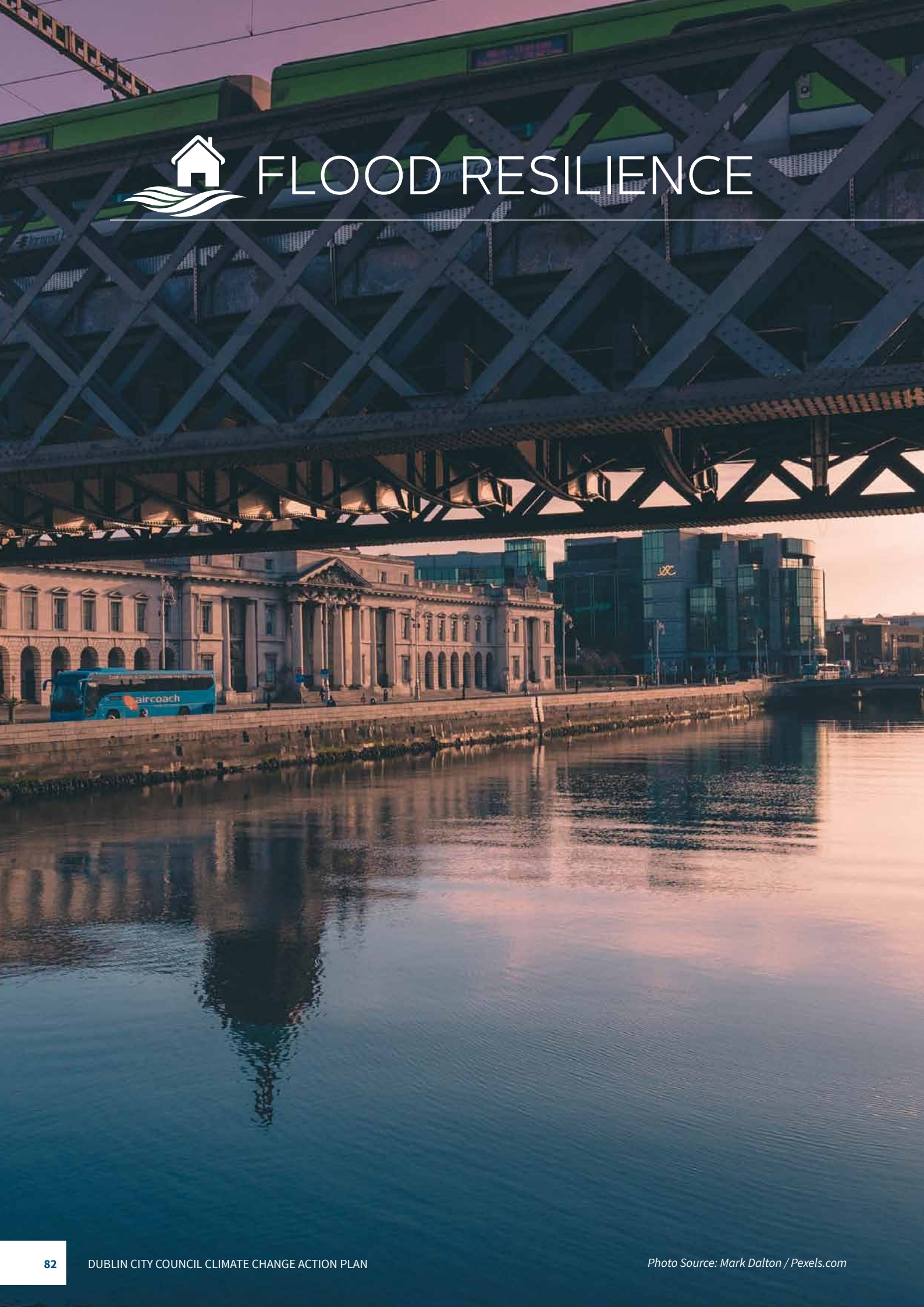




# FLOOD RESILIENCE



OVERVIEW

**3** MAIN RIVERS:  
LIFFEY, DODDER, TOLKA

**52 km**  
COASTLINE IN DUBLIN CITY



TARGET



A CLIMATE-RESILIENT  
REGION

REDUCTION/MITIGATION  
OF FLOOD RISKS  
IN DUBLIN CITY

EXAMPLES OF MAIN ACTION TYPES

Building flood alleviation,  
defence or adaption schemes



Coastal zone management  
plan for Dublin Bay



Expansion of rainfall  
sensors and weather  
stations



Implementing sustainable  
urban drainage guidelines  
in Council buildings



Coordinating emergency  
response plans



Flood awareness  
campaign with OPW



STAKEHOLDERS TO WORK WITH AND INFLUENCE

OFFICE OF  
PUBLIC WORKS

GOVERNMENT  
DEPARTMENTS

GENERAL  
PUBLIC

COMMUNITY  
GROUPS

ENVIRONMENTAL  
GROUPS

DEVELOPERS



“**Dublin City Council’s policies and objectives intend to provide high-quality public infrastructure which aims to minimise waste, provide flood protection, reduce flood risk in Dublin City as far as possible, mitigate where possible and adapt to the impacts of climate change, protect and improve water resources/water dependent ecosystems and to support the green infrastructure network.**”  
- Dublin City Development Plan 2016-2022

Flooding is a key climate change risk facing the Dublin Region. Climate change is expected to increase the frequency and/or intensity of heavy rainfall events and storm surges, which would increase the risk of pluvial, fluvial and coastal flooding in vulnerable areas of the City. Extreme rainfall and weather events can also place additional pressure on the urban drainage network and water supply, which can result in network flooding and water shortages. Together with the Office of Public Works (OPW) and neighbouring local authorities, DCC is actively working to implement projects and programmes that align with the EU Floods Directive and Water Framework Directive. The Floods Directive calls for member states to undertake strategic flood risk assessments and to identify flood risk management measures. Flood maps have been prepared for future climate scenarios, and the proposed community-scale measures are set out in the Flood Risk Management Plans ([www.floodinfo.ie](http://www.floodinfo.ie)). Additional local measures can include nature-based solutions such as integrated wetlands, green infrastructure, and Sustainable urban Drainage Systems (SuDS,) to be used for adaptation and mitigation responses to achieve flood resilience.

