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**Natural
Resources
Wales**

Flood and Coastal Erosion Risk Management in Wales, 2011 – 2014

**First Report to the Minister under Section 18 of the Flood and
Water Management Act 2010**

Foreword

Under section 18 of the Flood and Water Management Act 2010 Natural Resources Wales has a statutory duty to report to the Welsh Ministers about the management of flooding and coastal erosion in Wales. In particular, the report has a role to inform the Ministers on progress to implement the Welsh Government's National Flood and Coastal Erosion Risk Management Strategy for Wales (hereafter referred to as the 'National Strategy').



This is the first of those reports and provides a summary of the key developments and achievements from November 2011, when the Welsh Government's National Strategy was published, to March 2014. Future reports will be produced every two years.

Supporting the Welsh Government in delivering the National Strategy are 31 organisations with a statutory role as a Risk Management Authority:

- Natural Resources Wales
- the 22 Lead Local Flood Authorities
- the three Internal Drainage Boards that are wholly or mainly in Wales
- the water and/or sewerage companies Dŵr Cymru Welsh Water, Severn Trent, Dee Valley, Scottish & Southern and Albion Water

This report has been produced from information provided by those Risk Management Authorities (RMAs) reflecting their work, often in close partnership, to manage the risks to people and properties from sources of flooding such as rivers, ordinary watercourses, the sea, surface water, reservoirs and sewers plus from erosion of the coastline. I am grateful to them and other partners for the data and support they have provided to inform this report.

The last two years have seen some of the most significant flooding in Wales for a generation, both inland and on the coast. Notable erosion of parts of the coastline has also occurred. These serve to remind us of the significant risks these pose to communities and of the continued efforts that are needed to help keep them safe and attractive places for people to live, work and visit. The National Strategy and the culture of working in partnership between organisations and with the communities themselves form a solid foundation on which to meet the challenges ahead.

A handwritten signature in black ink that reads "Emyr Roberts". The signature is fluid and cursive, with the first name "Emyr" and the last name "Roberts" clearly distinguishable.

Emyr Roberts
Chief Executive
Natural Resources Wales

Executive Summary

This report summarises the significant developments and achievements in managing flood and coastal erosion risks in Wales undertaken by Natural Resources Wales, Lead Local Flood Authorities, Internal Drainage Boards, Water and Sewerage companies during the reporting period November 2011 to March 2014.

There were a number of very significant flood events in Wales on both rivers and the coast. The estimated costs of these impacts is £71 million. Over 1,000 homes and businesses were flooded along with disruption to infrastructure, particularly rail and road networks. However, as result of investment in both new and existing flood defences, many properties which were at risk did not flood. For example, in the winter storms 2013/14 it was estimated that approximately 75,000 properties and 34,000 hectares of agricultural land did not flood. This meant damages estimated at nearly £3bn were avoided as a result of the investment.

Over the reporting period, £165m was invested in flood and coastal erosion risk management by the Welsh Government, along with additional investment by water and sewerage companies and Internal Drainage Boards. In excess of 340 coastal and river flood defence schemes were delivered, reducing flood risk to approximately 6,700 properties.

During the reporting period, most of the new legal framework from the Floods and Water Management Act was implemented. In their role managing local sources of flooding such as surface water, most Lead Local Flood Authorities completed their local flood risk management strategies as part of the Act's requirements and all delivered their Preliminary Flood Risk Assessments for the EU Floods Directive. Strategic management plans for coastal flooding and erosion were prepared and management plans for river catchments continued to be implemented through close partnership working in their planning and operational delivery. There has also been notable progress in the management of sewer flooding through the increasing use of sustainable drainage methods.

In March 2014 there are 208,000 properties shown to be at risk from river and/or sea flooding, 61,000 being at high or medium risk (greater than a 1% chance every year). 163,000 properties are at risk of surface water flooding, with 43,000 being at high or medium risk.

There has been a number of coastal erosion incidents; particularly during the storms of winter 2013/14, which saw substantial changes to cliffs, sand dunes and beaches. No properties were lost to coastal erosion during the reporting period but 2126 are estimated to be at risk during the next 100 years if there is no active intervention to manage that risk.

There were advancements in understanding the nature and location of flooding and coastal erosion during the reporting period through the development of new maps and predictive models. Flood forecasting and warning capabilities also improved with 82 locations around Wales at risk from river flooding and 81 locations at risk from coastal flooding now benefitting the forecasting service. Protection and enhancement of the natural environment was delivered as part of organisations' management of flood and coastal erosion risk. Community engagement and preparedness for flooding was also significantly expanded with 624 flood plans now in place for communities and individual businesses.

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1. Strategy & Policy Framework

Substantial reform took place of the legal and policy framework within which the Risk Management Authorities (RMAs) deliver their flood and coastal erosion risk management functions in Wales. This reform occurred throughout the reporting period, from the publication in November 2011 of the Welsh Government's National Strategy to the end of the reporting period in March 2014. This chapter summarises those developments and their outcomes in enabling more effective management of flood and coastal erosion risks.

1.1 The National Strategy for Flood and Coastal Erosion Risk Management in Wales

The Welsh Government's National Strategy was published on the 14th November 2011 and in doing so met the requirements of Section 8 of the Flood & Water Management Act 2010¹. It sets out policy objectives for the management of flood and coastal erosion risk in Wales and outlines the responsibilities and key objectives and sub objectives to be achieved. The four over-arching objectives are:

- **Reducing the consequences** for individuals, communities, businesses and the environment from flooding and coastal erosion;
- **Raising awareness of and engaging people in the response** to flood and coastal erosion risk;
- **Providing an effective and sustained response** to flood and coastal erosion events; and
- **Prioritising investment** in the most at risk communities.

Under the four objectives there are 11 sub-objectives which define the measures required to deliver National Strategy during the strategy period (2011-2016). Annex 1 of this report describes the progress to date in implementing these objectives. Of the 53 objectives detailed within the National Strategy, 7 were completed during the reporting period. 14 objectives are on-going and have a fixed deadline, and a further 31 are on-going but currently have no fixed deadline. Only 1 objective is unlikely to be progressed at this time.

