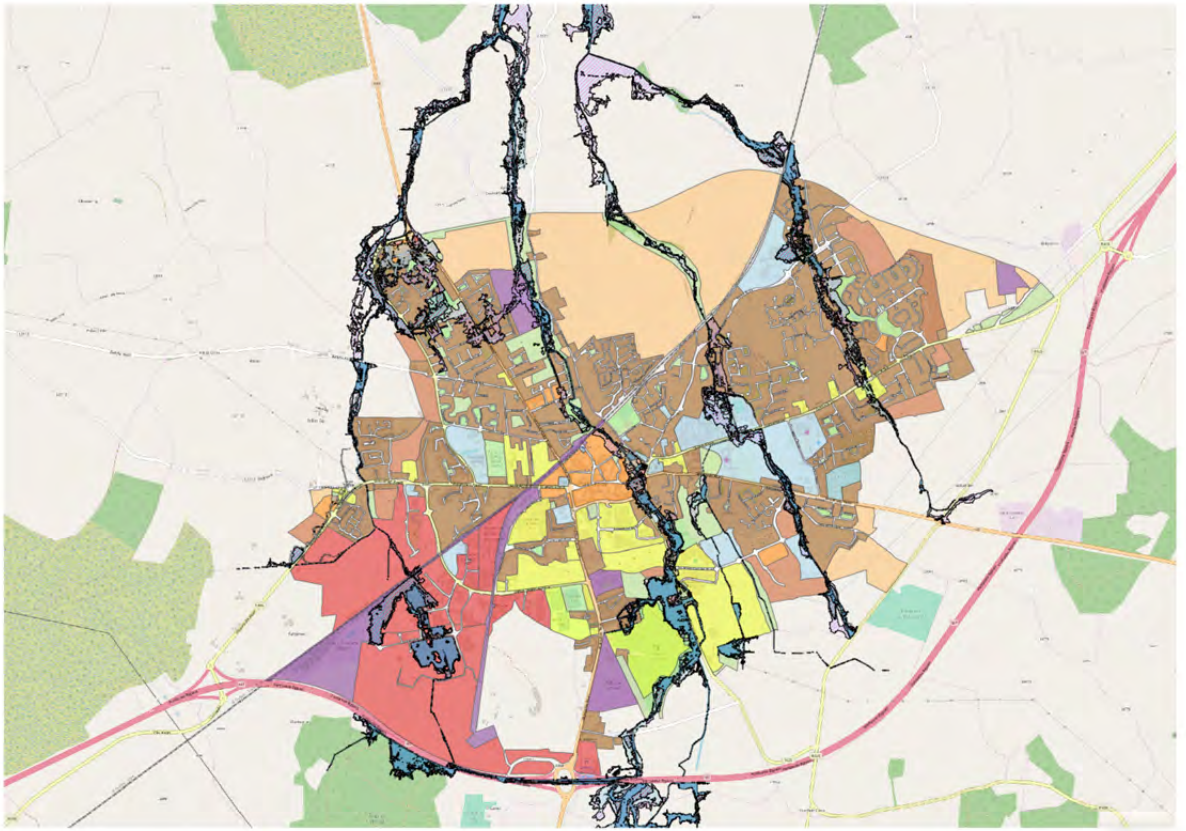


Figure 4-13 – Broad spatial distribution of flood risk in Portlaoise

Flood Zone Mapping	CFRAM Flood Zone mapping
Commentary	Portlaoise has been developed on the banks of four watercourses the Triogue, Borris, Clonmanin and Togher. They are tributaries of the River Barrow. There areas along the banks of each watercourse that lie within Flood Zones A and B including the National Enterprise Park, commercial and residential properties along the Abbeyleix Road, Summerhill Lane and existing residential areas adjacent to Colliers Lane. The town has space between the four watercourses to carry implemented the regeneration RPO without increasing the

	flood risk to residents.
RPO - Urban Regeneration and Development	Regeneration of existing residential and commercial areas within Flood Zones A and B should be carried out in accordance with the Guidance specifically circular PL02/2014 (august 2014). Consideration should be given the sequential approach, FFLs and flood resilient construction. There are large areas that lie outside the flood zones that could be prioritised for regeneration.
Future Residential Development	Some proposed residential areas along the Borris stream are within Flood Zones A and B. Any development in these areas should follow the sequential approach and should be accompanied by a Justification Test and FRA.
Existing - Flood Risk Management Measures	There is no existing flood scheme in place for Portlaoise.
Proposed - Flood Risk Management Measures	Potentially viable flood relief works for Portlaoise that may be implemented after a detailed cost assessment and project-level assessment and planning or Exhibition and confirmation might include physical works. The proposed measure consists of building a combination of hard defences and storage, at risk properties would be protected by a series of flood embankments and walls along the Triogue, Borris, Clonmanin and Togher watercourses. These hard defences would protect to the 1% AEP flood event with an estimated average height of 0.82m and a total length of 1.5km. An upstream storage area of approximately 98,000m3 located south east of the Carrick Hill area is also required.
Flood Risk Summary	**Existing Flood Risk** The CFRAM study provides the best source of existing fluvial flooding information for Portlaoise. This mapping is presented in **Figure 4-13**. This does not provide a complete assessment of flood risk to the area nor does it assess flood risk from all sources. This must be covered in the SFRA informing the LAP and FRAs for any other development plans in the town. **Flood Risk Impact and Spatial Planning Integration** The areas within lands zoned future residential and commercial developments identified within the predicted Flood Zone A & B require site specific flood risk assessments to ensure no adverse flood risk impacts. Applications for major development within these areas required a site specific flood risk assessment to ensure no increase in flood risk to the development and surrounding areas. Future development plans and flood risk assessments should consider the potential of climate change influence on flood extents in accordance with the Guidelines. Flood extents for the Mid-Range and High-End Future Climate Change scenarios identified a number of additional properties likely to be impacted. Adaptation of proposed measures would require additional lengths and heights of hard defences and major structural works required for the storage method to maintain the required Standard of Protection. Whilst the proposed measure has poor adaptability other measures including Natural Flood Risk Management Measures may be adopted to monitor and adapt the scheme. **Recommendations For Flood Risk Management** As detailed above the CFRAM FRMP has outlined flood alleviation measures for the town that should be reviewed by the planning

	authorities in conjunction with the OPW to deliver a flood alleviation scheme if it is deemed appropriate and viable. The planning authority should also review and implement where appropriate the suggested CFRAM flood risk management policy measures as outlined in Appendix B and the FRMP. SFRAs should be undertaken for all development plans and existing SFRAs should be updated and reviewed in line with statutory timelines for development plans. Flood extents for the Mid-Range and High-End Future Climate Change scenarios identified a number of additional properties likely to be impacted. Adaptation of proposed measures would require additional lengths and heights of hard defences and major structural works required for the storage method to maintain the required Standard of Protection. Whilst the proposed measure has poor adaptability other measures including Natural Flood Risk Management Measures may be adopted to monitor and adapt the scheme. **Opportunities for Joint Studies** N/A

