



Northern Ireland Audit Office

The Rivers Agency: Flood Prevention and Management



REPORT BY THE COMPTROLLER AND AUDITOR GENERAL
13 September 2016



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K J Donnelly

Northern Ireland Audit Office

Comptroller and Auditor General

13 September 2016

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Abbreviations and Glossary

DARD	Department of Agriculture and Rural Development
DFP	Department of Finance and Personnel
DOE	Department of the Environment
DoF	Department of Finance
DRD	Department for Regional Development
ESS	Enterprise Shared Services within the Department of Finance provides shared services to the NI government departments and some of their agencies, including Account NI, HR Connect, Records NI, Network NI, the Centre for Applied Learning and IT Assist.
EU	European Union
FIL	Flooding Incident Line
Flood Response Agencies	Rivers Agency, NI Water and TransportNI are often referred to as The three Flood Response Agencies
FRMP	Flood Risk Management Plan
GB	Great Britain
GIS	Geographic Information System
NI	Northern Ireland
NIAO	Northern Ireland Audit Office
NICS	Northern Ireland Civil Service
NIFRS	Northern Ireland Fire and Rescue Service
OFMDFM	Office of the First Minister and the Deputy First Minister
PEDU	Performance and Efficiency Delivery Unit
PPE	Post Project Evaluation
PPS	Planning Policy Statement
PSNI	Police Service of Northern Ireland
SPPS	Strategic Planning Policy Statement
UK	United Kingdom

Executive Summary



Upper Bann, January 2016. *Photograph courtesy of the Rivers Agency.*

Executive Summary

1. The Rivers Agency is a division of the Department for Infrastructure and prior to 6 May 2016 a division of the Department of Agriculture and Rural Development (DARD). It is the statutory drainage and flood defence authority for Northern Ireland.
2. This study examines the identification of flood risk and the implementation and maintenance of the Rivers Agency's flood prevention assets.

Identification of flood risk

3. Flooding is a natural process that cannot be entirely prevented but it can be managed and its effects can be mitigated. In Northern Ireland there have been a number of major flooding events in the last 20 years resulting in disruption to people and damage to infrastructure and the natural environment.
4. The number of properties in Northern Ireland that are at risk from flooding is low when compared to many other EU countries. Nevertheless, the impact of flooding can be devastating.
5. The Rivers Agency has developed a Flood Risk Management Strategy, flood maps and plans that have identified areas at significant risk of flooding. It has also identified and worked with communities at risk of flooding to build flood resilience and put in place suitable flood warning and informing activities.

6. The Rivers Agency could do more to engage with stakeholders. We also believe there is considerable scope to improve the performance of the Flooding Incident Line.

Implementation and maintenance of the Rivers Agency's flood prevention assets

7. The Strategic Flood Map and Detailed Flood Maps, developed by the Rivers Agency, are useful for development planning, promoting and designing resilience measures and flood defence prioritisation.
8. Our review of flood defence projects undertaken by the Rivers Agency found a number of time and cost overruns. The Rivers Agency has identified a number of lessons from these projects that have the potential to improve performance in the future.

Summary of recommendations

On the Identification of Flood Risk

9. In our view the number of multi-agency Flood and Water management groupings may be too large to allow an effective, co-ordinated approach. **We recommend that consideration is given to streamlining these groupings.** (Paragraph 2.6)

10. **We recommend that the Strategic Flood Map approach is assessed against the Detailed Flood Maps, for areas where both exist, to understand better the implications of the weaknesses within the models.** (Paragraph 2.13)

11. The Detailed Flood Maps are fit for purpose and likely to meet stakeholders' needs. **We recommend that the Rivers Agency reviews the weaknesses identified in the Strategic Flood Map and Detailed Flood Maps for stakeholders and examines the benefits of providing water speed and flood duration information suitable for emergency and evacuation planning.** (Paragraph 2.21)

12. **We recommend that the Rivers Agency, as chair of the Floods Strategy Steering Group, continues to work with Enterprise Shared Services to ensure the FIL telephony service meets their, and the public's needs.** (Paragraph 2.36)

13. In relation to the FIL telephony service, **we recommend that the relevant agencies reconsider how online technology can be harnessed to better meet the public's needs.** (Paragraph 2.39)

On the Implementation and Maintenance of the Rivers Agency's Flood Protection Assets

14. We found the 2030 future scenario presented in the Strategic Flood Map and Detailed Flood Maps is unlikely to be long enough into the

future to represent flooding risk over a development's lifetime, which could typically be 50-100 years. **We recommend that the Rivers Agency should consult with the Planning Authority to determine if the maps meet their needs and how they could be improved, if cost effective to do so.** (Paragraph 3.4)

15. We found the flood defence capital projects' cost-benefit assessments are robust and consistent with NI Guide to Expenditure Appraisal and Evaluation guidance. **However, we recommend that the Rivers Agency should ensure that PPEs, tailored to the size of the project, are completed in a timely manner and any lessons learned, including the reasons why projects exceed budget, are disseminated as soon as possible.** (Paragraph 3.17)

16. **We also recommend that the causes of the budget and time overruns, which have been already identified by the Rivers Agency, are used to develop an action plan to reduce future delays and cost overruns.** (Paragraph 3.18)

17. We found that the Rivers Agency's management accounting information system is able to provide a breakdown of the different types of project but unable to provide detail on the stages within the projects i.e. planning, design, implementation and evaluation. This detail is maintained by the project manager. **We recommend that the Rivers Agency routinely reviews the effectiveness of the project**

Executive Summary

management information to ensure it meets its needs, provides detail on the project stages and considers what improvements a project management software tool could add. (Paragraph 3.22)

Part One: Background and Introduction



Lough Neagh near Maghery Road, November 2015. *Photograph courtesy of the Rivers Agency.*

Part One: Background and Introduction

Flooding cannot be entirely prevented

- 1.1 Flooding is a natural process that cannot be entirely prevented or controlled. However, arrangements can be put in place to help mitigate the risks of flooding and ensure that public bodies are adequately prepared to deal with the effects of flooding and protect the public.
- 1.2 In Northern Ireland, the Rivers Agency is the statutory drainage and flood defence authority for Northern Ireland. Under the terms of the Drainage (NI) Order 1973, the Rivers Agency has discretionary powers to:
- maintain watercourses and sea defences which have been designated by the Drainage Council for NI;
 - construct and maintain drainage and flood defence structures; and
 - administer advisory and enforcement procedures to protect the drainage function of all watercourses.
- 1.3 To reduce the risk of flooding, the Rivers Agency manages a culvert network of 400km and 107km of engineered soft defences¹. The Rivers Agency also monitors and maintains 26km of sea defences and two tidal barriers designed to reduce the risk of flooding to low lying coastal land.

A number of other public bodies are involved in flood prevention and response

- 1.4 Whilst the Rivers Agency is the statutory drainage and flood protection authority for Northern Ireland, a number of other departments and agencies² also have significant flood related responsibilities:
- **TransportNI³** has responsibility for blocked gullies and road drains (a major contributor to urban flash flooding).
 - **NI Water** is responsible for provision and maintenance of public sewers and for effectively dealing with the contents of those sewers (including surface water, domestic sewage or trade effluent).
 - **The Department for Infrastructure (formerly the Department of the Environment) and local councils** have to consider the risk of flooding when deciding on planning applications.
 - **NI Fire and Rescue Service** provide the flood rescue service.
 - **Local councils** facilitate coordination of the local level multiagency emergency response to flooding when there is no risk to life. There are currently five multiagency

1 Engineered soft defences are flood embankments made of clay or other soft natural material.

2 The Rivers Agency, TransportNI and NI Water are referred to as the three Flood Response Agencies.

3 On 15 April 2013 the Roads Service became known as TransportNI, the sole road authority in Northern Ireland, responsible for public roads, footways, bridges and street lights.

Emergency Preparedness Groups in Northern Ireland, which each has a flood working group and work to the same flood plan template.

- **The Department of Finance (formerly the Department of Finance and Personnel (DFP))** manages the Flooding Incident Line (FIL).

1.5 The Rivers Agency estimate that around five per cent of properties⁴ in Northern Ireland lie within the 100-year river floodplain⁵ or the 200-year coastal floodplain. One third of these properties currently have some level of flood protection.

1.6 In December 2015 the Rivers Agency published Flood Risk Management Plans setting out how the Rivers Agency, other responsible bodies and the community will work together to manage flood risk. The plans aim to help shape decision making and the investment within the communities in greatest need of flood mitigation measures, through:

- preventing increased flooding by appropriate land use planning;
- protecting communities and the environment by the provision of schemes and approaches to reduce flood risk; and
- improving preparedness arrangements, to improve dealing with flooding when it occurs.

Flooding has caused significant damage in Northern Ireland

1.7 Over the past 20 years, flooding in Northern Ireland has resulted in significant disruption to people and damage to infrastructure and the natural environment. Examples include:

- **December 2015 and January 2016** – storms Desmond, Eva and Frank caused flooding to several counties, many roads were temporarily closed and a number of homes were flooded.
- **January 2014** – high tides and strong winds caused difficult driving conditions, damage to roads on the east coast and posed a significant threat to Belfast city centre.
- **June 2012** – more than 1,000 flooding related incidents occurred in South and East Belfast and around 1,600 homes were damaged. This resulted in over 600 emergency payments of £1,000 being made by Belfast City Council, on behalf of the Department of the Environment, to households affected by floodwater.
- **October 2011** – in the Omagh area houses flooded, roads washed away, roads and bridges were closed, an electricity substation was under threat, culverts collapsed, and people had to be rescued. There

4 The Rivers Agency estimates 46,000 of Northern Ireland's 830,000 properties are within these floodplains.

5 The 100-year floodplain describes the area that is likely to be flooded in a 100-year flood. This is a flooding event that has a 1% probability of occurring in any given year.

Part One: Background and Introduction

was also flooding in Omagh during 1972, 1987, 1991, 1996, 1999, 2007.

- **November 2009** – Fermanagh suffered flooding, leading to a significant disruption to life in the county at both individual and community level, with the main Enniskillen to Dublin road closed.
- **October 2009** – South and East Belfast had localised flooding with sewage contamination.
- **August 2008** – 1,600 properties mainly in Belfast, County Down and County Armagh were affected by flooding, 37 major roads were closed and the Westlink underpass was submerged under 20 feet of water.

1.8 The Rivers Agency currently has a total budget of almost £24 million. Of this, around £9 million is allocated to capital expenditure and £15 million is allocated to resource costs (see **Figure 15**). In 2015 its flood defence assets were valued at £620 million. The Rivers Agency employs more than 370 staff, 214 of whom are a direct labour force, assigned to maintenance work and capital projects.

1.9 In April 2013 the three flood response agencies estimated that up to £420 million of additional funding, if available, could be spent to further mitigate flooding. This funding would:

- allow for an increase in the frequency of certain operational maintenance activities;
- accelerate the rate of sewer upgrades;
- bring forward major infrastructure projects;
- address infrastructure vulnerabilities which are not part of the public network; and
- go beyond the current design standards on both the public and private network.

1.10 Even a substantial increase in expenditure of this nature, however, could not prevent all flooding. To engineer systems designed to meet all possible weather events would be prohibitively expensive. The three flood response agencies suggested that lower, targeted investment could make a significant contribution to reducing flood risk in local areas.

Flooding is predicted to be more frequent in the future

1.11 Climate change predictions for Northern Ireland suggest a rise in sea level, an increase in winter rain and an increase in the frequency and intensity of extreme rainfall events.

1.12 In addition to the climate change predictions it is generally accepted that Northern Ireland is likely to experience more frequent flooding in the future. Within urban areas, surface water flooding may increase due to the development on green spaces and the paving of gardens and driveways. In Northern Ireland, most storm water drainage systems are designed to cope with a 1 in 30 year rainfall event. Climatology predicts that these rainfall events will be exceeded more frequently.