1.2 Legislation

Flood and Water Management Act

The phased implementation of the Flood and Water Management Act 2010 continued throughout the reporting period so that by March 2014 most of its elements had been put in place. These include requirements for:

- RMAs to act consistently with the National Strategy in exercising their flood and coastal erosion risk management functions;
- Lead Local Flood Authorities to lead the management of flooding from surface water, ground water and ordinary watercourses and develop a strategy for doing so which other RMAs must act consistently with or have regard to;
- Lead Local Flood Authorities to investigate and report on flooding incidents in its area.
- RMAs to contribute towards sustainable development when exercising their Flood and Coastal Erosion Risk Management functions.

¹ <http://wales.gov.uk/topics/environmentcountryside/epq/flooding/nationalstrategy/strategy/?lang=en>

- Natural Resources Wales to report to the Minister on progress across Wales in managing flood and coastal erosion risk management

The Act also provides Lead Local Flood Authorities and Natural Resources Wales with further powers to carry out works that cause flooding and coastal erosion for environmental purposes, or to designate third parties structures (man-made or natural) that serve as flood defence to prevent them being altered without consent

The remaining flood related parts of the Act, which are scheduled to be implemented in Wales during 2014 and 2015 are:

- Reservoirs Provisions to bring large raised reservoirs between 25,000m³ and 10,000m³ into the regulatory regime, and;
- Sustainable Drainage Provisions to put in place a set of national standards and an approval scheme for sustainable drainage systems that will be required for most new developments.

Floods Directive

The Flood Risk Regulations 2009 implement the requirements of the European Floods Directive. This aims to provide a consistent approach to managing flood risk using a six year cycle of assessing, mapping and developing plans to manage flood risk.

The first cycle of the Directive began in 2010 and by the end of the reporting period (March 2014), the flood risk assessment and mapping phases had been completed and the development of management plans begun. All 22 Lead Local Flood Authorities completed a Preliminary Flood Risk Assessment of local flood risk and had reported to the European Commission by 22nd March 2012. From this exercise eight 'Flood Risk Areas' of national significance for surface water flooding were identified in Wales. Natural Resources Wales then worked with Welsh RMAs and the Environment Agency to develop flood hazard and risk maps for all sources of flooding across Wales. These were published and reported to the European Commission by 22nd March 2014.

The Lead Local Flood Authorities encompassing the eight Flood Risk Areas and Natural Resources Wales are required to produce statutory Flood Risk Management Plans (FRMPs) by December 2015. The remaining 14 Lead Local Flood Authorities decided to accept an invitation from the Welsh Government to voluntarily produce FRMPs as well. This means that once all the plans are completed there will be a comprehensive framework across the whole of Wales for the management of all sources of flooding.

The Water Bill and Flood Insurance

During the reporting period the Water Bill, covering Wales and England, was developed and consulted upon. Alongside measures to reform the water industry are several measures related to flood risk, the principal one being related to flood insurance.

The UK Government in consultation with the devolved administrations in Wales, Scotland and Northern Ireland, has negotiated a new approach to flood insurance for residential properties. With a statutory foundation in the Water Bill, the "Flood Re" reinsurance initiative for high risk households is planned to commence in 2015.

1.3 Welsh Government Policies

Natural Resources Wales

The Public Bodies Act 2011 (applied to England and Wales) became law in December 2011. It allows Ministers to abolish or reform a specified list of public bodies and it was through this legislation that Welsh Ministers made a decision to create a single body responsible for the management of the natural resources and environment.

On 1st April 2013, Natural Resources Wales took over the functions of the Countryside Council for Wales, Environment Agency Wales and Forestry Commission Wales, as well as some marine and wildlife licensing functions from Welsh Government. This new public body's remit is to ensure that the natural resources of Wales are sustainably maintained, enhanced and used, now and in the future.

Internal Drainage Boards

On 18th November 2013 the Minister for Natural Resources and Food announced his decision to transfer the functions, assets and staff of all Internal Drainage Boards (IDBs) either partly or wholly in Wales to Natural Resources Wales by April 2015. Those IDBs are: Lower Wye IDB split between Wales and England; Powysland IDB mostly in Wales, and; Caldicot & Wentlooge Levels IDB which is wholly in Wales. NRW already exercises the functions of an IDB for the remaining eleven Internal Drainage Districts in Wales.

In his announcement, the Minister outlined that his desired outcomes from the transfer were to be: a more integrated approach to the management of natural resources; removal of duplicated organisational arrangements; improved resilience and value for money, and; a long term solution to governance issues.

Sustainable development and climate change

Following on from the Flood and Water Management Act 2010 the Welsh Ministers issued guidance in November 2011² on how RMAs are to discharge their sustainable development duty in the Act.

In spring 2013 Welsh Government also consulted on their white paper for a Sustainable Development Bill, now called the 'Future Generations Bill'. This sets out the proposed approach to make sustainable development the central organising principle of the public service in Wales, and to establish a sustainable development body. The White Paper also included the Welsh Government's proposal to put integrated planning on a statutory footing in the Future Generations Bill.

² Welsh Government, November 2011. Sustainable Development: Guidance to Risk Management Authorities Section 27 – Sustainable Development <http://wales.gov.uk/docs/desh/publications/111231floodingsustainableen.pdf>

The Welsh Government also issued guidance to RMAs on adapting to and mitigating climate change³, which is to be used within the development of all flood and coastal erosion risk management projects or strategies. This guidance replaces the Welsh Government FCDPAG3 Economic Appraisal Supplementary Note to Operating Authorities—Climate Change Impacts, July 2007.

Other relevant developments

Planning Policy Wales and Technical Advice Note (TAN)15: Development and Flood Risk set out the precautionary framework to guide planning decisions in areas at flood risk. In January 2014 the Welsh Government's Chief Planner wrote to the Chief Planning Officers in all 25 Local Planning Authorities, updating them on a number of issues to consider when determining planning applications. Those issues included surface water flood risk, climate change, flood insurance and consultation with Natural Resources Wales.

During the reporting period the Welsh Government consulted on a number of policies with relevance to the management of flood and/or coastal erosion in Wales, including:

- Planning Bill – on proposals to modernise the planning system in Wales
- Glastir – on proposals for the Welsh Government's primary agri-environment scheme in the Wales Rural Development Plan period 2014 to 2020
- Vibrant & Viable Places – proposed approaches for a new regeneration framework
- Marine policy – future policy proposals for managing the marine environment

The National Assembly for Wales' Environment and Sustainability Committee also held inquiries in both 2012 and 2014 into coastal protection.