CASE STUDY



### **FloodResilienCity Outcomes**

DCC participated in the EU Interreg IVB project, ‘FloodResilienCity’ (FRC). This project built on work completed in the Strategies and Actions for Flood Emergency Risk (SAFER) project, which ran from 2002 to 2008 and resulted in the development of a tidal flood forecasting and warning system, emergency response procedures and coastal flood maps. FRC ran from 2008 to 2012 with the aim of making Dublin a more flood resilient capital. This involved the development of a pluvial flood risk management strategy for Dublin, based on modelling and mapping of Dublin’s pluvial flood risk. The results of FRC have informed this action plan and DCC’s strategy to mitigate and adapt to pluvial flood risk. Through the project, DCC has identified three categories of measures with options for reducing pluvial flood risk in Dublin, such as:

#### **1. Community & Business Flood Resilience:**

- Awareness raising and education
- Rainwater harvesting
- Domestic rain gardens

#### **2. Site Specific Measures**

- SuDS storage and infiltration
- Green infrastructure / bioswales
- Surface conveyance

#### **3. Overall Measures**

- Flood warning
- Land-use management
- Vegetation management



## FLOOD RISK MANAGEMENT

Dublin City Council is working with a range of stakeholders including Irish Water in the management of pluvial flooding in combined network areas of the City. In partnership with the OPW and neighbouring local authorities, DCC is working to adapt areas that are vulnerable to flooding by using comprehensive flood risk mapping. DCC is looking at measures that include natural and engineered solutions, and has adopted a FAB Plus Strategy:

- **Flood** risk mitigation
- **Amenity** enhancement
- **Biodiversity** opportunity
- **Plus:** Carbon reduction/sequestration, waste reuse, potential for regeneration, recreational enhancement

CASE STUDY



**Triton and Tidewatch**

Triton and Tidewatch are two tidal flood forecasting and warning systems that were developed following the coastal flood event in February 2002. Both systems make use of weather and/or surge forecasts in the Irish Sea to provide future predictions of tide levels, with Tidewatch providing forecasts up to five days in advance and Triton two days in advance.