4.8.13 Growth Settlement – Swords

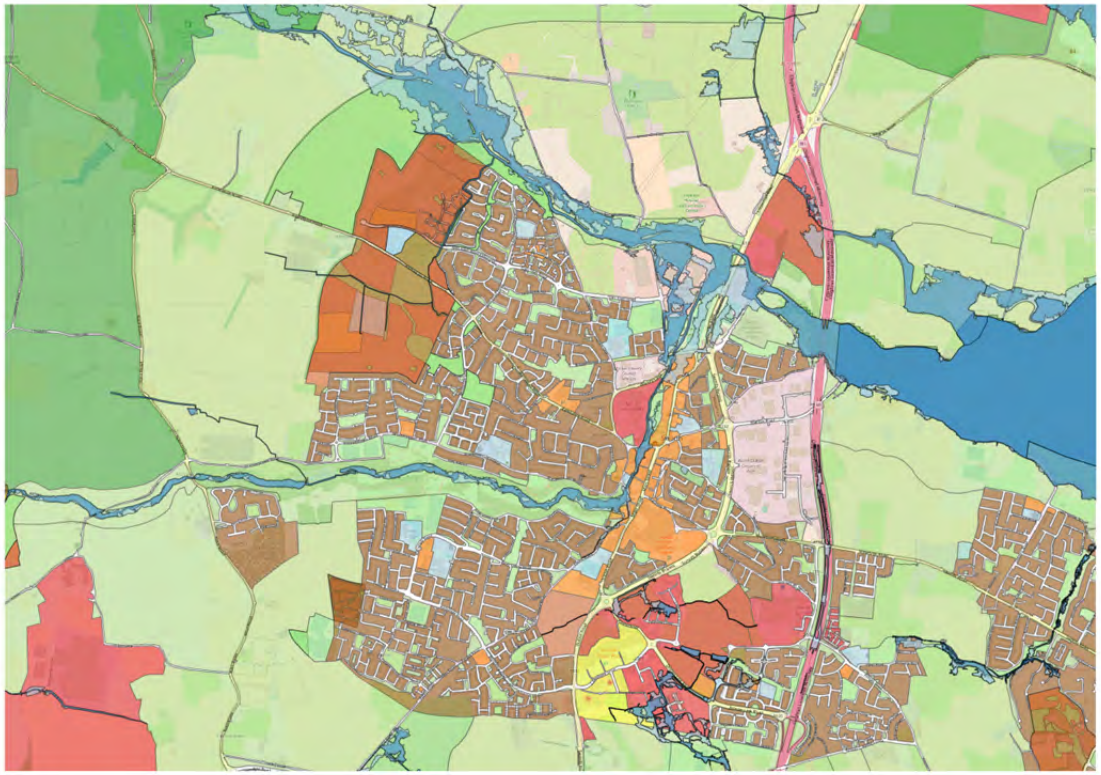


Figure 4-14 – Broad spatial distribution of flood risk in Swords

Flood Zone Mapping	CFRAM Flood Extent mapping
Commentary	Greenfield lands at Lissenhall were identified as an area for a future strategic study to promote the development of a planned sustainable mixed-use urban development area. The flood extents generated for Lissenhall as part of the FEMFRAM study show flooding in parts of these lands. A further detailed FRA during the development of a LAP for Lissenhall lands is required by the Fingal CDP to assign an appropriate land uses.

	The Balheary area in the north of Swords town id already heavily industrialised with development and lies within a significant flood extent for Flood Zone A and B. This area was also identified as being subject to increased flood extent under climate change scenarios due to its proximity to the confluence of the Ward and Broadmeadow Rivers. Any future expansion of the industrial / commercial development lands must be reviewed in terms of flood risk and an appropriately detailed FRA submitted with any planning application. Highly vulnerable development should be avoided in the Flood Zones A and B with less vulnerable development subject to a detailed FRA in Flood Zone A.
RPO - Urban Regeneration and Development	Regeneration of existing residential and commercial areas within Flood Zones A and B should be carried out in accordance with the Guidance specifically circular PL02/2014 (august 2014). Consideration should be given the sequential approach, FFLs and flood resilient construction. There are large areas that lie outside the flood zones that could be prioritised for regeneration.
Future Residential Development	Oldtown - Mooretown and Lissenhall LAP areas identified for future residential neighbourhoods largely contained in Flood Zone C. As discussed above a FRA of the Lissehnall LAP is required by the Fingal CDP to assign an appropriate land uses.
Existing - Flood Risk Management Measures	The Aspen Minor Works Flood Scheme was identified by the FEM FRAM Study within the Swords (south) AFA. The scheme, to protect a number of properties on Aspen Drive, was completed by 2013. The works entailed widening and deepening of the Gaybrook Stream at Aspen (Swords South) and a culvert replacement.
Proposed - Flood Risk Management Measures	No additional measures specific to Swords are proposed.
Flood Risk Summary	**Existing Flood Risk** The CFRAM study provides the best source of existing fluvial flooding information for Swords. This mapping is presented in **Figure 4-14**. This does not provide a complete assessment of flood risk to the area nor does it assess flood risk from all sources. This must be covered in the SFRA informing the LAP and FRAs for any other development plans in the town. **Flood Risk Impact and Spatial Planning Integration** The areas within lands zoned future residential and commercial developments identified within the predicted Flood Zone A & B require site specific flood risk assessments to ensure no adverse flood risk impacts. Applications for major development within these areas required a site specific flood risk assessment to ensure no increase in flood risk to the development and surrounding areas. Future development plans and flood risk assessments should consider the potential of climate change influence on flood extents in accordance with the Guidelines. The worst affected area is the confluence of the Ward and Broadmeadow Rivers with a for the MRFS and HEFS respectively. **Recommendations For Flood Risk Management** As detailed above the CFRAM FRMP has not outlined flood alleviation measures for the town. However the planning authority should

	also review and implement where appropriate the suggested CFRAM flood risk management policy measures as outlined in Appendix B and the FRMP. SFRAs should be undertaken for all development plans and existing SFRAs should be updated and reviewed in line with statutory timelines for development plans. **Opportunities for Joint Studies** N/A