³ Welsh Government, 2011. Adapting to Climate Change: Guidance for Flood and Coastal Erosion Risk Management Authorities in Wales

<http://wales.gov.uk/topics/environmentcountryside/epq/flooding/nationalstrategy/guidance/climateguide/?lang=en>

2. Partnership Working

2.1 Introduction

The National Strategy places a strong emphasis on partnership working in the delivery of a co-ordinated approach to flood and coastal erosion risk management. That principle applies to Risk Management Authorities (RMAs) and also other organisations, whether at a local or national level. The National Strategy explains that “... this means that all Risk Management Authorities in Wales are required to implement the objectives and measures set out in the National Strategy, and not to contradict or undermine them” (para 187). This chapter describes the main groups and partnership approaches being progressed in Wales to collectively prepare for and respond to flood or erosion incidents

2.2 Coastal erosion and flooding from the sea

The coast is dynamic and requires management planning at a scale which respects the physical environment rather than being restricted by political or administrative boundaries. This, along with the range of interests and responsibilities of the multiple organisations means that working in partnership to manage coastal erosion and flooding is essential.

There are five Coastal Groups in Wales which embed the principles of partnership working on coastal issues: North Wales and North West England (a cross border group); Ynys Enlli to Great Orme; Cardigan Bay; Swansea Bay and Carmarthen Bay, and the Severn Estuary (a cross border group).

2.3 Inland flooding - surface water, rivers, sewer and reservoir

Three regional flood risk management groups were created in 2011 for southeast, southwest and north Wales. Comprising Lead Local Flood Authorities, Natural Resources Wales, IDBs, Dŵr Cymru Welsh Water and the Welsh Local Government Association these are informal working groups who coordinate partnership working primarily on surface water, river and other watercourse flooding. They also share expertise and best practise on a range of activities including Floods Directive implementation.

Dŵr Cymru Welsh Water have developed particularly strong partnerships with Lead Local Flood Authorities to deliver its RainScape surface water management programme. For example, in Llanelli and Gowerton, a Memoranda of Understanding has been developed and agreed to facilitate on-going development whilst mitigating flood risk and environmental impacts. This has been an evolving process to which NRW provides on-going technical advice and support to both Dŵr Cymru Welsh Water and the Lead Local Flood Authorities.

Working together on reservoir safety has largely been progressed through Local Resilience Fora.

There is a Memoranda of Understanding between Natural Resources Wales and the Environment Agency to facilitate the planning and delivery of work to effectively manage river flooding in cross border catchments, for example the Rivers Dee, Severn and Wye, and along the coast and in estuaries.

2.4 Working together to improve resilience

The four Local Resilience Fora, based on the four police force areas in Wales: South Wales, Gwent, North Wales and Dyfed-Powys, are the main partnership framework through which responses to emergencies such as flooding are co-ordinated. During the reporting period all four have developed Multi-Agency Emergency Flood Plans and established evacuation protocols, mutual aid protocols for resources, equipment and respite for emergency events.



At the all-Wales level, the Wales Resilience Forum has been established to endorse good communication and to enhance emergency planning across agencies and services in Wales. There is also a Wales Flood Group which operates under the umbrella of the Wales Resilience Forum.

The partnership approach being applied in Wales is both comprehensive and successful as demonstrated during the recent storm events. The Coastal Review⁴ into the coastal storms of winter 2013/14 found there had been well coordinated and effective partnership working between the organisations in managing these significant incidents.

2.5 Other partnership groups and events

Natural Resources Wales' Flood Risk Management Wales Committee provides a link on partnership working between national and local levels. Comprising members with expertise in topics such as flood victim support, academia, agriculture, coastal management and other members representing all 22 Lead Local Flood Authorities, it provides advice to Natural Resources Wales on its flood risk management roles and acts to champion flood and coastal issues through responses to Welsh Government public consultations and its own research work.

One of the major advantages in Wales is that it is possible to quickly convene all RMAs and other partners to discuss issues and agree consensus. This can prove very effective in disseminating information and joint planning to inform future ways of working. Examples of regional or national level workshops include: flood risk management planning for the Floods Directive (September 2013); Flood Warden training in North Wales (November 2013) delivered in conjunction with the North Wales Local Resilience Forum., and; a Forum for Supervising Engineers for all reservoirs in Wales to discuss forthcoming changes in legislation and the approach to enforcement in Wales (March 2014). The Institution of Civil Engineers and other professional bodies also provide support to the sector, for example by holding an annual flooding conference which is a key event for flood and coastal practitioners.

⁴ NRW 2014. Wales Coastal Flooding Review Phase 2 Report <http://naturalresourceswales.gov.uk/our-work/news/major-report-identifies-ways-improve-wales-resilience-coastal-flooding/?lang=en#.U2DbWDf4b1U>

3 Understanding Flood and Coastal Erosion Risk

3.1 Introduction

Risk is defined as a combination of the likelihood of an event happening and the impacts or consequences that occur as a result of it. To manage, minimise and adapt to flood and coastal erosion risk and to enable investment to be prioritised, it is important that both the likelihood and consequences are well understood and communicated amongst Risk Management Authorities and those likely to be affected.

Climate change predictions suggest that sea-level rise will increase the likelihood of coastal erosion and flooding from the sea, and more frequent and intense rainfall events will increase the risk of flooding from rivers and surface water. This chapter describes the improvements that have been delivered during the reporting period in terms of understanding flood and coastal erosion risk.

3.2 Flooding- current risk

To help raise public awareness and understanding of flood risk across Wales and to meet the requirements of the Flood Risk Regulations 2009, new flood hazard and flood risk maps for flooding from rivers, the sea, reservoirs and surface water were published by Natural Resources Wales on their website (December 2013)⁵.

River & Sea

Natural Resources Wales' National Flood Risk Assessment (NaFRA) indicates where flooding could occur in all river catchments and the coastline around Wales and consider the chance of weather severe enough to cause a flood and the likelihood that this will overwhelm defence structures or lead to their failure.

