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Wales

# Wales Coastal Flooding Review: Delivery Plan for Phase 2 Recommendations

## Progress Report August 2016

Prepared by Natural Resources Wales  
for Lesley Griffiths AM, Cabinet Secretary for Environment  
and Rural Affairs

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## Acknowledgement

This progress report has been collated and coordinated by Natural Resources Wales working in partnership with many colleagues across Wales, in particular with the coastal Local Authorities, the Welsh Local Government Association and Welsh Government.

We wish to acknowledge this contribution and thank our colleagues for their continued support with this initiative since its inception in January 2014, whilst they have also continued to deliver activities and services to manage the risks to the communities of Wales.



Delivery Plan Workshop Discussions, 26<sup>th</sup> March 2015

## Executive Summary

Following the flooding to the North Wales Coast on 5<sup>th</sup> December 2013 and the more widespread coastal storms of early January 2014, Natural Resources Wales, working with partners around Wales, completed a two stage Review as instructed by the Minister for Natural Resources. Phase 1 identified the impacts incurred during the storms and Phase 2 concluded with the identification of 47 individual Recommendations ('the Phase 2 Recommendations'). Natural Resources Wales then published a Delivery Plan in January 2015 that outlined how each of the Recommendations could be taken forward.

At the time of Delivery Plan publication, some notable progress had already been made on the Phase 2 Recommendations, whereby:

- 5 were already complete.
- 35 were ongoing (with some significant progress made since the 2013/14 winter).
- 7 were yet to be commenced.

Consistent progress has been achieved in implementing the Delivery Plan throughout 2015/16 and as documented within this Progress Report. By the end of August 2016 and out of the 47 Phase 2 Recommendations:

- 40 are complete.
- 7 are ongoing (with significant progress made since the 2013/14 winter).

Completion of 35 Recommendations in the 20 month period between January 2015 and August 2016 is a significant achievement by all contributing parties, particularly when considering the demands of fluvial flooding during the 2015/16 winter upon Risk Management Authorities in Wales.

Of the 40 completed Recommendations, some tangible improvements are already benefitting the coastal risk management sector in Wales such as:

- Improvements made through supplying more local, longer-range information within flood forecasts to professional partners as and when required.
- 40 of the flood warning thresholds and flood warning areas have been revised following the December 2013 and January 2014 coastal storms.
- A programme of coastal risk management training courses has been delivered to 90 members of staff from across Welsh Risk Management Authorities (RMAs), the Welsh Local Government Association and Welsh Government in Spring 2016.

Realisation of the full benefits from all completed Recommendations will require further commitment and resources from all parties, including Welsh Government. There needs to

be a sustained effort and continuous improvement to ensure that the intended outcomes are fully delivered.

The 7 currently ongoing Recommendations reflect either inter-linkages with the England and Wales Flood and Coastal Erosion Risk Management (FCERM) Research and Development programme (Recommendation 5), specialised science and resource demand (Recommendations 6 and 8), or through recent best endeavours confirming their more onerous nature as tasks which will take place over much longer timescales (Recommendations 19, 31, 33 and 41).

A monitoring and review action should be established for 2016/17 to safeguard momentum on these 7 ongoing Recommendations. The following routes are suggested to further progress these ongoing Recommendations to completion:

- Recommendations 5 (review guidance design of coastal standards and joint probability), 6 (improvements to longer range forecasts), 8 (improvements to the accuracy of the coastal forecasting service) and 33 (developments in the national coastal modelling and mapping programme) are to be taken forward internally by Natural Resources Wales through integration alongside business as usual activities.
- Recommendation 19 (continue to develop potential 'impact scenario' assessments, maps and/or statements) will require further liaison with the Wales Flood Group to gauge level of need and priority to inform Natural Resources Wales' future Flood Incident Management workstreams.
- Recommendation 31 (a national dataset for all flood risk assets, across all key organisations) will require significant and continued collaboration between Welsh Government and all Risk Management Authorities in Wales to share and securely store asset data. This work is progressing well, but will require sustained effort.
- Recommendation 41 (development of local adaptation 'toolkit', to assist communities predicted to experience natural coastal change) will require further liaison with the Wales Coastal Group Forum and the Coastal Groups in Wales to support creation of a toolkit for local coastal adaptation.

Extensive consultation was undertaken with partners in the summer and autumn of 2015 to determine the existing baseline position upon which suggestions for improvements and the formulation of future options have been based. Reporting has appraised options where necessary and identified solutions for future implementation subject to Welsh Government agreement, supplemented by tangible Recommendation outputs where achievable.

Natural Resources Wales are grateful for the additional funding received from the Minister for Natural Resources for implementation of the Delivery Plan during 2015/16, in order to avoid the demands of this task having any detrimental impact on other Natural Resources Wales' flood risk management work.

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## Supporting Information

A number of Annexes are available as separate documents, where necessary to provide supporting information for this Progress Report for 2015/16. The internally produced reports are published alongside this report on our website, whilst the externally produced reports have their hyperlinks within the corresponding Recommendation summary page of this report.

### Project Reports List:

- Project 1 Report – Recommendation 7
- Project 2 Report – Recommendations 11 & 12
- Project 3 Report – Recommendation 13, 14, 15, 16 & 17
- Project 4 Report – Recommendation 19
- Project 5 Report – Recommendations 25 & 26
- Project 6 Report – Recommendation 31 & 32
- Project 7a Report – Recommendation 37
- Project 7b Report – Recommendation 38
- Project 8 Report – Recommendation 39
- \*Project 10 Report – Recommendation 18, 43, 44, 45, 46 & 47

\*There is no Project 9 Report for Recommendations 41 & 42 due to the longer-term, ongoing nature of Recommendation 41. The respective summary pages within this report recognise progress to date and associated external publications.

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## Origin and Purpose of this Progress Report for 2015/16

This Progress Report supplements and complements the following four publications within the Wales Coastal Flooding Review initiative produced at the request of the Minister for Natural Resources in response to the coastal flooding events in Wales of December 2013 and January 2014:

- *Wales Coastal Flooding Review, Phase 1 Report – Assessment of Impacts* ('the Phase 1 Report'), was submitted to Welsh Government on 31<sup>st</sup> January 2014 and published on 14<sup>th</sup> February 2014.
- *Wales Coastal Flooding Review, Phase 2 Report* ('the Phase 2 Report') submitted to Welsh Government on 28<sup>th</sup> April 2014 and published on 30<sup>th</sup> April 2014.
- *Wales Coastal Flooding Review, Delivery Plan for Phase 2 Recommendations* ('Delivery Plan' main report) was submitted to Welsh Government on 2<sup>nd</sup> December 2014 and published on 5<sup>th</sup> January 2015.
- *Wales Coastal Flooding Review, Delivery Plan for Phase 2 Recommendations, Supporting Documents* ('Delivery Plan Supporting Documents') was submitted to Welsh Government on 2<sup>nd</sup> December 2014 and published on 5<sup>th</sup> January 2015.

The Delivery Plan drew together the Phase 2 Recommendations, considering them collectively, to provide a strategic approach to planning, prioritisation, programming and delivery. For efficiency, the Delivery Plan packaged 30 of the 47 Recommendations into a series of 10 Projects according to common technical themes, with the remaining 12 Recommendations standing outside of these Projects due to their individuality. The 10 Projects were aligned against the following five Priority Areas identified in Phase 2 of the Review where improvements could be made to deliver a more resilient coastal flood and erosion management service in Wales:

### Priority Area:

**More support to communities to help them become more self-sufficient and resilient**

- Project 1 = Recommendations 3 to 8 – Flood Forecasting and Coastal Design
- Project 2 = Recommendations 11 and 12 – Flood Warning and Forecasting
- Project 3 = Recommendations 13 to 17 – Community Resilience
- Project 4 = Recommendations 19 and 20 – Operational Response

### Priority Area:

**Improved information on coastal flood defence and erosion management systems**

- Project 5 = Recommendations 25 and 26 – Coastal Defences
- Project 6 = Recommendations 31 and 32 – National Coastal Defence dataset and inspection

**Priority Areas:**

**Greater clarity of roles and responsibilities, and an assessment of skills and capacity of Risk Management Authorities**

Project 7 = Recommendations 37 and 38 - Skills and Capacity Audit and Roles and Responsibilities

**Priority Area:**

**Locally developed and delivered plans for coastal communities and infrastructure operators**

Project 8 = Recommendation 39 – Review of Coastal Groups  
Project 9 = Recommendations 41 and 42 – Coastal Adaptation  
Project 10 = Recommendations 18\* and 43 to 47 – Infrastructure Resilience

\*Recommendation 18 was originally placed in Project 4 of the Delivery Plan, however practical implementation has moved it into Project 10 due to synergies with the other Recommendations relating to infrastructure resilience.

The Phase 2 Report also identified a sixth Priority Area of ‘Sustained investment to coastal flood and erosion risk management’. This is a core requirement addressed through Recommendation 27.

This Progress Report captures the effort invested in implementing the Delivery Plan in the twenty months following its publication in January 2015 through to the end of August 2016. Appendix 1 provides a list of the 47 Phase 2 Recommendations. For each Recommendation in turn, this Progress Report considers:

- Who has been the lead on delivering the Recommendation.
- If the Recommendation has been completed by the end of August 2016 and if so, by when.
- Summary of the implementation of the Recommendation.

## **Programme Management and Governance**

Implementation of the Delivery Plan has been a considerable body of work which has needed management and prioritisation of the personnel and financial resources available and efficient and effective use of the collective expertise and capacity across Risk Management Authorities (RMAs) in Wales.

A governance structure was established to monitor and direct progress of the Delivery Plan. This governance structure was needed to be appropriate and proportionate and sought to use existing arrangements where possible.

Each of the 10 Projects required the resource of a temporary Project Manager. Collectively the 10 Projects were coordinated by a Natural Resources Wales Programme Manager and Support Officer, alongside their role in tracking progress of the remaining 12 Recommendations outside of the Projects (as 5 were already completed by January 2015). The Programme Manager reported to a Natural Resources Wales Programme Board on a monthly basis and to Welsh Government typically on a quarterly basis.

## Consultation and engagement measures to shape progress

Since publication of the Delivery Plan in January 2015, Natural Resources Wales has designed and actioned an extensive consultation programme to gather baseline evidence to inform implementation of each Recommendation and/or Project and to seek views on options where appropriate. This consultation programme has included the following activities:

- Hosting two Wales Coastal Flooding Review: Delivery Plan workshops for RMAs.
- Hosting two workshops regarding community engagement and resilience under Project 3.
- Hosting two Flood Warden Volunteer networking events under Project 3.
- Presenting on coastal risk management assets under Project 6 to the three Regional Flood Risk Management Groups in Wales.
- Managing a comprehensive set of data requests to the 15 coastal LAs (or when considering inland flood risk management, a total of 22 LAs) in summer 2015.
- Data requests to the four Local Resilience Fora in Wales.
- Data requests to the Wales Utility Group, Network Rail and the Trunk Road Agencies under Project 10.
- Holding focused meetings and telephone conversations with partners as appropriate.

Regular updates on progress were given as part of the above activities, supplemented by presentations at the Institution of Civil Engineers Wales' 'Learning to live with flooding' conference of June 2015, to the Wales Flood Group twice, to the Wales Utility Group and at routine Coastal Group meetings. Briefing notes were also issued to stakeholders and Local Resilience Fora / their Severe Weather Groups.

Where an external organisation led implementation of a specific Recommendation(s), similar consultation activities such as questionnaires and discussion at pre-established practitioner group meetings was undertaken to shape direction.

## Progress made prior to publication of the Delivery Plan

In addition to the priority given to the repair and restoration of coastal defences in the aftermath of the December 2013 and January 2014 coastal storms, some initial notable progress was made across the Recommendations prior to publication of the Delivery Plan in January 2015. This work was documented in the published Delivery Plan and included:

- Welsh Government worked to protect the flood risk core budgets in face of public spending pressures and the core flood budget was maintained for 2015/16.
- In Rhyl stop logs at stairwell openings have been replaced by pre-cast concrete walls and steel flood gates, and a topographic survey of Rhyl Golf Course has been completed. Work to evaluate longer term options is ongoing.
- Three Shoreline Management Plans were approved by Welsh Government (South Wales, West of Wales and Severn Estuary) by early December 2014.
- Rebranding of the flood warning service in Wales, so the provider is clearly identified as Natural Resources Wales.
- A permanent offshore waverider buoy has been deployed off the West Pembrokeshire coast to help improve flood forecasting.
- Improvements to Flood Forecasting, with 5 day forecast information now available to local Natural Resources Wales officers.
- Continued progress made by the Fairbourne Multi-Agency Project Board and accompanying Task and Finish Groups in identifying valuable lessons for wider application.
- Preparatory work undertaken for Exercise Megacyma Cymru in March 2015.
- Completion and publication of the assessment of environmental change experienced during the December 2013 and January 2014 storms (Duigan C, Rimington N & Howe M (Eds) 2014. *Welsh Coastal Storms, December 2013 & January 2014 – an assessment of environmental change*, NRW Evidence Report).
- Ongoing work to identify and evaluate improvement options at multiple locations around the coast which either experienced flooding or came close to flooding during last winter's storms.
- National Sciencewise Research & Development programme research carried out into the way Natural Resources Wales communicates flood messages to the public.

## Progress made since publication of the Delivery Plan

Following publication of the Delivery Plan in January 2015, tangible progress has been made to support its implementation to date and in addition to the Project Reports produced to accompany this Progress Report for 2015/16. These successes include:

- A review of the extreme sea level dataset was undertaken by the National Oceanography Centre for Natural Resources Wales, using the UK Coastal Monitoring & Forecasting partnership, and concluded that the inclusion of the more recent peak sea level data does not make a statistically significant difference to the design sea level estimates around Wales.
- On-going engagement with the joint Wales and England Flood and Coastal Erosion Risk Management (FCERM) Research and Development programme working with UK partners to consider joint probability analysis.
- Improvements made through supplying more local, longer-range information within flood forecasts to professional partners as and when required.
- 40 of the flood warning thresholds and flood warning areas have been revised following the December 2013 and January 2014 coastal storms.
- Continued work on the Flood Awareness Wales Programme has increased registrations of at-risk members of the public to Flood Warnings Direct, with 866 full registrations between January 2015 and June 2016.
- Continued work developing community flood plans through Flood Awareness Wales has resulted in 977 plans across Wales, supported locally by 300 flood volunteers.
- Completion of an Independent review of the Flood Awareness Wales community engagement programme which provides insights into delivery improvements. Publishing of a Research and Development project which explores the value of engaging young people in flood risk management to achieve sustainable community resilience.
- NRW Flood Incident Management teams are now developing a training programme to improve staff confidence in their role in the decision-making process for issuing a Severe Flood Warning.
- 'Exercise Megacyma Cymru', being the national coastal evacuation exercise, was held in March 2015 to test capabilities and resources in dealing with a large scale flooding event in Wales.
- Option appraisal has been undertaken to result in a Project Appraisal Report for a future East Rhyl Coast Protection Scheme for determination by Welsh Government.
- Development of Welsh Government's Coastal Risk Management Programme providing a £150 million programme to Local Authorities to deliver coastal risk management activities between 2018 and 2021.
- Additional funding for 2016/17 has been secured for coastal local authorities to undertake project appraisals and detailed design work in preparation for the Coastal Risk Management Programme.

- Additional funding has been secured for NRW and local authority schemes, maintenance and emergency repairs in light of the December 2015 storms.
- Natural Resources Wales has updated the North Wales tidal defence survey which now offers valuable data to inform a future national dataset of coastal protection and defence assets.
- Completion of a national skills and capacity audit for all Risk Management Authorities to assess and quantify the scale of the issue plus to assess the size of the skills and capacity gap.
- A programme of coastal risk management training courses has been delivered to 90 members of staff from across RMAs, the Welsh Local Government Association and Welsh Government.
- The fourth and final Shoreline Management Plan for North Wales and North West England was approved by the Minister for Natural Resources in late December 2014.
- Progress has continued within the Fairbourne: Moving Forward project, with publication of the project's first Annual Report in May 2015 and Welsh Government's appointment of a researcher to work alongside the project through to the end of 2017.
- The National Trust published their '*Shifting Shores – playing our part at the coast*' in November 2015 that captures progress made in the ten years since their original 'Shifting Shores' publication and identified the opportunities and challenges facing delivery of coastal adaptation.
- In December 2015, the joint Wales and England Flood and Coastal Erosion Risk Management (FCERM) Research and Development programme published a report entitled '*Adapting to Coastal Erosion: Evaluation of rollback and leaseback schemes in Coastal Change Pathfinder projects*'.

## Recommendations – Completion status and progress

At the time of Delivery Plan publication in January 2015, some notable progress had already been made on the Phase 2 Recommendations, whereby:

- 5 were already complete.
- 35 were ongoing (with some significant progress made since the 2013/14 winter).
- 7 were yet to be commenced.

Consistent progress has been achieved in implementing the Delivery Plan throughout 2015/16. By the end of August 2016 and out of the 47 Phase 2 Recommendations:

- 40 are complete.
- 7 are ongoing (with significant progress made since the 2013/14 winter).

Completion of 35 Recommendations in the twenty month period between January 2015 and August 2016 is a significant achievement by all contributing parties, particularly when considering the unforeseen demands of fluvial flooding during the 2015/16 winter upon Risk Management Authorities in Wales.

Table 1 overleaf provides a summary of completion status and/or progress made against each individual Recommendation or Project.