- a move from the Rivers Agency's current headquarters location to Loughry College.

This study examines the Rivers Agency's management of flood risk and protection within Northern Ireland

1.14 This report examines the Rivers Agency's effectiveness in identifying and reducing flood risk and developing and maintaining the flood defence assets, considering:

- has the Rivers Agency adopted an effective Flood Risk Management Strategy, to meet the requirements of the EU Floods Directive? (**Part Two**);
- are there effective collaborative working relationships across the public sector to support flood prevention and a flood response? (**Part Two**); and
- has the Rivers Agency established specific methodologies for identifying serious flood risk areas, and produced supporting action plans to reduce flooding and build flood resilience? (**Part Three**).

The Rivers Agency is facing a number of challenges

1.13 The Rivers Agency, like the rest of the NI public sector, is facing a number of challenges:

- a period of financial constraint and a reduced budget;
- the loss of a number of staff through the Northern Ireland Civil Service (NICS) wide Voluntary Exit Scheme⁶;
- organisational change – the Rivers Agency has recently become a division within DARD and in May 2016 moved to the Department for Infrastructure;
- dealing with reduced number of local councils, new structure and powers; and

1.15 To inform our review we:

- **interviewed relevant personnel** – we conducted semi-structured interviews with officials, management and staff in the Rivers Agency;

⁶ The NICS-wide Voluntary Exit Scheme was launched in March 2015 to address the budget pressures facing Departments, by delivering an NICS paybill reduction.

Part One: Background and Introduction

- **contracted a consultant** – a consultant was engaged to assess the technical capability of the Rivers Agency's Flood Risk Map data to inform and prioritise funding and programme management (further details at **Appendix 1**);
- **identified case studies** – examples were identified to illustrate good practice;
- **carried out a data and document review** – including those relating to expenditure, performance, fixed assets, financial management reporting, legislation and EU Directives; and
- **met with stakeholders** – meetings with staff in NI Water, Planning Authority, Red Cross, Met Office and Belfast City Council to gain views on collaborative working.

Value for Money statement

- 1.16 In our view, the Rivers Agency's actions in preparing for and implementing the EU Floods Directive have been effective. It remains too early to evaluate whether the additional capital expenditure incurred on flood defences have provided value for money.
-

Part Two: Identification of Flood Risk



Toome Sluices at the Upper Bann, November 2009. *Photograph courtesy of the Rivers Agency.*

Part Two: Identification of Flood Risk

2.1 This part of our report considers the extent to which the Rivers Agency has adopted an effective Flood Risk Strategy and established effective collaborative working relationships.

- » prepare detailed hazard and flood maps; and
- » produce flood risk management plans containing objectives and measures to reduce flood risk.

The Rivers Agency's Flood Risk Management Strategy is in line with the EU Floods Directive requirements

2.2 The EU Floods Directive aims to establish a framework that will contribute to reducing the impact of flooding on communities and the environment. The Directive required a staged approach whereby each EU Member State was required to undertake:

- a Preliminary Flood Risk Assessment by 22 December 2011 to identify areas which have a significant risk of flooding (see **Figure 1**);
- for these areas at risk:

2.3 To comply with the EU Floods Directive the Rivers Agency published the 'Preliminary Flood Risk Assessment', in December 2011, which identified areas with a significant risk of flooding. The Preliminary Flood Risk Assessment considered flooding from the main flooding sources including rivers, the sea, surface water runoff and impounded water bodies⁷. The timetable and work programme for the preparation of detailed Flood Risk Management Plans were published on the 20 December 2012 and reflect the EU Floods Directive requirements.

Figure 1: The Rivers Agency's four stage strategy to implement EU Floods Directive by 2015

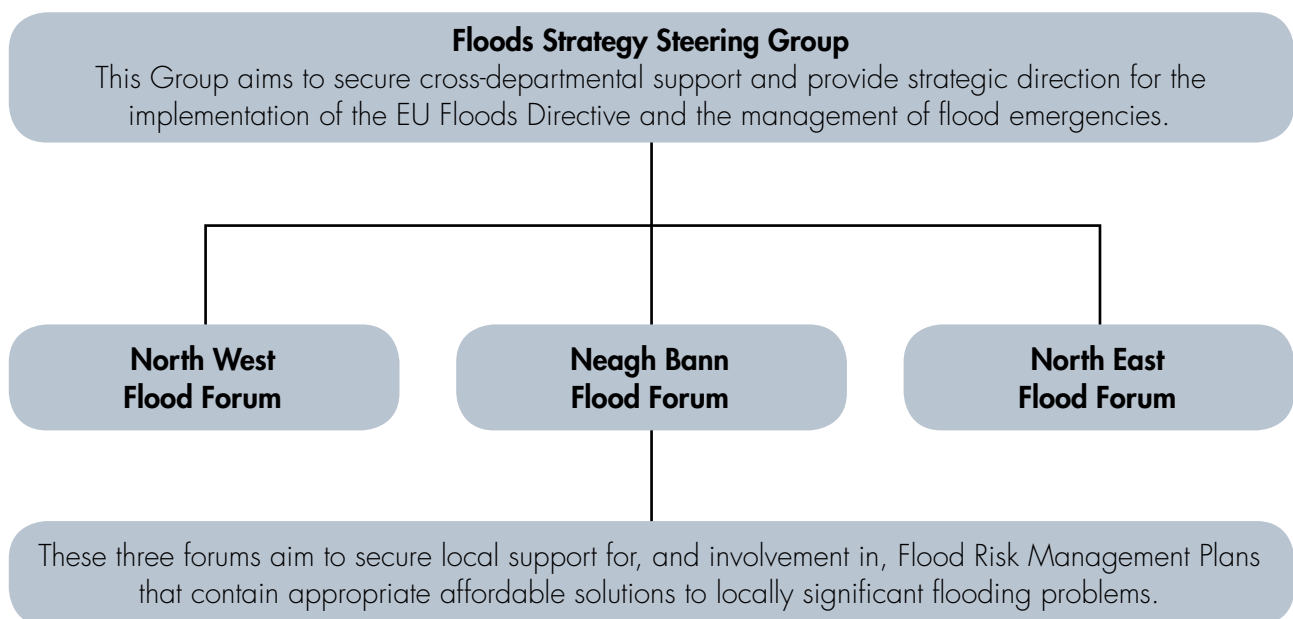
Stage		Target date	Result
Stage 1	Create NI legislation to implement the EU Floods Directive	Dec 2009	Achieved
Stage 2	Undertake a preliminary flood risk assessment and identify significant flood risk areas	Dec 2011	Achieved
Stage 3	Produce hazard and flood risk maps for the significant flood risk areas	Dec 2013	Achieved
Stage 4	Produce flood risk management plans containing objectives and measures to manage flood risk in the significant flood risk areas	Dec 2015	Achieved

Source: NIAO based on the Rivers Agency's documents

⁷ Impounded water bodies are reservoirs, bodies of water confined within an enclosure such as water held by a factory / plant, artificial lakes or ponds formed or modified by human activity.

- 2.4 The Floods Strategy Steering Group was established to provide cross-departmental support and strategic direction for the implementation of the EU Floods Directive and the management of flood emergencies (see **Figure 2**). This was in addition to a large number of other pre-existing multi-agency Flood and Water management groupings in Northern Ireland (see **Appendix 2**). In our view, the duplication of membership offers an opportunity to reduce the number of these groupings.
- 2.5 The Rivers Agency told us that these structures are constantly evolving and the groupings are being rationalised to:
- reduce the number of liaison meetings;
 - remove the membership overlap between groups;
 - reflect restructuring; and
 - take account of contributions from organisations such as Councils, the NI Fire and Rescue Service (NIFRS) and the Police Service of Northern Ireland (PSNI).
- 2.6 In our view, the number of multi-agency Flood and Water management groupings may be too large to allow an effective, co-ordinated approach. **We recommend that consideration is given to streamlining these groupings.**

Figure 2: Floods Directive Governance structure established (post December 2015)



Source: The Rivers Agency

Part Two: Identification of Flood Risk

The methodologies and risk calculations used to support the Strategic Flood Map and the Detailed Flood Maps are fit for purpose

- 2.7 In October 2008 the Rivers Agency published the Strategic Flood Map for Northern Ireland. While this map was used to locate general areas at risk of flooding, it was unable to provide detailed flooding information at individual property level. The EU Floods Directive requires detailed Hazard and Flood Risk Maps for areas at significant risk of flooding. In response to the Directive, the Rivers Agency developed models (see **Case Study 1**) to visualise how the most significant flood waters travel along various pathways and impact on people, property and infrastructure. The Rivers Agency produced 69 of these Detailed Flood Maps. The maps have been designed for the Government, utility stakeholders and the public.
- 2.8 The Detailed Flood Maps for the 69 areas and the other geographical areas covered by the Strategic Flood Map are hosted on DARD's website, within Flood Maps (NI) (see **Figure 3**) (<https://mapping.infrastructure-ni.gov.uk/FloodMapsNI/index.aspx>).
- 2.9 We found that the Strategic Flood Map is compliant with the technical requirements of the EU Floods Directive and is likely to be useful in development planning, promoting and designing resilience measures, and defence prioritisation.
- 2.10 We also found that the approach adopted by the Rivers Agency in the preparation of Detailed Flood Maps was adequate in covering catchments down to a small enough scale, and in modelling higher risk areas more accurately.
- 2.11 Whilst there were some shortcomings in the Strategic Flood Map, these were not

Case Study 1

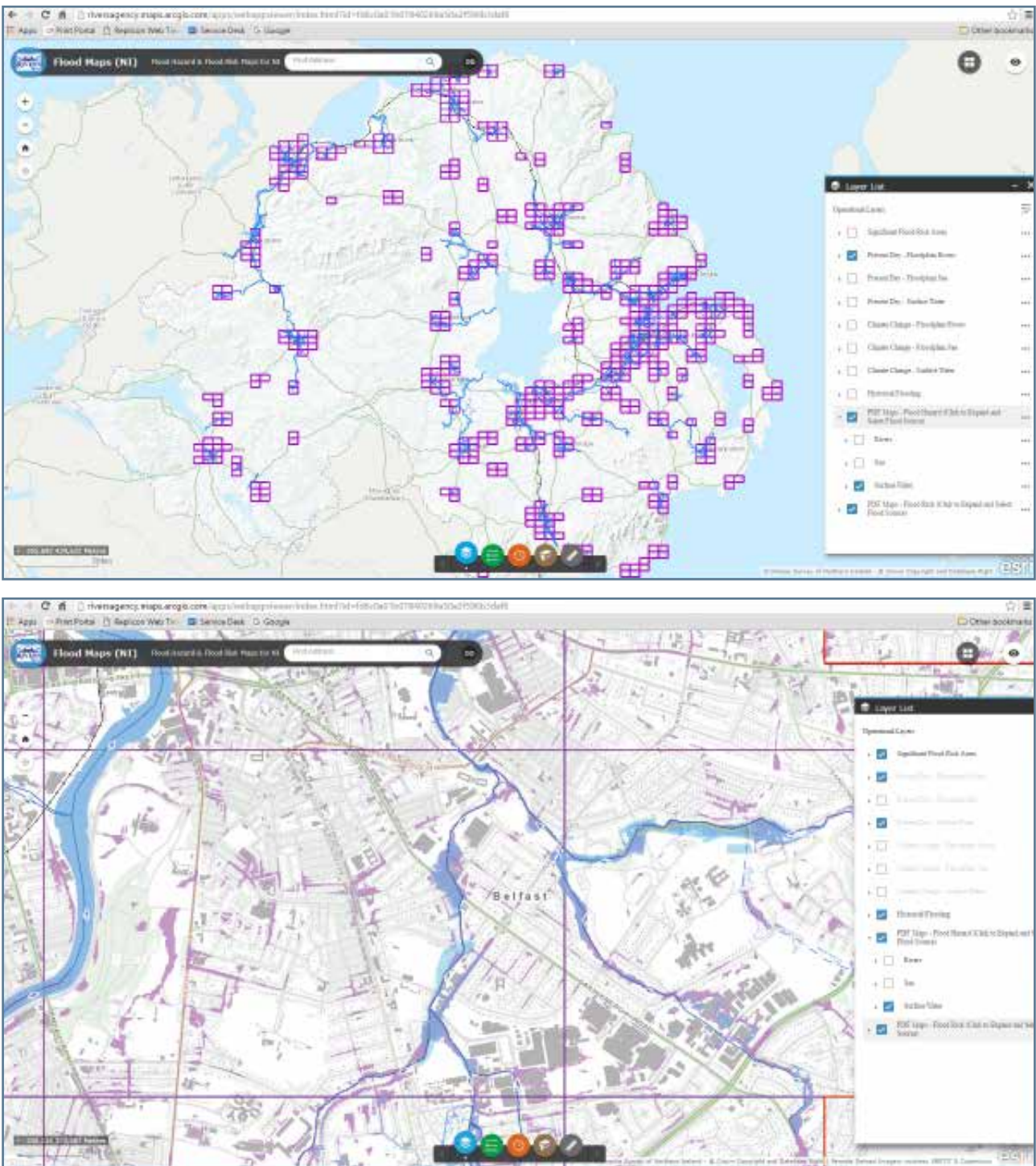
The Rivers Agency received an industry award for its use of geographic information system technology.