4.8.14 Growth Settlement – Tullamore

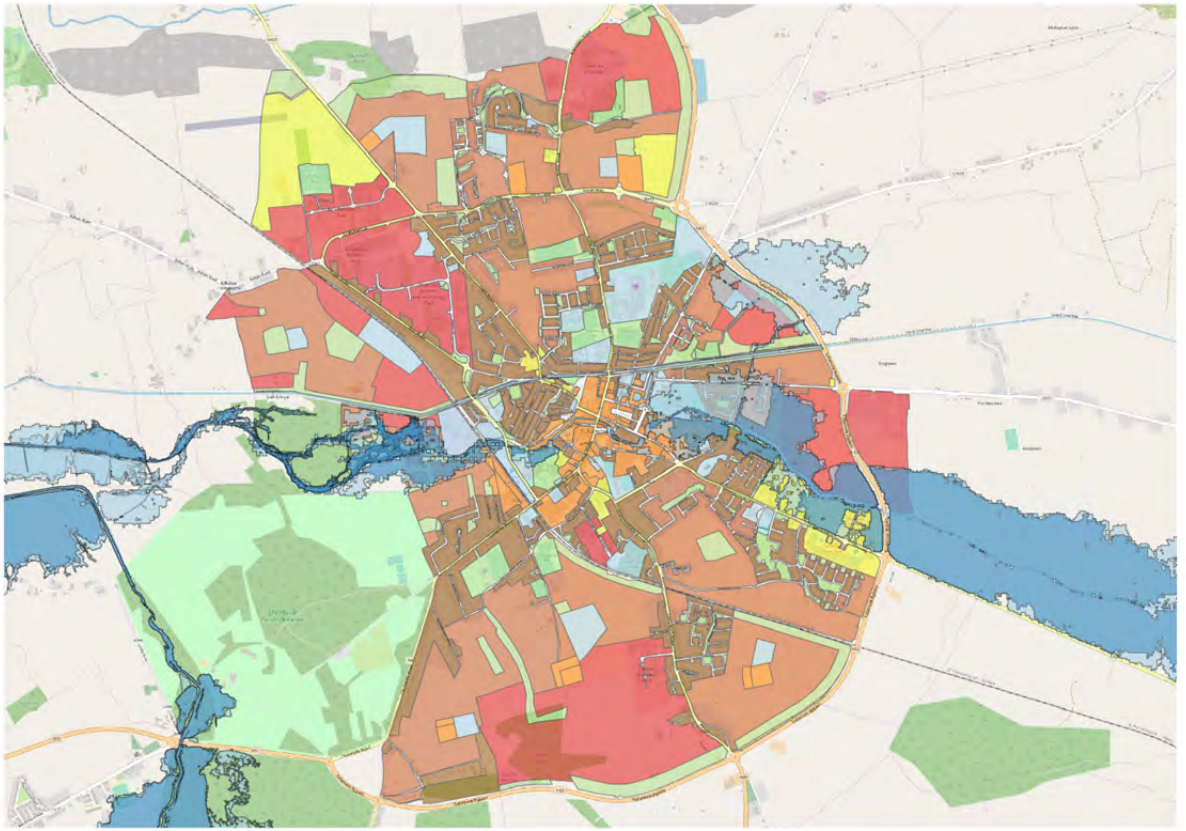


Figure 4-15 – Broad spatial distribution of flood risk in Tullamore

Flood Zone Mapping	CFRAM Flood Extent mapping
Commentary	The datasets received as part of this assessment did not included Flood Zones for Tullamore therefore the CFRAM flood extents where used for the RFRA. Future development plans for Tullamore should use flood zones to accurately categorise the residual risk to properties in the town centre which were defended as part of the 2008 Tullamore Flood Relief Scheme. The flood extents for Tullamore are largely confined to the eastern and western parts of the town. The Flood Zone A extents appear to be mostly on existing greenfield

	sites with some existing commercial and residential properties in Flood Zone B. The areas in Flood Zone A and currently zoned for residential and industrial zonings. These zones should be reviewed as part of the next development plan to assess if they are still appropriate. There is lots of other land available to employ the principle of avoidance.
RPO - Urban Regeneration and Development	Regeneration of existing residential and commercial areas within Flood Zones A and B should be carried out in accordance with the Guidance specifically circular PL02/2014 (august 2014). Consideration should be given the sequential approach, FFLs and flood resilient construction. There are large areas that lie outside the flood zones that could be prioritised for regeneration. Flood Zones for the town centre should be generated to accurately define the residual risk for properties in defended areas.
Future Residential Development	As discussed above some areas in the western part of the town are within Flood Zone A adjacent to the train station. These sites should be reviewed in accordance with the Guidelines to assess if the zoning is appropriate.
Existing - Flood Risk Management Measures	The Tullamore Scheme was initiated in 2008 and was constructed from 2012 to 2013. The Scheme comprises flood defence walls and embankments along the Tullamore River and the Barony Stream and provides protection against a 1% AEP (100 year) fluvial event for 100 properties.
Proposed - Flood Risk Management Measures	No additional measures specific to Tullamore are proposed.
Flood Risk Summary	**Existing Flood Risk** The CFRAM study provides the best source of existing fluvial flooding information for Tullamore. This mapping is presented in **Figure 4-15**. This does not provide a complete assessment of flood risk to the area nor does it assess flood risk from all sources. This must be covered in the SFRA informing the LAP and FRAs for any other development plans in the town. **Flood Risk Impact and Spatial Planning Integration** A review of zonings in Flood Zones A and B in the east and west of the town should be undertaken during the development plan process. Applications for major development within these areas required a site specific flood risk assessment to ensure no increase in flood risk to the development and surrounding areas. Future development plans and flood risk assessments should consider the potential of climate change influence on flood extents in accordance with the Guidelines. There are no MRFS or HEFS flood extents available for Tullamore. These should be generated as part any future SFRAs for the town. **Recommendations For Flood Risk Management** As detailed above the CFRAM FRMP has not outlined flood alleviation measures for the town. However the planning authority should also review and implement where appropriate the suggested CFRAM flood risk management policy measures as outlined in Appendix B and the FRMP. SFRAs should be undertaken for all development plans and existing SFRAs should be updated and reviewed in line with statutory timelines for development plans.