### Key to Table 1: Classification of Recommendation Progress Status

<b>RECOMMENDATION PROGRESS STATUS</b>	
<b>35</b>	Recommendations complete following the publishing of the Delivery Plan (Jan 2015 to August 2016)
<b>5</b>	Recommendations complete when the Delivery Plan was published (Jan 2014 to Jan2015)
<b>7</b>	Recommendations ongoing (Ongoing as of August 2016)
<b>47</b>	<b>Total</b>



**Table 1: Summary of Recommendation and Project Status**

Rec. no.	Report available ? Yes / No	Completion status	Summary of individual Recommendation / Project status	Delivery Lead	Delivery Plan target completion date	Actual completion date	
1	No		Recommendation completed prior to Delivery Plan publication.	NRW	Dec 2014	Dec 2014	
2	No		Recommendation completed prior to Delivery Plan publication.	NRW	Dec 2014	Dec 2014	
3	No		<b>Project 1 – Flood Forecasting and Coastal Design</b> See progress summarised within this report and supplementary Project 1 Report for Recommendation 7.	NRW	Ongoing and linked to progress of joint Research & Development Programme	Dec 2015	
4	Yes	Jan 2016					
5	No	Ongoing					
6	No			NRW	Summer 2015	Ongoing	
7	Yes			NRW		Oct 2015	
8	No			NRW		Ongoing	
9	No			Recommendation completed prior to Delivery Plan publication.	NRW	Dec 2014	Dec 2014
10	No			Recommendation completed prior to Delivery Plan publication.	NRW	Sep 2014	Sep 2014
11	Yes		<b>Project 2 – Flood Warning and Forecasting</b> See progress summarised within this report and supplementary Project 2 Report.	NRW	Autumn 2015	Dec 2015	
12	Yes			NRW		Dec 2015	
13	Yes		<b>Project 3 – Community Resilience</b>	NRW	Winter 2015	Mar 2016	
14	Yes					Mar 2016	

15	Yes		See progress summarised within this report and supplementary Project 3 Report.			Mar 2016
16	Yes					Mar 2016
17	Yes					Mar 2016
18 <sup>1</sup>	Yes		<b>Project 4 – Operational Response</b> See progress summarised within this report and supplementary Project 4 Report for Rec 19 and summary page (Page 46) for Rec 20.	NRW	Winter 2015	Nov 2015
19	Yes					Ongoing
20	No					Mar 2016
21	No		'Exercise Megacyma Cymru', a coastal mass evacuation exercise, was held in March 2015.	LRF	After Spring 2015	Jun 2015
22	No			Wales Flood Group	Spring 2015	Jun 2015
23	No		Recommendation was informed by the coastal exercise above.	LRFs	After Spring 2015	Jun 2015
24	No		Recommendation specific to Garford Road area Rhyl.	Denbighshire County Council	Ongoing and dependent upon completion of options appraisal work	Mar 2016
25	Yes		<b>Project 5 – Coastal Defences</b> See progress summarised within this report and supplementary Project 5 Report.	WLGA	Winter 2015	Jan 2016
26	Yes					Jan 2016
27	No		Welsh Government continually works to protect budgets and the core flood budget was maintained for 2015/16.	WG	Ongoing	Jun 2015
28	No				Ongoing	Jun 2015

<sup>1</sup>Recommendation 18 has been moved from Project 4 to Project 10 due to the links with infrastructure resilience.

29	No		National Programme of Investment, now called Flood and Coastal Investment Programme (FaCIP), was consulted upon in early 2015.	WG	End 2014	Jun 2015
30	No		Announcements have been made regarding Welsh Government's Coastal Risk Management Programme and bids are currently being determined.	WG	Spring 2015	Jun 2015
31	Yes		<b>Project 6 – National Coastal Defence dataset and inspection</b> See progress summarised within this report and supplementary Project 6 Report.	NRW	Winter 2015	Ongoing
32	Yes					Nov 2015
33	No		Continue to develop a Flood Risk Modelling and Mapping Strategy/Work plan for Wales.	NRW	Spring 2016	Ongoing
34	No		Risk based review of <b>flooded locations</b> is completed. See progress summarised within this report.	NRW	Varies According to location	Nov 2015
35	No		Risk based review of <b>'near miss'</b> locations is completed. See progress summarised within this report.	NRW	Varies According to location	Nov 2015
36	Yes		Recommendation completed prior to Delivery Plan publication.	NRW	Linked to other individual Recommendations	Dec 2014
37	Yes		<b>Project 7 Skills and Capacity audit and roles and responsibilities</b> See progress summarised within this report and supplementary Project 7a Report for Recommendation 37 and Project 7b Report for Recommendation 38.	WLGA	Winter 2015	Dec 2015
38	Yes			NRW	Summer 2015	Mar 2016

39	Yes		<b>Project 8 – Review of Coastal Groups</b> See progress summarised within this report.	WG	By Winter 2015	July 2016
40	No		WCMC future business case determined.	WG	Spring 2015	Feb 2016
41	No		<b>Project 9 – Coastal Adaptation</b> See progress summarised within this report.	*WG and LLFAs	Long term	Ongoing
42	No			*WG	Summer 2015	Mar 2016
43	Yes		<b>Project 10 – Infrastructure Resilience</b> See progress summarised within this report and supplementary Project 10 Report.	*WG	Spring 2015	Nov 2015
44	Yes			*WG	Spring 2015	Nov 2015
45	Yes			*WG	Spring 2015	Nov 2015
46	Yes			*WG	Ongoing	Nov 2015
47	Yes			*WG	Ongoing	Nov 2015

*Table 1 - Summary of Recommendations and Project Status*

**Table 1 Acronyms:** NRW – Natural Resources Wales, LRF – Local Resilience Forum, WLGA – Welsh Local Government Association, WG – Welsh Government, RMA - Risk Management Authority.

\*The Delivery Plan named Welsh Government as the lead for Recommendations 41 to 47, however NRW have overseen progress and reporting on these Projects during 2015/16, in collaboration with Welsh Government.

As identified in Table 1, the 7 ongoing Recommendations are numbers 5, 6, 8, 19, 31, 33, and 41. The ongoing nature of these Recommendations reflect either inter-linkages with the Wales and England Flood and Coastal Erosion Risk Management (FCERM) Research and Development programme (Recommendation 5), specialised science and resource demand (Recommendations 6 and 8), or through recent best endeavours confirming their more onerous nature as tasks which will take place over much longer timescales (Recommendations 19, 31, 33 and 41).

## Progress summaries for each Recommendation

Progress made by end of August 2016 is summarised in this section. Each summary confirms who has been the lead on delivering the Recommendation, the completion date for the Recommendation where applicable and outlines the methodology followed to implement the Recommendation. These progress summaries are supplemented as appropriate by a separate report within the Supporting Information.

### Supporting Information

A number of Annexes are available as separate documents, where necessary to provide supporting information for this Progress Report for 2015/16. The internally produced reports are published alongside this report on our website, whilst the externally produced reports have their hyperlinks within the corresponding Recommendation summary page of this report.

#### Project Reports List:

- Project 1 Report – Recommendation 7
- Project 2 Report – Recommendations 11 & 12
- Project 3 Report – Recommendation 13, 14, 15, 16 & 17
- Project 4 Report – Recommendation 19
- Project 5 Report – Recommendations 25 & 26
- Project 6 Report – Recommendation 31 & 32
- Project 7a Report – Recommendation 37
- Project 7b Report – Recommendation 38
- Project 8 Report – Recommendation 39
- \*Project 10 Report – Recommendation 18, 43, 44, 45, 46 & 47

\*There is no Project 9 Report for Recommendations 41 & 42 due to the longer-term, ongoing nature of Recommendation 41. The respective summary pages within this report recognise progress to date and associated external publications.

## Recommendation 1 – Progressing the Recommendations

**Rec 1: The recommendations included in this report are compiled into a Delivery Plan. This Delivery Plan will identify how the recommendations will be progressed. It will consider matters such as; the parties to be involved lead responsibility, priorities, governance and resources and capacity to deliver.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Outside Projects

**Completion Date:** December 2014

### Summary of Recommendation Implementation

Following the flooding to the North Wales Coast on 5<sup>th</sup> December 2013 and the more widespread coastal storms of early January 2014, Natural Resources Wales, working with partners around Wales, completed a two stage Review as instructed by the Minister for Natural Resources. This Review concluded with the identification of 47 individual recommendations in April 2014.

In January 2015, we published the Coastal Flooding Review Delivery Plan, which proposed how each recommendation can be taken forward and implemented.

The Delivery Plan identified that thirty recommendations have been packaged into ten Projects to reflect common themes. The remaining seventeen recommendations are being addressed independently outside of projects by individual leads.

The 10 Projects and their broad technical themes are listed below:

- Project 1 – Flood Forecasting and Coastal Design
- Project 2 – Flood Warning and Forecasting
- Project 3 – Community Resilience
- Project 4 – Operational Response
- Project 5 – Coastal Defences
- Project 6 – National Coastal Defence Dataset and Inspection
- Project 7 – Skills and Capacity Audit and Roles and Responsibilities
- Project 8 – Review of Coastal Groups
- Project 9 – Coastal Adaptation
- Project 10 – Infrastructure Resilience

Within the Delivery Plan a methodology has been proposed to take forwards and progress each Recommendation. These have been developed through liaison with coastal practitioners across Wales, to draw on the expertise and experience of the key people managing flood and erosion risk across the country.

## Recommendation 2 – Progressing the Recommendations

**Rec 2: The Delivery Plan should consider opportunities to expand the recommendations beyond just coastal flooding and erosion risks and to consider the link to risks from other sources of flooding.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Outside Projects

**Completion Date:** December 2014

### Summary of Recommendation Implementation

Following the flooding to the North Wales Coast on 5th December 2013 and the more widespread coastal storms of early January 2014, Natural Resources Wales, working with partners around Wales, completed a two stage Review as instructed by the Minister for Natural Resources. This Review concluded with the identification of 47 individual Recommendations in April 2014.

In January 2015, we published the Coastal Flooding Review Delivery Plan, which proposed how each Recommendation could be taken forward and implemented.

The potential to expand each Recommendation to include additional sources of flood risk was determined within the Delivery Plan and hence this Recommendation is complete.

Where linkages were identified to other sources of flooding, the impact of including other flood sources upon the proposed methodology for a specific Recommendation has been considered.

Additional non-coastal sources of flooding increased the number of partners involved in developing and implementing the Delivery Plan, this required more liaison with partners and incorporating more ideas. This increased the cost and time required to implement Recommendations. Expanding a Recommendation to consider other non-coastal sources generated access to additional funding and resources. Such avenues were investigated where possible.



## Recommendation 3 – Storm Severity

**Rec 3: Further work is required to assess the joint probability of wind, waves and tides for these recent winter storms. This may take the form of an initial assessment coupled with consideration of more thorough analysis. The scope of this work will require further technical discussion.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Project 1

**Completion Date:** December 2015

### Summary of Recommendation Implementation

The UK Coastal Monitoring and Forecasting Service (UKCMF) Factual Report into the Coastal Storms of December 2013 and January 2014 including Joint Sea Level and Wave Analysis was commissioned by Natural Resources Wales and produced by JBA Consulting. It was shared with RMAs on 9th June 2014 <sup>[1]</sup>. The joint probability assessment for that study used the “Desk Study” spreadsheet method within the Defra Best Practice Guide and the results gave very high estimates of joint return period which were deemed implausible. The JBA report recommended that:

*“Return periods calculated for the coincident sea levels and wave heights seen in December 2013 and January 2014 are extreme and very uncertain. We recommend that they are quoted with this in mind. We recommend more robust statistical modelling to determine a more reliable estimate of return period”.*

And that: *“We recommend further research to develop methods of joint probability assessment along the lines of those discussed in Environment Agency science project SC060088.”*<sup>3</sup>

JBA Consulting were also commissioned by Denbighshire County Council in 2015 to undertake a joint probability analysis focusing for Rhyl to support the development of a flood risk management scheme. For this, a detailed statistical analysis of the December 2013 coastal event was undertaken using the Heffernan and Tawn method for multivariate probability. The analysis indicated that the conditions on the 5th of December 2013 were the largest in the month, and were a relatively uncommon tidal event in their own regard. The probability of the offshore wave and skew surge conditions occurring during this extremely large tide was calculated to have a 0.005% AEP, representing an approximate 1 in 200-year return period.

JBA consulting also undertook a comparison of the Heffernan and Tawn multivariate probability assessment and the Defra “Desk Study” spreadsheet method. This identified that the Defra “Desk Study” method tended to under predict the range and magnitude of coastal storm events. This could lead to the under estimation of risk and the under design of structures. Further details of the work undertaken by JBA Consulting for Denbighshire County Council are provided under Recommendation 24.

It has become clear from the work carried out following the 2013/14 storms and further detailed modelling carried out at Rhyl that this is a very specialist area of work with a range of methods available, from the relatively simple to the more complex. There is the potential for misunderstanding on how to apply the methods and the situations in which the various methods should be used.

Following the initial assessment of the joint probability of wind, waves and tides for the 2013/2014 storms and the subsequent analysis of joint probability carried out for the Rhyl flood

## Recommendation 3 – Storm Severity

risk management scheme, Recommendation 3 concludes that further specialist work is required to review and update standard methods of joint probability analysis and best practice guidance.

We believe this is best achieved by working at a UK level, because of the need to establish best practice which RMAs and their consultants can use across England and Wales, in a similar vein to the approach taken for fluvial flood frequency (where the Flood Estimation Handbook has become established as the UK wide industry standard).

We also share coastal waters with England (Liverpool Bay and Severn Estuary) so consistency becomes an issues for assessment of storm severity and joint probability in these locations.

To begin to take this forward, NRW have engaged through the Defra-Welsh Government Flood and Coastal Erosion Risk Management Joint Research Development (R&D) Programme with two projects which are developing new techniques related to joint probability assessment:

- Planning scenarios for FCRM and the National Risk Assessment (H21 widespread inland flooding) Capturing the true spatial nature and joint probability of flood risk across all sources
- Defra National Risk Assessment H19 extreme coastal flooding.

Further work engaging with these R&D projects will continue as part of Recommendation 5 (see page 29) with a view to using these projects as a platform for establishing best practice methodologies and supporting guidance, including the assessment of the joint probability of sources of coastal flooding. It is likely that any new guidance will need to be supported by practitioner workshops.

Until these projects are complete and best practice methodologies and guidance implemented, there would be little further benefit in trying to undertake further joint probability assessments on the severity of the 2013/2014 storm events at other sites across Wales.

<sup>[1]</sup> JBA (2014) UKCMF Factual Report into the Coastal Storms of December 2013 and January 2014 Including Joint Sea Level and Wave Analysis

<sup>[2]</sup> Heffernan, J.E., Tawn, J.A., 2004. A conditional approach for multivariate extreme values (with discussion). *J. R. Stat. Soc. Ser. B Stat Methodol.* 66 (3), 497–546

<sup>[3]</sup> Environment Agency R&D project SC060088 “*The Risk of widespread flooding – capturing spatial patterns in flood risk from rivers and coasts*” was a scoping study to identify, develop and trial a method for assessing flood risk when aggregated over large spatial scales”. This work was a predecessor to the R&D project “*Planning scenarios for FCRM and the National Risk Assessment (H21 widespread inland flooding) Capturing the true spatial nature and joint probability of flood risk across all sources*” which is currently in progress.

## Recommendation 4 – Storm Severity

**Rec 4: Review and update if required, the extreme sea level dataset around the Welsh coast. The recent tidal conditions are amongst the highest for many years. This dataset may need to be amended.**

**This is to include methods for assessment of joint probability for storm severity.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Project 1

**Completion Date:** January 2016

### Summary of Recommendation Implementation

The December 2013 and early January 2014 sea levels were significant in terms of the available records from the UK national tide gauge network.

The Phase 1 Report identified that the peak sea level experienced in December 2013 was the highest recorded in Liverpool Bay in over 20 years since the tide gauge was established. The level exceeded the previous highest value by a considerable amount (0.3m or 1 ft.).

In January 2014, the peak recorded sea level at:

- Milford Haven was 4.51mAOD. This was the highest level since at least February 1997 and exceeded the March 2008 level (another notable event) by 0.14m.
- Newport was 8.03mAOD. This was the highest level since at least February 1997 and exceeded the February 1997 level by 0.20m.
- Barmouth was 3.92mAOD. This was marginally higher than the February 1997 level.
- Liverpool was 5.86mAOD. This was 0.36m lower than the peak level on 5th December 2013.

The Coastal Flood Boundary conditions for UK mainland and islands: design sea levels, completed in 2010, published in February 2011, is the industry standard, best practice dataset used in coastal flood risk management across England and Wales. This Environment Agency (EA) R&D project, which worked in partnership with the Scottish Environment Protection Agency (SEPA), provided an up-to-date scientifically robust national evidence base and practical guidance on appropriate design sea level and swell wave conditions around the country and how to use them.

Following the 2013/14 coastal storms and the significant sea levels recorded around Wales, we needed to understand whether inclusion of the more recent 2013/14 peak sea levels in the datasets and analysis used for the 2010 published research would alter the design estimates of extreme sea levels at key locations around the Welsh coast. Put another way, would the 1 in 200 year and 1 in 1,000 year design levels frequently used in coastal modelling and asset design significantly change with inclusion of the 2013/14 peak data.

A study was commissioned by Natural Resources Wales, using the UK Coastal Monitoring & Forecasting partnership, and undertaken by the National Oceanography Centre (NOC), Liverpool.

This study carried out a re-analysis of the extreme sea level estimates for seven locations on the national tide gauge network around, or close to, the Welsh coastline (Liverpool, Llandudno,

## Recommendation 4 – Storm Severity

Barmouth, Milford Haven, Mumbles, Newport and Avonmouth) using the same methodology as used in the 2011 published research.

**The conclusion of the study was that inclusion of the more recent peak sea level data does not make a statistically significant difference to the design sea level estimates around Wales.**

The table below, extracted from the report, shows the 200 year return period sea levels at all seven locations as calculated in the original 2011 published research, the change from including the 2013/14 recorded sea levels and the 95% confidence intervals.

Table 2. 200 year return level from McMillan et al. (2010), confidence interval, and change due to 2013/2014 data

	200 year level (m)	Change to 200 year level (m)	95% confidence interval (m)
Liverpool	6.03	0	0.2
Llandudno	5.38	+0.01	0.2
Barmouth	4.22	+0.05	0.2
Milford Haven	4.75	0	0.2
Mumbles	6.15	+0.04	0.3
Newport	8.41	+0.10	0.3
Avonmouth	9.11	+0.10	0.3

It would be reasonable to extrapolate these results, and hence the conclusions, to the entire Welsh coastline since the seven tide gauge locations (a) provide the best data available and (b) are well distributed around the entire Welsh coastline.