In July 2011 the Rivers Agency received a Special Achievement Award at the Environmental Systems Research Institute User Conference in San Diego, California, for its Strategic Flood Map for Northern Ireland.

The Rivers Agency map viewer provides location and zoom search features to make it easy for people to find, view and interpret information about their area. The map viewer now attracts regular users, public and private organisations, who can view historical, present day, climate change and flood defence maps.

Source: NIAO based on the Rivers Agency's documents

Figure 3: Extracts from Flood Maps (NI) indicating areas at risk of surface water flooding and a detailed search result for the south/east area in Belfast



Source: <https://riversagency.maps.arcgis.com/apps/webappviewer/index.html>

Part Two: Identification of Flood Risk

significant and are mitigated by the level of detail contained in the Detailed Flood Maps which cover the areas of greatest risk.

- 2.12 The Rivers Agency has not subjected the Strategic Flood Map or the Detailed Flood Maps developed by external consultants to independent validation. The contract for the development of the maps included comparing the consultant's technical specifications against the Rivers Agency preset quality assurance criteria. The comparison was completed by Rivers Agency staff. However, to date, no assessment of these technical specifications has been undertaken.

- 2.13 **We recommend that the Strategic Flood Map approach is assessed against the Detailed Flood Maps, for areas where both maps exist, to understand better the implications of any weaknesses within the models.**

More could be done to engage with stakeholders

- 2.14 From 2008 the DARD website made the maps publicly available for people to check if they were in flood prone areas, their expected level of flood risk and the potential flood range during a flooding event. Other government agencies and key stakeholders with an interest or role in the management of flood risk also have access to a more detailed version of the maps. The maps, along with other relevant flood risk information, will help in flood alleviation, land use planning and emergency planning work.
- 2.15 In April 2014, the Rivers Agency improved the way it presents the maps to the public and stakeholders by providing:
- an enhanced scale;
 - access to pre-formatted maps showing flood extents, depth, velocity and flow along channels, and flood risk;
 - an estimate of the number of people affected; and
 - the potential impact on economic activity.
- 2.16 Whilst the Rivers Agency hosted Floods Directive Stakeholder forums in the lead-up to the December 2013 target date for completion of the maps, it has not subsequently sought feedback from stakeholders.
- 2.17 The Rivers Agency also held meetings with Planning Authority to outline that the content of the Strategic Flood Map and the Detailed Flood Maps on the DARD Flood Maps (NI) viewer was being updated. This was to ensure that Planning Authority were using the most up-to-date flood maps when dealing with Area Plan development and individual planning applications. The Planning Authority provided verbal feedback.

Figure 4: The Strategic Flood Map is unlikely to meet all stakeholders' needs

	Stakeholders' main uses for flood maps	Information needed	Maps required to show	Weaknesses in the Strategic Flood Map	Weaknesses in the Detailed Flood Maps
1.	Resilience measures	How/where/when to install property level measures to reduce vulnerability - helps Rivers Agency focus promotion	Depth and probability	Depths unreliable, extents too uncertain to identify specific properties which may benefit	None
2.	Planning for development	Decide where to develop new/existing properties	Extents, to identify sites; surface water impacts	Extents too uncertain to identify specific properties	None
3.	Emergency and evacuation planning	Evacuation routes and timings; safe havens; scenarios for realistic exercises	Flood extents, depths, velocities, rapidity and duration of flooding	No useful velocities or timing possible with this approach	Velocities and timings need to be added
4.	Long term strategic planning	Broad scale risk estimates	Risk to people and property across NI and regionally	Lower level of accuracy than detailed maps	None
5.	Defence and other flood risk management prioritisation	Risk estimates at intermediate scale	Extents and depths, to identify places where defences could give most benefit	Not of sufficient accuracy	None
6.	Flood warning delivery and uptake	Which stakeholders might benefit from a warning; targeting correspondents; prioritising areas; promote uptake	Identify places at risk, lead times	No useful velocities or timing possible with this approach	None

Source: NIAO

Part Two: Identification of Flood Risk

2.18 With no formal feedback sought by the Rivers Agency from its stakeholders, we undertook a stakeholder analysis (see **Appendix 3**) which identified six broad uses for the flood maps (see **Figure 4**).

2.19 We found that the Strategic Flood Map and the Detailed Flood Maps will be useful in planning and implementing resilience measures, planning for development, and defence and other flood risk management prioritisation. Weaknesses in the information displayed, mainly in the Strategic Flood Map, hamper other uses, in particular the lack of information suitable for emergency and evacuation planning regarding the speed of the water and flood duration (see **Figure 4**). The scale at which data is displayed also limits application to strategic planning.

2.20 Based on our review of the stakeholders' needs and main uses of the maps, we concluded that the Strategic Flood Map is not of sufficient accuracy for most of the stakeholders' needs, but is of sufficient accuracy for broad scale strategic needs. The Detailed Flood Maps are fit for purpose and likely to meet stakeholders' needs.

2.21 **We recommend that the Rivers Agency reviews the weaknesses identified in the Strategic Flood Map and Detailed Flood Maps for stakeholders and examines the benefits of providing water speed and flood duration information suitable for emergency and evacuation planning.**

The recommendations from a 2012 review of flooding have been implemented

2.22 There have been a number of reports into major flooding and other incidents, (see **Figure 5**). In July 2012, the Northern Ireland Executive agreed to carry out a review of the response of government agencies to the severe flooding of 27 and 28 June 2012. The former Performance and Efficiency Delivery Unit (PEDU)⁸ reviewed the actions, handling and co-ordination of the key central government agencies with operational roles in responding to the flood emergencies, including the Rivers Agency, NI Water and TransportNI. PEDU were tasked to make recommendations to improve co-ordination and efficiencies across all government agencies. In addition, PEDU reviewed the operation of the Flooding Incident Line (FIL).

2.23 PEDU reported in September 2012 and made 12 recommendations (see **Appendix 4**) covering investment in flooding counter measures, developing a NI flood alert system and improving operational flood response. All the recommendations were accepted and allocated to the appropriate organisations.

2.24 Whilst all of the PEDU recommendations have now been implemented, nine recommendations missed their target deadlines.

8 Performance and Efficiency Delivery Unit (PEDU) was a unit within the former Department of Finance and Personnel which had authority to scrutinise and review, critically, the nature of spending in all areas.

Figure 5: A number of major reviews have been carried out into flooding and other incidents

October 2008	Independent Report into the Flooding Incident affecting the Broadway Underpass – Westlink, Belfast on 16 August 2008
January 2009	Belfast City Council Report into Belfast Flooding on 16 August 2008
July 2010	OFMDFM Report of the Flooding Task Force into the Fermanagh Flooding of November 2009
March 2011	Utility Regulator's Report of the investigations into the Freeze/Thaw incident of 2010/11 presented to the NI Executive in March 2011
June 2012	Belfast City Council June 2012 Flooding Incident Report
November 2012	PEDU Review of Response to Flooding on 27 and 28 June 2012

Source: NIAO

2.25 Progress reports on the PEDU recommendations have been presented to the Head of the Civil Service each year from 2012, with the latest update provided in January 2015.

Weather warning arrangements in Northern Ireland have been improved

2.26 Unlike the rest of the UK, Northern Ireland does not have a flood forecasting centre. The Rivers Agency told us that the flood catchment areas in Northern Ireland are smaller than elsewhere in the UK and any warning time would be much shorter, greatly reducing the benefit of such a centre. The Met Office told us that it recognised the challenges presented by smaller scale, rapidly

reacting catchment areas and believe that there is benefit in working to achieve a better understanding of the trigger thresholds for such catchment areas in terms of rainfall depth and duration. Flood warning and informing activities suitable for Northern Ireland commenced in 2013. These improvements to flood warning information are being progressed through a four stage plan (see **Figure 6**).

2.27 We found that the partnering approach between the Rivers Agency and the Met Office is likely to improve the system for flood warning in Northern Ireland. These arrangements continue to be developed in partnership with the Met Office, under a staged approach, and supported by a Memorandum of Understanding.

Part Two: Identification of Flood Risk

Figure 6: Four stage improvement plan to the Northern Ireland flood warning system

Stage	Expected action	Result
1 Formal engagement with the Met Office in a 'partnering' approach to better information and the impact assessment of National Severe Weather Warning for heavy rainfall.	A Memorandum of Understanding between the Rivers Agency and the Met Office.	Completed
2 Ensuring adequate 'informing' in relation to flood risk, to enable responders and the public to be effective in dealing with flooding.	Creation of the Regional Community Resilience Group to identify communities, prepare community resilience plans and agree on information to be shared.	Completed and reviewed by the Red Cross
3 Public dissemination of water level information.	Provision of river level warnings, real time flood alert and gauging data on the Rivers Agency website, where these are likely to be beneficial.	Ongoing
4 Review and development.	Consider the need for further refinement, taking into account national advances in this area and feedback from community groups and the wider public.	Ongoing

Source: NIAO

2.28 The improvements will principally benefit river flood warnings, as effective warnings for heavy thundery downpours, which often result in surface water flooding, continue to present challenges due to their often highly localised nature.

Improvements to the Flooding Incident Line have been slow and too many calls are abandoned

2.29 The Flooding Incident Line (FIL) was established in 2009 to improve the way members of the public could report a serious flooding situation to a single

point of contact (see **Figure 7**). The main benefits of FIL are:

- the call will be logged and passed to the relevant agency;
- the caller doesn't have to decide which agency to contact; and
- the call won't be redirected, nor will the caller be given other numbers to call.

2.30 During flooding incidents in June 2012, members of the public reported that they were unable to get through to FIL, with 80 per cent of calls abandoned.

Case Study 2 – Flooding in County Fermanagh during December 2015 and January 2016

The River Erne is over 100 kilometres long, rises in Co. Cavan, flows through Upper and Lower Lough Erne in Fermanagh and onwards to Ballyshannon in Co. Donegal where it enters the sea. The catchment area is over 4,300 square kilometres. Lower Lough Erne has a surface area of 111 square kilometres and is nearly three times the size of Upper Lough Erne.

The current system for managing the Loughs was set up in 1950. The levels in the Upper Lough and the inter-lough channel are kept below certain levels. This management balances power generation, flood alleviation, agricultural land use, environmental considerations, tourism and leisure interests. During exceptional periods of prolonged and heavy rainfall, the Loughs' levels can rise over the set levels.