	Opportunities for Joint Studies N/A

4.8.15 Growth Settlement – Wicklow-Rathnew

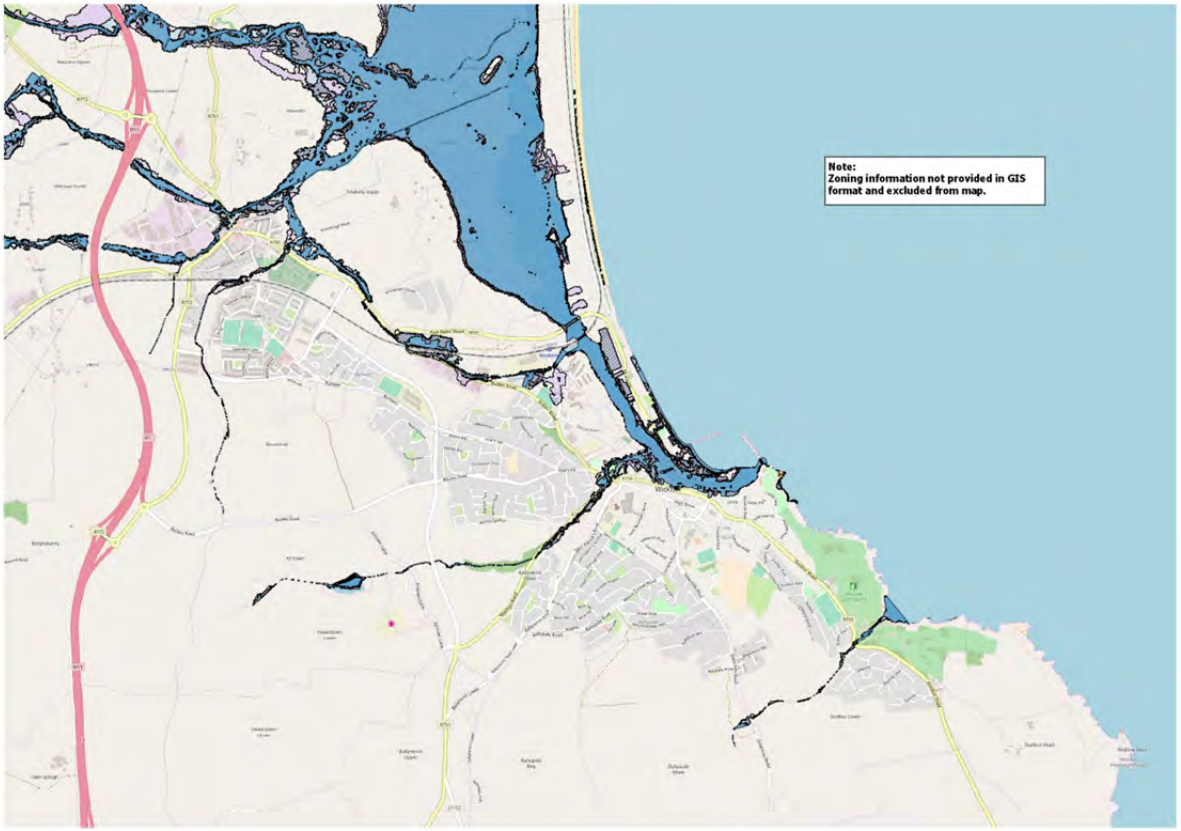


Figure 4-16 – Broad spatial distribution of flood risk in Wicklow-Rathnew

Flood Zone Mapping	CFRAM Flood Zone mapping
Commentary	Wicklow town is physically bordered by the Irish Sea and the hills surrounding the town which has influenced its spatial development north westwards towards Rathnew. The mixed use areas of the town centre adjacent to quays lie within Flood Zones A and B along with an industrial zoning adjacent to the Glebe Stream and the railway line. Rathnew neighbourhood centre has a few properties within Flood Zone A and B along with a low-lying industrial zoning adjacent the Wicklow Road.

RPO - Urban Regeneration and Development	Regeneration of existing residential and commercial areas within Flood Zones A and B should be carried out in accordance with the Guidance specifically circular PL02/2014 (august 2014). Consideration should be given the sequential approach, FFLs and flood resilient construction. There are large areas that lie outside the flood zones that could be prioritised for regeneration. Flood Zones for the town centre should be generated to accurately define the residual risk for properties in defended areas.
Future Residential Development	Areas zoned for future residential appear to be zoned in Flood Zone C however due to the hilly nature of the Wicklow-Rathnew area an assessment of overland flow paths should still be carried out as part of FRAs for the development sites.
Existing - Flood Risk Management Measures	There is no existing flood scheme in place for Wicklow – Rathnew.
Proposed - Flood Risk Management Measures	Potentially viable flood relief works for Wicklow, Ashford and Rathnew that may be implemented after project-level assessment and planning or Exhibition and confirmation might include physical works, such as a series of hard defences, storage and improvement of channel conveyance. The hard defences would protect to the 1% AEP fluvial flood event, with an average height of 1.1m (reaching a maximum height of 1.5m) and a total length of 4km. The two storage areas on the Broomhall and Burkeen catchments have a total capacity of approximately 14,800m3.
Flood Risk Summary	**Existing Flood Risk** The CFRAM study provides the best source of existing fluvial flooding information for Wicklow-Rathnew. This mapping is presented in **Figure 4-16**. This does not provide a complete assessment of flood risk to the area nor does it assess flood risk from all sources. This must be covered in the SFRA informing the LAP and FRAs for any other development plans in the town. **Flood Risk Impact and Spatial Planning Integration** The mixed use areas of the town centre adjacent to quays lie within Flood Zones A and B along with an industrial zoning adjacent to the Glebe Stream and the railway line. Rathnew neighbourhood centre has a few properties within Flood Zone A and B along with a low-lying industrial zoning adjacent the Wicklow Road. Applications for major development within these areas required a site specific flood risk assessment to ensure no increase in flood risk to the development and surrounding areas. Future development plans and flood risk assessments should consider the potential of climate change influence on flood extents in accordance with the Guidelines. An assessment of climate and catchment changes shows Wicklow, Ashford and Rathnew to be highly vulnerable to the increases as modelled in the mid-range and high end future scenarios. **Recommendations For Flood Risk Management** As detailed above the CFRAM FRMP has outlined flood alleviation measures for the town that should be reviewed by the planning authorities in conjunction with the OPW to deliver a flood alleviation scheme if it is deemed appropriate and viable. The planning authority should also review and implement where appropriate the suggested CFRAM flood risk management policy measures as outlined in Appendix B and the FRMP. SFRAs should be undertaken for all development plans and existing SFRAs should be updated and