The full report from this study is provided at <http://nora.nerc.ac.uk/512661/>. It has been published as NOC Research & Consultancy Report No. 54.

We have therefore concluded that following this review of the extreme sea level data set around Wales, there is no immediate need to update the 2011 published coastal flood boundary design sea levels on account of the peak sea levels recorded around Wales during the 2013/14 winter.

However, the NOC study we commissioned has highlighted that whilst the methods used in the 2010 research remain valid, further recommended improvements could be made, in particular to:

- Refine the statistical models used at some locations for the most extreme sea levels;
- Include the seasonal dependencies between storm surges and tides within the 'skew surge' methodology which underpins the 2010 research.

These recommendations are beyond the scope of the Recommendation 4 project but will be picked up by Natural Resources Wales through:

- Ongoing engagement with the joint Defra-Welsh Government Flood & Coastal Erosion Risk Management R&D Programme;
- Our working relationships with the EA and SEPA, so we ensure design sea level estimates and supporting research remain coherent around the UK coastline.

## Recommendation 5 – Storm Severity

**Rec 5: Review and update if required, the guidance used for the assessment and design of coastal standard of service against flooding. The review should consider whether more clarification is needed, in particular on the issues of the treatment of joint probabilities, in combination effects and appropriate national consistency.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Project 1

**Completion Date:** Ongoing

### Summary of Recommendation Implementation

There is a close dependency with Recommendation 3 which states:

*“Further work is required to assess the joint probability of wind, waves and tides for these recent winter storms. This may take the form of an initial assessment coupled with consideration of more thorough analysis. The scope of this work will require further technical discussion.”*

Following the initial assessment of the joint probability of wind, waves and tides for the 2013/2014 storms and the subsequent analysis of joint probability carried out for the Rhyl flood risk management scheme, Recommendation 3 concluded that further specialist work is required to review and update standard methods of joint probability analysis and best practice guidance.

As stated in the summary report for Recommendation 3, we believe this is best achieved by working at a UK level, because of the need to establish best practice which RMAs and their consultants can use across England and Wales, in a similar vein to the approach taken for fluvial flood frequency (where the Flood Estimation Handbook has become established as the UK wide industry standard).

We also share coastal waters with England (Liverpool Bay and Severn Estuary) so consistency becomes an issues for assessment of storm severity and joint probability in these locations.

To begin to take this forward, NRW have engaged through the Defra-Welsh Government Flood and Coastal Erosion Risk Management Joint Research Development (R&D) Programme with two projects which are developing new techniques related to joint probability assessment:

- Planning scenarios for FCRM and the National Risk Assessment (H21 widespread inland flooding) Capturing the true spatial nature and joint probability of flood risk across all sources.
- Defra National Risk Assessment H19 extreme coastal flooding.

NRW will continue to engage with these R&D projects to support delivery of this Recommendation with a view to using these projects as a platform for establishing best practice methodologies and supporting guidance for coastal design standards of service, including the assessment of the joint probability of sources of coastal flooding. It is likely that any new guidance will need to be supported by practitioner workshops.

Once these R&D projects are complete, we will review if further work is required to take forward the R&D outputs and/or develop best practice guidance based in order to deliver the Recommendation.

## Recommendation 6 – Flood Forecasting

**Rec 6: Continue to identify and implement risk based opportunities to deliver further improvements to longer range forecasts.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Project 1

**Completion Date:** Ongoing

### Summary of Recommendation Implementation

This is addressed as part of ongoing work, including collaborative work with the Met Office, utilising emerging science. This enhancement and improvement to Natural Resources Wales' long range coastal forecasting capability enables earlier discussion around the scale, impacts and location of coastal flood events. Some illustrations of the ongoing work include:

- Natural Resources Wales input into the United Kingdom Coastal Flood Forecasting (UKCFF) partnership which provides a strategic overview of the current and future needs of those who provide coastal warnings. Natural Resources Wales contribute to, propose and lead, UKCFF work.

As part of the ongoing portfolio of the work of UKCFF, there are several examples of how Natural Resources Wales both input into the work and benefit from the collaborative work undertaken, including:

- A project to better align Met Office, Environment Agency and Natural Resources Wales' forecast data, enabling better sharing of data and discussions around specific forecasts – instigated by Natural Resources Wales;
  - A project to better understand coastal processes within the Bristol Channel – also instigated by Natural Resources Wales;
  - A project to review the potential benefit of, and implement the operation use of, wave ensemble forecasts, providing improved long range forecasting ability.
- Surge, wind and wave data provided by the Met Office, now extend to 5 days' worth of forecasts (compared to 48 hours' previously). This data is processed through Natural Resources Wales' bespoke forecasting models, providing site specific forecast at 80 locations around Wales to better inform the flood warning service.
- Surge ensemble data has been implemented, in collaboration with the Met Office, to give a greater understanding of uncertainty in the current forecast and flagging potential events earlier.

These improvements provide a greater lead-in time to coastal flood events, giving a greater understanding of the potential risks earlier. This enables earlier discussions between professional partners around the scale and potential impacts of coastal flood events. Earlier and more informed discussions increase the effectiveness of both preparatory action and the resulting response.

**Rec 7: Review with partners what additional forecast information could be provided to support local incident management decisions. Identify options and recommendations.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Project 1

**Completion Date:** October 2015

### Summary of Recommendation Implementation

A Natural Resources Wales working group was set up to undertake this recommendation, comprising a Flood Incident Management team technical specialist from each area within Wales (North, South West and South East) and a member of the national Flood Forecasting team to advise on the forecast data which could be provided and how this could be done.

The first step was to consult with professional partners to identify what additional forecast information they felt would be useful for local incident management decisions. Professional Partners were asked three questions:

1. What forecasting information do you currently receive and in what format?
2. What additional forecast information would be beneficial to your operations and why?
3. Can you identify any situations when forecast information is diluted through onward sharing within organisations and may therefore not fully reach all the intended recipients?

A total of 20 consultation responses were received. The responses indicated that:

- There is a variety in the type and amount of forecast information received by partners across different areas within Wales.
- A large proportion of partners would like to receive additional forecast information.
- There are no current concerns over the dilution of information through onward sharing within organisations.

Based on this information the working group developed and discussed potential solutions to provide additional forecast information and achieve greater consistency in the forecast data provided across Wales.

This led to the development of a two-stage solution to achieve the Recommendation, which was reviewed and agreed with the NRW national forecasting team:

- Stage 1 - Short Term Response: Provide generic information on a more local level to partners via email
- Stage 2 - Long Term Response: Provide more detailed forecast information to partners

Stage 1, the short term solution, aims to provide professional partners with more local, longer-range information via email correspondence. Emails will be provided on a Local Resilience Forum basis, covering the geographical area associated with the each LRF in a similar style to those of the Met. Office Advisor emails. The contents of these emails will vary in detail depending on the conditions forecast, but templates and examples have been developed to enable this to be a consistent process across Wales. This solution can be implemented immediately and is already being implemented under some events.

## Recommendation 7 – Flood Forecasting

Stage 2, the long term solution, is the provision of more detailed forecast information, such as site specific forecasts. This is technically more difficult to implement due to the need to ensure that uncertainty in the forecast is fully communicated and the need for development of a user friendly and efficient data dissemination process. A feasibility study should be undertaken by NRW to progress this task. Decisions on the level of data provided and the manner in which it is presented are key for this to work successfully.

Further information on this Recommendation can be found within the accompanying Project Report 1 - Recommendation 7.



## Recommendation 8 – Flood Forecasting

**Rec 8: Continue to progress risk based opportunities to deliver improvements to the accuracy of the coastal forecasting service. Develop and deliver a programme of improvement works.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Project 1

**Completion Date:** Ongoing

### Summary of Recommendation Implementation

This is ongoing work and forms part of the continuous improvement, review and recalibration of Natural Resources Wales' coastal forecasting models. Improvements to the accuracy of the coastal forecasting service directly influences the coastal flood warning service, leading to more effective action in the lead up to coastal flood events. Some examples of the ongoing work to improve the accuracy of the coastal forecasting service include:

- Continuing to utilise improvements in forecast data available to Natural Resources Wales. This involves working with the Met. Office and the Flood Forecasting Centre, as well as the United Kingdom Coastal Flood Forecasting partnership (UKCFF) of which Natural Resources Wales is a member, to both identify our needs and understand advancing scientific forecasting methods. Examples of this include the empirical re-tuning of astronomic data, and the manual assessment of surge performance, both of which are done during flood events to improve the accuracy of the raw model outputs.
- Continuing to improve Natural Resources Wales' site specific coastal flood forecasting modelling capabilities by:
  - Updating forecasts for individual locations using the latest forecast modelling techniques to improve accuracy;
  - Continuing to capture site observations where possible to verify the model output, better understand model performance and recalibrate where necessary.
- Improving the understanding of strengths and limitations of current coastal forecasting techniques. Whilst Natural Resources Wales utilises the latest coastal flood forecasting modelling methods, this is still an emerging science. By delivering in-house training to duty officers on the nuances and assumptions of coastal flood modelling, the forecasting service benefits from detailed interpretation of the model outputs.

This work provides an enhancement to the coastal flood forecasting service, better informing the flood warning service and hence Natural Resources Wales' ability to advise and respond to coastal flood events. The understanding of coastal processes and hence the modelling of these is an emerging and evolving science – inputting into the development of coastal flood forecasting methods, and utilising the outputs enhances Natural Resources Wales' coastal flood warning capability.

## Recommendation 9 – Flood Forecasting

**Rec 9: Review the whole wave buoy network around the Welsh coast, including working with UKCMF to address a strategic gap in the offshore wave buoy network in the Irish Sea. This is required to better validate offshore wave forecasts, leading to improvements to the Wales forecasting service. (UKCMF- UK Coastal Monitoring and Forecasting Service).**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Outside Projects

**Completion Date:** December 2014

### Summary of Recommendation Implementation

A new wave rider buoy was installed off the West Pembrokeshire Coast on 11<sup>th</sup> September 2014.

The method followed to reach this outcome comprised:

- The wave buoy network around the Welsh coast was reviewed and a gap identified in the network in the Irish Sea.
- Centre for Environment, Fisheries & Aquaculture Science (Cefas) helped assess locations and prepare for the operational deployment of the new buoy.
- Funding was secured via UKCMF (from the UK Government flood recovery funds).
- The optimal location was identified by Natural Resources Wales through consultation with professional partners and the new installation will provide directional wave data as well as wave height and wave period.

A live telemetry feed supplies instantaneous data and will be used to routinely calibrate Natural Resources Wales' forecast data, as well as monitor wave conditions during storm events. The resilience and suitability of the wave buoy network will continue to be assessed including the impact of the new buoy. Any issues or strategic gaps will continue to be raised as appropriate.

## Recommendation 10 – Flood Warning and Community Response

**Rec 10: Complete the ongoing work by summer 2014 to ‘rebrand’ the flood warning service in Wales so that the provider is clearly identified as Natural Resources Wales.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Outside Projects

**Completion Date:** September 2014

### Summary of Recommendation Implementation

All flood warnings issued in Wales clearly identify Natural Resources Wales as the provider of the service.

- The work was completed in September 2014.
- We have continued to develop our own web products in the meantime, while continuing the partnership with the Environment Agency for certain products such as the 3 day flood forecast, live flood warnings and registration to the service.
- We developed a live flood warning map which went live in March 2015
- We are developing our own pages for live flood warnings and the 3 day flood forecast - which is due to be live by the end of March 2016.
- We are procuring this system in partnership with the Environment Agency but the service for Wales will be entirely hosted by Natural Resources Wales’ website.

Natural Resources Wales continue to work in partnership with the Environment Agency for provision of online supporting information and we are working with them to improve their webpages to further help with this clarity.

## Recommendation 11 – Flood Warning and Community Response

**Rec 11: Develop and implement a prioritised programme of improvement works to flood warning areas and thresholds, using the experience and data gathered from these storms. This should include engagement with professional partners and communities as appropriate.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Project 2

**Completion Date:** December 2015

### Summary of Recommendation Implementation

A Natural Resources Wales working group was set up to undertake these Recommendations, comprising a Flood Incident Management Team technical specialist from each local team within Wales (North, South West and South East).

Recommendations 11 and 12 are inherently linked, as to improve the Flood Warning Service, in particular the setting of flood warning areas and flood warning thresholds, validation information from real storm events is required. These two Recommendations were combined into one report.

The methodology involved consultation with Professional Partners to identify any concerns they may have with the current flood warning areas and thresholds including any specific locations.

Professional Partners were asked three questions with regards to Recommendation 11. From the replies received the Professional Partners had no concerns with the issue and timeliness of the flood warnings, but do have some concerns over the tone and wording of the messages. There were some specific locations which partners have raised, NRW are aware of these and are addressing these locations apart from two flood warning areas where further study is taking place (Caldicot and Wentlooge Levels in South East Wales).

Based on the responses from our Professional Partners the working group concluded that following review of the December 2013 and January 2014 flood events, the flood warning areas that required changes to them have already been undertaken and these areas are summarised within appendices to the report.

To help NRW improve our Flood Warning Service and our understanding of flood risk, for future events, we encourage anyone to send any evidence of flooding to the following email addresses so that we have all the available information to support any decisions taken.

South East Wales – [flinese@cyfoethnaturiolcymru.gov.uk](mailto:flinese@cyfoethnaturiolcymru.gov.uk)

South West Wales – [flinesw@cyfoethnaturiolcymru.gov.uk](mailto:flinesw@cyfoethnaturiolcymru.gov.uk)

North Wales - [flinen@cyfoethnaturiolcymru.gov.uk](mailto:flinen@cyfoethnaturiolcymru.gov.uk)

Further information on this Recommendation can be found within the accompanying Project Report 2 - Recommendations 11 & 12.

## Recommendation 12 – Flood Warning and Community Response

**Rec 12: Review and consider additional sources of validation information for future incidents. This has potential to improve confidence in both forecasting and warning. This may involve seeking feedback from professional partners and others.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Project 2

**Completion Date:** December 2015

### Summary of Recommendation Implementation

A Natural Resources Wales working group was set up to undertake these Recommendations, comprising a Flood Incident Management Team technical specialist from each local team within Wales (North, South West and South East).

Recommendations 11 and 12 are inherently linked, as to improve the Flood Warning Service, in particular the setting of flood warning areas and flood warning thresholds, validation information from real storm events is required. These two Recommendations were combined into one report.

The methodology to Recommendation 12 involved consultation. Professional Partners were consulted to identify what validation techniques they currently use, if any. There were five questions asked as part of Recommendation 12.

From the replies received the majority of the Professional Partners do not carry out formal validation of impacts following flood events, though a few replied that they do carry out site inspections following receipt of flood warnings. From the replies received only police drones were suggested as capturing event data that NRW doesn't currently use. Gaps within validation data relate more to the sharing of data rather than the data collection itself. The replies suggest that there are no formal triggers for carrying out data validation and there are a variety of systems used for validation data and that approximate 40% of the replies share their data with NRW.

Validation is already carried out and will continue to be used within NRW. The working group concluded that all available methods of validation are being used. These validation techniques have been shared within NRW to ensure best practices are followed and the group concluded that new technologies when they become available should always be explored to see if further validation methods can be used.

To help NRW improve our Flood Warning Service and our understanding of flood risk, for future events, we encourage anyone to send any evidence of flooding to the following email addresses so that we have all the available information to support any decisions taken.

South East Wales – [flinese@cyfoethnaturiolcymru.gov.uk](mailto:flinese@cyfoethnaturiolcymru.gov.uk)

South West Wales – [flinesw@cyfoethnaturiolcymru.gov.uk](mailto:flinesw@cyfoethnaturiolcymru.gov.uk)

North Wales - [flinen@cyfoethnaturiolcymru.gov.uk](mailto:flinen@cyfoethnaturiolcymru.gov.uk)

Further information on this Recommendation can be found within the accompanying Project Report 2 - Recommendations 11 & 12.

## Recommendation 13 – Flood Warning and Community Response

**Rec 13: Work with sample communities to identify options to help sustain an effective local response to flood warnings. This should consider communities where effective response and or confidence in the warning system is low.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Project 3

**Completion Date:** March 2016

### Summary of Recommendation Implementation

Natural Resources Wales led a series of participatory workshops which involved a wide range of professional partners along with members of the public who had experienced flooding, or who represented communities at risk from across Wales.

An assessment of barriers and ways to overcome them was considered which resulted in the identification of the following 5 options as key to achieving recommendation 13:

1. Better education about risks.
2. Improve local gathering of information.
3. Better local communication.
4. Improve the quality of warnings.
5. Improve the response to warnings.

Summary:

There are interdependencies between all 5 options above, so they need to be progressed as part of an ongoing 'before during and after' a flood cycle.

They need to be achieved through better local engagement (see Recommendation 14) availability of good information and advice which details what warnings sound and look like what to do and when (Recommendation 15) and supported locally by volunteers as part of flood planning processes (Recommendation 16 & 17).

Organisations are already making improvements to existing warning services and using learning from Sciencewise and Ipsos Mori Flood communications research and public feedback to improve quality and accessibility of warning messages.

**The recommended option: Better education about risks.**

**This needs to be led on a National Level by NRW, supported by a range of others, specifically the 4 newly formed LRF Community Resilience groups and locally by a wide range of interest groups and individuals.**

Further information on this Recommendation can be found within the accompanying Project 3 Report – Recommendations 13, 14, 15, 16 & 17.

## Recommendation 14 – Flood Warning and Community Response

**Rec 14: Identify and evaluate options to help communities to become more self-sufficient and resilient and identify a recommended option**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Project 3

**Completion Date:** March 2016

### Summary of Recommendation Implementation

Natural Resources Wales led a series of participatory workshops which involved a wide range of professional partners along with members of the public who had experienced flooding, or who represented communities at risk from across Wales.