The forecasts are used to implement emergency response procedures such as closing of flood gates within existing flood defences. For example, the flood defences along Spencer Dock, the South Campshires and the River Dodder contain a number of flood gates and demountable defences, which require closing during an extreme event and when closed, ensure that a 1-in-200-year standard of protection is provided by these defences. Thus, the tide forecasts form an important and integral element of the flood defences in these areas.

CASE STUDY

**Gully Monitoring SBIR Challenge**

The Smart Dublin Gully Monitoring SBIR Challenge was launched in 2017 with the aim of using technology to monitor gullies, especially in high-risk areas. This monitoring involves implementing a system that provides real-time information on high-risk gullies in the City during a flood event, through a wireless network of low-cost water sensors (over 30 are now deployed). The system then notifies the closest available drainage team with this real-time information, so that City Operations can provide the most optimised response. Six companies were involved in Phase 1; three of these have now progressed to Phase 2 and have been awarded additional funding to further develop their solutions.

CASE STUDY

**Connect Flooding Demonstrator**

As part of the Smart Dublin programme, DCC is working in collaboration with Intel and the CONNECT Centre to build a network of low-cost, low-powered rainfall sensors. This pilot project was initiated to revolutionise rainfall and water level monitoring around the City and to demonstrate how the Internet of Things (IoT) and smart technology can deliver smart, affordable and scalable solutions. The long-term goal is to build an experimental flood prediction and response platform. Phase 1 of the project involved the placement of eight sensors at five different locations, while Phase 2 involved the placement of a further 16 sensors at a total of eight locations across the City, which are configured to send updates to the Council every two hours. DCC will add up to 10 river-level monitors and four weather stations, and will begin exploring the link between the data sets in relation to early flood prediction and prevention in Dublin City.

## FLOOD DEFENCE

While flood alleviation incorporating nature-based solutions is DCC's preferred response, there are certain areas of the City that are not suited to soft solutions. Therefore, DCC is building physical flood defences, specifically walls and Dutch dams along the North and South Campshires that take into consideration increased risk from climate change. Additionally, DCC is actively researching alternatives to physical flood defences, such as zoning policies to restrict further development in at-risk areas.

### CASE STUDY

#### Clontarf Promenade

DCC aimed to provide a solution that would not only protect homes and businesses, but would provide a solution that would add value to the area. The end result is a wall that includes a segregated cycle path, providing an additional recreational option, whilst protecting homes and business properties from storm surges and flood events. The project is now serving as a model for the Sutton-to-Sandycove Cycle Way.

### CASE STUDY



#### Liffey Flood Defence

The River Liffey is the heart of Dublin, but as a tidal river, it poses unique challenges for the City in terms of flood risk. Protecting the river and the City walls calls for a mix of solutions. For example, where access needs to be maintained (onto the Boardwalks, for example) DCC has incorporated Dutch dams within the flood walls at these gaps. These demountable defences can be closed manually when a flood risk has been forecasted by one of the operational flood forecasting systems.

Further upstream, DCC has implemented soft solutions such as increasing the buffer distance from the river's edge to reduce dependency on the hard defences downstream. Additionally, developments adjacent to the River Liffey have been required to incorporate Sustainable urban Drainage Systems and green infrastructure features to absorb rainfall; this is now required for all new developments across the City, as it increases the City's flood resilience.