There are two water level control structures on the Erne system: sluice gates at Portora, Enniskillen which are operated by the Rivers Agency in dry conditions and a hydro-electric station at Cliff, Co. Donegal. The gates at Portora control water levels upstream through Enniskillen and into Upper Lough Erne, and are operated by the Rivers Agency in dry conditions to manage water levels through Enniskillen and Upper Lough Erne at its minimum level. In wet conditions the gates are left fully open and have no direct effect on water levels, as the volume of water flowing into the Loughs can be up to three times more than the maximum outflow volumes.

Parts of Northern Ireland had record-breaking rainfall during December 2015, which resulted in significant flooding around Lough Erne in Fermanagh. A number of roads remained closed during January 2016. At the start of January 2016 the water level in Upper Lough Erne peaked at 157 feet 11 inches, which is almost 3 feet above the prescribed level.

A review carried out following severe flooding in Fermanagh in 2009 concluded that "it would not be economically or environmentally feasible to increase the capacity of the system to a level where flooding from extreme events, such as the November 2009 flooding, could be prevented. Neither would it be feasible to significantly reduce existing water levels, given the detrimental impact this would have on the natural environment and on water based tourism."

Source: NIAO based on the Rivers Agency's documents

In December 2012, the former DFP on behalf of, Enterprise Shared Services⁹ agreed a new telecommunications contract to help improve the public's access to government services, including FIL. Enterprise Shared Services expected that this would improve the service by increasing the number of skilled staff who can take calls when incidents occur.

2.31 The Rivers Agency has been engaged in work to identify potential improvements to FIL since 2013. To support this work, Enterprise Shared Services created the FIL Steering Group in 2014 which meets every two months and includes representatives from the Rivers Agency, TransportNI and NI Water.

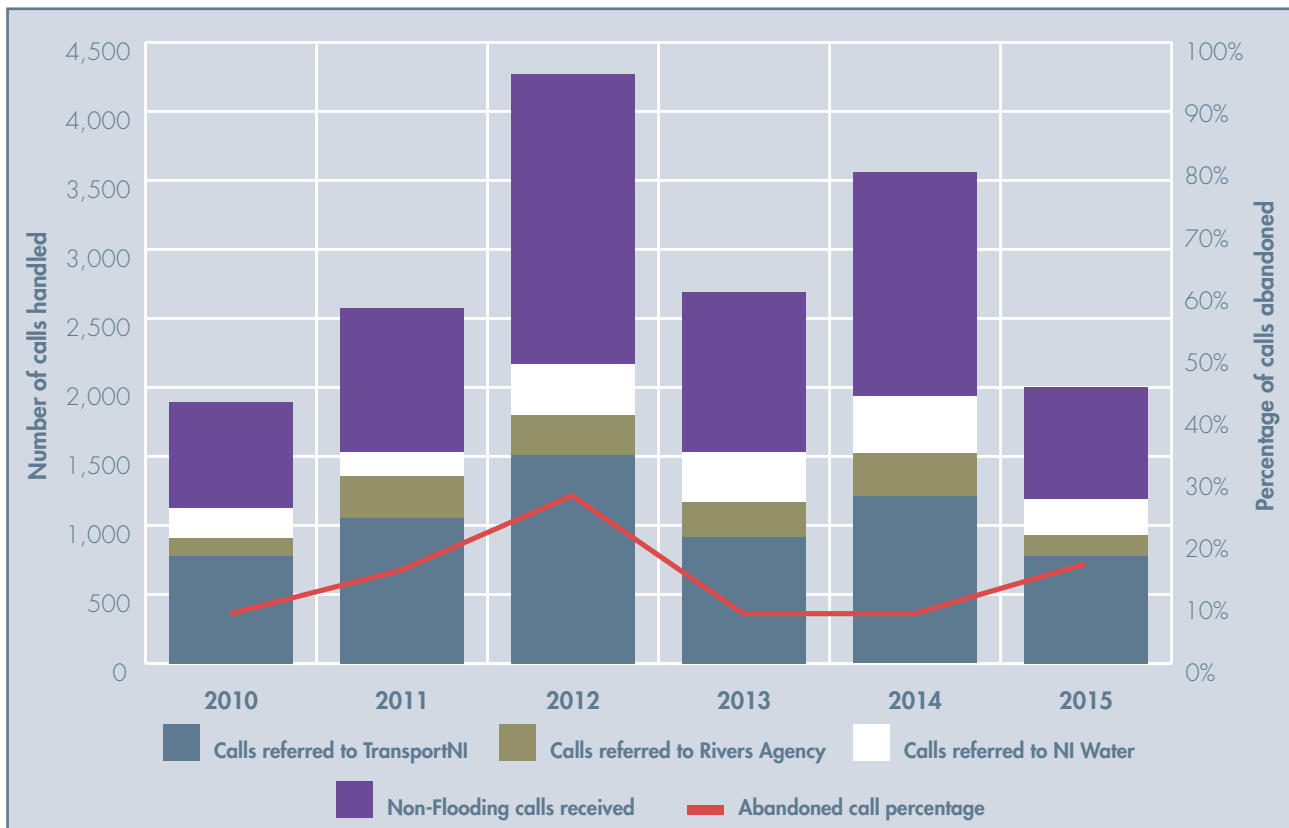
⁹ Enterprise Shared Services within the Department of Finance provides shared services to the NI government departments and some of their agencies, including Account NI, HR Connect, Records NI, Network NI, the Centre for Applied Learning and IT Assist.

Part Two: Identification of Flood Risk

- 2.32 Since 2013, work has been ongoing with Enterprise Shared Services to ensure that the telephony service is able to meet stakeholders' needs during a significant flood event. The FIL stress tests, involving large volumes of simulated calls, identified poor performance.
- 2.33 The FIL performance statistics (see **Figures 7 and 8**) show that the calls abandoned peaked in 2012 at 27 per cent. **Figure 8** shows that from the start of the new contract in 2013 the abandonment rate has fallen from the 2012 peak, and was below 8 per cent in the first two years of the new contract. However, the call abandonment rate rose to nearly 16 per cent in 2015.
- 2.34 The three Flood Response Agencies (see **Footnote 2**) highlighted other problems with FIL including emergency flood calls failing to connect and reports from PSNI that they could not get through to FIL on 15 November 2015. DFP have advised that the incident on 15 November is not reflective of the overall service and that the technical fault causing this issue has been identified and rectified.
- 2.35 We found that the implementation of improvements to FIL has been slow. Problems identified in June 2012 were discussed in 2013, a steering group was set up in 2014, and improvements are now due to be in place by 2016. Enterprise Shared Services have provided the three Flood Response Agencies with options for improving
- FIL that will provide them with a higher level of assurance that the FIL telephony service will perform effectively should a major flooding incident occur. These options are currently being considered by the three Flood Response Agencies.
- 2.36 **We recommend that the Rivers Agency, as chair of the Floods Strategy Steering Group, continues to work with Enterprise Shared Services to ensure the FIL telephony service meets their, and the public's needs.**
- 2.37 The upgrade and development of FIL, called 'FIL 2' has been included in the NICS Digital Transformation '16 by 16'¹⁰ online projects. Enterprise Shared Services has started to develop an on-line system to report flooding and provide back office communication with the three Flood Response Agencies, hot spots for calls taken, sand bag locations and details on the cessation of the incident.
- 2.38 The three Flood Response Agencies told us that they have now agreed that Enterprise Shared Services continues to develop the online system in parallel with improving the resilience of the telephony aspect of FIL.
- 2.39 **We recommend that the relevant agencies reconsider how online technology can be harnessed to better meet the public's needs.**

10 The NICS Digital Transformation Programme includes the '16 by 16' in which 16 online projects are planned to be delivered by April 2016. While the initial commitment is for 16 services, more than 30 citizen facing services are being worked on as part of the programme.

Figure 7: The total number of calls handled and abandoned by Flooding Incident Line peaked in 2012



Source: NI Direct

Figure 8: Too many calls to the Flooding Incident Line are abandoned

	Total Calls Received	Calls Abandoned	Calls Answered	Calls Abandoned %
2010	2,054	164	1,890	8.0%
2011	3,027	458	2,569	15.1%
2012	5,846	1,577	4,269	27.0%
2013	2,857	216	2,640	7.6%
2014	3,775	297	2,985	7.9%
2015	2,532	398	2,134	15.7%

Source: NI Direct

Part Two: Identification of Flood Risk

There are effective structures, guidance and protocols in place to allow relevant stakeholders to collaborate during flooding incidents

2.40 The Rivers Agency, as the designated lead agency during flooding incidents, is responsible for developing and leading emergency planning exercises. For example, in November 2013 the Rivers Agency conducted a major tidal flood response exercise in the Belfast area, attended by 179 specialists in emergency response. The Rivers Agency told us that the learning from this exercise greatly enhanced the speed of response when the scenario arose in January 2014 with the threatened inundation of Sydenham, the Belfast Docks and various other parts of NI.

2.41 The Rivers Agency also has a key role in the multi-agency Flood Strategy Steering Group which meets quarterly to:

- develop strategies to improve flood response;
- provide direction to some of the Flood Working Groups (see **Appendix 2**) linked to the Emergency Planning Groups which deal with issues at an operational level; monitor and review the effectiveness of flood response during and following major events; and ensure that there are effective communication channels and

processes in place at a strategic level among the flood response organisations.

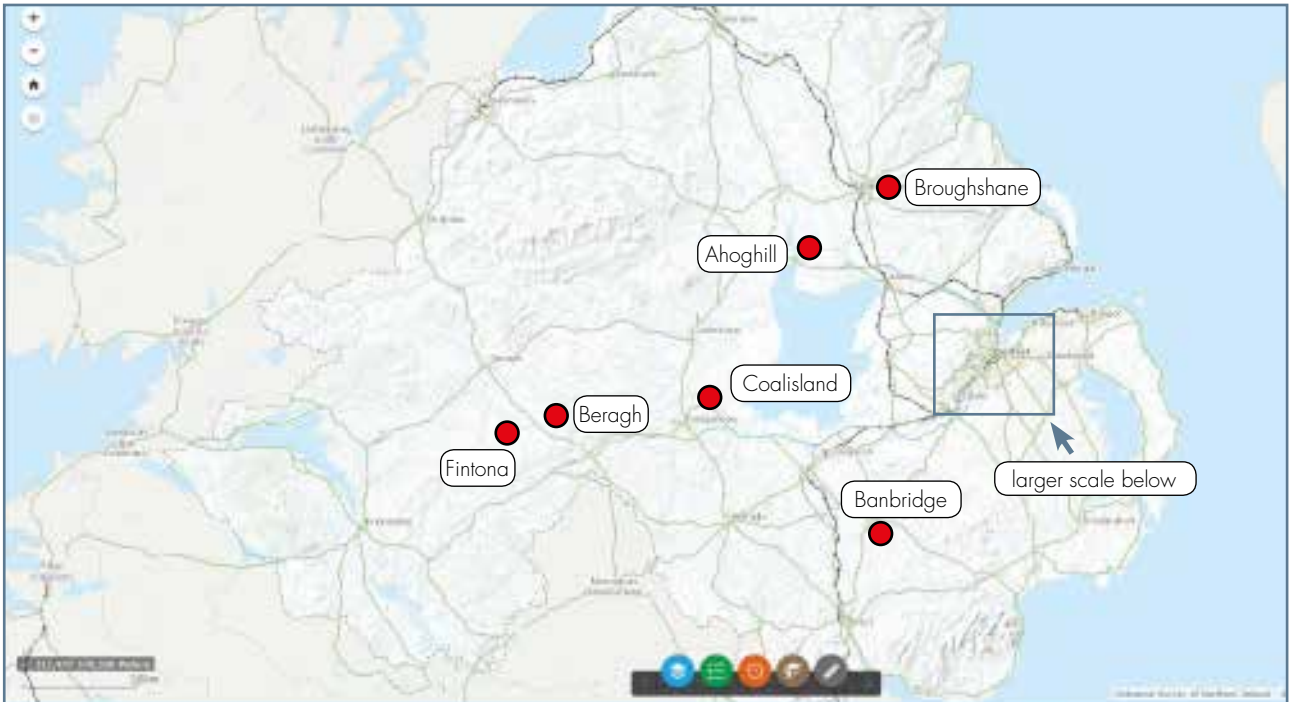
2.42 We found that during a flooding event there are effective structures, guidance and protocols in place to allow effective collaborative working which are routinely tested and improved.