The aims of the workshops were to:

- Bring together representatives of Risk Management Authorities, the public and other key delivery organisations within Wales who contribute to Recommendations 13 - 17.
- Act as a technical multi-partner advisory group, considering evidence, identifying gaps and opportunities which help to create more self-sufficient and resilient communities in Wales.
- Contribute practical ideas and suggestions as to how the recommendations are best taken forward, by identifying who should lead and support and the timescales involved (short, medium or long term).

Agreement was reached at an early stage of the project that:

- The scope of Project 3 work should be expanded to include all sources of flooding (not just coastal).
- Recommendations 13,15,16 & 17 should sit under the umbrella of Recommendation 14, as they are all essential components that contribute to achieving longer term sustainable resilience.

Findings were clear in that all 5 options listed below need to be delivered concurrently, delivering just one or two will not fully deliver Recommendation 14. This is due to the causal links that emerged:

- Improved Inter-Agency Working.
- Better Engagement (current).
- Better public information about options.
- Develop a broader community resilience plan – not just flooding.
- Better engagement with future generations (education of young people).

## Recommendation 14 – Flood Warning and Community Response

### Summary

As a result of a 4 stage consultative process, which was informed by existing and newly commissioned research, including 2 pilot Volunteer events, a set of practical suggestions for delivering recommendation 14's agreed vision '*Self-supporting communities that are resilient to flooding*' have been identified.

### **The recommended option (what needs to be done First):**

#### **Improved Inter-Agency Working, which needs to be supported by Better Engagement at local level**

Improved Inter-Agency working needs to start with direction from Welsh Government – through the All Wales Community Resilience Group to implement the identified actions within this report. The new Flood and Coastal Risk Erosion Committee would also have a key role to play in supporting and progressing these recommendations.

Better Engagement at local level can also be improved by sharing of existing best practice and local resources. The mechanism for this is the same as above.

Further information on this Recommendation can be found within the accompanying Project 3 Report – Recommendations 13, 14, 15, 16 & 17.



## Recommendation 15 – Flood Warning and Community Response

**Rec 15: Produce and communicate nationally consistent, public focused information on the types and availability of property level protection measures and the support available.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Project 3

**Completion Date:** March 2016

### Summary of Recommendation Implementation

**There is a clear need to:**

- Produce separate tailored advice for professional and public audiences.
- Consider and address issues regarding data protection, commercial sensitivity and confidentiality around sharing of information when storing and sharing advice for and between professionals.

**Recommendations identified:**

- Pilot an annual Wales Flood Conference for public, professionals and all partner organisations. Consider using the Institution of Civil Engineers (ICE) event.
- Strengthen Joint Communications meetings between NRW, EA, SEPA, Met Office and DARDNI.
- Establish All Wales Professional Partner Network training events.
- Increase access to and use of Resilience Direct for professional partners including voluntary orgs, and promote this through the Wales Flood Group, Warning and Informing Group, Community Resilience Group and LRF Community Resilience subgroups.
- Develop an online public microsite and ensure the content addresses known information gaps including, for example, how to access and how to use Property/Individual Level Protection (PLP/IPP).

**The recommended option: All of the above are relevant, but the recommended next step is to establish an online ‘micro site’ for Wales that all organisations can signpost public to for consistent advice and information that covers before during and after a flood cycle.**

**This should be taken in the first instance to the All Wales Community Resilience Group (Welsh Government).**

**The rationale for this is that this group functions at all Wales Level, its membership includes representation from many of the relevant organisations including the LRFs and has a wider remit that allows for consideration of the whole flood cycle in the context of longer term social and emotional resilience. NRW and other organisations can assist with the micro-site development.**

Further information on this Recommendation can be found within the accompanying Project 3 Report – Recommendations 13, 14, 15, 16 & 17.

## Recommendation 16 – Flood Warning and Community Response

**Rec 16: Using the experience from these recent storms, identify and evaluate options for the future development of local Flood Plans in coastal areas and identify a recommended option to help these be more effective at improving community resilience.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Project 3

**Completion Date:** March 2016

### Summary of Recommendation Implementation

Natural Resources Wales led a series of participatory workshops which involved a wide range of Professional Partners along with members of the public who had experienced flooding, or who represented communities at risk from across Wales.

The following 5 options were identified as key to delivering Recommendation 16, with the acknowledgement that there are interdependencies with other Project 3 Recommendations (see Recommendation 14):

- Better understanding of who does what in the local community flood plan.
- Improve the engagement of communities in planning.
- Maintain community engagement if there is no flood, or after a flood.
- Better implementation of the local community flood plan.
- Learn and implement lessons after the event.

### Recommendations identified:

- Consider and disseminate learning from Flood Awareness Wales' Independent Review commissioned by NRW which looks at flood plans and volunteers.
- Develop broader resilience plans that incorporate flooding (see Recommendation 14).
- Share emergency plans with relevant agencies and increase communication links with the public and partners on a more local level (see Recommendation 14).

**The recommended option: A combination of the above is required, starting with raising awareness of a better understanding of who does what in all resilience plans, and particularly local community flood plans.**

**This should be led at National Level by Welsh Government – through the Wales Flood Group and Local Resilience Forum structures. NRW can and will assist with this, but it needs buy-in from all parties.**

Further information on this Recommendation can be found within the accompanying Project 3 Report – Recommendations 13, 14, 15, 16 & 17.

## Recommendation 17 – Flood Warning and Community Response

**Rec 17: Using the experience from these recent storms, identify and evaluate options for the future development of local Flood Plan Leads / Warden Volunteers in coastal areas and identify a recommended option.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Project 3

**Completion Date:** March 2016

### Summary of Recommendation Implementation

Natural Resources Wales led a series of participatory workshops which involved a wide range of Professional Partners along with members of the public who had experienced flooding, or who represented communities at risk from across Wales. This included 2 pilot Volunteer Network events which aimed to:

1. Provide an opportunity for Volunteers to meet others carrying out similar roles and share best practice.
2. Share advice from specialist partner organisations to obtain an increased understanding of roles and responsibilities at the 3 stages; before, during and after a Flood.
3. Discuss health and safety risks associated with flood volunteer roles and identify ways to mitigate them.

As there are strong linkages and interdependencies between this Recommendation and others within Project 3, (specifically Recommendation 16) the options and Recommendations should be considered together.

#### **Options identified (specific to Volunteers):**

- Consider and disseminate learning from Flood Awareness Wales' Independent Review commissioned by NRW which looks at flood plans and volunteers.
- Hold Flood Plan Volunteer Network events.
- Develop Volunteer Health and Safety Checklists.

**These options should be considered in the first instance at National Level by Welsh Government – through the All Wales Community Resilience Group and its member organisations.**

**The rationale for this is that this group functions at all Wales Level, its membership includes representation from many of the relevant organisations including the LRFs and organisations that specialise in supporting volunteers. NRW can and will assist with this process.**

Further information on this Recommendation can be found within the accompanying Project 3 Report – Recommendations 13, 14, 15, 16 & 17.

## Recommendation 18 – Operational Response

**Rec 18: Review and identify how to improve involvement of infrastructure operators and managers in the coastal flood risk incident management process.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Project 10

**Completion Date:** November 2015

### Summary of Recommendation Implementation

Natural Resources Wales created a questionnaire which was sent out to 15 Coastal Risk Management Authorities (RMAs), Local Resilience Forums (LRFs), the Wales Utility Group (WUG), Network Rail (NR) and the Trunk Road Agencies within Wales.

This consultation process was to help identify:

- Current levels of awareness and involvement from infrastructure operators and managers;
- Concerns or barriers that restrict the involvement of other organisations;
- Suggestions on how improved involvement can be achieved and implemented.

A total of 26 consultation responses were received. The key points raised were that:

- There is a need for awareness raising and more regular contact / involvement between organisations;
- Infrastructure operators, utility providers and RMAs should be able to share appropriate contact details;
- There should be improved sharing and understanding of infrastructure and utility asset inspection and maintenance regimes at a local level;
- There should be a greater shared understanding at a local level of infrastructure and utility assets that are at risk of flooding.

Summary:

All groups consulted felt that more needed to be done, and could be done, to improve the involvement of infrastructure providers and utility operators in the flood risk management process from forward planning to incident response. The starting point for improved involvement was suggested to be better information sharing between organisations.

After considering the information gathered, the following solution has been proposed:

Resilience Direct is explored as an option for all parties to share and store information at the 'official sensitive' level.

Further information on this Recommendation can be found within the accompanying Project 10 Report – Recommendations 18, 43, 44, 45, 46 & 47.

## Recommendation 19 – Operational Response

**Rec 19: Continue to develop potential ‘impact scenario’ assessments, maps and/or statements. This work must be developed in close discussion with professional partners to ensure it meets all parties’ requirements.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Project 4

**Completion Date:** Ongoing

### Summary of Recommendation Implementation

An internal Natural Resources Wales (NRW) working group was set up to undertake this Recommendation, which included a Flood Incident Management (FIM) team technical specialist from each area within Wales (North, South West and South East).

Static impact scenario assessment maps have previously been produced for South West and South East Wales, but there are currently no similar maps available for North Wales. These impact scenario maps were produced by the local FIM teams based on documented flood depths and extents which occurred during previous flood events.

The working group discussed whether these static maps should be extended to the North Wales area. During the discussion it was identified that North Wales would prefer a more dynamic approach to the mapping, with maps produced automatically each time a flood event is forecast to occur, based on the forecast condition triggering activation of the flood warning areas. Consultation has been undertaken with Risk Management Authorities (RMAs) to identify their opinion on the existing static mapping approach and the new more dynamic mapping methodology proposed for North Wales.

For this Recommendation, a pilot study has been undertaken to trial the new dynamic mapping for a number of sites in North Wales. This has involved work being undertaken by the FIM teams with help from NRW GIS specialists. A review of the pros and cons of the existing static mapping and the pros and cons of the proposed dynamic mapping has been undertaken.

The scope of this work needs to be considered within NRW’s future mapping and modelling programme. The merits of these proposals need to be gauged against other priorities within the business before engaging externally with Welsh Government and the Wales Flood Group as end users of the maps via Local Resilience Forum activities and access to the Resilience Direct website.

Further information on this Recommendation can be found within the accompanying Project Report 4 - Recommendation 19.

## Recommendation 20 – Operational Response

**Rec 20: Review the local decision making process associated with the issue of Severe Flood Warnings and evacuation procedures in December 2013 and early January 2014. Identify improvements and share at an all Wales level.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Project 4

**Completion Date:** March 2016

### Summary of Recommendation Implementation

A working group was set up to undertake this Recommendation internally within Natural Resources Wales (NRW), which included a Flood Incident Management (FIM) team technical specialist from each area within Wales (North, South West and South East) with a Senior Advisor in Flood Warning and Informing to steer the Recommendation.

*“Severe Flood Warnings (SFW) are reserved for exceptional flooding situations. They should not be used when flooding of property is expected, even if evacuation may be necessary, unless at least one of the following criteria are met:*

- *Significant risk to life, or*
- *Significant disruption to the community caused by widespread or prolonged flooding.”*

The first stage included consultation with our Professional Partners through a short questionnaire to establish the level of understanding of the meaning and purpose of a Severe Flood Warning as well as their role in the decision making process. Responses to the questionnaire highlighted varying degrees of understanding.

A review of NRW processes confirm that the decision making process was consistently applied. However it was felt that staff and duty officer confidence in their role in the decision-making process varied.

The SFW is a nationally consistent message and there is no clear driver for changing it.

Levels of understanding within both NRW and Partner organisations could however be improved. This led to an action plan to deliver training and table-top exercising to both groups. A training presentation has been developed and will be rolled through internal NRW duty officer training along with presentations and (light-touch) table-top exercises to multi-agency groups.

NRW Flood Incident Management teams are now developing a programme of training for these groups with the aim to complete by Autumn 2016.

## Recommendation 21 – Operational Response

**Rec 21: Assess our national capacity to respond to a widespread and sustained period of coastal flooding. This should include consideration of when the current national resource pool will no longer function effectively. This should also consider post incident recovery issues.**

**Provide a report with recommendations for improvement.**

**Recommendation Lead:** Welsh Government

**Project Reference:** Outside Projects

**Completion Date:** June 2015

### Summary of Recommendation Implementation

Wales Flood Group is best placed to lead on this work as each agency within the group has emergency plans in place, which they have tested against flood scenarios.

Recommendation 22 and the coastal evacuation exercise ('Exercise Megacyma) held in March 2015 helped inform the process of how we prepare for major incidents but ultimately this Recommendation relates to local multi-agency planning which is already taking place; particularly in the high risk areas.

In terms of national capacity, the emergency services have national arrangements for wide-area support for all emergencies but nothing like this exists for Local Authorities. In taking forward planning at the local level, the LRFs also need to consider how Local Authorities broker mutual aid not only with neighbouring authorities but also with those from further afield.

- Review output and lessons learnt from Exercise Megacyma in March 2015. There are 10 recommendations within the Exercise's de-brief report which will be ongoing and monitored by the Wales Flood Group.
- Link with Recommendation 22 and 37.

Further information on this Recommendation can be found within the linked summary page of the Megacyma Exercise.

## Recommendation 22 – Operational Response

**Rec 22: Assess the collective ability to provide an effective response to a potential large scale evacuation scenario in either north east or south east Wales. This should also consider post incident recovery issues.**

**Provide a report with recommendations for improvement.**

**Recommendation Lead:** Wales Flood Group

**Project Reference:** Outside Projects

**Completion Date:** June 2015

### Summary of Recommendation Implementation

Wales Flood Group is best placed to lead on this work as each area of the agencies within the group have emergency plans in place, which they have tested against flood scenarios.

Recommendation 22 and the coastal evacuation exercise ('Exercise Megacyma) held in March 2015 helped inform the process of how we prepare for major incidents but ultimately this Recommendation relates to local multi-agency planning which is already taking place; particularly in the high risk areas.

In terms of national capacity, the emergency services have national arrangements for wide-area support for all emergencies but nothing like this exists for Local Authorities. In taking forward planning at the local level the LRFs also need to consider how Local Authorities broker mutual aid not only with neighbouring authorities but also with those from further afield.

- Review output and lessons learnt from Exercise Megacyma. There are 10 Recommendations within the Exercise's de-brief report which will be ongoing and monitored by the Wales Flood Group.
- Link with Recommendation 22 (and 37).

Further information on this Recommendation can be found within the linked summary page on Exercise Megacyma.



## Recommendation 23 – Operational Response

**Rec 23: Review the Wales resilience structures and ways of working to identify what changes may be needed to enable us to collectively be better prepared and resilient to future coastal flooding.**

**Recommendation Lead:** Local Resilience Forums

**Project Reference:** Outside Projects

**Completion Date:** June 2015

### Summary of Recommendation Implementation

The Local Resilience Forums (LRFs) and their Severe Weather Groups were best placed to lead on this work as each area has recovery plans in place, which they have tested against flood scenarios.

The findings of Phase 2 of the Compact for Change were accepted by the Wales Resilience Forum on 13th November 2014. The LRFs now have responsibility for implementing these changes.

The proposed changes to the Wales resilience structures under the Compact for Change were tested through Exercise Megacyma Cymru in March 2015. The Exercise generated a further ten recommendations for change and these will be ongoing and monitored by the Wales Flood Group. Learning from the Exercise will be applied to ensure we are better prepared for future coastal flooding incidents.

The Exercise Megacyma summary page can be found at:

<http://gov.wales/topics/environmentcountryside/epq/flooding/planning/exercisemegacyma/?lang=en>

There is work to be done to make the Exercise's recommendations a reality, with the following key points being of note:

1. An update to the Wales Flood Response Framework.
2. The principles of a joint-Strategic Coordination Group (SCG) should be considered across all Welsh LRFs, where this is practicable, and the Pan-Wales Response Plan should reflect any changes at the local and regional level– A Task and Finish Group has been established and a concept paper produced. The LRFs will be consulted on the outcome with a view to embedding the principles in local plans.
3. Further work is required in drawing together all existing initiatives of dealing with vulnerable people into a single, national planning group to take this work forward in a co-ordinated way – A pilot project is currently being undertaken in West Wales to develop a GIS system to provide real time data on the location of vulnerable people during flooding incidents.
4. The principle of wide-area recovery groups should also be explored – A Task and Finish Group has been established and its findings are currently with the LRFs for consultation.
  - Review output and lessons learnt from Megacyma Cymru exercise 2015.

Further information on this Recommendation can be found within the linked summary page on Exercise Megacyma.

## Recommendation 24 – Operational Response

**Rec 24: Options to seek improvements to the standard of protection at the Garford Road area of Rhyl should be identified and evaluated. This should include detailed hydraulic analysis of the capacity and performance of the storage lagoon. This should include an assessment of the stairwell and slipway openings and the interaction with the adjacent golf course area.**

**Recommendation Lead:** Denbighshire County Council

**Project Reference:** Outside Projects.

**Completion Date:** March 2016

### Summary of Recommendation Implementation

During the early stages of carrying out this recommendation, it was recognised by Denbighshire County Council that there was the possibility of achieving some ‘quick wins’ by carrying out some quite basic, but highly effective, improvements to the existing coastal defences. These improvements included:

1. The replacement of timber stop logs at stairwell and slipway openings by steel flood gates, thus significantly reducing the risk of a breach scenario.
2. The construction of a new steel flood gate at Splash Point to prevent overtopping waves being driven in an easterly direction along the promenade and towards properties (as happened on 5<sup>th</sup> December 2013).
3. The introduction of a formal channel at the east end of the Garford Road flood storage lagoon to encourage the passage of flood water towards Rhyl golf course and away from properties.
4. The replacement of the chain link fence between the storage lagoon and the golf course by a collapsible fence (debris which built up on the fence during the 2013 storm probably contributed to the flooding problem).

Whilst the overtopping that took place in 2013 was sufficient to completely overwhelm the defences, and inundate the golf course, it was apparent from studying topographical surveys of the golf course that additional temporary storage capacity could be found fairly easily by constructing a wall and/or bund around the golf course and carrying out some relatively minor re-shaping of the course itself. In addition, a system has been designed whereby flood water can be released back out to sea at low tide via a culvert and penstock arrangement. This work is ongoing and should be complete by summer 2016.