	reviewed in line with statutory timelines for development plans. An assessment of climate and catchment changes shows Wicklow, Ashford and Rathnew to be highly vulnerable to the increases as modelled in the mid-range and high end future scenarios. Adaptation to maintain the level of protection as provided by the proposed measure would require increasing the height of the Hard Defence (by circa 1m) and extending their length. It is unlikely that the storage areas can be increased to provide the additional capacity required under the future scenarios. The weir removal proposed to increase channel conveyance would be sufficient for future flows, and the channel would not require further adaption. Future monitoring, and subsequent implementation of other measures such as Natural Flood Risk Management Measures, may be adopted to assist in identifying and off-setting the impacts of climate change. **Opportunities for Joint Studies** N/A

5 REVIEW OF RSES POLICY OBJECTIVES

The RESES sets out the policies for all City/ County and local development plans to adhere too. The integration of land use planning and flood risk in that process is required by the Planning System and Flood Risk Management Guidelines and this document will be applied at all levels of the planning process. This RFRA has reviewed the proposed regional strategies and the flood risk management regional objectives for the RSES in the context of the Guidelines and has considered their potential impact. The RFRA has also reviewed changes to the Draft RSES by EMRA which were amendments in response to motions from councillors prior to the publication of the Draft RSES.

5.1 REGIONAL STRATEGIC OUTCOMES

This chapter sets out the key principles and the 15 RSOs that will drive the plan (as detailed in Chapter 2 previously). **Table 5-1** provides an assessment of the RSOs in the context of the Guidelines.

Table 5-1 – Review of RSOs

RSO	Description	Discussion
Sustainable settlement patterns	Better manage the sustainable and compact growth of Dublin as a city of international scale and develop Athlone, Dundalk-Drogheda and a number of key complementary growth settlements of sufficient scale to be drivers of regional growth.	Development in the settlement centres and docklands needs to be managed in a sustainable manner as some of these areas are flood risk areas. Flood resilient construction methods should be implemented where appropriate in the urban environment where development space is restricted (as identified in the Dublin City SFRA for construction adjacent to the Liffey and along the quays). Implementation of the Guidelines and best practice for storm water runoff is vital for new greenfield sites to achieve sustainable development and reduce flood risk to these areas.
Compact growth and Urban regeneration	Promote the regeneration of our cities, towns and villages by making better use of underused land and buildings within the existing built-up urban footprint and to drive the delivery of quality housing and employment choice for the region's citizens.	Policies which encourage re-development in the settlement centres needs to be managed in a sustainable manner in areas of flood risk. The sequential approach and application of the Justification Test will be required at all levels of the planning process and adequate mitigation measures introduced to manage residual risk. Regeneration should the Guidelines and Circular PL02/2014 (August 2014). The circular specifically addresses regeneration areas and flood risk management of their development.
Rural communities	Support sustainable rural development by managing urban generated growth in areas under strong urban influence and by encouraging sustainable growth in areas that have experienced decline or stagnation.	Reusing vacant properties and reuse of existing buildings reduces the need for further development but regeneration projects should consider the Guidelines and Circular PL02/2014 (August 2014). The circular specifically addresses regeneration areas and flood risk management of their development. Some of these buildings may already be developed in inappropriate areas. Development of rural areas also needs to be developed

RSO	Description	Discussion
		in accordance with the Guidelines. FRAs should be carried out to an appropriate detail to ensure development is sustainable and avoided in flood risk areas. Smaller rural areas may not be covered by the scope of the CFRAM mapping but this does not mean they are free of flood risk. Serviced development sites should also include management of storm water runoff, an integrated catchment approach should be followed.
Healthy Communities	Support the provision of quality healthcare and services that support human health, including the protection of the natural environment to ensure clean air and water for all.	Healthcare infrastructure should be developed in line with the Guidelines and FRAs to an appropriate level of detail should be carried out to ensure infrastructure is avoided in flood risk areas insofar as possible.
Creative places	Enhance, integrate and protect our arts, culture and heritage assets to promote creative places and heritage led regeneration.	Implementation of the Guidelines to ensure that development follows the sequential approach to avoid non appropriate development in flood prone areas.
Integrated Transport and Land Use	Promote best use of Transport Infrastructure, existing and planned and promote sustainable and active modes of travel to ensure the proper integration of transportation and land use planning.	Development of major infrastructural transportation projects such as airports, roads and ports should include an FRA to ensure development is appropriate if they lie in a flood risk area. Infrastructural projects should include SuDS to ensure runoff is controlled to at least the greenfield runoff rate. The critical transport infrastructure should also be considered to be designed to a higher flood event return period (e.g. 0.1% AEP) so as to ensure that in extreme weather events that emergency services are not hindered and plans can be implemented.
Sustainable Management of Water, Waste and other environmental resources	Conserve and enhance our water resources to ensure clean water supply, adequate waste water treatment and greater resource efficiency to realise the benefits of the circular economy.	Any public utility infrastructure that is required to maintain these services should be developed in accordance with the Guidelines. Water supply and waste water infrastructure needs to stay operational during extreme flood events to reduce pressure on emergency services and also to ensure that the public have access to those vital services in times of emergency.
Build Climate Resilience	Ensure the long-term management of flood risk and build resilience to increased risks of extreme weather events, changes in sea level and patterns of coastal erosion to protect property, critical infrastructure and food security in the region.	Adopting climate change factors for hydrology and hydraulic calculations in FRAs will allow for consideration of climate change effects on flood extents. Therefore avoiding development in areas which may be prone to flood risk in the future as our climate changes. Implementation of the Planning System and Flood Risk Assessment Guidelines for Planning Authorities (2009) and best practice for storm water runoff is vital to achieve sustainable development and reduce flood risk.
Support the Transition to Low Carbon and Clean Energy	Support national policy targets for climate mitigation and harness the potential for a more distributed renewables-focussed energy system to support the transition to a low carbon economy by 2050.	Flood Risk Management policies should encourage the use of climate change predictions to ensure that its potential influence is captured in our spatial planning and development.
Enhanced Green	Identify, protect and enhance Green Infrastructure and	Integration and development of green infrastructure will reduce runoff rates therefore reducing flood risk.