Risk category for a location	The chance of flooding in any one year at that location
High	Greater than or equal to a 1 in 30 chance in any given year (1:30)
Medium	Less than 1 in 30 chance but more than or equal to 1 in 100 chance in any given year (<1:30, > 1:1000)
Low	Less than 1 in 100 but more than or equal to a 1 in 1000 chance in any given year (<1:100, >1:1000)
Very low	Less than a 1 in 1000 chance in any given year (<1:100)

Table 1 Definition of flood risk categories

NaFRA modelling data is used to inform the numbers of properties at risk from rivers and the sea in Wales. During the reporting period, a new approach to calculating and describing the number of properties at risk of flooding was implemented in Wales (Dec 2013). Previously, risk was described as 'significant' (>1:75), 'moderate' (1:75-1:1000) and 'low'

⁵ NRW- Flood hazard and risk maps <http://naturalresourceswales.gov.uk/alerts/whats-my-flood-risk/?lang=en#.U38NKGbTXMI>

(<1:1000). The new approach has re-categorised the terminology and flood risk banding as described in Table 1 above.

	High	Medium	Low	Very Low	Total at risk from flooding
Residential	11,100	25,600	110,500	950	148,150
Non-Residential	10,500	13,850	35,600	400	60,350
Total Properties	21,600	39,450	146,100	1,350	208,500

Table 2 Properties at risk of flooding from rivers and the sea

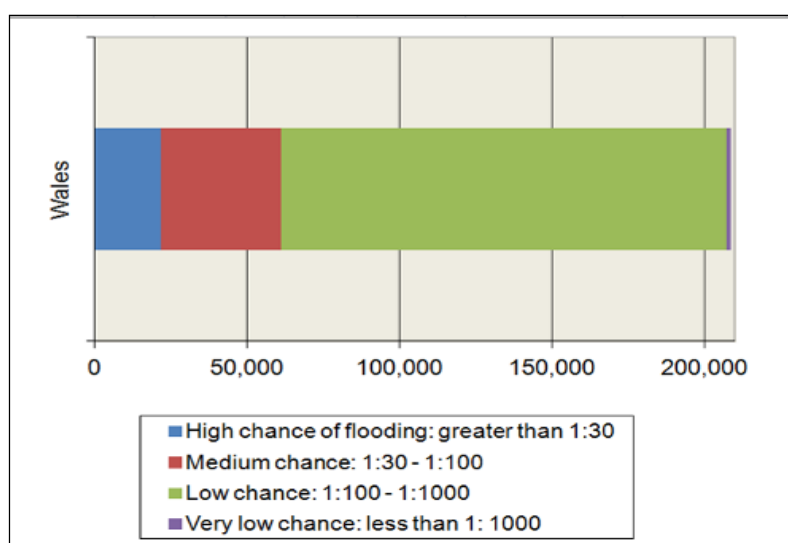


Figure 1 Total number of properties (residential & non-residential, at risk of flooding in any one year from rivers and the sea in Wales (December 2013)

In December 2013, NRW published figures from the most recent NaFRA to meet the requirements set out in the Flood Risk Regulations (Figure 1, Table 2). The latest assessment found that of the total properties in Wales (residential and non-residential), there are around 208,000 properties at risk of flooding from rivers and the sea in Wales. A proportion of these will also be at risk of surface water flooding. The reduction in the total properties at risk, compared with figures of 220,000 published in Flooding in Wales 2009⁶, is largely a result of improved modelling and mapping capabilities. This has improved Natural Resources Wales knowledge of what will flood and when. In addition, as a result of investment in flood risk management schemes, many properties that were previously at high risk of flooding have seen their level of risk lowered to medium or from medium to low risk.

Surface Water

During the reporting period, there have been significant improvements in the methodology for estimating the number of properties considered to be at risk of surface water flooding in

⁶ Environment Agency Wales, 2009. Flooding in Wales: A national assessment of flood risk

Sewer Flooding

Groundwater

In 2011, a strategic assessment of groundwater flood risk was undertaken. The assessment found that groundwater flooding was not a widespread issue in Wales. Any incidents are likely to be localised isolated issues on a small scale.

Wafre River Basin Districts - Management Catchments

Legend

Wafre Management Catchments

WFD Management Catchments

REO

- Dale
- Rivers
- Wafre

Scale: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 99

Figure 2 Map of River Basin Districts

⁸ References to flooding from reservoirs in this report are based upon large raised reservoirs regulated under Reservoirs Act 1975

3.3 Coastal Erosion – current risk

The coast is inherently dynamic and subject to change, with some erosion occurring gradually over relatively long periods of time, and in some instances rapid and significant change can occur, as experienced during the winter storms 2013/14⁹.

When the National Strategy was first published it was recognised that understanding the risk to properties, business and infrastructure arising from coastal erosion was less well developed than the understanding of flood risk.

A first step to addressing this was the publication of a National Coastal Erosion Risk Map in April 2012. This is the first consistent country-wide assessment of coastal erosion risk and provides a series of interactive maps, which are available online¹⁰

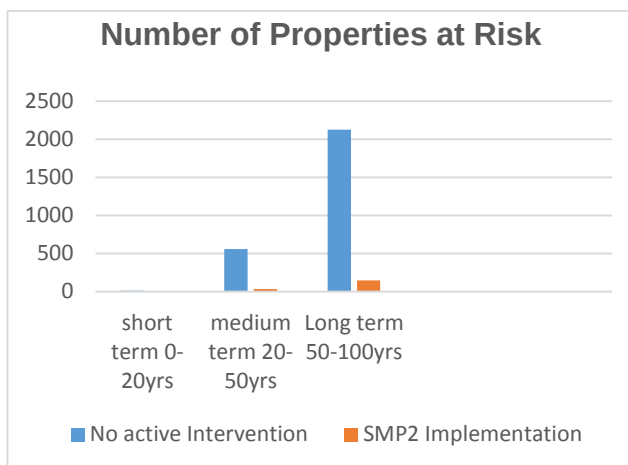


Figure 3 Properties at risk (residential & non-residential). Comparison between 'no active intervention' and adoption of SMP2

Since the publication of the National Coastal Erosion Risk Map data, Welsh Government has collaborated with Natural Resources Wales to analyse erosion data to ascertain the risk to homes, businesses and infrastructure over the three Shoreline Management Plan (SMP) epochs: 0-20 years, 20-50 years and 50-100 years.