Notwithstanding the particular requirements of Recommendation 24, as a Lead Local Flood Authority Denbighshire County Council has an overarching aim to understand why the flood occurred, the chances of a flood of a similar magnitude happening again and measures that can be taken to reduce the risk. To this end, the Council appointed consultants to carry out a detailed assessment of the 5<sup>th</sup> December 2013 event and to carry out a project appraisal study to identify options to reduce the risk to an acceptable level. The findings of the consultant’s work are as follows.

- i. In order to determine the return period of the event, the consultant carried out a multi-variate probability assessment, which examined the likelihood of a number relatively unusual events all occurring at the same time, for instance, a high astronomical tide

## Recommendation 24 – Operational Response

- combined with an atmospheric surge with gale force onshore winds. The assessment concluded that the event had approximately a 0.5% annual probability.
- ii. Using the outputs from the multi-variate probability assessment, the consultant has been able to establish a set of 'design events' from 100% to 0.1% annual probability, which has enabled an assessment of the current standard of protection in the Garford Road area. The conclusion from this work is that flooding of property is likely to occur during events of between a 2% and 1% annual probability. When sea level predictions are applied, the likelihood of flooding increases significantly.
  - iii. The project appraisal study has considered a number of possible options to reduce flood risk to an acceptable level; these include:
    - a) Beach Recharge
    - b) An offshore breakwater
    - c) A new sea defence consisting of a higher sea wall with concrete stepped revetment
    - d) Rock armour
    - e) A sand engine

The recommended option is (b) an offshore breakwater. Not only does this provide the most economical solution, when considering the whole life costs of the option, it also reduces the likelihood of beach erosion and the consequential increased risk of breach and overtopping. The Project Appraisal Report is currently with the Welsh Government for its comment and approval.

## Recommendation 25 – Operational Response

**Rec 25: All Risk Management Authorities (RMAs) around Wales should review their local use of stop boards, stop logs, temporary barriers or moveable gates. The purpose of this review is for RMAs to satisfy themselves that existing arrangements are appropriate and robust. Consideration should be given to replacing existing arrangements with more permanent or more robust temporary solutions. This review should be ‘risk based’ and focused on the locations with highest local risk.**

**Recommendation Lead:** Welsh Local Government Association

**Project Reference:** Project 5

**Completion Date:** January 2016

### Summary of Recommendation Implementation

The initial exercise was to assess current arrangements with regards to temporary installations across all Risk Management Authorities (RMAs). This included locations of use, when are the structures installed and removed, current inspection and maintenance regimes and gathering good practice from across Wales.

A data request in the form of a brief questionnaire was sent out to Coastal RMAs to gather information relevant to Recommendation 25 (and shares links with Rec 26 & 31).

The survey was sent out to 16 RMAs and 13 responses were received. The responses indicated that:

- There is a good confidence level on the location of high flood risk areas across Wales.
- There are some inconsistencies in the way data related to temporary defences is recorded.
- There are solid and consistent inspection and maintenance regimes in place within all RMAs.

Based on the responses a report has been produced that addresses Recommendations 25 and 26 in combination. The report comprises of 2 parts:

- Review of the findings.
- Conclusion and recommendations.

Five recommendations have been put forward within the report:

1. Creation of systems to record information related to temporary and secondary defences (for those who haven't already done so).
2. Compare inspection regimes between LLFAs and NRW to avoid duplication and overlap.
3. Share relevant information between RMAs on temporary or secondary defences (locally or regionally).
4. Focus on the performance of whole defence systems instead of focussing on individual sections.
5. Welsh Government to review Schedule 1 of the Flood Water Management Act 2010 to enable RMAs to designate third party townscape or landscape assets as secondary defences.

Further information on this Recommendation can be found within the accompanying Project Report 5 – Recommendations 25 & 26.

## Recommendation 26 – Coastal Defences

**Rec 26: All Risk Management Authorities (RMAs) around Wales should review locations where they have secondary defence systems in place. The purpose of this review is for RMAs to satisfy themselves that the secondary systems will operate as designed when required. This review should be ‘risk based’ and focused on the locations with highest local risk.**

**Recommendation Lead:** Welsh Local Government Association

**Project Reference:** Project 5

**Completion Date:** January 2016

### Summary of Recommendation Implementation

The initial exercise was to assess current arrangements with regards to secondary defences across all Risk Management Authorities (RMAs). This included locations of use, when are the structures installed and removed, current inspection and maintenance regimes and gathering good practice from across Wales.

A data request in the form of a brief questionnaire was sent out to Coastal RMAs to gather information relevant to Recommendation 26 (and shares links with Rec 25 & 31).

The survey was sent out to 16 RMAs and 13 responses were received. The responses indicated that:

- There is a good confidence level on the location of high flood risk areas across Wales.
- There are some inconsistencies in the way data related to secondary defences is recorded.
- There is low confidence level in the identification of secondary flood defences.

Based on the responses a report has been produced that addresses Recommendations 25 and 26 in combination. The report comprises of 2 parts:

- Review of the findings.
- Conclusion and recommendations.

Five recommendations have been put forward within the report:

1. Creation of systems to record information related to temporary and secondary defences (for those who haven't already done so).
2. Compare inspection regimes between LLFAs and NRW to avoid duplication and overlap.
3. Share relevant information between RMAs on temporary or secondary defences (locally or regionally).
4. Focus on the performance of whole defence systems instead of focussing on individual sections.
5. Welsh Government to review Schedule 1 of the Flood Water Management Act 2010 to enable RMAs to designate third party townscape or landscape assets as secondary defences.

Further information on this Recommendation can be found within the accompanying Project Report 5 – Recommendations 25 & 26.

## Recommendation 27 – Coastal Defences

**Rec 27: There needs to be continued sustained investment to manage the national coastal risks to acceptable levels.**

**This must include flood forecasting, warning, awareness, response and recovery, as well as flood defences. Particular focus has to be on the existing defences to ensure they continue to be fit for purpose, as well as investment in new defences to reduce the flood risk for more locations.**

**Recommendation Lead:** Welsh Government – Flood and Coastal Erosion Risk Management

**Project Reference:** Outside Projects

**Completion Date:** June 2015

### Summary of Recommendation Implementation

- The flood and coastal risk management budget for 2016/17 has seen an increase thanks to additional funding from central capital.
- The focus remains on maximising the funding available to deliver the flood and coastal erosion risk management programme.
- Additional funding for 2016/17 has been secured for coastal local authorities to undertake project appraisals and detailed design work in preparation for the Coastal Risk Management Programme.
- Additional funding has been secured for NRW and local authority schemes, maintenance and emergency repairs in light of the December 2015 storms.

Flood and coastal erosion risk management (FCERM) remains a priority for this Government. All indications are that public spending constraints are likely to continue but flood budgets have been sustained and are currently complemented by an injection of funds for the Coastal Risk Management Programme.

Welsh Government will continue to maximise opportunities to sustain investment within the funding envelope available. Welsh Government FCERM team hold regular discussions with finance colleagues and have successfully bid for additional capital resulting in an increase in FCERM funding for 2016/17.

Whilst investment needs to continue to ensure existing defences continue to be fit for purpose, investment will also focus on improved flood risk mapping, forecasting and warning, community resilience and awareness, response and recovery as well as new flood and coastal risk management schemes and adaptation.

Any flood and coastal erosion risk management investment will consider all types of flooding.

Welsh Government will also consider the Recommendations from ‘the Welsh Coastal Storms, December 2013 & January 2014 – an assessment of environmental change’ report delivered under Recommendation 36.

## Recommendation 28 – Coastal Defences

**Rec 28: Review and identify options to maximise certainty in flood and coastal erosion risk management funding over a longer timeframe and to maximise flexibility in the use of this funding.**

**This would mean less focus on annual and in year budgets and more focus on delivery and budget management of 3-5 years.**

<b>Recommendation Lead:</b>	Welsh Government – Flood and Coastal Erosion Risk Management
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<b>Project Reference:</b>	Outside Projects
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<b>Completion Date:</b>	June 2015
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### Summary of Recommendation Implementation

Existing funding for flood and coastal erosion risk management considers all types of flood risk management and interventions.

The Flood and Coast Investment Programme will consider all sources of flooding. Further development of the Programme will provide a methodology for prioritisation of funding and a long term schedule of schemes for future investment. Improvements are already being made to the programme. Welsh Government are working with NRW to refine the Communities at Risk Register so that it can be shared with all RMAs and used to prioritise areas for investment.

Developing the Coastal Risk Management Programme providing a £150 million capital value programme to Local Authorities to deliver coastal risk management activities between 2018 and 2021. Welsh Government is working with local authorities supporting the development of investment cases for potential projects. Programme improvements are underway to create a longer pipeline of schemes and improve the claims and appraisal process.

## Recommendation 29 – Coastal Defences

**Rec 29: The development of the National Programme of Investment should be progressed as a matter of importance and its development should seek a wide range of ways of working and technical improvements to the flood and coastal erosion risk management investment allocation, decision making and prioritisation process.**

**Recommendation Lead:** Welsh Government – Flood and Coastal Erosion Risk Management

**Project Reference:** Outside Projects

**Completion Date:** June 2015

### Summary of Recommendation Implementation

Welsh Government held a consultation on the proposed Flood and Coast Investment Programme between December 2014 and March 2015. A summary of consultation responses received was published in June 2015.

Full details about this consultation exercise are available at:

<https://consultations.gov.wales/consultations/flood-and-coast-investment-programme-facip>

This programme will set out a prioritisation methodology to enable areas of Wales to be ranked according to risk from all sources of flooding. An index will be created for use in helping to identify schemes and prioritise funding.

The Flood and Coast Investment Programme will consider all sources of flooding. Further development of the Programme will provide a methodology for prioritisation of funding and a long term schedule of schemes for future investment. Improvements are already being made to the programme. The next step will be to work with NRW to consider how the Communities at Risk Register can be used to prioritise areas for investment and ensuring that asset/defence data is accurate and reflected in the maps.



## Recommendation 30 – Coastal Defences

**Rec 30: Review and identify options to gain additional funding to supplement core FCERM investment. This must be closely aligned with the development of the National Programme for Investment.**

**Recommendation Lead:** Welsh Government – Flood and Coastal Erosion Risk Management

**Project Reference:** Outside Projects

**Completion Date:** June 2015

### Summary of Recommendation Implementation

Ministers have announced a £150 million capital value programme of investment in flood risk infrastructure projects with construction scheduled to taking place 2018-2021. This is being taken forward as the Coastal Risk Management Programme. This will be co-financed between local authorities and Welsh Government with Welsh Government contributing 75% to construction costs. This additional funding will be achieved using borrowing powers and is additional to the core grant-funded national programme of investment.

Alignment with the development of the core national programme is achieved by shared ministerial oversight and overlapping governance structures.

An initial list of projects has been identified for further development and prioritisation through feasibility studies, project appraisals and detailed design.

Whilst the Coastal Risk Management Programme will directly benefit coastal/tidal projects it will also indirectly benefit fluvial and surface water flood risk schemes by allowing core funding to concentrate on these areas.

## Recommendation 31 – Coastal Defences

**Rec 31: Produce a complete national dataset of coastal protection and defence assets including details of areas benefitting.**

**It is essential that this dataset becomes a ‘live management tool’ and not merely a representative picture of a snapshot in time. This dataset must therefore be associated with a process for ensuring the information is maintained.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Project 6

**Completion Date:** Ongoing

### Summary of Recommendation Implementation

At an early stage, it was decided that the asset data issues highlighted in the Wales Coastal Review Delivery Plan Recommendation 31 were also applicable to fluvial watercourses. As a result, it was decided that Project 6 would address asset data across the whole of Wales and include ‘landlocked’ Risk Management Authorities (RMAs) as well as those with interests on the coast.

The first phase of addressing the issues raised in Recommendation 31 was to get a sound understanding of how asset data management is currently being carried out amongst all RMAs. A questionnaire to capture this information was created for RMAs to complete in July 2015. While the main focus was on Natural Resources Wales (NRW) and Local Authorities (LAs), organisations such as Welsh Water, Network Rail and both Trunk Road Agents for Wales were also consulted. The survey targeted key information such as:

- How many assets are maintained?
- The type of assets maintained?
- What information is stored and in what format?
- Do you have plans to upgrade your current asset database?

There was a good response to the survey with around 85% completing the survey. The main findings of the survey were:

- All stored information on assets in some format.
- Fundamental asset data is in place e.g. asset owners, asset type, location, National Grid Reference.
- Over 60% are interested in using AMX.
- Information on maintenance and inspection is patchy.
- There is little in the way of data showing the people and property benefitting from flood risk assets.

Using the information provided a number of options were put forward. It was identified that there was no perfect solution in achieving the aim of a nationally consistent asset dataset. All options had their relative merits and drawbacks.

The main areas addressed were in relation to how data would be accessed and managed in the future, along with ensuring a consistent data format. Also, the availability of resources was a major factor in identifying the most viable solution.

## Recommendation 31 – Coastal Defences

The issue of the asset database needing to be a ‘live management tool’ was also considered. Whilst it is important that asset data should be kept up-to-date and accurate, it should be remembered that there is relatively little change in the basic asset data over time. While it is important that changes are logged, the need for updates on a daily/weekly basis should not be the most influential factor in a future solution.

### Recommendations

The recommendations put forward to address Recommendation 31 are:

- The NRW AMX asset management system should be used to store flood risk asset information for all RMAs in Wales. Other RMAs to supply NRW with asset data in a suitable format for placement on the NRW AMX system.
- Where AMX is being purchased by other RMAs, the same AMX system architecture currently used in NRW, should be used. This will ensure that all asset data fields are consistent across RMAs in Wales.
- NRW Area flood risk teams to review their respective coastal asset datasets on AMX. This is to ensure that all flood risk assets have been captured and have the correct inspection frequency assigned to it.

### Conclusion

The views of senior Flood Risk Managers at NRW, WLGA and the AMX Project team have been taken into account to assess the viability of the options put forward. The general opinion is that AMX can be used to provide a consistent national asset dataset in Wales. WLGA, WG and NRW will need to collectively agree on which option is to be taken forward.

Further information on this Recommendation can be found within the accompanying Project Report 6 – Recommendations 31 & 32.

## Recommendation 32 – Coastal Defences

**Rec 32: Review and identify options to achieve a more consistent approach to the inspection of the network of coastal defence systems. This must include recommendations to improve the efficiency and effectiveness of the asset inspection process.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Project 6

**Completion Date:** November 2015

### Summary of Recommendation Implementation

As with Recommendation 31, the decision was made at an early stage to address the issue across all Risk Management Authorities (RMAs) in Wales, not only those with a coastal element. Once again, the starting point for this piece of work was to investigate what inspections regimes are currently being employed. To capture this information, an additional section was added to the asset data management questionnaire.

The asset inspection section focussed on:

- The method and tools RMAs use to inspect flood risk assets in Wales.
- The frequency of inspection and what information is collected.
- Who carries out the inspections and their qualifications.

Again, there was a good response from the RMAs with both positive and negative trends identified, the main findings were:

- Inspections are being carried out in some form e.g. during culvert grid clearance.
- The majority of assets have at least an annual inspection.
- Few RMAs have a dedicated inspection resource.
- There is little in the way of inspection of third party assets on Ordinary Watercourses.
- There is no consistency in asset condition assessment methodology.
- There is no like-for-like comparison of asset condition between RMAs.

An evaluation exercise looking at the options available in creating a consistent and risk based asset inspection process was carried out. As with the options appraisal made under Recommendation 31, each option identified has its inherent benefits and drawbacks.

### Recommendations

The following recommendations are put forward in the main report to create a consistent and effective asset inspection process in Wales:

- The current inspection methodology used in NRW should be adopted across all RMAs in assessing the condition of flood risk assets. This would include the 5 point asset condition grading system.
- T98 accreditation courses in asset inspection to be arranged to train other RMA representatives to carry out flood risk asset inspections for their respective areas.

## Recommendation 32 – Coastal Defences

- In the short term, NRW asset inspectors to carry out inspection of the key flood risk assets identified by the other RMAs. It is proposed that inspections in low flood risk areas on Main Rivers will be temporarily stopped or reduced. This will be until representatives of the other RMAs achieve the T98 accreditation in asset inspection and can carry out inspections themselves.
- A rebranded version of the EA Condition Assessment Manual (CAM) to be developed for use across all RMAs in Wales.

### Review of coastal asset data on AMX

Whilst the scope of Project 6 covers asset data management and inspection for all of Wales, coastal data stored on AMX was given specific focus. A desk-top exercise was carried out of asset data on the coast with particular interest given to the relationship between inspection frequency and ownership. The main findings of this review were:

- The majority of NRW maintained coastal assets are inspected on a 6 or 12 month frequency. However, there is evidence that Local Authority and third party assets on the coast do not get inspected at the same frequency. Some of these assets provide flood and erosion protection to key infrastructure and industry.

### Recommendations following the coastal asset data review:

- South East Area and South West Area of NRW to review their respective coastal datasets to ensure that all flood risk assets have been identified and placed on AMX.
- Blanket annual inspection for all flood risk assets on the coast - irrespective of ownership.

Further information on this Recommendation can be found within the accompanying Project Report 6 – Recommendations 31 & 32.

## Recommendation 33 – Coastal Defences

**Rec 33: Continue to develop a nationally prioritised programme of coastal modelling and mapping improvements. This must be nationally risk based and consistent.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Outside Projects

**Completion Date:** Ongoing

### Summary of Recommendation Implementation

We will aim to develop and implement a National prioritised programme or Work plan of modelling and mapping within Natural Resources Wales.

This will use the Communities at Risk Register to provide an All-Wales view of risk to develop the National Work plan.

We will aim to balance National-scale projects against local priority projects but using the register ranking to assign priority scores.

The work plan will improve our datasets to provide a more consistent description of risk at both fluvial (broad scale) and coastal level.

The method for using resources in this National format is still to be agreed, and is subject to the ongoing Business Area Review in Flood Risk Management.

We will also continue to develop our suite of online flood risk information products, which will align with the improvement of the flood risk datasets.