RSO	Description	Discussion
Infrastructure	ecosystem services in the Region and promote the sustainable management of strategic natural assets such as our coastlines, farmlands, peatlands, uplands woodlands and wetlands.	Implementation of the Guidelines will help achieve these policies by maintaining green spaces and reducing urban sprawl thus avoiding new development in potential flood risk areas. This will also maintain natural flood management features which help to reduce downstream flooding in urban areas.
Biodiversity and Natural Heritage	Promote co-ordinated spatial planning to conserve and enhance the biodiversity of our protected habitats and species including landscape and heritage protection.	Maintaining habitats such as those peatlands, woodlands and wetlands will also maintain natural flood management features which help to reduce downstream flooding in urban areas.
A Strong Economy supported by Enterprise and Innovation	To build a resilient economic base and promote innovation and entrepreneurship ecosystems that support smart specialisation, cluster development and sustained economic growth.	Development to aid economic growth should still follow the sequential approach of the Guidelines and best practice for storm water runoff is vital to achieve sustainable development and reduce flood risk.
Improve Education Skills and Social Inclusion	To improve education and develop the right skills to attract employers and retain talent and promote social inclusion to ensure opportunities for quality jobs across the region.	Educational infrastructure should be developed in line with the Guidelines and FRAs to an appropriate level of detail should be carried out to ensure infrastructure is avoided in flood risk areas insofar as possible.
Global City Region	Promote Dublin as a global city region and protect and enhance international connectivity, including ports and airports and promote the region as a gateway to Ireland.	Implementation of the Guidelines and best practice for storm water runoff is vital to achieve sustainable development and reduce flood risk for the Gateway Region.
Enhanced Regional Connectivity	Develop and enhance regional accessibility between key regional growth centres to build economic resilience and support strengthened rural communities and economies including the blue-green economy and tourism.	Development of regional transportation projects such as roads and railways should include an FRA to ensure development is appropriate if they lie in a flood risk area. Infrastructural projects should include SuDS to ensure runoff is controlled to at least the greenfield runoff rate.
Collaboration Platform	Provide a regional framework for collaboration and partnerships and to support local and regional bodies in leveraging funding and partnership opportunities.	Collaborative FRAs for settlements which cross administrative boundaries (e.g. Carlow town, Drogheda) should be undertaken. Also this will ensure that development in border counties on shared catchments is appropriate and follows the principles of the Guidelines and the Northern Ireland Department of Environment Planning Policy Statement, PPS 15 'Planning and Flood Risk'. This cross border co-operation will ensure that flood risk on shared catchments is reduced and managed.

5.2 REGIONAL STRATEGIC FLOOD RISK MANAGEMENT OBJECTIVES

Table 5-2 details policy objectives of the RSES that control sustainable development of the region in terms of flood risk and the management of surface water. These policies will ensure that an assessment of flood risk is undertaken to assist planning authorities make informed strategic land-use planning decisions and that surface water runoff is managed to reduce the risk of downstream flooding.

Table 5-2 – Regional Strategic Flood Risk Management Objectives

Flood Mitigation and Sustainable Urban Drainage (SUDs)	Future statutory landuse plans shall include Strategic Flood Risk Assessment (SFRA) and seek to avoid inappropriate land use zonings and development in areas at risk of flooding and to integrate sustainable water management solutions (such as SUDS, non-porous surfacing and green roofs) to create safe places in accordance with the Planning System and Flood Risk Assessment Guidelines for Local Authorities.
	EMRA will work with local authorities, OPW and other relevant Departments and agencies to implement the recommendations of the CFRAM programme to ensure that flood risk management policies and infrastructure are progressively implemented.
	Local Authorities shall take account of and incorporate into the development of local planning policy and decision making the recommendations of the Flood Risk Management Plans (FRMPs), including planned investment measures for managing and reducing flood risk.
	Local Authorities shall take opportunities to enhance biodiversity and amenities and to ensure the protection of environmentally sensitive sites and habitats, including where flood risk management measures are planned.
	Support the relevant local authorities (and Irish Water where relevant) in the Region to improve storm water infrastructure to improve sustainable drainage and reduce the risk of flooding in the urban environment and in the development and provision at a local level of Sustainable Urban Drainage solutions.
	Implement policies contained in the Greater Dublin Strategic Drainage Study (GDSDS), including SuDS.
	Implement the specific recommendations of the GDSDS in relation to Climate Change Regional Drainage Policies for all relevant developments within the region.
	Local Authorities shall ensure adequate surface water drainage systems are in place which meet the requirements of the Water Framework Directive and the associated River Basin Management Plans.

5.3 RESPONSE TO COUNCILLOR MOTIONS

5.3.1 Motion Received

The Draft RSES was issues to councillors for feedback and comment. There was one motion relevant to the RFRA. It stated:

"There should be a table of the CFRAM schemes identified under CFRAM process as approved by OPW in order to support the future planning applications that may be made – they are mentioned under Dundalk and Drogheda but what about Mountmellick or Portarlington, etc."

5.3.2 EMRA Response

The EMRA response was as follows:

Section 7.4 Flood Risk Management was prepared in extensive consultation with OPW to ensure that the Director's Draft RSES supports the national CFRAMs programme. RPO 7.13: EMRA will work with Local Authorities, OPW and other relevant Departments and agencies to implement the recommendations of the CFRAM programme to ensure that flood risk management policies and infrastructure are progressively implemented.

5.3.3 Discussion

To ensure their commitment to working with the OPW and Local Authorities on implementing schemes identified in the CFRAM FRMPs, EMRA included an Appendix in the RSES of the new Flood Relief Schemes in the EMRA Region that the OPW have identified to be advanced in an initial phase of schemes for detailed design and construction.