No Active intervention – Number of properties at risk from coastal erosion			
	Short Term 0-20yrs	Med. Term 20-50yrs	Long Term 50-100yrs
Residential	10	507	1944
Non-residential	0	52	182
Total	10	559	2126
Implementation of SMP2 - Number of properties at risk from coastal erosion			
Residential	3	29	126
Non-residential	0	4	19
Total	3	33	145

Table 3 Number of properties at risk from coastal erosion over the next 100 years. Figures based on 'no active interaction' and implementation of SMP2 policies.

⁹ NRW, 2014. Wales Coastal Flooding Review Phase 1 Report – Assessment of Impacts
<http://naturalresourceswales.gov.uk/alerts/flood-warnings/reapps.environmentcent-flooding-incidents/wales-coastal-flooding-report/?lang=en>

¹⁰ National Coastal Erosion Risk Mapping <http://apps.environment-agency.gov.uk/wiyby/134808.aspx>

Two scenarios have been considered: 'no active intervention' in the maintenance and management of new and existing coastal erosion defences, and: implementation of SMP Policies, which include investment in coastal erosion defences. This analysis indicates that the main impacts will be witnessed during the 20-50 year epoch and are likely to increase in the 50-100 year epoch. As shown in Figure 3 and Table 3 above, the number of properties at risk of coastal erosion would be significantly less through the implementation of the SMP policies.

3.4 What is the future risk?

Climate Change

The Intergovernmental Panel on Climate Change's (IPCC) Fifth Assessment Report estimates global temperatures have risen 0.85°C from 1880-2012¹¹. There has been an associated rise in global sea level which is increasing at approximately 3.2 mm per year¹². This rise in sea level is likely to directly impact on coastal communities in Wales, increasing the risk and frequency of flooding they experience.

The IPCC consider it likely that the rate of sea level rise will accelerate. Evidence suggests a rise of 0.5m can be expected in northern Europe by the end of the century, resulting in a 10-100 fold increase in sea level extremes. This will make coastal storm events and storm surges more frequent, thereby increasing the risk of flooding to coastal communities in Wales.

Extreme rainfall events are also likely to be exacerbated by climate change, contributing to an increased flood and erosion risk. The Met Office have recorded an increase in days of heavy rain in the UK. A rain event with an average frequency of every 125 days in the 1970s now has an average frequency of 85 days¹³. In terms of storminess, the Met Office have concluded that while there have been no significant changes in storm frequency, the intensity of individual storms has increased.

Wales Coastal Monitoring Centre

The need to increase the understanding of coastal processes along the Welsh coastline led to the creation of the Wales Coastal Monitoring Centre in January 2010. Funded by Welsh Government, the Centre has five target aims: communication, efficiency, consistency, knowledge and advice.

During the reporting period it has continued to document the existing baseline situation regarding coastal monitoring activities in Wales and created a network of coastal practitioners. The Centre has also established a technical advisory group to share experience and knowledge.



¹¹ http://www.climatechange2013.org/images/report/WG1AR5_SPM_FINAL.pdf

¹² http://www.climatechange2013.org/images/report/WG1AR5_Chapter13_FINAL.pdf

¹³ http://www.metoffice.gov.uk/media/pdf/1/2/Recent_Storms_Briefing_Final_SLR_20140211.pdf

3.5 Likelihood of Flooding

During the reporting period there has been continued improvements in detecting and forecasting when a flood event is expected and what the severity of that event is likely to be. In particular, there have been improvements in long-range forecasting, and the ability to share that information early with key partners.

Flood forecasting services in Wales

Natural Resources Wales delivers a forecasting service for 163 locations in Wales at risk of flooding from both rivers and the sea.

The coverage of the forecasting service in Wales has increased to 82 locations for river forecasting and 81 locations for coastal. This improved service has resulted from investment in real time river catchment models and new coastal forecasting models.

Combined with improved Met Office forecasts Natural Resources Wales are now able to predict flooding further in advance of it actually occurring. For example:

- Earlier warning of the St.Asaph flooding in November 2012 than would have been possible only a few years ago.
- Flood warnings issued to a greater number of coastal communities during the December 2013 and January 2014 storms where previously the forecasting capability was limited.

NRWs' programme of developing new models for river catchments is anticipated to continue through 2015 to 2020.

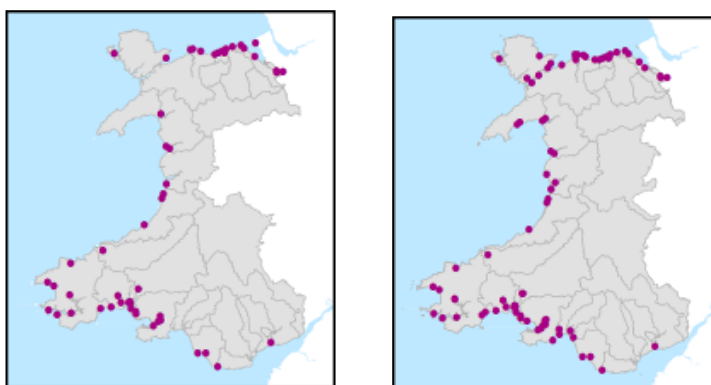


Figure 4 – NRW's coastal forecasting service coverage in 2006 (left hand map) and 2014 (right hand map). Dots show communities serviced by a local coastal forecast (sea level or sea level and wave height).

Detecting flooding

NRW has continued its programme to improve and extend the flood detection network of hydrometric gauges (rainfall, river and tide) to enable improved detection of flooding and provide data for input to local forecasting models. The data from these gauges is collected in real time using a telemetry system. Its real time telemetry network now amounts to over 400 gauges across Wales.

Figure 5– new telemetry rain gauge used to record rainfall in real time at Rhos Ymyrson in the Teifi catchment.



4. Flood and Erosion Risk Schemes

4.1 Introduction

Delivering schemes to not only build new defences, but to also improve and maintain existing structures that reduce the frequency of flooding and coastal erosion remains a key priority for all RMAs alongside the delivery of other risk management measures. One of the over-arching objectives of the National Strategy is *prioritising investment in the most at risk communities*. Investment will continue to be required into the future to manage the increasing levels of flood and erosion risk from the predicted effects of climate change. This Chapter describes work carried out during the reporting period¹⁴ to maintain and improve protection against flooding and coastal erosion.