## Recommendation 34 – Coastal Defences

**Rec 34: Locations and communities which experienced flooding in December 2013 and early January 2014 should be subjected to a risk based assessment to determine if further risk management activity/intervention is needed and can be justified.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Outside Projects

**Completion Date:** November 2015

### Summary of Recommendation Implementation

The Wales Coastal Flooding Review Phase 1 Report identified areas around the coast that suffered impacts from the December 2013 and January 2014 storms. The Phase 2 Report defined this Recommendation, listing different locations around Wales that were flooded in these winter storms.

To complete this Recommendation Natural Resources Wales periodically sought information from Risk Management Authorities for these flooded locations regarding:

- a) Any additional works that have been implemented at this site since the winter 2013/14 storms, or,
- b) Any works that are planned to be implemented at this site in the near future.

These requests were issued in:

- October 2014.
- June 2015.
- October 2015.

Responses have been collated and summarised into the accompanying *Table 2* to show works that have been carried out at these locations between January 2014 and November 2015, together with identification of any further works planned for these locations.

**Table 2 - Overview of Flooded Locations**

This table has been drawn from Table 5 of the Wales Coastal Flooding Review: Phase 2 Report in providing an overview of locations that experienced the higher numbers of property flooding in December 2013 and January 2014, with a final column added to the right that summarises the updates received from Risk Management Authority partners. This table is not intended to be fully inclusive of all property flooding.

Community name	No properties flooded	Local Authority	Which Event	Status of works carried out
Rhyl (Splash Point)	138 homes	Denbighshire	Dec'13	Denbighshire County Council has developed a Project Appraisal Report for a future East Rhyl Coastal Defence Scheme that is being considered under Welsh Government's Coastal Risk Management Programme. See Recommendation 24 for details.
Kinmel Bay	8 homes, 1 supermarket	Conwy	Dec'13	Repair works completed and no further work planned.
East of Pwllheli	Caravan park	Gwynedd	Jan'14	Repair works completed and identified scope for possible further work.
Llanbedr	4 homes plus farms	Gwynedd	Jan'14	Repair works completed and no further work planned.
Barmouth	15 homes, 2 commercial	Gwynedd	Jan'14	Gwynedd Council is seeking to progress coastal defence schemes at both the north promenade area and Viaduct Gardens via Welsh Government's Coastal Risk Management Programme.
Borth	12 homes, 2 non-residential	Ceredigion	Jan'14	Repair/reinstatement works were undertaken at Borth, Aberystwyth, Aberaeron and Llangrannog following the storms. Ceredigion County Council is seeking to progress coastal defence schemes at Aberystwyth and Aberaeron via Welsh Government's Coastal Risk Management Programme and is looking to develop future management proposals at Borth and Llangrannog. NRW are promoting a scheme to address tidal inundation and associated flooding problems at Cardigan in conjunction with Dwr Cymru Welsh Water and Ceredigion County Council.
Aberystwyth	23 properties (typically basement flats)	Ceredigion	Jan'14	
Aberaeron	7 properties	Ceredigion	Jan'14	
Cardigan	30 properties	Ceredigion	Jan'14	
Lower Town Fishguard	13 homes, 2 non-residential	Pembrokeshire	Jan'14	Ongoing community resilience project. All planned works now complete.
Little Haven	4 homes, 3 non-residential	Pembrokeshire	Jan'14	Repair works now complete and no further work planned.
Amroth	4 homes, 1 caravan park, 1 non-residential	Pembrokeshire	Jan'14	Repair works now complete and no further work planned.
Carmarthen Bay Holiday Park near Kidwelly	70 chalets, 6 static caravans flooded.	Carmarthenshire	Jan'14	Privately owned defence. Unknown whether structural repairs were carried out at this location.

*Table 2- Overview of Flooded Locations*



## Recommendation 35 – Coastal Defences

**Rec 35: Near miss locations and locations subjected to substantial foreshore change should be identified and subjected to a risk based assessment to determine if further risk management activity/intervention is needed and can be justified.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Outside Projects

**Completion Date:** November 2015

### Summary of Recommendation Implementation

The Wales Coastal Flooding Review Phase 1 Report identified areas around the coast that suffered impacts from the December 2013 and January 2014 storms. The Phase 2 Report outlined this recommendation, listing over 30 different locations around Wales that had experienced 'near misses' in these winter storms.

To complete this Recommendation Natural Resources Wales periodically sought information from Risk Management Authorities for these 'near miss' locations regarding:

- a) Any additional works that have been implemented at this site since the winter 2013/14 storms, or,
- b) Any works that are planned to be implemented at this site in the near future.

These requests were issued in:

- October 2014.
- June 2015.
- October 2015.

Responses have been collated and summarised into the accompanying *Table 3* to show works that have been carried out at these locations between January 2014 and November 2015, together with identification of any further works planned for these locations.

This table has been drawn from Table 6 of the Wales Coastal Flooding Review: Phase 2 Report in providing an overview of 'near miss' locations that came close to more significant flooding in either December 2013 or January 2014, with a final column added to the right that summarises the updates received from Risk Management Authority partners.

Community name	County/Authority	Which event	Status work carried out
Prestatyn (Tower Gardens, Central Beach)	Denbighshire	Dec'13	Flood walls and a steel flood gate at the crest of the beach access ramp have been installed to replace stop logs at Tower Gardens, Prestatyn.
Llanfairfechan	Conwy	Dec'13	Repair works now complete and no further work planned.
Hen Wrych	Conwy	Dec'13	Repair works now complete and no further work planned.
Pensarn Shingle Bank	Conwy	Dec'13	Repair works now complete and no further work planned.
Abererch and Traeth Crugan	Gwynedd	Jan'14	Repair works now complete and no further work planned.
Borth-y-Gest	Gwynedd	Jan'14	Repair works now complete and no further work planned.
Ceredigion – various locations	Ceredigion	Jan'14	Repair/reinstatement works were undertaken at Aberaeron South and Tresaith following the storms and no further work planned.
Loughor, Burry Port, Llansteffan, Pendine and Machynys.	Carmarthenshire	Jan'14	Works have been undertaken at Burry Port. Minor repairs have been undertaken at Llansteffan and Pendine, with no further work planned. Minor repairs completed and regular inspection and monitoring undertaken at Loughor and Machynys.
Mumbles	Swansea	Jan'14	Repair works now complete and no further work planned.
Swanbridge	Vale of Glamorgan	Jan'14	Repair works now complete and no further work planned.
Sandy Bay, Porthcawl	Bridgend	Jan'14	Repair works now complete and no further work planned.
Shaftesbury and Crindau	Newport	Jan'14	Repair works now complete and no further work planned.
Northern and Hawarden Embankments along Dee from Connah's Quay to Chester	NRW	Dec'13	Repair works now complete and no further work planned.
Abererch	NRW	Jan'14	Repair works now complete and no further work planned.
Newton (near Porthcawl)	NRW	Jan'14	Repair and improvement works completed, with no further work planned.
Caerleon	NRW	Jan'14	Works are currently ongoing by NRW to raise the standard of protection around the Isca Road area of Caerleon.

Table 3 - Overview of 'near miss' locations

## Recommendation 36 – Coastal Defences

**Rec 36: Complete the ongoing update to the Phase 1 ‘rapid’ assessment of environmental changes experienced during the December 2013 and January 2014 storms.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Outside Projects

**Completion Date:** December 2014

### Summary of Recommendation Implementation

In December 2013 and January 2014, significant storm surges and relatively powerful waves, in combination with high tides, caused considerable disruption along the Welsh coast.

Following the storms, we carried out an environmental audit of the storms' impact on wildlife and coastal conservation sites.

This report identifies a number of areas of further work, through the creation of fifteen recommendations.

Recommendation 36 has been completed via publication of Duigan C, Rimington N & Howe M (Eds) 2014. *Welsh Coastal Storms, December 2013 & January 2014 – an assessment of environmental change*, NRW Evidence Report 33.

The report can be found at:

<http://naturalresources.wales/media/1069/welsh-coastal-storms-december-2013-and-january-2014-an-assessment-of-environmental-change.pdf>

## Recommendation 37 – Coastal Defences

**Rec 37: Carry out a national skills and capacity audit for all Risk Management Authorities to assess and quantify the scale of the issue – to assess the size of the skills and capacity gap.**

**Produce an options document for how the skills and capacity gap could be addressed to meet present day flood risk management needs and future challenges.**

**Recommendation Lead:** Welsh Local Government Association

**Project Reference:** Project 7a

**Completion Date:** December 2015

### Summary of Recommendation Implementation

An online survey was the preferred option to collate the information required to produce rec 37 report. It was sent out to all 22 Lead Local Flood Authority (LLFAs) and Natural Resources Wales (NRW) on June 10<sup>th</sup> 2015 with a 4 week window to complete and return.

The survey was completed by 45 respondents: 44 Flood Risk Management (FRM) practitioners from 22 LLFAs and 1 from NRW covering their full Flood Coastal Erosion Management (FCERM) function. The survey didn't include Operations and Emergency Planning but mostly focussed on those delivering FCERM duties under the Flood & Water Management Act.

A findings report was consequently produced and presented to Welsh Government (via email) on January 27<sup>th</sup> 2016 following a review and approval from The Coastal Delivery Board. The report includes 6 short-term recommendations and 2 long-term. RMAs, WG and the WLGA have been highlighted as the key players to take forward these recommendations.

### Conclusion

It is apparent that only providing training to practitioners to '*fill in the knowledge gap*' is not going to reverse the current trend but merely turn practitioners into knowledgeable clients although this approach is necessary to enable practitioners to challenge contractors' proposal and ensure best use of public monies.

Flood risk management is a long-term issue currently being tackled with a short-term solution. To ensure long-term planning, succession and resilience Risk Management Authorities and Welsh Government need to look at a more sustainable approach to flood risk management.

### Next steps

- One of the recommendation highlighted in the report: Providing an initial round of coastal training to LLFAs and NRW has already been completed.
- The WLGA has engaged with Institute of Civil Engineers (ICE) and Chartered Institution of Water and Environmental Management (CIWEM) to look at developing long-term and up to date training and to give LLFAs officers the opportunity to gain membership with these organisations and continuous support and training through reviews.
- We will be starting in the 3rd quarter of 2016 an awareness raising campaign with Head of Service and Directors on the importance of succession planning.
- We have been in discussion with NRW to develop a Project Management Toolkit more specific to FCERM or Highways type scheme.
- The remaining of our recommendations will be embedded in the WLGA Flood & Water Work Programme which is currently funded until March 2018.

Further information on this Recommendation can be found within the accompanying Project Report 7a – Recommendations 37.

## Recommendation 38 – Coastal Defences

**Rec 38: Clarify roles and responsibilities amongst risk management authorities at both the local and national level as required.**

**Develop consistent and common communication messages and tools to convey roles and responsibilities to communities.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Project 7b

**Completion Date:** March 2016

### Summary of Recommendation Implementation

This Recommendation was one of the top six priority themes from the Phase 2 Review and arises from the Coastal Review identifying that the national network of coastal defences and the flood risk management service as a whole in Wales is complex and multi-faceted. In some locations and aspects of work this has contributed to a lack of clarity about roles and responsibilities within risk management authorities. This lack of clarity can in part contribute to community confusion and frustration. Improved clarity of roles and responsibilities will also improve the efficient and effective delivery of flood and coastal risk management outcomes.

Practical delivery of this Recommendation has focused on coastal rather than all flood risk sources and on routine asset management considerations rather than those related to operational incident response as covered under Project 4 - Recommendation 20.

Consultation to inform delivery of this Recommendation has occurred through a workshop with Risk Management Authority partners in March 2015, a questionnaire exercise from July to September 2015 and ad-hoc feedback gathered from routine meetings of Regional Flood Risk Management Groups and Coastal Groups in Wales.

The overall view from consultation was that a clarification of roles and responsibilities at the coast would be helpful but that the extent of current issues and queries amongst Risk Management Authorities did not appear to merit any formal change to the existing arrangements. Consultees demonstrated a good level of understanding of existing legislation and Welsh Government's National FCERM Strategy. Collectively, the three main concerns noted in the consultation were:

- Resource limitations impacting upon effective delivery of roles and responsibilities;
- The need to mitigate organisational risk when conducting routine operations at the coast, and;
- How to optimise collaborative working at the local level.

The following two future Recommendations are generated in this report:

Recommendation 1: A national coastal overview map for Wales should be produced which can be used as a management tool by all Risk Management Authorities and to inform the public and other organisations.

Recommendation 2: NRW develop and maintain a national register of third party owned coastal flood and erosion assets.

Further information on this Recommendation can be found within the accompanying Project Report 7b – Recommendations 38.

## Recommendation 39 – Coastal Defences

**Rec 39: Undertake a review of Welsh Coastal Groups and the Wales Coastal Group Forum. This review should include, as appropriate, links and relationships with other similar groups who have a role in the management of flood and coastal erosion risks.**

**This review should identify improvement options to maximise efficient and effective delivery of flood and coastal risk management.**

**Recommendation Lead:** Welsh Government

**Project Reference:** Outside Projects

**Completion Date:** July 2016

### Summary of Recommendation Implementation

Project 8 is fully implemented through Recommendation 39. This recommendation charges the Welsh Government to:

*Undertake a review of Welsh Coastal Groups and the Wales Coastal Group Forum. This review should include, as appropriate, links and relationships with other similar groups who have a role in the management of flood and coastal erosion risks.*

*This review should identify improvement options to maximise efficient and effective delivery of flood and coastal risk management.*

The review was undertaken through 3 stages:

Stage 1: A questionnaire was sent to the 15 Welsh Maritime Local Authorities (MLAs), Natural Resources Wales (NRW) and the Welsh Local Government Association (WLGA) during June 2015 with responses received by July 2015. As part of this exercise, a request for the Terms of Reference (ToR) of each Coastal Group was also sent during July 2015.

Stage 2: Informal interviews with individuals from selected organisations including NRW and WLGA.

Stage 3: Desk based analysis of the summary of questionnaire responses, ToRs and a wider desk based literature review of the governance around coastal flood risk management in Wales was undertaken through the Winter 2015 & Spring 2016.

The following actions were proposed:

Action 1: Coastal Groups and Forum to form part of the wider governance structure around the planned Flood and Coastal Erosion Committee. This would involve a two way process, with the Coastal Groups providing information and advice, while taking account of the strategic priorities of the Committee.

Action 2: Coastal Groups seek to contribute towards the following national strategic aims:

- a) Contributing along with Local Authorities, Welsh Government and NRW towards the development of a toolkit for coastal adaption of communities for SMP implementation;
- b) Working with a re-established Wales Coastal Monitoring Centre (WCMC) to enable the collation and standardisation of Welsh coastal monitoring data.

Action 3: Coastal Forum to standardise the Terms of Reference of the Coastal Groups, including encouraging consistency in the calculation of subscription rate and membership organisations.

Further information on this Recommendation can be found within the accompanying Project Report 8 – Recommendations 39.

## Recommendation 40 – Coastal Defences

**Rec 40: The Wales Coastal Monitoring Centre submitted a business case for the future of the centre to Welsh Government in December 2013. This business case should be determined by Welsh Government.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Outside Projects

**Completion Date:** Winter 2015

### Summary of Recommendation Implementation

The business case was assessed by the Welsh Government during 2015 with the result that the need for a Wales Coastal Monitoring Centre was accepted.

The financial and operational implications of the business case were however deemed to be unsustainable given the uncertainty on the flood programme budget during Autumn/Winter of 2015.

Welsh Government is working with local authorities, the Welsh Local Government and NRW to establish a sustainable operating model that meets user requirements. It is intended to complete this within financial year of 2016-17.

## Recommendation 41 – Coastal Defences

**Rec 41: Welsh Government should endorse the strategic framework established by the Shoreline Management Plans (SMP2). This should be accompanied by more national and local support to communities and community involvement in the development of local adaptation options and plans.**

**Develop a ‘local adaptation toolkit’ to better support communities. This may include technical guidance, templates, and engagement and communication tools and policy positions.**

**Local discussions in all coastal communities need to begin now, involving professional partners and the community. These discussions should consider communities on a risk basis. These discussions need to explore and develop local plans to adapt and increase resilience over time.**

**Support and draw upon the experience of the Fairbourne multi-agency group to help inform adaptation and community resilience discussions at other locations.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Project 9

**Completion Date:** Ongoing

### Summary of Recommendation Implementation

The Minister for Natural Resources signed-off each of the four second edition Shoreline Management Plans (SMP2) for Wales between October and December 2014. Welsh Government has confirmed this documentation equates to approval of both the IROPI (imperative reasons of overriding public interest) test and the coastal management policies contained within the SMP2s.

Delivery and communication of SMP2s needs to be done at a local level, understanding local issues and needs and involving local communities. Welsh Government can provide strategic direction and support, however decision making, planning and adaptation needs to be delivered locally.

In spring 2014, Gwynedd Council initiated the Fairbourne: Moving Forward project (<http://fairbourne.info/>) with the project’s vision being ‘to ensure that the community of Fairbourne get the help they need in relation to matters affected by the SMP2’ and the project’s mission being to ‘work on a multi-agency basis, facilitating access to the necessary information and resource required to guide and support the community of Fairbourne, over the next 40 years’. Phase 1 of the project aimed to address immediate problems including communication, emergency response and planning procedures, the impact of the information provided by the SMP2 and co-ordinating the short term response to the storms that occurred during the early part of 2014. Fairbourne: Moving Forward produced their first Annual Report in May 2015, reflecting on progress made. Structure to the project has evolved over time, with five task and finish groups that achieved their initial objectives having merged into one working group that meets monthly and reports quarterly to a multi-agency Project Board. The project has submitted bids to Welsh Government for funding of work streams including the scoping of a ‘buy to let’ scheme, investigating ‘the effect the SMP2 has and will have on the people an community of Fairbourne, ‘building community resilience and self-sufficiency’ and routine project management. The current Phase 2 of the project aims to focus



## Recommendation 41 – Coastal Defences

on further understanding risk to the community through development of a draft Masterplan in 2016/17 to support implementation of change in the medium term.