The Rivers Agency is proactive in improving resilience to flooding within Northern Ireland, especially in areas subject to repetitive flooding

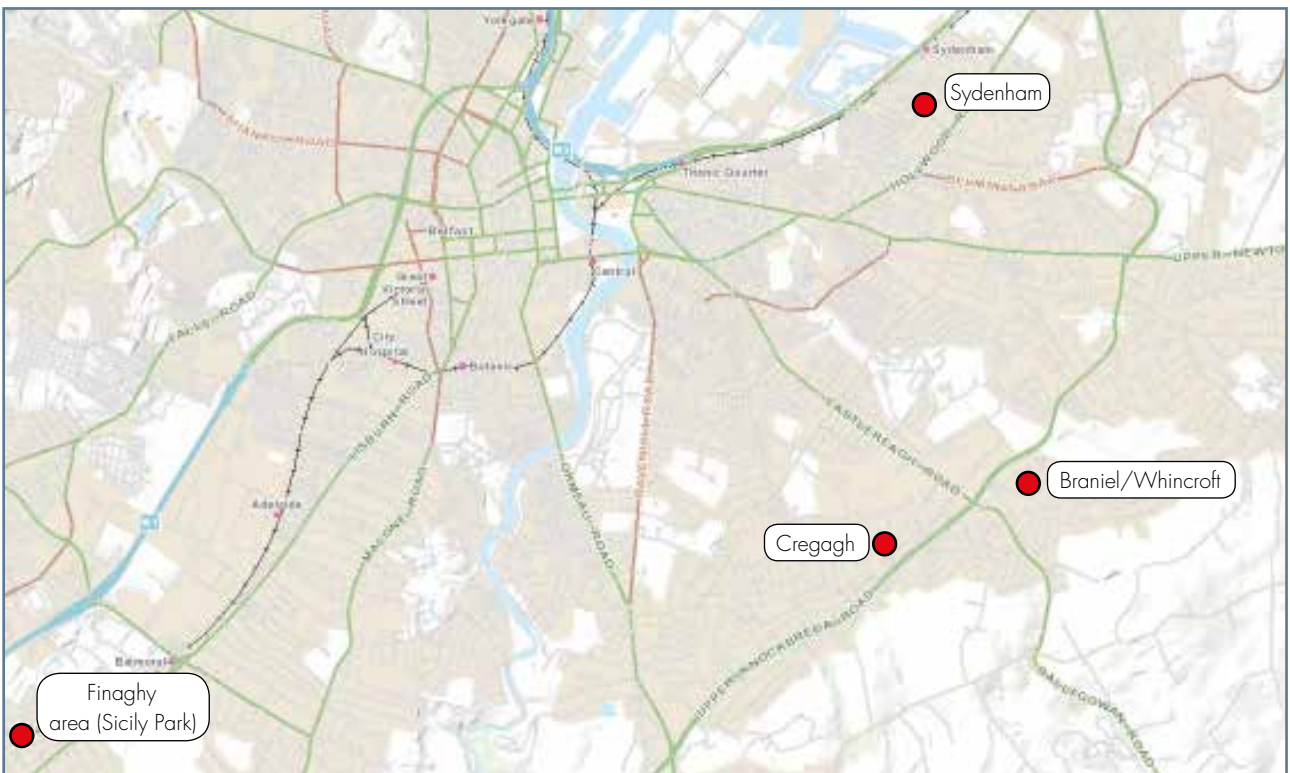
2.43 The Rivers Agency has undertaken a number of schemes aimed at increasing community resilience to flooding. Around £80,000 per annum has been committed to the development of flooding resilience.

2.44 During 2014, a Regional Community Resilience Group (see **Appendix 2**) pilot scheme commenced, to identify and engage with ten communities (see **Figure 9**) at risk of flooding to help them be better prepared (see **Case Study 4**). The review of the pilot scheme, completed by the Consumer Council and the Red Cross, concluded that the pilot scheme had been successful, with more than 70 per cent of residents indicating that they felt better informed and prepared for flooding. The review determined that the work of the Regional Community Resilience Group should continue.

Figure 9: Ten communities selected to pilot the engagement to build community resilience to flooding scheme



There are four communities within the greater Belfast area



Source: British Red Cross and the Consumer Council's Review of the Regional Community Resilience Group pilot

Part Two: Identification of Flood Risk

The issue of resourcing needs to be addressed to determine the rate at which the initiative can be rolled out to other communities.

- 2.45 The Rivers Agency developed a business case for an Individual Property Protection Scheme, called the Homeowner Flood Protection Grant Scheme, on behalf of the Floods Directive Steering Group. This £1 million scheme was launched in January 2016 to assist families whose homes are at risk of flooding. Home owners eligible for the scheme will receive a 90 per cent grant, up to a maximum of £10,000, towards the cost of installing equipment to protect their homes.
- 2.46 The Homeowner Flood Protection Grant Scheme includes an information and awareness campaign to promote the benefits of property-level flood protection, provide homeowners with technical support and grant financial assistance to fit protection to their homes. It has been agreed that the Homeowner Flood Protection Grant Scheme, will be available to the owners of all residential properties located within high-risk flood areas and which are unlikely to benefit from publicly-funded community-level flood mitigation solutions within five years of their application.
-

Case Study 3 – In January 2016 the water level on Lough Neagh was at an almost 100 year high

Lough Neagh, with an area of over 150 square miles, is the largest lake in Ireland. Around 40 per cent of the land area of Northern Ireland is drained into the Lough by many tributaries, including six rivers. Lough Neagh's level is controlled by floodgates at Toomebridge in County Antrim, which were fully opened in early November 2015.

November 2015 was the fourth wettest since 1910, and December 2015 was the wettest on record and often stormy, including storms Desmond, Eva and Frank. These repeated storms put pressure on the Lough peaking at over 13 metres on 8 January 2016, more than a metre above the statutory maximum level. This is the highest recorded level in almost 100 years.

During the first week of January 2016, a small number of properties around Lough Neagh were flooded, including some businesses which were badly impacted.

Water levels only began to recede in the second week of January 2016.

Source: NIAO

Case Study 4 – Practical examples of resilience building

The Regional Community Resilience Group engaged with 10 flood risk communities and delivered some of the following, where appropriate:

- an agreed community plan;
- sandbag stores established;
- local volunteers registered with the Met Office's detailed Hazard Manager System;
- agreed pumping locations;
- 'Flood Ahead' traffic warnings provided to residents;
- Flood Warden Scheme;
- at-risk culvert grilles identified, mapped and inspection responsibilities allocated to local volunteers;
- river station alerts have been installed in relevant locations and alerts to be sent to volunteers; and
- household packs - 'medicine in a bottle' packs and NI Water's stop valve tags were provided free to the residents.

Source: NIAO based on Red Cross and Consumer Council evaluation report

Part Three:

Implementation and Maintenance of the Rivers Agency's Flood Prevention Assets



Upper Lough Erne, near Shanaghy and Derryad townlands, November 2009. *Photograph courtesy of the Rivers Agency.*

Part Three:

Implementation and Maintenance of the Rivers Agency's Flood Prevention Assets

- 3.1 This part of our report examines the Rivers Agency's performance in identifying, developing and maintaining flood prevention assets to reduce the risk of flooding.

The Strategic Flood Map and the Detailed Flood Maps are useful for development planning, promoting and designing resilience measures, and flood defence prioritisation

- 3.2 The Rivers Agency aims to reduce flood risk by preventing inappropriate development within floodplains. The Rivers Agency's Planning Advisory Unit provides advice to each of the local councils' planning offices¹¹ on the drainage and flood risk aspects of Development Plans and planning applications, commensurate with the need to prevent inappropriate or unsustainable development in floodplains or elsewhere. This aims to avert any increase in risk to life and damage to property and the environment through flooding, as noted in the Strategic Planning Policy Statement¹² (SPPS), published in September 2015.
- 3.3 We found the Strategic Flood Map and Detailed Flood Maps (see **Paragraphs 2.9 to 2.24**) are fit for purpose in supporting the implementation of the SPPS, as they allow properties and sites at risk of flooding to be identified. While the identification of surface water risk is uncertain the SPPS requires the

Planning Authority to consult with other relevant bodies, including Rivers Agency, where prevailing information suggests that flood risk or inadequate drainage is likely to be a material consideration. One limitation of the maps, in respect of planning, is the time period represented by climate change, which is unlikely to be sufficient to cover a development's lifetime.

Case Study 5 – Planned development site in a floodplain flooded December 2015

The site of a £50million retail development, on a floodplain, near Strabane, was under two feet of water as a result of storm Desmond in December 2015. The development site is situated near the rivers Finn, Mourne and Foyle.



Photograph source: The Rivers Agency.

11 On 1 April 2015, the Department of the Environment transferred responsibility for the majority of planning functions to local government, empowering local councils to shape how their area grows and develops. The Department of the Environment retained responsibility for: determination of regionally significant and 'called-in' applications; regional planning policy; planning legislation; oversight and guidance for councils; and performance management.

12 Planning Policy Statement 15 (PPS15), Planning and Flood Risk, was revised and published in September 2014. It has since been consolidated and reflected in a strategic way within the Strategic Planning Policy Statement for Northern Ireland (SPPS), published September 2015. The revised PPS15 is being retained under the transitional arrangements, as set out in the SPPS.

The group behind the development are satisfied that its proposed measures will prevent any future flooding. Following the flooding, the group's engineers reviewed their proposed method for tackling the flooding issue which included reinforcing and recontouring lands surrounding the rivers. The project manager added that flood mitigation measures would include a widening of local rivers to accommodate a larger volume of water and there is a strong case for the water-walls in Strabane to be extended around the development site.

During the planning process, the Rivers Agency indicated that this site lies with the 1 in 100 year floodplain of the Mourne and Foyle Rivers. However, the Planning Authority determined that this application was regionally significant and therefore was permitted under Planning Policy Statement 15 (PPS15), with mitigation.

The building of a 90 bed hotel, supermarket, sports and well-being centre, garden centre, employment park and petrol station is due to start in 2016.

Source: NIAO

- 3.4 We found the 2030 future scenario presented by the Strategic Flood Map and Detailed Flood Maps is unlikely to be long enough into the future to represent flooding risk over a development's lifetime, which could typically be 50 -100 years. **We recommend that the Rivers Agency should consult with the Planning Authority to determine if the maps meet their needs and how they could be improved, if cost effective to do so.**

The Rivers Agency's assessment of capital schemes could be less subjective

- 3.5 The Rivers Agency subjects potential flood alleviation schemes (see **Figure 10** for example schemes) to a feasibility study, including an economic appraisal and placed on a prioritisation list. The relevant Detailed Flood Map is used to estimate likely property damage from a range of flood events. The estimated cost of a scheme is then compared to the 'total avoidance benefits'¹³ over the scheme's life.

13 Total avoidance benefits are based on the avoidance of losses which would have occurred had the scheme not been implemented.

Part Three:

Implementation and Maintenance of the Rivers Agency's Flood Prevention Assets

Figure 10: A variety of flood defences were constructed in response to flooding in Co. Tyrone during 2011

Sheet pile Core Floodbank – Beragh, Co. Tyrone. Constructed as part of the Beragh Flood Alleviation Scheme in 2014-2015.

Flood protection is provided by the steel sheet pile core set at the designed flood level. The pile core is then overlaid with soil and sown with grass for aesthetics to provide the finished flood embankment.