4.2 Building new structures and assets

4.2.1 River and coastal

Between April 2011 and March 2014 NRW (and legacy body Environment Agency Wales) delivered over £45 million of investment in flood and coastal defence schemes. This investment has provided improved flood protection to 2678 properties. Lead Local Flood Authorities also undertook defence schemes on ordinary watercourses and the coast within their locality.

Year	Total Invested (£ million)	Number of properties protected	Location of schemes include:
2013/14	20.3	1220	Fairbourne, Ystradgynlais, Higher Ferry, Balderton Brook, Prestatyn Tidal Embankment, Lower Swansea Vale
2012/13	14.1	769	Riverside Newport, Pwll, Elwy Embankment, Ritec Culvert
2011/12	13	689	Whydden Control System, Afon Gele, Afon Ganol, Glynea Coastal Improvement scheme

Table 4 Summary of EAW/NRW Flood and Coastal Erosion Schemes 2011-2014

Between April 2011 and March 2014, £39 million of Local Authority flood and coastal defence projects have been delivered through Welsh Government capital grant aid. The funding enabled defence schemes have provided improved protection to over 4000 properties over the reporting period and include works at Rhydyfelin, Colwyn Bay, West Rhyl and Talgarth

¹⁴ The reporting period starts in November 2011 which is part-way through a financial year. All figures for investment and outcomes have been provided in full for the 2011/12 financial year.

Lower Swansea Vale

This £6.7 million project provides protection to 284 businesses and industrial premises employing more than 10,000 people, six houses and Riverside Caravan Park. It has also improved other measures such as flood warning, awareness raising and emergency planning within the area.

This joint project between Natural Resources Wales and the City and County of Swansea was partly funded (£3million) from the European Regional Development Fund. It involved raising 100m of embankment defences, the re-alignment of the Swansea Vale embankment to improve channel conveyance and the removal of two bridges.



Figure 6 Scheme at Lower Swansea Vale

Colwyn Bay

The £16 million regeneration scheme delivered by Conwy Council over the reporting period has provided wide ranging benefits to coastal risk management, regeneration and tourism.

The coastal defence improvements, which included beach re-nourishment, has provided protection for over 200 residential properties and 10 commercial properties, as well as safeguarding crucial infrastructure such as the A55 expressway and the main Holyhead to London rail line. The works have included the construction of a watersports centre, café and information centre, attributed to increased visitor numbers in the area and essential to supporting the local economy. It is estimated the partnership approach to working has generated significant cost savings of over £2m

The scheme has also stood up well to the recent coastal surge incidents with no reports of serious flooding or significant damage.



Figure 7 coastal defence and regeneration works at Colwyn Bay, Photo/Image courtesy of BCA Landscape

Caldicot and Wentlooge Levels Internal Drainage Board (IDB)

During the reporting period capital works have been completed, including re-alignment and lowering of the inlet culvert at Bishton, Newport. Modern tilting weirs have also been installed, which in addition to improving water level management accuracy and efficiency, has also improve eel passage and health and safety for staff. Bank stabilisation works were also undertaken at Percoed Reen, Wentlooge Level and on the River Trothy to stabilise banks and reduce blockages which could lead to increased flood risk.



Figure 8 Percoed Reen, Wentlooge Level - Bank Stabilisation works July 2013, photo courtesy of Caldicot and Wentlooge Levels IDB

4.2.2 Individual Property Protection

Individual Property Protection schemes offer an alternative to large river and tidal flood alleviation schemes. These measures are often appropriate in locations where a large project is uneconomical, or unfeasible. The schemes provide a range of property protection devices to groups of houses specific to their property needs. They vary from permanent fixtures to demountable devices; such as flood gates, air brick guards and drain covers. Investment in individual property protection measures began in 2010/11, and since then over 600 properties have benefitted, including Dolybont, Lechryd and Cardigan, with over £850,000 invested by Natural Resources Wales.



Figure 9 Examples of Individual Property Protection measures

4.2.3 Surface water and sewer flooding

During the reporting period there have been several notable examples of Sustainable Drainage Systems (SuDS) being built across Wales through infrastructure investment. These schemes, largely led by Water Companies and Lead Local Flood Authorities help reduce run-off, mitigate against the impacts of flood risk and help improve water quality.

Both Dŵr Cymru Welsh Water and Severn Trent Water encourage the use of SuDS, and have a policy position on their use and adoption. They expect surface water to be sustainably managed on all new development sites and request via the planning process, that surface water is managed by infiltration techniques or by discharge to a watercourse wherever possible before connection to a public sewer is considered.

Dŵr Cymru Welsh Water is investing over £40m in the 2010-15 period to reduce the risk of surface water and sewer flooding at around 600 properties across its operating area. Solutions include traditional approaches such as sewer upsizing, flow attenuation and new/improved pumping stations and treatment plants, but also innovative SuDS schemes. Surface water runoff is the predominant factor in causing sewer flooding and the £11m RainScape programme aims to reduce or remove surface water from entering the public sewer system by using a range of SUDS techniques. Dŵr Cymru Welsh Water is delivering its programme in close collaboration with other RMAs, particularly Lead Local Flood Authorities and Natural Resources Wales.

RainScape Programme

Successful RainScape schemes were delivered at a number of locations including;

- work with Monmouthshire County Council to agree use of a playing field as a sacrificial flood plain in Caldicot;
- work with Cardiff County Council Highways Department in Trelawney Avenue to divert surface water from the combined sewer network into an existing surface water sewer, and also providing 75 water butts to residents to reduce peak flows, all delivered at a third of the cost of a traditional solution;
- work with Carmarthenshire County Council to reduce sewer flooding incidents and reduce the number of spills into the Loughor Estuary. To date, the scheme at Stebonheath School (pictured below, figure 13) and Queen Mary's Walk have been completed. These schemes use a range of interventions such as swales, kerbside planters and basins to remove and attenuate flows entering the combined sewer network in the area.



Figure 10 RainScape initiatives at Stebonheath School, photos courtesy of Dŵr Cymru Welsh Water

Progress towards the implementation of SUDS during the reporting period can be seen at Llanharan, Rhondda Cynon Taff as detailed below.