In autumn 2015, Welsh Government appointed JBA Consulting Ltd and Icarus on a research contract through to the end of 2017 to support learning from the experience of the SMP2 at Fairbourne. The first, reflective stage of the research aims to get a good independent understanding of the impact on the community of the SMP2 and the subsequent process of engagement and consultation, appraising what went well and what could be improved. In the second stage, the researchers will form a 'critical friend' to the Fairbourne: Moving Forward project and the Fairbourne Facing Change Community Action Group, via attending key meetings, talking to everyone involved and feeding back learning and recommendations from observations in Fairbourne and elsewhere on a regular basis. It is hoped the research findings will not only support the community engagement process in Fairbourne, but also help other coastal communities at risk across Wales and beyond.

In November 2015 the National Trust published their 'Shifting Shores - playing our part at the coast' (<https://www.nationaltrust.org.uk/documents/shifting-shores-report-2015.pdf>) capturing collectively the progress made against goals set out in its 2005 'Shifting Shores' report. The wider challenges posed within the report for Wales focused upon a) long-term planning (to review the Coastal Groups (see Recommendation 39); to re-establish a coastal monitoring facility (see Recommendation 40); to develop a coastal adaptation toolkit to support local change (as per this Recommendation 41), and; to turn policy into action and establish a target against which progress in moving the coastal adaptation agenda forward can be assessed) and b) Government co-ordination and innovation (including to review Technical Advice Notes (TAN) 14 and 15 (see Recommendation 42); to make SMP2 implementation a requirement within the development of local plans; to develop a national policy to support adaptive coastal change management, and; to implement Welsh Government's Coastal Risk Management Programme (see Recommendation 28 and 30). An associated 'Shifting Shores' seminar was held in Swansea on 26th November 2015. An important seminar outcome was the need for early, transparent community engagement, especially involving the process of building of trust between the statutory bodies, other stakeholders and residents. The National Trust's coastal adaptation sites have great potential to demonstrate managed realignment in the future, which in turn could inspire other similar projects. Consequently, the National Trust is promoting the concept of coastal adaptation strategies for their most at risk sites, with projects being currently initiated for Cemlyn on Anglesey and at Aberdaron, Porthdinllaen and Llandanwg in Gwynedd, in collaboration with the relevant Local Authorities and NRW.

It is hoped that findings from the above initiatives over the coming years will feed into 1) any future change to coastal planning policy by Welsh Government, and 2) future development of a 'local adaptation toolkit' to better support communities and the practical delivery of coastal adaptation on the ground. This should be prepared and led by the Coastal Groups, with support from Natural Resources Wales, the Welsh Local Government Association and Welsh Government. For this reason, Recommendation 41 remains ongoing.

**Rec 42: Review and evaluate existing barriers and gaps to supporting coastal adaptation and make recommendations for improvement.**

**Review, where necessary, existing climate change guidance to ensure the most appropriate approach is being used by all parties involved in all aspects of flood and coastal erosion risk management (i.e. all Government departments, RMAs infrastructure and utility operators).**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Project 9

**Completion Date:** March 2016

### Summary of Recommendation Implementation

This Recommendation has been addressed in two parts, as described below:

*i) Reflection on relevant external publications.*

May 2015 saw publication of Fairbourne: Moving Forward's '*first Annual Report*', which noted a key barrier to effective planning as the uncertainty associated with SMP2 timescales. This uncertainty is recognised as a core concern to residents, affecting the way in which they can plan for and invest in their future, and has negative impacts upon: people (loss of asset value, reduced mobility and reliance on health and basic services); community coherence (a lack of clarity on actions needed brings apathy, and reduced confidence in the community); investment (negative perception and decreasing business opportunities detract from investment and economic prosperity); planning (in the absence of a clear adaptation management plan, planning constraints would apply in a manner potentially not reflecting the specific time limited needs of the community), and; risk management (without a future plan there is a real risk that investment in defences is reduced and that improvements are made in a piecemeal, reactive manner, bringing higher risk, earlier damages or inappropriate over investment giving asset redundancy). A further barrier is the challenge of 'eventuality planning' i.e. the inevitable lack of understanding of what the future will look like in reality and how best to prepare for that scenario. This barrier that will be tackled through development of a draft masterplan for Fairbourne in 2016/17.

In November 2015, the National Trust published '*Shifting Shores – playing our part at the coast*' (<https://www.nationaltrust.org.uk/documents/shifting-shores-report-2015.pdf>) capturing its own performance against goals set out in its 2005 '*Shifting Shores*' report, as well as overall progress by Government and RMAs in managing and adapting to coastal change. An associated seminar was held in Swansea on 26<sup>th</sup> November 2015. Outputs identified a key barrier to coastal adaptation as being the understandable reluctance of local authorities and/or landowners to embark on community engagement relating to potentially controversial issues, in view of the recognition that any future loss of funding on community engagement projects would cause a serious setback in relations and cooperation. A further barrier was funding, where the long-term financial implications of SMP2s policies should be flagged as part of long-term budget needs, especially where relating to managed realignment causing impact on communities.

The England & Wales FCERM R&D programme published '*Adapting to Coastal Erosion: Evaluation of rollback and leaseback schemes in Coastal Change Pathfinder projects*': (<http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=19218&FromSearch=Y&Publisher=1&SearchText=FD2679&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description>) in December 2015. This research looked at key mechanisms

## Recommendation 42 – Coastal Defences

explored by local authorities in five of the English coastal change adaptation pathfinders relating to 'rollback' (the relocation/replacement of at risk property and infrastructure to areas inland away from the eroding coastline). Barriers to undertaking rollback varied, with the most common being problems associated with 1) selecting land for rollback, 2) a lack of community awareness or understanding of erosion and the rollback process and 3) funding constraints e.g. the ability for property owners to afford to buy land and rebuild. The research identified three planning policies with the potential to enable rollback, being: allow for conversion of at risk buildings to temporary, alternative use e.g. holiday lets; make rollback development an exception to avoid excessive development; and enable development with clear policies and legal obligations to avoid misuse.

A common theme from the above research, and therefore a recommendation for future improvement, is for informed RMAs to increase their effective communication and engagement with coastal communities at risk, the media, planners, estate agents and mortgage providers on the challenge and opportunities for coastal adaptation.

### *ii) Discussion with Welsh Government (WG).*

NRW are working closely with WG to review the climate change guidance used for FCERM and development planning purposes. In line with planning policy, new development decisions should take into account the potential effects of climate change over the lifetime of a development, including a flood event which has a 0.1% annual probability of occurrence. This planning policy requirement was clarified in a Chief Planning Officers letter in January 2014. The letter acted as a catalyst for NRW and WG to further discuss the implications climate change may have on future development, particularly at the coast. There is also a requirement on RMAs to factor in the predicted effects of climate change on future sea and river levels in FCERM scheme design.

Although current planning policy advises that the climate change allowances provided in the latest project appraisal guidance should be used, there is currently no aligned set of climate change guidance for FCERM and development planning. This is a priority issue to be addressed.

NRW and WG are now working together on a task that will provide clarity to Local Planning Authorities on the climate change allowances that should be using for planning purposes. These will be informed by the latest available information on climate change projections and will align with allowances used in England and Scotland, as well as those used by RMAs in Wales for FCERM projects. Guidance will be developed and issued with an accompanying Chief Planning Officers letter confirming which set of figures should be used. It is anticipated that this will be issued in September 2016, with adoption of the revised allowances taking full effect by 1<sup>st</sup> October 2016. The guidance will be reviewed when more up-to-date climate change research is available.

WG have also confirmed the intention to undertake a factual update of Planning Policy Wales Technical Advice Note 15 (TAN15): Development and Flood Risk (July 2004). The update will not be an amendment to planning policy, but intends to bring the document up to date with current thinking and provide clarity on certain aspects that are open to interpretation. This task should help deliver a consistent and appropriate approach to decision making for future development, helping to reduce long term flood risk to people and communities. NRW has been invited to contribute to this work, which is scheduled for completion in 2017.

Through delivery of these two tasks, much of Recommendation 42 will have been carried out.

## Recommendation 43 – Infrastructure Resilience

**Rec 43: Review and make recommendations for how Risk Management Authorities and infrastructure and utility operators can work together operationally more efficiently and effectively. This should consider a range of working agreements to ensure clarity of roles and responsibilities between professional partners and for communities.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Project 10

**Completion Date:** November 2015

### Summary of Recommendation Implementation

Natural Resources Wales created a questionnaire which was sent out to 15 Coastal Risk Management Authorities (RMAs), Local Resilience Forums (LRFs), the Wales Utility Group (WUG), Network Rail (NR) and the Trunk Road Agencies within Wales.

This consultation process was to help identify:

- Current levels of awareness and involvement from infrastructure operators and managers;
- Concerns or barriers that restrict the involvement of other organisations;
- Suggestions on how improved involvement can be achieved and implemented.

A total of 26 consultation responses were received. The key points raised were that:

- There needs to be greater clarity on roles and responsibilities in the flood incident management processes.
- There needs to be better working relationships between RMAs and Infrastructure providers and utility operators.
- There should be an annual commitment to developing and undertaking flooding exercises.

Summary:

The consultees for how RMAs, infrastructure providers and utilities operators can work together more efficiently and effectively provided a variety of recommendations. The recurring themes were clarity on roles and responsibilities, working agreements between organisations, a mechanism to store and share information and annual exercises or training undertaken jointly.

After considering the information gathered, the following solution has been proposed in addition to the solution proposed for Recommendation 18:

A structured programme of incident response exercises is developed by the Wales Learning and Development Group to test strategies and develop greater links.

Further information on this Recommendation can be found within the accompanying Project 10 Report – Recommendations 18, 43, 44, 45, 46 & 47.

## Recommendation 44 – Infrastructure Resilience

**Rec 44: Review and make recommendations if more needs to be done to enable infrastructure and utility operators to effectively work together and interact on issues of mutual interest. This may include a review of the role and remit of the Wales Utility Group and other options.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Project 10

**Completion Date:** November 2015

### Summary of Recommendation Implementation

Natural Resources Wales created a questionnaire which was sent out to 15 Coastal Risk Management Authorities (RMAs), Local Resilience Forums (LRFs), the Wales Utility Group (WUG), Network Rail (NR) and the Trunk Road Agencies within Wales.

This consultation process was to help identify:

- Current levels of awareness and involvement from infrastructure operators and managers;
- Concerns or barriers that restrict the involvement of other organisations;
- Suggestions on how improved involvement can be achieved and implemented.

A total of 26 consultation responses were received. The key points raised were that:

- There is a need for clarity on the role and remit of WUG.
- There needs to be a reinvigoration of the group to include the transport sector and RMAs.
- RMAs reported limited awareness and interaction with WUG.
- WUG can be a good forum if the right members are together.

After considering the information gathered, the following solution has been proposed:

The Wales Utilities Group is reinvigorated as the Wales Infrastructure Group (WIG) with Network Rail and the Trunk Road Agents invited to attend as new members. A representative for Flood and Coastal Risk Management Authorities is also invited to attend on behalf of all 22 Lead Local Flood Authorities across Wales. The broader membership will help establish better understanding between organisations and better working relationships. The reinvigoration needs to be supported by a new chair elected within the group with Welsh Government taking on a supportive role by providing administrative and secretariat support to the group.

Further information on this Recommendation can be found within the accompanying Project Report 10 - Recommendations 18, 43, 44, 45, 46 & 47.

## Recommendation 45 – Infrastructure Resilience

**Rec 45: Encourage and support the development of programmes of works to increase resilience of infrastructure and utility assets. These must be aligned with local community adaptation planning.**

**Review where appropriate if there are regulatory barriers to obstruct this process of adaptation and identify regulatory improvements, which could help adaptation.**

**Recommendation Lead:** Natural Resources Wales

**Project Reference:** Project 10

**Completion Date:** November 2015

### Summary of Recommendation Implementation

Natural Resources Wales created a questionnaire which was sent to the Wales Utility Group (WUG), Network Rail (NR) and the Trunk Road Agencies within Wales.

This consultation process was to help identify:

- Current programmes of work to increase resilience;
- Regulatory barriers that obstruct the process of adaptation;
- Suggestions of how improved involvement can be achieved and implemented.

The key findings were that:

- Most infrastructure operators and utility providers have work programmes to increase resilience.
- There were no barriers identified that could obstruct the process.

Summary:

Most infrastructure providers and utility operators in Wales have work programmes to some extent to help increase resilience to all sources of flooding. Opportunities could be gained through joint forward planning between organisations.

Further information on this Recommendation can be found within the accompanying Project Report 10 - Recommendations 18, 43, 44, 45, 46 & 47.

## Recommendation 46 – Infrastructure Resilience

**Rec 46: Review and evaluate at the national Wales level, the impacts of climate change scenarios on Network Rail infrastructure and highways infrastructure around the Welsh coastline and the long-term adaptation options.**

Recommendation Lead: Natural Resources Wales

Project Reference: Project 10

Completion Date: November 2015

### Summary of Recommendation Implementation

Natural Resources Wales created a questionnaire which was sent to Network Rail and the Trunk Road Agencies within Wales for completion. Separate meetings were held with both parties. This consultation process was to help identify:

- Current awareness and planning by each organisation for climate change;
- Concerns or barriers that restrict long term adaptation planning, and;
- Suggestions for how greater infrastructure resilience can be encouraged and delivered.

Both Network Rail and the Trunk Road Agencies are reviewing the impact of climate change scenarios on their infrastructure around the Welsh coastline. Both are also considering long-term adaptation options to protect their networks in the future. Both organisations acknowledge that financial pressures can restrict the present level of work and planning for climate change.

Further information on this Recommendation can be found within the accompanying Project Report 10 - Recommendations 18, 43, 44, 45, 46 & 47.

## Recommendation 47 – Infrastructure Resilience

**Rec 47: Undertake a periodic national assessment of infrastructure and utility resilience across Wales, in order to provide assurance of a national progress towards increased resilience to coastal flooding and erosion risks.**

Recommendation Lead: Natural Resources Wales

Project Reference: Project 10

Completion Date: November 2015

### Summary of Recommendation Implementation

Natural Resources Wales undertook an online assessment study of infrastructure operators and utilities providers to assess what they are currently doing to address resilience and climate change. This information was collated into a table which captures whether operators and providers have produced and promoted their own resilience and climate change programmes for the short and long term.

The study indicated that many operators and providers have plans in place to increase resilience to coastal flooding and erosion risks.

After considering the information gathered, the following solutions have been proposed: In order to demonstrate progress towards increased resilience, this assessment should be undertaken annually with involvement from organisations to provide assurance of progress.

The newly revised Wales Infrastructure Group (see summary sheet R44) will take on the responsibility of undertaking an annual National assessment of infrastructure and utility resilience to flood and coastal erosion risks to demonstrate progress towards a more resilient Wales. This should be reported to the Welsh Government Resilience department annually as evidence.

Further information on this Recommendation can be found within the accompanying Project 10 Report – Recommendations 18, 43, 44, 45, 46 & 47.



## Outputs from all Phase 2 Recommendations

Through implementation of the Delivery Plan in 2015/16, some Recommendations have been entirely completed through closure of an action (e.g. Recommendations 1 and 2 were completed through publication of the Delivery Plan) where no further work is necessary. Some Recommendations however are deemed complete through the creation of an output that presents a preferred option or proposal(s) for future consideration. Progression of the 7 ongoing Recommendations may also have identified proposals for future consideration to date despite only being currently incomplete.