There are many more schemes identified in the FRMP within the EMRA region and although they are not specifically listed in the RSES, EMRA has policies and objectives which are committed to liaising with the OPW and Local Authorities to implement the subsequent phases of FRMP schemes as they are prioritised by the OPW.

6 GUIDANCE ON FRAS

6.1 PREPARATION OF DEVELOPMENT PLANS

All city and county level SFRAs should be developed in accordance with the Planning System and Flood Risk Assessment Guidelines for Planning Authorities (2009) and Circular PL02/2014 (August 2014). The Guidelines Technical Appendices give detail descriptions on how to undertake FRAs of all levels. FRAs should include an appropriate level of detail in line with the level of flood risk associated with a development. The CFRAM FRMPs have the most up to date flood risk information available to help develop FRAs. Flood Maps and the proposed flood risk management measures identified in the FRMPs should be reviewed for all development plans.

Management of surface water run-off should be assessed and carried out in accordance with the Greater Dublin Strategic Drainage Study (GDSDS), county and/ or local level policies and also reference should be made to best practice guidance such as the Construction Industry Research and Information Association (CIRA) SuDS Manual (C753).

FRAs should follow the sequential approach as described in **Section 3.4** above and also undertake Justifications Tests where appropriate. All Justification Tests should ensure that adequate flood risk management measures have been recommended.

LAPs should ensure that any FRAs they undertake or are assessing have considered flood zones as described in **Section 3.7** and climate change scenarios as described in **Section 3.8**. The CFRAM FRMP have developed climate change scenario mapping that can be used for such assessments.

FRAs aim to identify, quantify and communicate to decision-makers and other stakeholders the risk of flooding to land, property and people. The purpose is to provide sufficient information to determine whether particular actions (such as zoning of land for development, approving applications for proposed development, the construction of a flood protection scheme or the installation of a flood warning scheme) are appropriate.

A FRA can be undertaken either over a large area or for a particular site to:

- Identify whether and the degree to which flood risk is an issue;
- Identify flood zones (if not already available);
- Inform decisions in relation to zoning and planning applications; and
- Develop appropriate flood risk mitigation and management measures for development sited in flood risk areas.

The general principles of FRAs should be:

- Proportionate to the risk scale, nature and location of the development;
- Undertaken by competent people, such as a suitably qualified hydrologist, flood risk management professional or specialist water engineer;
- Undertaken as early as possible in the particular planning process;

- Supported by appropriate data and information, including historical information on previous events, but focusing more on predictive assessment of less frequent or more extreme events, taking the likely impacts of climate change into account;
- Clearly state the risk to people and development and how that will be managed over the lifetime of the development;
- Focused on addressing the impact of a change in land use or development on flood risk elsewhere, ensuring that any such change or development must not add to and should, where practicable, reduce flood risk;
- Consider the vulnerability of those that could occupy the development, including arrangements for safe access and egress; and
- Consider the modification to flood risk that infrastructure such as raised defences, flow channels, flood-storage areas and other artificial features provide, together with the consequences of their failure.

6.2 PLANNING AUTHORITY COLLABORATION

Planning authorities that share administrative boundaries should work together during the SFRA process to ensure that all flood risk issues are captured to inform their preparation of spatial plans. Where it is found to be necessary the planning authorities should prepare joint studies to address flood risk issues. **Section 4** outlines some potential planning authority partnerships for the growth settlements addressed in this RFRA.

7 SUMMARY

7.1 OVERVIEW

The RFRA has been prepared as part of the SEA of the EMRA Regional RSES in accordance with national and EU legislation. This RFRA was prepared by considering the requirements of The Planning System and Flood Risk Assessment Guidelines for Planning Authorities (2009) and Circular PL02/2014 (August 2014). The purpose of the RFRA is to ensure that the RSES follow the principles of the Guidelines and implements policies and development strategies that:

- Avoid inappropriate development in areas at risk of flooding, unless there are proven wider sustainability grounds that justify appropriate development and where the flood risk can be reduced or managed to an acceptable level;
- Avoid developments increasing flood risk elsewhere;
- Adopt a sequential approach to flood risk management when assessing the location for new development based on avoidance, reduction and mitigation of flood risk;
- Avoid unnecessary restriction of national, regional or local economic and social growth;
- Incorporate flood risk assessments into the planning process;
- Improve the understanding of flood risk among relevant stakeholders; and
- Ensure that the requirements of EU and national law in relation to the natural environment and nature conservation are complied with at all stages of flood risk management.

7.2 METHODOLOGY

This was carried out by using an approach from the Guidelines which due to the scale of flood risk at a regional level recommends that the appraisal should primarily undertake a flood risk identification that will detect areas of future growth conflicting with flood risk. This will promote the sequential approach and help flag the need for more detailed FRAs at lower level development plans. As recommended by the Guidelines the RFRA addressed the following:

- Summary plans/figures and statement showing the broad spatial distribution of flood risk and any potential conflicts with growth/ development areas
- Supplementary description of any areas of a region where addressing flood risk is especially important – e.g. central urban areas in Gateways or areas of development pressure, with a view to highlighting these as priority locations for further assessment of flood risk, and / or the need for coordinated action at development plan level
- Suggested policies for sustainable flood risk management for incorporation into the RPGs
- Guidance on the preparation of city and county level SFRAs and the management of surface water run-off within new development, highlighting significant flood risk issues, potential infrastructure investment requirements and the need for co-operation between planning authorities and identifying any need for more detailed assessment

The appraisal identified the broad nature of flooding that may affect the primary growth settlements located in the Eastern & Midland Regional Assembly (EMRA) geographic area. The moderate growth settlements identified in the RSES are not included in the assessment as it would be more appropriate for these settlements to be assessed at county development plan level.

There are several sources of relevant flood risk information available for the EMRA geographical region however the main source used for this appraisal are the flood zones and flood extents generated as part of the National Catchment Flood Risk Assessment and Management (CFRAM) Programme studies. This dataset forms part of the most comprehensive flood risk assessment ever undertaken in Ireland. They have been generated using expert hydrological and hydraulic assessments which have been calibrated against actual measured data insofar as possible. While the CFRAM studies are comprehensive, they do not cover all sources of flooding and they only focus on areas of significant risk. There are numerous other areas within settlements and within the EMRA geographic area which have local scale flooding issues and these need to be captured in SFRAs accompanying county/ city development plans and LAPs.