Llanharan, Rhondda Cynon Taff

A brownfield site has been transformed into a new housing development, fronting onto a SuDS. The scheme includes a balancing pond and wetland area which drains to a local watercourse. This cost effective and low cost scheme effectively manages surface water on site and also provides community and biodiversity benefits. Rhondda Cynon Taff County Borough Council has now adopted the SuDS scheme and is responsible for maintaining it.

Figure 11, SuDS Scheme in Llanharan, Rhondda Cynon Taf



4.3 Maintaining structures, watercourses and reservoirs

Structures

Regular inspections and the maintenance of existing assets is an important part of the work programme for all RMAs. This ensures the structural integrity of flood defences continue to provide the required standard of protection and improvements can be made as and when necessary. The management and maintenance of reservoirs is also an important role for RMAs.

Natural Resources Wales owns and maintains 504km of river and coastal flood defences and 4145 individual assets. Approximately 99% of its high risk assets have been maintained at the national condition target. A national monitoring and record keeping system is used by NRW to manage its maintenance programme.

Lead Local Flood Authorities also have ongoing programmes of inspection and maintenance of their assets. The frequency of regular asset inspections is determined by asset location, type and significance. Further inspections of strategically important assets are undertaken on receipt of severe weather warnings and after storm events.

Dŵr Cymru Welsh Water and Severn Trent Water both own structures within Wales, (typically sewers), that relate to managing floodwater. Severn Trent Water has launched a new web-based version of sewer records that have been shared with all local authorities in its operating area. Dŵr Cymru Welsh Water has an extensive network of assets including 30,000km of sewers, 1,912 sewage pumping stations and 838 wastewater treatment works. Accompanying these is a large scale asset inspection and maintenance programme.

Natural Resources Wales and 16 of the Lead Local Flood Authorities record asset information in a database or register. This is updated as assets are upgraded, replaced, removed, or where new assets are constructed.

Some Lead Local Flood Authorities have invested in new software during the reporting period to support their asset management duties. Most, including Natural Resources Wales, have a GIS based asset management system, as illustrated in Figure 13. The specification of asset registers, inspection regimes and asset target conditions varies between each RMA.

Watercourses

The continued maintenance of watercourses, (natural and man-made) is an important part of flood risk management and is required to keep them free from obstructions and allow water to flow freely downstream and out to sea. The National Strategy requires RMAs to undertake their maintenance activities using a risk based approach within their areas of operation, prioritising flood risk management work that avoids risk to life above all other factors.

A balanced and catchment wide approach is applied on where, when and how to clear silt and gravel from rivers and streams. This approach helps to avoid causing communities downstream to flood, damage water quality and biodiversity, or businesses such as fisheries. Channel and bankside maintenance also play a key role in maintaining biodiversity and many managed watercourses are designated as SSSIs.

IDBs, Natural Resources Wales and Lead Local Flood Authorities all routinely undertake maintenance work. This includes removing obstructions from watercourse channels, the grills and screens of sluices and culverts, removing aquatic weed, gravels and silts and managing bankside grass, trees and bushes to prevent excessive build-up of fallen plant material within channels. Continued maintenance also enables easy inspection of flood defences and other bankside structures.



Figure 12 Output from NRW's GIS based asset maintenance system

Reservoirs

There are currently 203 large raised reservoirs in Wales subject to the regulatory requirements of the Reservoirs Act 1975. The Act requires these reservoirs to be registered with the enforcement authority (in Wales this is Natural Resources Wales) and places supervision and inspection duties on the reservoirs owners or managers. With the expected changes to reservoir legislation in the near future (as described in Chapter 1), all RMAs have begun to assess and review the implications for reservoirs which they own, manage and regulate.

5. Raising Awareness

5.1 Introduction

It is not possible to completely prevent flooding or coastal erosion from happening. It is therefore important that action is taken to help reduce the impacts that are caused when it does happen. Raising awareness of and engaging people in the response to flood and coastal erosion is a key part of the overall management of these risks in Wales and an overarching objective of the National Strategy. This Chapter describes work carried out during the reporting period to help inform and prepare households, businesses and whole communities for when flooding or coastal erosion may occur.

5.2 Awareness Raising and Preparing for Flood and Coastal Erosion Risk

RMAs carry out a range of community awareness and engagement activities, applying the guidance provided in the Flood Risk Management Community Engagement Toolkit¹⁵. The purpose of the toolkit is to assist those responsible for flood risk management schemes or those who may be involved in wider flood risk management activity; and provide guidance on how to approach community engagement and partnership working. By applying the toolkit, and engaging with the public about flood risk, the aim is to promote behavioural change and to increase the resilience of communities and individuals to the impacts of flooding.

NRW and Flood Awareness Wales

Natural Resources Wales delivers a public facing engagement programme called 'Flood Awareness Wales'. It aims to increase awareness of local flood risk and uses behavioral change techniques to encourage people to take their own practical actions so that the impacts of flooding on people's lives, homes and businesses are reduced.

Since Flood Awareness Wales began, a total of 314 communities across Wales have been engaged with through a variety of methods identified below. These include;

- The Welly Boot tour in 2012, which took 8ft blue wellies to 26 locations across Wales to raise general awareness of flooding. The tour was supported by a wider communications campaign through press and media
- Face to face engagement - Natural Resources Wales officers' door knocked at over 71,000 homes in areas where flood risk was high, encouraging householders to register for free warnings, complete personal flood plans, check insurance cover, safeguard valuable possessions and consider fitting flood resilience products to protect their homes. Over 7,997 people have signed up to receive a flood warning.
- Community level engagement - Natural Resources Wales officers have worked with 191 communities, plus supported a further 21 communities following flooding during 2012 and 2014. Flood Awareness Wales officers work with local residents and partner organisations to develop and test community flood plans. These plans aim to increase community resilience and recovery before, during and after a flood.

¹⁵ <http://wales.gov.uk/topics/environmentcountryside/epq/flooding/communities/toolkit/?lang=en>

- Flood Plan Leads (or Wardens) are identified by Natural Resources Wales as part of community flood plan development. These volunteers play a series of vital roles before during and after a flood including keeping the community flood plan and general awareness of local flood risk 'live' at local level, acting as a communication point - 'eyes and ears' on the ground by communicating warnings, informing on the local flood situation, implementing local plans during a flood and providing post flood feedback to a range of professional partners including Natural Resources Wales, Local Authorities, and their local community. There are 274 volunteers supporting community flood plans.
- Over 19,455 children have carried out practical flood awareness educational activities.