Sheet Pile/Reinforced Concrete Flood Wall – Beragh, Co. Tyrone. Constructed as part of the Beragh Flood Alleviation Scheme in 2014-2015.

Flood protection is provided by the sheet piles driven below ground level to provide a foundation. A reinforced concrete floodwall is then cast on top of the sheet piles to provide protection to the designed flood level.



Masonry Flood Wall - Beragh, Co. Tyrone.

Constructed as part of the Beragh Flood Alleviation Scheme in 2014-2015.

Flood protection is provided by a concrete masonry blockwork floodwall constructed to the required elevation. In this case the floodwall was clad with brick to provide an aesthetic finish as the floodwall is located within the garden of a domestic property.



Reinforced Concrete Cantilever Flood Wall - Ballygawley, Co. Tyrone.

Constructed as part of the Ballygawley Flood Alleviation Scheme in 2013.

Flood protection is provided by a reinforced concrete floodwall cast on site to the designed flood level.



Source: *The Rivers Agency*

Part Three:

Implementation and Maintenance of the Rivers Agency's Flood Prevention Assets

3.6 The Rivers Agency told us that its scheme prioritisation procedures ensure consistency, as each scheme is assessed against five criteria, in order of importance:

- existing degree of protection;
- structural category / risk of collapse of an existing culvert;
- economic appraisal score;
- special considerations, which include potential for negligence claims,

planning blight and repair difficulty; and

- a financial control score which assigns a higher score to cheaper measures.

3.7

We evaluated these prioritisation procedures against a set of criteria, developed for us by our consultant, based on their experience and practice elsewhere in the UK. We found a number of areas for improvement (see **Figure 11**).

Figure 11: The Rivers Agency's prioritisation procedures for flood protection measures do not meet some of NIAO's expected criteria

Criteria	How well criterion is met	Reasons
Covers appropriate sources of flooding	Well	Covers flooding from rivers and the sea which are the responsibility of the Rivers Agency.
Covers lifetime of defence	Well	Lifetime costing is a requirement within NI Guide to Expenditure Appraisal and Evaluation guidance methodology.
Reflects strategic priorities	Partially	From <i>Living with Rivers and the Sea</i> : The opportunities for a more holistic approach to flood risk reduction through the consideration of catchment-based solutions to flooding will be explored. This measure is not covered.
Promotes sustainability	Partially	There are no specific sustainability requirements included and we note that NI Guide to Expenditure Appraisal and Evaluation guidance includes some sustainability criteria, but these are likely to be discounted significantly.
Reduces subjectivity	Partially	Why the decision is reached is clear through scoring system, but some scores are subjective i.e. special considerations and consequences of culvert collapse.
Includes appropriate range of impacts	Partially	Property, people, and the environment should be covered, these are NI Guide to Expenditure Appraisal and Evaluation guidance requirements; emphasis on cost benefit ratios focuses on economics.
Covers appropriate range of measures	Not met	A limited number of flood risk management measures identified as the Rivers Agency responsibilities are addressed by the procedure.
Uses proportionate methods	Not met	The full cost benefit analysis method is specified and this may not be proportionate for the screening exercise. However, a pre-feasibility stage is used to screen out projects which will be non-viable and uses a ready reckoner instead of the full cost benefit.

3.8 We found some further strengths of the prioritisation procedure, for example, the financial control score promotes small schemes, which is likely to be a good way of spreading a limited budget, in preference to concentrating the money in a few, large schemes. The score awarded for the existing degree of protection promotes schemes where there is currently a high risk of flooding, whether these have a good cost benefit ratio or not. This is a good way of addressing 'nuisance flooding' which is associated with significant, but difficult to quantify, impacts.

3.9 In our view the process could be less subjective, especially around the award of scores for 'special considerations', which appear to be subjective. They take account of issues such as the potential for negligence claims, planning blight and repair difficulty. We found that points awarded to projects in this manner can have an impact on the prioritisation of individual schemes at the expense of other projects.

3.10 Our review also included an assessment of the suitability of the information and data generated by the maps to support the Rivers Agency's decision making. We found that the data required for capital spend prioritisation is available through the Detailed Flood Maps, at an appropriate scale.

3.11 We found that the Strategic Flood Map and the Detailed Flood Maps are capable of supporting the capital project prioritisation procedure.

Our review of flood defence projects found cost overruns

3.12 Over the last five years the Rivers Agency has invested nearly £33 million in the construction of new flood defence assets, improving protection to 694 households by completing 20 projects. We reviewed documents detailing the selection, project management and post project evaluations (PPEs) for a number of capital projects (see **Appendix 5**) undertaken by the Rivers Agency. We found:

- business cases / economic appraisals supporting the projects comply with the majority of NI Guide to Expenditure Appraisal and Evaluation guidance requirements;
- projects were subject to appropriate progress reviews and reporting; and
- projects were subject to post project evaluation, concentrating on actual cost against budget and meeting expected deadlines.

3.13 Our review of PPEs completed by the Rivers Agency found that two projects had significant cost overruns:

- New flood walls at Moneymore were completed at a cost of £2.2 million, an 85 per cent increase in the estimated cost of £1.2 million. The increase in cost was due to a low initial estimate for the works, an increase in the extent of the works undertaken, and the fact that the contract was undertaken when the economy was buoyant, hence prices

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were inflated well above normal (detail at **Appendix 5**); and

- A section within a project at the Mount Vernon stream in Belfast, estimated at £189,000, was completed at a cost of more than £590,000, 231 per cent over budget, due to less accurate and very optimistic initial estimates and greater uncertainty at conceptual design stage (detail at **Appendix 5**).

3.14 Our review of PPEs for projects constructed between 2007-08 and 2014-15 found that the majority of projects finished over budget, by time and / or cost (see **Figure 12** and **Appendix 6**).

Figure 12: Most of Rivers Agency's capital projects finished over time or budget between 2007 and 2015

Capital projects finishing over time or budget	Capital projects finishing over time only	Capital projects finishing over budget only
8 out of 13 62 %	6 out of 13 46 %	4 out of 12** 33 %

**one project, not yet completed, has exceeded its expected time but not its budget.

Source: NIAO based on the Rivers Agency figures

3.15 In December 2015 the Rivers Agency reported that it had reviewed the findings of post project evaluations, to identify lessons learnt and make recommendations on how future schemes could improve delivery and value for money. The report concluded that there was potential for efficiency improvements by addressing several issues:

- Choice of procurement method not optimum
 - The report found that in some cases the procurement method is not fit for purpose, creates an administrative burden, is time consuming and is disproportionate to the value of the project.
- Cost difference between the pre-tender cost estimate and the construction outturn cost
 - The report found that this is generally caused by a lack of accurate site information, design changes on-site, and protracted project management.
- Delays due to re-visiting the feasibility study at the detailed design stage
 - The report found this was caused by a failure to identify all the associated risks; a need to update information in the feasibility study; and the cost of works being underestimated.
- Excessively low tender prices
 - The report found the main reasons were: poor site and works information; the contractor not fully understanding the scope of the construction; the contractor submitting claims for necessary or extra work not covered in the scope; and a high level of competition.
- Inadequate stakeholder/landowner agreements
 - The report explained that this occurs when there is a different

interpretation of the Lands Agreements, the land owner reneges on the signed Land Agreement, and there is difficulty accessing the land.

3.16 The Rivers Agency report on PPEs includes solutions to these issues. However, it will take a number of years to determine if the suggested solutions are effective in reducing the increased costs and time delays.

3.17 We found the flood defence capital projects' cost-benefit assessments are robust and consistent with NI Guide to Expenditure Appraisal and Evaluation guidance. **However, we recommend that the Rivers Agency should ensure that PPEs, tailored to the size of the project, are completed in a timely manner and any lessons learned, including the reasons why projects exceed budget, are disseminated as soon as possible.**

3.18 **We also recommend that the causes of the budget and time overruns, which have been already identified by the Rivers Agency, are used to develop an action plan to reduce future delays and cost overruns.**

Whilst the Rivers Agency's management accounting system can identify each major project, it is unable to provide detail on the stages within each project

3.19 The Rivers Agency's main financial accounting system is Account NI¹⁴ which facilitates the monthly monitoring and

profiling of budgets. Account NI contains information on individual projects but it does not contain sufficient detail to allow for monitoring.

3.20 The individual project managers retain the detail of each project. The Rivers Agency Operations Director meets with the project managers each month, reviews the overall programme and makes the adjustments to the delivery plan, as necessary.

3.21 The Rivers Agency told us that it has previously considered and decided against using a project management software tool, due to the small number of projects.

3.22 **We recommend that the Rivers Agency routinely reviews the effectiveness of the project management information to ensure it meets its needs, provides detail on the project stages and considers what improvements a project management software tool could add.**

The cost of responding to, and damage caused by, serious flooding incidents is unknown

3.23 The Rivers Agency has established methodologies for estimating the annual average damage for each building within the Strategic Flood Map and Detailed Flood Maps and the estimated cost of the impact on the health of these sufferers of floods. The aggregated annual average damage in NI (without climate change) is expected to be £291 million. This figure comprises river

14 Account NI is a shared service centre providing a financial processing service for all NI government departments and 18 other public bodies. The services provided include: checking and paying invoices and making grant payments; reconciling bank accounts; issuing invoices on behalf of departments and administering debt management; maintaining accounting records; developing management reports; and reimbursing staff travel and expenses claims.

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(£117 million), coastal (£33 million), and surface water (£140 million) combined. The aggregated annual average damage of £291 million increases to £341 million when the effects of climate change are included. These annualised figures reflect the range of floods that may occur over a very long term - in many years there may be no damage at all. In others there may be damage higher than that estimated above.

3.24 In June 2007 the NI Assembly introduced an emergency payment scheme for householders affected by flooding, known as the Hardship Fund. A £1,000 payment was made to householders who had suffered severe inconvenience as a result of flooding, as an offer of practical assistance to ensure that homes were made habitable as quickly as possible. It is not a compensation payment. The Hardship Fund is administered by local councils and funded by the Department of the Environment.

3.25 In March 2016 the NI Executive agreed to extend the Hardship Fund to assist farmers and small businesses affected by flooding during the winter of 2015-16. These non-domestic properties, including sports facilities, community halls and churches, will be eligible for the £1,000 payment administered by local councils.

3.26 To 31 March 2015, over £4.2 million had been paid to over four thousand households (see **Figure 13**), including 313 households receiving multiple payments for different incidents.