# FLOOD RESILIENCE



NO	ACTION	TIMEFRAME	LEAD DEPT(S)	INDICATORS	TARGET(S) IMPACTED
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## ACTIONS CURRENTLY BUDGETED

### FLOOD RISK MANAGEMENT

<b>F1</b>	Implement flood risk management guidelines	2018 onwards	Environment and Transportation	# of projects following guidelines	
<b>F2</b>	Coordinate Emergency Response Plans	Ongoing	Multi-departmental	Plans completed	
<b>F3</b>	Implement flood awareness campaign with the OPW	2019	Environment and Transportation	Campaign implemented	
<b>F4</b>	Monitoring of flood forecasting and warning system	Ongoing	Environment and Transportation	System maintained	
<b>F5</b>	Produce a new Design Guide for SuDS and green infrastructure	2019 onwards	Culture, Recreation and Economic Services, and Environment and Transportation	Guide developed	
<b>F6</b>	Implement Sustainable urban Drainage Guidelines in Council buildings where feasible	2019 onwards	Environment and Transportation	# of buildings with SuDS measures implemented	
<b>F7</b>	Build demonstration sites to show options for SuDS	2019 onwards	Environment and Transportation	# of demonstration sites developed	
<b>F8</b>	Establish a Dublin Bay Sentinel Group, led by DCC and including other key stakeholders, to monitor tide levels and other marine related flood risk issues in Dublin Bay	2019 onwards	Multi-departmental	Group established, medium and long term action plan developed	
<b>F9</b>	Develop and implement Coastal Zone Management plan for Dublin Bay, aligned with the four DLA Climate Change Action Plans for Dublin and other local authority plans and strategies	2019 onwards	Culture, Recreation and Economic Services, Environment and Transportation and Planning	Plan developed	
<b>F10</b>	Implement the Dublin Bay Biosphere work programme	2018-2020	Multi-departmental, NPWS, Dublin Port	Work programme developed and implemented	

*The following flood storage actions will incorporate nature-based solutions and biodiversity enhancement measures where possible (Refers to Actions 11 to 18):*

<b>F11</b>	Trial hemp baskets for flood protection	2020	Culture, Recreation and Economic Services, Environment and Transportation	Trials implemented, report on findings	
<b>F12</b>	Identify areas for integrated constructed wetlands	2020	Culture, Recreation and Economic Services	Areas identified and report published	
<b>F13</b>	Expansion of rainfall sensors and weather stations, as part of the Connect Flooding Demonstrator programme	Ongoing	Environment and Transportation	# of sensors installed, # of weather stations added	
<b>F14</b>	Phase 2 of Gully Monitoring SBIR Challenge	Ongoing	Environment and Transportation	# of solutions developed and implemented	
<b>F15</b>	Develop a climate change impact GIS risk map with scenarios for the Dublin Region	2020	Climate Ireland, Environment and Transportation, multi-departmental	GIS map developed	



NO	ACTION	TIMEFRAME	LEAD DEPT(S)	INDICATORS	TARGET(S) IMPACTED
F16	Develop template to capture impacts, response and costs (including consideration of ecosystem services/natural capital costs) for all major climate events	2019	Environment and Transportation	Template developed and issued	
F17	Establish a Working Group to deal with the issue of pluvial flood risk	2019	Multi-departmental, Water Framework Directive Office	Working group established	
F18	Update DLA urban drainage and flooding policies promoting natural flood measures as a priority to inform new development plan	2019	Multi-departmental	Policies updated	
F19	Risk workshops to assess the likely impacts on Council services	2019	All departments	Risks identified	
<b>FLOOD DEFENCE</b>					
F20	South Campshires Flood Defence	Ongoing	Environment and Transportation, Culture, Recreation and Economic Services	Project completed	
F21	Sir John Rogerson's Quay flood alleviation scheme	2020	Environment and Transportation, Culture, Recreation and Economic Services	Project completed	
F22	North Campshires flood alleviation scheme	2025	Environment and Transportation, Culture, Recreation and Economic Services	Project completed	
F23	Clanmoyle flood alleviation scheme	Ongoing	Environment and Transportation, Culture, Recreation and Economic Services	Project completed	
F24	Wad flood alleviation scheme	2021	Environment and Transportation, Culture, Recreation and Economic Services	Project completed	
F25	Poddle flood alleviation scheme	2019	Environment and Transportation, Culture, Recreation and Economic Services	Project completed	
F26	Camac flood alleviation scheme	2020	Environment and Transportation, Culture, Recreation and Economic Services	Project completed	
F27	Dollymount flood alleviation scheme	Ongoing	Environment and Transportation, Culture, Recreation and Economic Services	Project completed	
F28	Clontarf Promenade flood alleviation scheme	2019	Environment and Transportation, Culture, Recreation and Economic Services	Project completed	
F29	Sandymount Promenade flood alleviation scheme	Ongoing	Environment and Transportation, Culture, Recreation and Economic Services	Project completed	
F30	Sandymount Phase 2 flood alleviation scheme	2019	Environment and Transportation, Culture, Recreation and Economic Services	Project completed	
F31	Chapelizod flood alleviation scheme	2020	Environment and Transportation, Culture, Recreation and Economic Services	Project completed	
F32	Island Bridge flood alleviation scheme	2020	Environment and Transportation, Culture, Recreation and Economic Services	Project completed	