Table 4 below captures the proposals for future consideration that have been generated during 2015/16 from the above scenarios:

Delivery Plan Rec. No	Proposal for future consideration
Rec. 7	<ul style="list-style-type: none"> <li>Stage 1 - Short Term Response: Provide generic information on a more local level to partners via email.</li> <li>Stage 2 - Long Term Response: Provide more detailed forecast information to partners.</li> </ul>
Rec. 13	<ul style="list-style-type: none"> <li>Better education about risks. This needs to be led on a National Level by NRW, supported by a range of others, specifically the 4 newly formed LRF Community Resilience groups and locally by a wide range of interest groups and individuals.</li> </ul>
Rec. 14	<ul style="list-style-type: none"> <li>Improved Inter-Agency Working, which needs to be supported by Better Engagement at local level.</li> </ul>
Rec. 15	<ul style="list-style-type: none"> <li>Establish an online 'micro site' for Wales that all organisations can signpost public to for consistent advice and information that covers before during and after a flood cycle. This should be led by the All Wales Community Resilience Group (Welsh Government).</li> </ul>
Rec. 16	<ul style="list-style-type: none"> <li>Develop broader resilience plans that incorporate flooding (see Recommendation 14).</li> <li>Share emergency plans with relevant agencies and increase communication links with the public and partners on a more local level. (See Recommendation 14).</li> </ul>
Rec. 17	<ul style="list-style-type: none"> <li>Consider and disseminate learning from Flood Awareness Wales' Independent Review commissioned by NRW which looks at flood plans and volunteers.</li> <li>Hold Flood Plan Volunteer Network events.</li> <li>Develop Volunteer Health and Safety Checklists.</li> </ul>
Rec. 18	<ul style="list-style-type: none"> <li>Resilience Direct is explored as an option for all parties to share and store information at the 'official sensitive' level.</li> </ul>
Rec. 21,22 & 23	<ul style="list-style-type: none"> <li>There are 10 recommendations within the Megacyma Exercise's de-brief report which will be ongoing and monitored by the Wales Flood Group.</li> </ul>
Rec. 24	<ul style="list-style-type: none"> <li>Welsh Government to determine the PAR for the future of East Rhyl Coast Protection Scheme.</li> </ul>

Rec 25 & 26	<ul style="list-style-type: none"> <li>• Creation of systems to record information related to temporary and secondary defences (for those who haven't already done so).</li> <li>• Compare inspection regimes between LLFAs and NRW to avoid duplication and overlap.</li> <li>• Share relevant information between RMAs on temporary or secondary defences (locally or regionally).</li> <li>• Focus on the performance of whole defence systems instead of focussing on individual sections.</li> <li>• Welsh Government to review Schedule 1 of the Flood Water Management Act 2010 to enable RMAs to designate third party townscape or landscape assets as secondary defences.</li> </ul>
Rec. 31	<ul style="list-style-type: none"> <li>• The NRW AMX asset management system should be used to store flood risk asset information for all RMAs in Wales. Other RMAs to supply NRW with asset data in a suitable format for placement on the NRW AMX system.</li> <li>• Where AMX is being purchased by other RMAs, the same AMX system architecture currently used in NRW, should be used. This will ensure that all asset data fields are consistent across RMAs in Wales.</li> <li>• NRW Area flood risk teams to review their respective coastal asset datasets on AMX. This is to ensure that all flood risk assets have been captured and have the correct inspection frequency assigned to it.</li> </ul>
Rec. 32	<ul style="list-style-type: none"> <li>• The current inspection methodology used in NRW should be adopted across all RMAs in assessing the condition of flood risk assets. This would include the 5 point asset condition grading system.</li> <li>• T98 accreditation courses in asset inspection to be arranged to train other RMA representatives to carry out flood risk asset inspections for their respective areas.</li> <li>• In the short term, NRW asset inspectors to carry out inspection of the key flood risk assets identified by the other RMAs. It is proposed that inspections in low flood risk areas on Main Rivers will be temporarily stopped or reduced. This will be until representatives of the other RMAs achieve the T98 accreditation in asset inspection and can carry out inspections themselves.</li> <li>• A rebranded version of the EA Condition Assessment Manual (CAM) to be developed for use across all RMAs in Wales.</li> </ul>
Rec. 37	<ul style="list-style-type: none"> <li>• The WLGA has engaged with Institution of Civil Engineers (ICE) and Chartered Institution of Water and Environmental Management (CIWEM) to look at developing long-term and up to date training and to give LLFAs officers the opportunity to gain membership with these organisations and continuous support and training through reviews.</li> <li>• We will be starting in the 3rd quarter of 2016 an awareness raising campaign with Head of Service and Directors on the importance of succession planning.</li> <li>• We have been in discussion with NRW to develop a Project Management Toolkit more specific to FCERM or Highways type scheme.</li> <li>• The remaining of our recommendations will be embedded in the WLGA Flood &amp; Water Work Programme which is currently funded until March 2018.</li> </ul>

Rec. 38	<ul style="list-style-type: none"> <li>• A national coastal overview map for Wales should be produced which can be used as a management tool by all Risk Management Authorities and to inform the public and other organisations.</li> <li>• NRW to develop and maintain a national register of third party owned coastal flood and erosion assets.</li> </ul>
Rec. 39	<ul style="list-style-type: none"> <li>• Coastal Groups and Forum to form part of the wider governance structure around the planned Flood and Coastal Erosion Committee. This would involve the Coastal Groups taking a strategic lead from the Committee and the Minister, while providing information and advice to the Committee via the Coastal Forum.</li> <li>• Coastal Groups seek to contribute towards the following national strategic aims: <ul style="list-style-type: none"> <li>– Contributing along with Local Authorities, Welsh Government and NRW towards the development of a toolkit for coastal adaption of communities for SMP implementation;</li> <li>– Working with a re-established Wales Coastal Monitoring Centre (WCMC) to enable the collation and standardisation of Welsh coastal monitoring data.</li> </ul> </li> <li>• Coastal Forum to standardise the Terms of Reference of the Coastal Groups, including encouraging consistency in the calculation of subscription rate and membership organisations.</li> </ul>
Rec. 40	<ul style="list-style-type: none"> <li>• Welsh Government to commence procurement process for Wales Coastal Monitoring Centre.</li> </ul>
Rec. 41	<ul style="list-style-type: none"> <li>• To ensure recent and ongoing research will feed into any future change to coastal planning policy by Welsh Government, and future development of a 'local adaptation toolkit' to better support communities and the practical delivery of coastal adaptation on the ground. This should be prepared and led by the Coastal Groups, with support from Natural Resources Wales, the Welsh Local Government Association and Welsh Government.</li> </ul>
Rec. 42	<ul style="list-style-type: none"> <li>• Risk Management Authorities to increase their effective communication and engagement with coastal communities at risk, the media, planners, estate agents and mortgage providers on the challenge and opportunities for coastal adaptation.</li> <li>• Welsh Government to develop guidance and issue it to Local Planning Authorities with an accompanying Chief Planning Officers letter confirming which climate change figures should be used by autumn 2016.</li> <li>• Welsh Government to undertake a factual update of Planning Policy Wales Technical Advice Note 15 (TAN15): Development and Flood Risk (July 2004) by end of 2016.</li> </ul>
Rec. 43	<ul style="list-style-type: none"> <li>• A structured programme of incident response exercises is developed by the Wales Learning and Development Group to test strategies and develop greater links.</li> </ul>
Rec. 44	<ul style="list-style-type: none"> <li>• The Wales Utilities Group is reinvigorated as the Wales Infrastructure Group (WIG) with Network Rail and the Trunk Road Agents invited to attend as new members.</li> <li>• A representative for Flood and Coastal Risk Management Authorities is also invited to attend on behalf of all 22 Lead Local Flood Authorities across Wales.</li> </ul>

<p>Rec. 47</p>	<ul style="list-style-type: none"> <li>• The newly revised Wales Infrastructure Group (see above and summary sheet R44) will take on the responsibility of undertaking an annual National assessment of infrastructure and utility resilience to flood and coastal erosion risks to demonstrate progress towards a more resilient Wales. This should be reported to the Welsh Government Resilience department annually as evidence.</li> </ul>
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*Table 4 - Outputs from all Phase 2 Recommendations*

## Next Steps for the Wales Coastal Flooding Review

There is value in quoting from the Delivery Plan as a reminder of the aspirations behind the Wales Coastal Flooding Review initiative:

*'The current flood risk management service in Wales is multi-faceted and in parts complex. Although collectively the Risk Management Authorities (RMAs) performed well during the winter storms of 2013/14, there are challenges and opportunities across all aspects of the service and a collective response, sustained over time, is required to enable Wales to become more resilient to coastal flooding. There is no simple or quick fix solution. These challenges and opportunities are reflected by the scope and scale of the 47 Phase 2 Recommendations.'*

*The Recommendations are a positive reflection of the ambition and aspiration of Welsh Government and the coastal risk management partners in Wales. They set out a shared framework of practical activities, which over time will deliver increased resilience to communities at risk from coastal flooding and/or coastal erosion in Wales.'*

The Wales Coastal Flooding Review initiative has achieved considerable success in promoting collaborative working between RMAs in Wales. Realisation of the full benefits of the 40 completed Recommendations during 2016/17 and beyond will require sustained commitment from RMAs and a focus on continuous improvement opportunities to aim for the intended outcomes to be fully achieved (i.e. through due consideration of the proposals in Table 4 above).

A monitoring and review action should be established for 2016/17 to safeguard momentum of the 7 ongoing Recommendations. The following routes are suggested to further progress these ongoing Recommendations to completion:

- Recommendations 5 (review guidance design of coastal standards and joint probability), 6 (improvements to longer range forecasts), 8 (improvements to the accuracy of the coastal forecasting service) and 33 (developments in the national coastal modelling and mapping programme) are to be taken forward internally by Natural Resources Wales through integration alongside business as usual activities.
- Recommendation 19 (continue to develop potential 'impact scenario' assessments, maps and/or statements) will require further liaison with the Wales Flood Group to gauge level of need and priority to inform Natural Resources Wales' future Flood Incident Management workstreams.
- Recommendation 31 (a national dataset for all flood risk assets, across all key organisations) will require significant and continued collaboration between Welsh Government and all Risk Management Authorities in Wales to share and securely store asset data. This work is progressing well, but will require sustained effort.
- Recommendation 41 (development of local adaptation 'toolkit', to assist communities predicted to experience natural coastal change) will require further liaison with the Wales Coastal Group Forum and the Coastal Groups in Wales to support creation of a toolkit for local coastal adaptation.

## Appendix 1: List of Phase 2 Recommendations

	<b>Progressing the Recommendations</b>
1.	<p>The recommendations included in this report are compiled into a Delivery Plan.</p> <p>This Delivery Plan will identify how the recommendations will be progressed. It will consider matters such as; the parties to be involved lead responsibility, priorities, governance and resources and capacity to deliver.</p>
2.	<p>The Delivery Plan should consider opportunities to expand the recommendations beyond just coastal flooding and erosion risks and to consider the link to risks from other sources of flooding.</p>
	<b>Recommendations – Storm Severity</b>
3.	<p>Further work is required to assess the joint probability of wind, waves and tides for these recent winter storms. This may take the form of an initial assessment coupled with consideration of more thorough analysis. The scope of this work will require further technical discussion.</p>
4.	<p>Review and update if required, the extreme sea level dataset around the Welsh coast. The recent tidal conditions are amongst the highest for many years. This dataset may need to be amended.</p> <p>This is to include methods for assessment of joint probability for storm severity.</p>
5.	<p>Review and update if required, the guidance used for the assessment and design of coastal standard of service against flooding. The review should consider whether more clarification is needed, in particular on the issues of the treatment of joint probabilities, in combination effects and appropriate national consistency.</p>
	<b>Recommendations – Flood Forecasting</b>
6.	<p>Continue to identify and implement risk based opportunities to deliver further improvements to longer range forecasts.</p>

7.	Review with partners what additional forecast information could be provided to support local incident management decisions. Identify options and recommendations.
8.	Continue to progress risk based opportunities to deliver improvements to the accuracy of the coastal forecasting service. Develop and deliver a programme of improvement works.
9.	Review the whole wave buoy network around the Welsh coast, including working with UKCMF to address a strategic gap in the offshore wave buoy network in the Irish Sea. This is required to better validate offshore wave forecasts, leading to improvements to the Wales forecasting service.  <i>(UKCMF- UK Coastal Monitoring and Forecasting Service)</i>
<b>Recommendations – Flood Warning and Community Response</b>	
10	Complete the ongoing work by summer 2014 to ‘rebrand’ the flood warning service in Wales so that the provider is clearly identified as Natural Resources Wales.
11.	Develop and implement a prioritised programme of improvement works to flood warning areas and thresholds, using the experience and data gathered from these storms. This should include engagement with professional partners and communities as appropriate.
12.	Review and consider additional sources of validation information for future incidents. This has potential to improve confidence in both forecasting and warning. This may involve seeking feedback from professional partners and others.
13.	Work with sample communities to identify options to help sustain an effective local response to flood warnings. This should consider communities where effective response and or confidence in the warning system is low.
14.	Identify and evaluate options to help communities to become more self-sufficient and resilient and identify a recommended option

15.	<b>Produce and communicate nationally consistent, public focused information on the types and availability of property level protection measures and the support available.</b>
16.	<b>Using the experience from these recent storms, identify and evaluate options for the future development of local Flood Plans in coastal areas and identify a recommended option to help these be more effective at improving community resilience.</b>
17.	<b>Using the experience from these recent storms, identify and evaluate options for the future development of local Flood Plan Leads / Warden Volunteers in coastal areas and identify a recommended option.</b>
<b>Recommendations – Operational Response</b>	
18.	<b>Review and identify how to improve involvement of infrastructure operators and managers in the coastal flood risk incident management process.</b>
19.	<b>Continue to develop potential ‘<i>impact scenario</i>’ assessments, maps and/or statements. This work must be developed in close discussion with professional partners to ensure it meets all parties’ requirements.</b>
20.	<b>Review the local decision making process associated with the issue of Severe Flood Warnings and evacuation procedures in December 2013 and early January 2014. Identify improvements and share at an all Wales level.</b>
21.	<b>Assess our national capacity to respond to a widespread and sustained period of coastal flooding. This should include consideration of when the current national resource pool will no longer function effectively. This should also consider post incident recovery issues.</b>  <b>Provide a report with recommendations for improvement.</b>
22.	<b>Assess the collective ability to provide an effective response to a potential large scale evacuation scenario in either north east or south east Wales. This should also consider post incident recovery issues.</b>  <b>Provide a report with recommendations for improvement.</b>



23.	Review the Wales resilience structures and ways of working to identify what changes may be needed to enable us to collectively be better prepared and resilient to future coastal flooding.
24.	Options to seek improvements to the standard of protection at the Garford Road area of Rhyl should be identified and evaluated. This should include detailed hydraulic analysis of the capacity and performance of the storage lagoon. This should include an assessment of the stairwell and slipway openings and the interaction with the adjacent golf course area.
25.	All Risk Management Authorities (RMAs) around Wales should review their local use of stop boards, stop logs, temporary barriers or moveable gates. The purpose of this review is for RMAs to satisfy themselves that existing arrangements are appropriate and robust. Consideration should be given to replacing existing arrangements with more permanent or more robust temporary solutions. This review should be 'risk based' and focused on the locations with highest local risk.
26.	All Risk Management Authorities (RMAs) around Wales should review locations where they have secondary defence systems in place. The purpose of this review is for RMAs to satisfy themselves that the secondary systems will operate as designed when required. This review should be 'risk based' and focused on the locations with highest local risk.
<b>Recommendations – Coastal Defences</b>	
27.	<p>There needs to be continued sustained investment to manage the national coastal risks to acceptable levels.</p> <p>This must include flood forecasting, warning, awareness, response and recovery, as well as flood defences. Particular focus has to be on the existing defences to ensure they continue to be fit for purpose, as well as investment in new defences to reduce the flood risk for more locations.</p>
28.	Review and identify options to maximise certainty in flood and coastal erosion risk management funding over a longer timeframe and to maximise flexibility in the use of this funding. This would mean less focus on annual and in year budgets and more focus on delivery and budget management of 3-5 years.

29.	The development of the National Programme of Investment should be progressed as a matter of importance and its development should seek a wide range of ways of working and technical improvements to the flood and coastal erosion risk management investment allocation, decision making and prioritisation process.
30.	Review and identify options to gain additional funding to supplement core flood and coastal erosion risk management investment. This must be closely aligned with the development of the National Programme for Investment.
31.	<p>Produce a complete national dataset of coastal protection and defence assets including details of areas benefitting.</p> <p>It is essential that this dataset becomes a <i>'live management tool'</i> and not merely a representative picture of a snapshot in time. This dataset must therefore be associated with a process for ensuring the information is maintained.</p>
32.	Review and identify options to achieve a more consistent approach to the inspection of the network of coastal defence systems. This must include recommendations to improve the efficiency and effectiveness of the asset inspection process.
33.	Continue to develop a nationally prioritised programme of coastal modelling and mapping improvements. This must be nationally risk based and consistent.
34.	Locations and communities which experienced flooding in December 2013 and early January 2014 should be subjected to a risk based assessment to determine if further risk management activity/intervention is needed and can be justified.
35.	Near miss locations and locations subjected to substantial foreshore change should be identified and subjected to a risk based assessment to determine if further risk management activity/intervention is needed and can be justified.
36.	Complete the ongoing update to the Phase 1 <i>'rapid'</i> assessment of environmental changes experienced during the December 2013 and January 2014 storms.
37.	Carry out a national skills and capacity audit for all Risk Management Authorities to assess and quantify the scale of the issue – to assess the size of the skills and capacity gap

	<p>Produce an options document for how the skills and capacity gap could be addressed to meet present day flood risk management needs and future challenges.</p>
38.	<p><b>Clarify roles and responsibilities amongst risk management authorities at both the local and national level as required.</b></p> <p><b>Develop consistent and common communication messages and tools to convey roles and responsibilities to communities.</b></p>
39.	<p><b>Undertake a review of Welsh Coastal Groups and the Wales Coastal Group Forum. This review should include, as appropriate, links and relationships with other similar groups who have a role in the management of flood and coastal erosion risks.</b></p> <p><b>This review should identify improvement options to maximise efficient and effective delivery of flood and coastal risk management.</b></p>
40.	<p><b>The Wales Coastal Monitoring Centre submitted a business case for the future of the centre to Welsh Government in December 2013. This business case should be determined by Welsh Government.</b></p>
41.	<p><b>Welsh Government should endorse the strategic framework established by the Shoreline Management Plans (SMP2). This should be accompanied by more national and local support to communities and community involvement in the development of local adaptation options and plans.</b></p> <p><b>Develop a ‘local adaptation toolkit’ to better support communities. This may include technical guidance, templates, and engagement and communication tools and policy positions.</b></p> <p><b>Local discussions in all coastal communities need to begin now, involving professional partners and the community. These discussions should consider communities on a risk basis. These discussions need to explore and develop local plans to adapt and increase resilience over time.</b></p> <p><b>Support and draw upon the experience of the Fairbourne multi-agency group to help inform adaptation and community resilience discussions at other locations.</b></p>
42.	<p><b>Review and evaluate existing barriers and gaps to supporting coastal adaptation and make recommendations for improvement.</b></p> <p><b>Review, where necessary, existing climate change guidance to ensure the most appropriate approach is being used by all parties involved in all aspects of flood and</b></p>

	coastal erosion risk management (i.e. all Government departments, RMAs infrastructure and utility operators).
	<b>Recommendations – Infrastructure Resilience</b>
43.	<b>Review and make recommendations for how Risk Management Authorities and infrastructure and utility operators can work together operationally more efficiently and effectively. This should consider a range of working agreements to ensure clarity of roles and responsibilities between professional partners and for communities.</b>
44.	<b>Review and make recommendations if more needs to be done to enable infrastructure and utility operators to effectively work together and interact on issues of mutual interest. This may include a review of the role and remit of the Wales Utility Group and other options.</b>
45.	<b>Encourage and support the development of programmes of works to increase resilience of infrastructure and utility assets. These must be aligned with local community adaptation planning.</b>  <b>Review where appropriate if there are regulatory barriers to obstruct this process of adaptation and identify regulatory improvements which could help adaptation.</b>
46.	<b>Review and evaluate at the national Wales level, the impacts of climate change scenarios on Network Rail infrastructure and highways infrastructure around the Welsh coastline and the long term adaptation options.</b>
47.	<b>Undertake a periodic national assessment of infrastructure and utility resilience across Wales, in order to provide assurance of national progress towards increased resilience to coastal flood and erosion risks.</b>



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