Figure 13: More than £4 million has been paid in Hardship Fund payments

	Number of properties awarded the Hardship Fund	Total amount paid (£)
2007-08	1,172	1,172,000
2008-09	1,603	1,603,000
2009-10	60	60,000
2010-11	6	6,000
2011-12	121	121,000
2012-13	978	978,000
2013-14	63	63,000
2014-15	238	238,000
2015-16	52*	52,000*
Total	4,293	4,293,000

Source: NIAO based on the Rivers Agency data

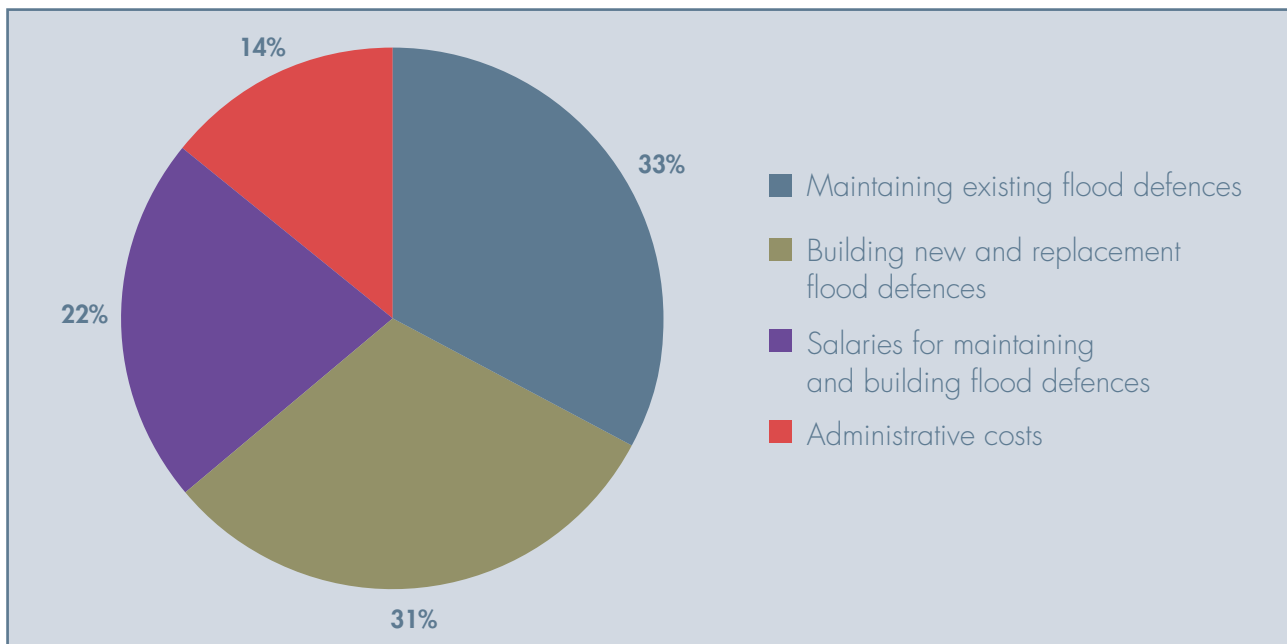
*These are provisional figures supplied by Department of Agriculture, Environment and Rural Affairs

3.27 The Rivers Agency's Strategic Flood Map and Detailed Flood Maps can estimate the damages for predicted flood events. However, we found that to date there is no estimate of the total cost to the Northern Ireland government or economy resulting from past major flooding events.

The Rivers Agency has an ongoing cycle of inspection, assessment and intervention which aims to ensure the effective functioning of flood defence assets

3.28 The Rivers Agency has an annual budget of approximately £24 million with building and maintaining flood defences (see **Paragraph 1.3**) accounting for 86 per cent (see **Figure 14**).

Figure 14: Over 85 per cent of the Rivers Agency's budget was spent in maintaining existing and building new flood defences (2014-15 figures)



Source: NIAO based on the Rivers Agency's figures

3.29 The Rivers Agency is developing an IT model for different budget allocations to be represented in assets' conditions in future years. The Rivers Agency estimates it needs an annual resource budget of over £1.1 million for the

inspections of the below ground assets and £1.3 million capital budget for asset renewal and upgrading to maintain the below ground assets to the current expected condition.

Figure 15: While the Rivers Agency's total expenditure has increased by 16 per cent, capital expenditure has increased by more than 40 per cent since 2010-11

	2010-11 £000	2011-12 £000	2012-13 £000	2013-14 £000	2014-15 £000	2015-16 £000	% increase between 2010-11 and 2015-16
Resource Budget	14,512	14,892	15,126	15,968	15,215	15,601	7.5
Capital Budget	6,157	6,047	6,299	7,505	8,686	9,089	47.6
Total	20,669	20,939	21,425	23,473	23,901	24,690	19.5

Source: The Rivers Agency

Part Three:

Implementation and Maintenance of the Rivers Agency's Flood Prevention Assets

- 3.30 We found that the Rivers Agency has an ongoing cycle of inspection, assessment and intervention to ensure the effective functioning of assets (see **Paragraph 1.3**). We also recognise that the Rivers Agency needs to work within its budgets, which may prove difficult if the budgets are cut during this period of financial uncertainty and austerity.
-

Appendix 1: (Paragraph 1.15)

Our Consultant's terms of reference

- 1 We commissioned a consultant to assist us in assessing the technical capability of the Flood Risk Maps developed by the Rivers Agency to satisfy the requirements of the EU Floods Directive.
- 2 Regarding the Strategic Flood Risk and Hazard Map (NI) the consultant was commissioned to:
 - determine if the Strategic Flood Risk and Hazard Map (NI) satisfies legislative and policy requirements;
 - assess the ease of use / fitness for purpose of the Strategic Flood Risk and Hazard Map (NI) in:
 - encouraging people living and working in flood prone areas to take appropriate action; and
 - providing information in a form likely to be of value to key users e.g. planners, utility providers, transport
 - This assessment should include a comparison with best practice example(s) identifying significant differences and suggesting improvements; and
 - provide a summary of these findings and possible / relevant recommendations.
- 3 Regarding the 'Predictive Computer Modelling Techniques' and data supporting the Strategic Flood Risk and Hazard Map (NI), the consultant was commissioned to:
 - assess whether the Predictive Computer Modelling Techniques, supporting the maps, are fit for purpose, whether the data used is appropriate, and whether any underlying assumptions are reasonable;
 - include a comparison with suitable best practice example(s), identifying significant differences and suggesting improvements; and
 - provide a summary of these findings and possible / relevant recommendations.
- 4 Regarding the Rivers Agency's identification and prioritisation of its programme of flood defence schemes and flood protection measures, the consultant was commissioned to:
 - assess the methodology used by the Rivers Agency to identify and prioritise flood defence projects and flood prevention measures;
 - assess the extent to which the Strategic Flood Risk and Hazard Map (NI) is capable of supporting better decision-making on the Rivers Agency's future programmes of flood defence projects and protection measures; and
 - provide a summary of these findings and possible / relevant recommendations.

Appendix 2: (Paragraph 2.4)

Multi Agency Water / Flood Management Groups in Northern Ireland Multi Agency Water / Flood Management Groups in Northern Ireland

Group	Frequency of Meetings	Rivers Agency	Transport NI	NI Water	DARD	DRD	DOE	OFMDFM	DCAL	Local Government Emergency Management Group	PSNI	NIFRS	NI Direct / FIL	Others
Flood Response Groups														
Flood Strategy Steering Group	Quarterly	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	NIEA
Emergency Planning Group, Flooding sub group for North	Quarterly	✓	✓	✓						✓	✓	✓		<ul style="list-style-type: none"> • Coastguard • NIAS • NIHE • Met Office • BT • NIE • Local Harbours
Emergency Planning Group, Flooding sub group for South	Quarterly	✓	✓	✓						✓	✓	✓		<ul style="list-style-type: none"> • Coastguard • NIAS • NIHE • Met Office • BT • NIE • Local Harbours
Emergency Planning Group, Flooding sub group for East	Quarterly	✓	✓	✓						✓	✓	✓		<ul style="list-style-type: none"> • Coastguard • NIAS • NIHE • Met Office • BT • NIE • Local Harbours
Emergency Planning Group, Flooding sub group for West	Quarterly	✓	✓	✓						✓	✓	✓		<ul style="list-style-type: none"> • Coastguard • NIAS • NIHE • Met Office • BT • NIE • Local Harbours

Group	Frequency of Meetings	Rivers Agency	Transport NI	NI Water	DARD	DRD	DOE	OFMDFM	DCAL	Local Government Emergency Management Group	PSNI	NIFRS	NI Direct / FIL	Others
Floods Directive Stakeholder Group	Twice a year	✓	✓	✓		✓	✓	✓	✓					<ul style="list-style-type: none"> • Freshwater Taskforce • NILGA • Association of British Insurers • Loughs Agency • NI Environment Agency • Ulster Farmers Union • Consumer Council
Local Flood Forums (3 in total)	Three times a year	✓	✓	✓										<ul style="list-style-type: none"> • Local Government Representative • Environmental Groups • Conservation Groups • Angling Group • Local Community Groups • Association of British Insurers • Ulster Farmers Union
Water Framework Directive Groups														
Water Framework Directive Interdepartmental Board	3 to 4 times a year	✓		✓	✓	✓	✓		✓					NI Environment Agency
Water Framework Directive Interdepartmental Implementation Group	3 to 4 times a year			✓	✓	✓	✓		✓					<ul style="list-style-type: none"> • NI Environment Agency • Loughs Agency • AFB
Catchment Stakeholder Groups (9 in total)	Twice a year	✓	✓	✓										<ul style="list-style-type: none"> • NGOs • Local Community Groups

Appendix 3: (Paragraph 2.18)

Stakeholders identified by NIAO for flood risk management in Northern Ireland

Infrastructure

Stakeholder	What they want to know	What they need from maps/data	Scale required	Probabilities of flood required	Types sources of flood water information required
Power infrastructure managers	Identify threat to lines and infrastructure; prioritise protection measures; plan for disruption	GIS layer to intersect with their own data; overview maps at same RP for planning	Individual location	All	Extent - depths
Telecomms infrastructure operators	Identify threat to lines and infrastructure; prioritise protection measures; plan for disruption	GIS layer to intersect with their own data; overview maps at same RP for planning	Individual location	All	Extent - depths
Reservoir operators	Identify impacts of uncontrolled release of water; plan for disruption (e.g. affecting access to reservoir)	Identify floodplain at risk from specific reservoir; roads liable to flooding	Community	Not related to natural flood probability	Extent - velocity - depths

Public Sector

Drainage Council for NI	Prioritisation for defence works; assess benefits of maintaining or building defences	Probability of flooding; economic risk and people affected; areas already protected by defences	River reach - community	All	Extent - depths - accurate levels
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Stakeholder	What they want to know	What they need from maps/data	Scale required	Probabilities of flood required	Types sources of flood water information required
NI Water	Identify risks to infrastructure assets; prioritise protection measures; plan for operational impacts and disruption of service delivery; identify pollution sources and impacts	GIS layer to intersect with NI Water data; overview maps at same RP for planning; duration of flooding.	Individual location	All	Extent – depths – velocity/ flowpaths
Local Councils	Identify priority areas for maintenance; plan for disruption	Locations and timing of flooding; key culverts for maintenance	Street	High	Extent – depths
NI departments	Overview of how flooding affects their responsibilities	Overview at large scale of flooding; numbers of people and properties at risk	Community - regional – national	All	Extent
NI Assembly	Overview of how flooding affects its responsibilities; long term risk; economic impact and likely spending requirements	Overview at large scale of flooding; numbers of people and properties at risk	Regional – national	All	Extent
Education Authority	Plan for disruption; evacuation routes; schools which may be required as reception centres	Identify schools and catchment at risk; how many neighbouring properties affected	Individual properties – street	High - medium	Extent - depths - velocity
Rivers Agency	Support defence prioritisation; design defences; support long-term investment decisions	Areas which could benefit from defences; risk reduction to properties and people	Street – community	All	Extent - depth - velocity

Appendix 3: (Paragraph 2.18)

Stakeholder	What they want to know	What they need from maps/data	Scale required	Probabilities of flood required	Types sources of flood water information required
Consultants	Support the Rivers Agency work		As per Rivers Agency		

Health and Public Safety Sector

Care/residential homes	Plan for disruption; evacuation routes	Identify homes at risk; evacuation routes, time of rise, depths/hazard	Individual properties - street	High - medium	Extent - depths - velocity
Health providers - hospitals and surgeries	Impacts for casualties; loss of services; contingency planning	Identify sites at risk on map; evacuation routes; duration of flooding	Individual properties - street	High - medium	Extent - depths - velocity
Emergency responders	Evacuation and access routes; identify their own sites at risk; general emergency planning	Identify sites at risk on map; evacuation routes; duration at flooding	Street - community	All	Extent - depths - velocity
Red Cross	Number of people at risk; where resources are needed	Broad areas and numbers affected; evacuation and access routes	Street - community	Low- medium	Extent - depths - velocity