NO	ACTION	TIMEFRAME	LEAD DEPT(S)	INDICATORS	TARGET(S) IMPACTED
F33	Santry River Regeneration Project	2027	Environment and Transportation, Culture, Recreation and Economic Services	Project completed	
F34	River Dodder flood defence works in the fluvial section upstream of Ballsbridge	Ongoing	Environment and Transportation, Culture, Recreation and Economic Services	Project completed	

### ACTIONS AWAITING BUDGET

F35	Study impacts and benefits of increased buffer distances to watercourses	2019	Environment and Transportation, Culture, Recreation and Economic Services, Finance	Study completed	
F36	Promote and encourage community involvement in the retrofit of SuDS in existing developments	2019	Culture, Recreation and Economic Services, Communications, Planning, WFD	# of communities involved	
F37	Survey possibly by drone / satellites of paved areas of the City	2020	Environment and Transportation	# of surveys	
F38	Environmental surveys of all City rivers and estuaries as baseline surveys	2020	Environment and Transportation	Surveys completed	
F39	Increase funding for gully cleaning in the city	Ongoing	Environment and Transportation	# of gullies cleaned	
F40	The Council will work with the Local Authority Waters Programme in its support of communities and stakeholders in the delivery of local water quality projects and initiatives	Ongoing	Environment and Transportation	# of projects delivered	
F41	Communication and awareness campaigns on flood risk management and natural flood management measures	Ongoing	Environment and Transportation	# of campaigns	

### EXAMPLES OF RELEVANT LEGISLATION/POLICIES/GUIDANCE

- Arterial Drainage Acts
- Catchment-Based Flood Risk Management Plans (CFRMP)
- Dublin Bay Biosphere Biodiversity Conservation and Research Strategy 2016-2020
- Dublin City Biodiversity Action Plan 2015-2020
- Dublin City Development Plan 2016-2022 - Strategic Flood Risk Assessment (SFRA)
- Dublin City Invasive Alien Species Action Plan 2016-2020
- Dublin City Tree Strategy 2016-2020
- Eastern Catchment Flood Risk Assessment and Management (CFRAM) Study 2011-2016
- EU Birds Directive 2009/147/EC
- EU Environmental Liability Directive 2004/35/EC
- EU Floods Directive 2007/60/EC
- EU Habitats Directive 92/43/EEC
- Floodinfo.ie
- Greater Dublin Strategic Drainage Study
- Irish Coastal Protection Strategy Study (OPW)
- National Landscape Strategy for Ireland 2015-2025
- OPW Flood maps
- The Planning System and Flood Risk Management Guidelines for Planning Authorities, November 2009
- The Ramsar Convention on Wetlands
- The 2nd Cycle River Basin Management Plan 2018 - 2021
- Water Framework Directive 2000/60/EC
- Water Services Strategic Plan (2015)