The RSES proposes sustainable growth and development of the primary growth settlements. Regional Policy Objectives (RPOs) outlined in the RSES address proposed development that will help achieve the RSES' key principles and 15 Regional Strategic Objectives (RSOs). The RFRA assessed the RPOs for each primary settlement that will influence the RSO's from a flood risk perspective. The RESES also sets out the policies for all city/ county and local development plans to adhere too. The integration of land use planning and flood risk in that process is required by the Planning System and Flood Risk Management Guidelines and this document will be applied at all levels of the planning process. The RFRA reviewed the proposed regional strategies and the flood risk management regional objectives for the RSES in the context of the Guidelines and considered their potential impact.

7.3 POTENTIAL IMPACT

The EMRA region is affected by fluvial flooding along its major rivers and their tributaries including the Liffey, Boyne, Broadmeadow, Barrow and Shannon. Coastal settlements along the Irish Sea are also impacted by tidal flooding and wave overtopping. The planned strategic residential and employment development sites in the MASP area for the most part have a low risk of fluvial and coastal flooding however some development areas lie within Flood Zones A and B. The regional growth centres have existing residential and mixed use developments in zoned for future regeneration located within the predicted Flood Zone A. They also do have lands zoned for future residential and commercial developments identified within the predicted Flood Zones A & B. Similarly some of the key growth settlements have lands zoned for future and proposed regeneration residential, educational and commercial developments identified within the predicted Flood Zone A & B.

7.4 MITIGATION STRATEGY

The EMRA RSES has included objectives (as show in **Table 5-2**) that recommend that subsequently produced County and City development plans carry out flood risk assessments in accordance with the Guidelines following the sequential approach to ensure development is carried out in a sustainable manner with respect to flood risk. Objectives (as show in **Table 5-2**) were also included to ensure Local Authorities shall incorporate the recommendations of the CFRAM Flood Risk Management Plans into the development of local planning policy and decision making. This includes planned investment measures for managing and reducing flood risk and having due regard to the CFRAM flood maps and other flood maps as available.

Lastly they have also included objectives for local authorities to implement policies that will reduce surface water runoff and also consider the potential impacts of climate change on flood extents.

These policies will ensure that any development and regeneration areas that have been or will be identified as having a flood risk will be either be developed in accordance with the Guidelines or the appropriateness of their land zoning will be reviewed to ensure that development is sustainable and not increasing flood risk in other areas.

APPENDIX A

Summary of CFRAM FRMP Regional Measures

CFRAM Recommendation Code	Measure Name	Measure	Implementation
Regional Measures			
IE09-UoM-9011-M22 IEGBNISH-25/26-9011-M21 IE07-UoM-9011-M21	Application of the Guidelines on the Planning System and Flood Risk Management (DECLG/OPW, 2009)	The Planning Authorities will ensure proper application of the Guidelines on the Planning System and Flood Risk Management (DHPLG/OPW, 2009) in all planning and development management processes and decisions, including where appropriate a review of existing land use zoning and the potential for blue/green infrastructure, in order to support sustainable development, taking account of the flood maps produced through the CFRAM Programme and parallel projects.	Planning Authorities
IE09-UoM-9012-M34 IEGNISH-25/26-9012-M34 IE07-UoM-9012-M34	Implementation of Sustainable Urban Drainage Systems (SUDS)	In accordance with the Guidelines on the Planning System and Flood Risk Management (DHPLG/OPW, 2009), planning authorities should seek to reduce the extent of hard surfacing and paving and require, subject to the outcomes of environmental assessment, the use of sustainable drainage techniques.	Planning Authorities
IE09-UoM-9013-M24 IEGBNISH-25/26-9013-M21 IE07-UoM-9013-M21	Consideration of Flood Risk in local adaptation planning.	Local authorities should take into account the potential impacts of climate change on flooding and flood risk in their planning for local adaptation, in particular in the areas of spatial planning and the planning and design of infrastructure.	Local Authorities
IE09-UoM-9023-M33	Ongoing Maintenance of Drainage Districts		
IE09-UoM-9031-M41	Establishment of a	The establishment of an	OPW, DHPLG, Met

CFRAM Recommendation Code	Measure Name	Measure	Implementation
IEGBNISH-25/26-9031-M41 IE07-UoM-9031-M41	National Flood Forecasting and Warning Service	operational unit in Met Éireann and an Oversight Unit in the OPW to provide, in the medium term, a national flood forecasting service.	Éireann, Local Authorities
IE09-UoM-9032-M42 IEGBNISH-25/26-9032-M42 IE07-UoM-9032-M42	Ongoing Appraisal of Flood Event Emergency Response Plans and Management Activities	Ongoing, regular appraisal of emergency management activities to improve preparedness and inter-agency coordination and to shape future MEM developments as part of the major emergency development programmes, taking into account in particular the information developed through the CFRAM Programme and this Plan.	Principal Response Agencies, Regional Steering Groups, National Steering Group
IE09-UoM-9041-M61 IEGBNISH-25/26-9041-M61 IE07-UoM-9041-M61	Flood-Related Data Collection	The OPW, Local Authorities / EPA and other organisations collecting hydro-meteorological data should continue to do so, and post-event event flood data should continue to be collected, to improve future flood risk management.	OPW, Local Authorities / EPA and other hydro-meteorological agencies
IE09-UoM-9051-M61 IEGBNISH-25/26-9051-M61 Ie07-UoM-9051-M61	Minor Works Scheme	The OPW will continue the Minor Works Scheme subject to the availability of funding and will keep its operation under review to assess its continued effectiveness and relevance.	OPW, Local Authorities
IEGBNISH-24-9020-M31 IE07-UoM-9021-M31	Assessment of Land Use and Natural Flood Risk Management Measures	The OPW will work with the EPA, local authorities and other agencies during the project-level assessments of physical works and more broadly at a catchment-level to identify, where possible, measures that will have benefits for both WFD and flood risk management objectives, such as natural water	Local Authority WFD Offices, OPW, EPA, Others

CFRAM Recommendation Code	Measure Name	Measure	Implementation
		retention measures, and also for biodiversity and potentially other objectives, including the use of pilot studies and applications, where possible.	