Transport Sector

Stakeholder	What they want to know	What they need from maps/data	Scale required	Probabilities of flood required	Types sources of flood water information required
Bus operators	Identify which sites and lines are at risk; prioritise protection; plan for disruption; removal of vehicles to safety; alternative routes	Identify sites at risk; identify evacuation/alternative routes; duration of flooding	Individual site - street	High - medium	Extent - depth - duration
TransportNI (formerly Roads Service)	Identify roads at risk; prioritise protection; plan for disruption; plan detours; incident management; damage to non-moveable infrastructure e.g. bridges, embankments	GIS layer to intersect with their own data; overview maps at same RP for planning; duration of flooding	Individual site - street	High - medium	Extent - depth - velocity
Rail operator	Identify lines at risk; prioritise protection; plan for disruption; damage to non-moveable infrastructure e.g. bridges, embankments	GIS layer to intersect with their own data; overview maps at same RP for planning; duration of flooding	Individual site - street	High - medium	Extent - depth

Appendix 3: (Paragraph 2.18)

Others

Stakeholder	What they want to know	What they need from maps/data	Scale required	Probabilities of flood required	Types sources of flood water information required
Business owners / managers / employees	Whether their property is at risk; whether insurance is required; to plan for disruption to business/customers/suppliers	Identify own business and risk on map; do same for main suppliers and clients; general risk in staff/customer catchment area	Individual property - street - community	All - high for incident planning, low for insurance	Extent - depths secondary
Conservation NGOs/ Charities/Trusts	Plan conservation works for key sites; plan for disruption/removal for easily damaged items	Identify sites at risk on map; warning lead times; flood levels	Individual location	All	Extent - depths
Landowners/ farmers/NFU	Identify which land is at risk; plan for disruption; select crop/livestock types	Which land floods often; water quality/salinity	Field scale	High - medium	Extent - duration - water quality
Neighbouring Country	Ensure consistency across borders	Metadata on flood maps	Community - regional	All	All
Consumer Council	Provide advice on where to get flood information	Advice on how to use the flood maps; same as householders		N/A	
Householders	Identify risk of flooding; make emergency plan if at risk; identify evacuation routes; adopt resilience measures	Identify if their home is at risk; probability/depth of flooding; identify evacuation routes; rise time and duration; water quality/salinity	Individual property - street	All	Extent - depths - velocity

Stakeholder	What they want to know	What they need from maps/data	Scale required	Probabilities of flood required	Types sources of flood water information required
Property developers	Identify sites suitable for development; assess planning implications; drainage planning; site access	Whether specific site is in planning policy statement band; probability of flooding; source of flooding for sewer water management	Individual properties/sites - streets	1%/0.5% as specified in PPS 15	Extent - depths
Private/public landlords	Planning for when properties become uninhabitable; resilience measures	Identifying specific properties at risk; portfolio risk - duration of flooding; depth/probability of flooding for resilience	Individual properties - portfolio	High-medium	Extent - depths
Insurers	Overview of risk in NI; estimate portfolio risk; not to be used for setting premiums or excesses	Numbers of properties at risk; probabilities	Regional - national	All	Extent

Source: NIAO

Appendix 4: (Paragraph 2.23)

The PEDU report, published in September 2012, made 12 recommendations as follows:

<p>Investment in Flooding Counter Measures</p> <p>It is recommended that Rivers Agency, TransportNI and NI Water work with their parent departments to review current flood defence expenditure priorities and report to the Executive on their adequacy to meet the potential threats over the next 10 years.</p> <p>By whom: Rivers Agency, TransportNI, NI Water and parent departments. By when: December 2012 Current status: implemented</p>
<p>Developing a NI Flood Alert System</p> <p>A good deal of information on drainage patterns and flood hot spots is already available within the flood response agencies. It is recommended that this resource is investigated to see how it could be used with Met Office forecasts to identify local threats. Even if the previous offering was not suitable, looking again at the “virtual” partnering with the Met Office in line with the SEPA model would be a useful start.</p> <p>By whom: Rivers Agency By when: March 2013 Current status: implemented</p>
<p>It is recommended that when considering the options for building a local flood alert and forecasting service, consideration should also be given to how flood alerts can be best communicated to responding organisations and the public.</p> <p>By whom: Rivers Agency By when: March 2013 Current status: implemented</p>
<p>Improving Operational Flood Response</p> <p>A key structural reason behind the question of who should be lead government department arises because Rivers Agency is in DARD while the TransportNI and NI Water are within DRD. In this context it is recommended that consideration is given to the consolidation all of the flood response organisations under one departmental ambit – i.e. by the transfer of Rivers Agency from DARD to DRD.</p> <p>By whom: OFMDFM, DARD, DRD By when: November 2012 Current status: implemented</p>
<p>It is acknowledged that local government in Northern Ireland is currently undergoing a period of substantial reform initiated by the Review of Public Administration. While recognising this context it is recommended that OFMDFM give urgent consideration to proposals for formalising the role of local government in Northern Ireland in civil contingency matters. This should include consideration to extending Resilience Fora across the full width of local government.</p> <p>By whom: OFMDFM By when: November 2012 Current status: implemented</p>

Improving Operational Flood Response (continued)	
<p>On 27th June the average call duration to FIL was 4 minutes and 32 seconds. While this does not appear excessive, it is essential that the telephone scripts of FIL are no longer than they need to be, and we note that FIL and the three organisations have been working together with a view to streamlining the process – it is recommended that this process should be accelerated.</p>	
<p>By whom: FIL, Rivers Agency, TransportNI, NI Water</p>	
By when: January 2013	Current status: implemented
<p>In the context where local councils are given a statutory emergency planning and protection role it is recommended that a process is developed whereby calls to FIL for property and personal assistance can be immediately relayed to local councils.</p>	
<p>By whom: FIL, OFMDFM</p>	
By when: March 2013	Current status: ongoing
<p>While flood notifications received by FIL are immediately passed to other organisational systems, in some cases there is also a need to contact a duty officer by telephone to alert them to the fact that the notices have been sent and need attention. While NI Water officials have some limited access to mobile communications that allow them to access FIL notices immediately, this is not the case in the TransportNI and Rivers Agency. It is recommended that the three Flood Response Agencies and FIL explore options for improved electronic communications.</p>	
<p>By whom: FIL, Rivers Agency, TransportNI, NI Water</p>	
By when: December 2012	Current status: implemented
<p>It is recommended that Rivers Agency completes its work on Individual Property Flood Protection Using Resistance and Resilience Measures urgently and incorporates it into a comprehensive strategy, for consideration by the Executive. This work should specifically include the promotion of self-help initiatives, and consideration of a scheme to help householders flood-proof their property.</p>	
<p>By whom: Rivers Agency</p>	
By when: March 2013	Current status: implemented
<p>Exercise Eluvies was scheduled for a re-run in 2014. Given the experience of June 2012 it is recommended that consideration is given to running the next exercise sooner, and that tests and exercises should be held more frequently until evidence of improved responses in real situations is evident.</p>	
<p>By whom: Rivers Agency, OFMDFM</p>	
By when: December 2012	Current status: implemented

Appendix 4: (Paragraph 2.23)

Improving Operational Flood Response <i>(continued)</i>	
<p>To make use of the momentum given to this issue by the recent floods, it is recommended that the relevant lead departments come together to produce a consolidated action plan for all of the reports' recommendations (see annexes 6-8) for implementing the improved flood defence framework. This work should also embrace the recommendations of this report.</p>	
By whom: Rivers Agency (lead role)	Current status: implemented
By when: November 2012	
<p>It is also recommended that PEDU should review the consolidated action plan and report on its implementation to the Executive in March 2013.</p>	
By whom: PEDU	Current status: implemented
By when: March 2013	

Source: *The Rivers Agency*

Appendix 5: (Paragraph 3.13)

To ensure the Rivers Agency was complying with the requirements of NI Guide to Expenditure Appraisal and Evaluation guidance we selected four capital projects, see below, compared the supporting business cases against the NI Guide to Expenditure Appraisal and Evaluation guidance's requirements, and reviewed the progress reports and PPEs.

Details of the projects selected

Project 1	<p>Moneymore-Moneyhaw River. This project involved the provision of new flood walls adjacent to existing housing developments in the village. The estimated cost was £1.2 million. The aim was to provide flood protection to the two recently constructed housing developments where various planning issues had led to a much lower level of protection being provided to the housing.</p> <p>The actual spend was £2.2 million, an 85 per cent increase due to low initial estimate for the works, extent of the works increased, contract was undertaken when the economy was buoyant hence the prices were inflated well above normal.</p>					
Project 2	<p>Mount Vernon Stream, Belfast. This was a culvert renovation works to three separate watercourses within the Greater Belfast Area.</p>					
		Estimated Cost (£)	Actual Outturn (£)	Cost Increase (£)	Cost Increase (%)	<p>Initial estimates including construction programmes tended to be less accurate, as there was greater uncertainty at conceptual design / problem identification stage. The costings were based on numerous isolated repairs and included basic assumption on the condition of un-surveyed sections of the network. It was concluded that initial construction programmes were optimistic. Perhaps the Consultant did not give sufficient consideration to the potential disturbance and constructability of these proposals and the rates were incorrect. This change for the original proposals accounts for the considerable increase in the outturn costs compared to feasibility estimates. While some of the increase in costs were due to various agreed compensation events.</p>
Ferndeen stream	128,329	209,598	81,269	63		
Rochester Avenue stream	298,785	353,331	54,546	18		
Mount Vernon stream	188,950	591,637	402,687	213		

Appendix 5: (Paragraph 3.13)

<p>Project 3</p>	<p>Maghera (Co Down) Flood Alleviation Scheme involves the construction of a clay cored flood bank. The estimated cost is £67,826, using the Rivers Agency direct labour force.</p> <p>This project was completed one day ahead of schedule. The project with a budget of £67,826 completed with an actual of £33,500, equating to a 51 per cent decrease.</p>
<p>Project 4</p>	<p>Four Mile Burn Alleviation Scheme at Parkgate, includes the Hollybank Road flood protection block work floodwall at a cost of £713,226 with expected benefits of £1,386,583. While the Grange Road scheme involves constructing a new flood wall at a cost of £129,197 with expected benefits of £156,313.</p>

Source: NIAO based on The Rivers Agency's documents

Appendix 6: (Paragraph 3.14)

Capital Projects constructed between 2007-08 and 2014-15 with a completed post project evaluation

Scheme	Start Date	Completion Date	Cost
East Belfast Greenway Phase 1 (Managed by Belfast City Council)	July 2013	September 2014	£1,700,000
East Belfast, Merok Burn	January 2015	July 2015	£297,971
Carrickfergus, Sullotober Water Phase 2	September 2011	August 2012	£260,000
Carrickbawn, Rostrevor	November 2009	September 2012	£54,950
Cappagh, Mill Burn	August 2009	October 2011	£26,868
Edenduff Cottages, Randlestown	March 2010	December 2011	£102,000
Ballygawley, St Ciaran's School	January 2013	September 2013	£1,694,017
Castlewellan, Annsborough	February 2013	June 2013	£132,500
Magherafelt, Highfield Road	November 2010	August 2011	£683,950
Magherafelt, Ballymoghán	April 2007	November 2007	£558,136
Maghera Flood Alleviation Scheme	January 2012	October 2012	£33,500
Coleraine, Lodge Burn	January 2011	June 2012	£2,992,706
Coleraine, Portna Sluice Gates Refurbishment	October 2010	March 2013	£1,227,710

Source: The Rivers Agency

NIAO Reports 2015-2016

Title	Date Published
2015	
Continuous improvement arrangements in policing	17 February 2015
Cross-border broadband initiative: the Bytel Project	03 March 2015
Protecting Strangford Lough	31 March 2015
DRD: the effectiveness of public transport in Northern Ireland	21 April 2015
General Report on the Health and Social Care Sector 2012-13 and 2013-14	26 May 2015
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The Northern Ireland Events Company	29 September 2015
Financial Auditing and Reporting: General Report by the Comptroller and Auditor General for Northern Ireland - 2015	24 November 2015
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