Figure 13 Cowbridge Brownies receive their Flood Awareness Badge, November 2012.

Overall, Flood Awareness Wales has facilitated the development of 624 flood plans, made up of community flood plans and other plans tailored for various at risk groups, such as schools and businesses, caravan parks and farms. These plans are estimated to help protect the lives and livelihoods of 74,971 people across Wales.

Natural Resources Wales delivers its Flood Awareness Wales programme in partnership with Lead Local Flood Authorities. For example it jointly held training events for community Flood Plan Leads with Rhondda Cynon Taf County Borough Council, Merthyr Tydfil County Borough Council and the Isle of Anglesey County Council. Some of these were also in conjunction with Community Councils such as Pencoed.

Other RMA activities

Lead Local Flood Authorities have reported leadership and involvement in more than 60 community based awareness and engagement activities during the reporting period. For example, in Wrexham County Borough Council a significant issue with flood awareness in the community was identified. As a result, a Community Resilience programme was launched in March 2013. This was aimed at local members, community town councils and community councils to help raise awareness and engage communities across the Borough.

Caerphilly County Borough Council carries out Environment Days in local communities ensuring flood awareness information is made widely available. They are also developing flood plans to include measures for targeting vulnerable people and groups.

Dŵr Cymru Welsh Water launched a communication campaign in 2013 entitled 'Let's Stop the Block'. It aims to raise awareness of and reduce the risk of sewer flooding. The campaign provides information on the factors causing blockages, flooding and pollution and offers advice on how customers can help reduce personal, environmental and financial impacts across Wales. Dŵr Cymru Welsh Water also provide practical advice and information on how to respond to sewer flooding on its website.

Severn Trent Water redesigned parts of its website to better inform its customers and raise awareness of how to help prevent sewer flooding. The website also includes a live incident map allowing customers and stakeholders to keep up to date with incidents and repair work being undertaken in their area.

5.3 Identification of 'At Risk' Groups and Vulnerable Individuals

Certain parts of communities require tailored information on flooding to meet their specific needs. Some may be unable to easily respond to flood events, whilst others may not be familiar with a locality and the flood risk that is present. In developing community flood plans, Lead Local Flood Authorities undertook work to identify vulnerable groups and individuals and worked closely with Emergency Response teams. This led to some specific parts of a community having its own flood plan such as the Monmouth Riverside Caravan Park. Lead Local Flood Authorities, such as Isle of Anglesey County Council, Ceredigion County Council, Gwynedd Council and Denbighshire County Council, maintain a list/database of vulnerable people in flood warning areas and offers assistance to those at risk. Other Lead Local Flood Authorities, for example Conwy County Borough Council have undertaken GIS projects to map Council infrastructure containing vulnerable persons. In addition Blaenau Gwent County Borough Council is leading a Welsh Government funded project on vulnerability, working with Torfaen County Borough Council and Caerphilly County Borough Council.

5.4 Flood Warnings and Single Point of Contact

Natural Resources Wales provides a free Flood Warnings Direct service to people at risk of flooding. By the end of March 2014 there were 95,275 number of people registered to receive flood warnings. This represents a 1.0% increase from the previous year.

This service is provided where feasible through a network of river and sea level monitoring that is manned round the clock and activates flood alerts, flood warnings and severe flood warnings to homes and businesses.

Different rivers react to rainfall in different ways and some rivers can rise very quickly and flood properties within minutes of rainfall. In communities where properties are close to fast reacting rivers, it is not possible to provide flood warning services using traditional forecasting methods. Therefore, Natural Resources Wales has begun introducing an automated flood warning service to provide these communities with bespoke advance notice of potential flooding. This has enabled NRW to increase the service to 4000 more properties (up from 76% in 2011/12) and has proved successful in issuing timely warnings in response to heavy rainfall e.g. Llanddowror in Carmarthenshire. At present Natural Resources Wales can provide the Flood Warning Service to 78% of properties in flood risk areas.

One of the National Strategy measures was to develop a single point of contact for queries relating to flood risk. During the reporting period, trials were undertaken by Natural Resources Wales to provide the public with an integrated phone line service to manage queries relating to all sources of flooding. Feasibility and future options are currently being considered by Welsh Government.

6. Incidents & Recovery

6.1 Introduction

RMAAs work together and with other key partners to provide an effective and sustained response to flood and coastal erosion incidents. Integral to that work is the planning and preparation in anticipation of future incidents and by facilitating post incident recovery within the shortest possible timescale. This chapter describes work undertaken during the reporting period to deliver the third overarching objective of the National Strategy –*providing an effective and sustained response to flood and coastal erosion events*.

6.2 Roles

As Category 1 responders under the Civil Contingencies Act 2004 Lead Local Flood Authorities, the Police, Fire and Rescue, and Ambulance services, Natural Resources Wales, and health bodies have a statutory duty to prepare for and respond to major incidents. A range of Category 2 partners, such as utility companies and railway operators, as well as the Health and Safety Executive, also work closely with Category 1 responders, before, during and after incidents.

The local police force is in charge during an incident, with the Lead Local Flood Authority as the recognised lead for emergency planning and post incident recovery at the community level. They play a critical role in civil protection and have a wide range of functions that are likely to be called upon in support of the emergency services during and after an incident such as a flood.

The Welsh Fire Rescue Services (WFRS) and the Royal National Lifeboat Institution (RNLI) have an established flood rescue partnership which allows WFRS to benefit from RNLI boat expertise and the RNLI to use WFRS's technical expertise on swift water awareness and rescue. This cost-neutral agreement covers training, training standards and quality assurance and is the first partnership of its kind in the UK.

6.3 Incidents

During the reporting period Wales experienced a number of very high rainfall events, with 2012 being recorded as being the third wettest year on record. A large number of other significant rainfall events occurred, which were either sudden or intense, or over prolonged periods, causing flooding from surface water, rivers and streams. There was also a prolonged period of storm conditions which affected much of the coastline during the winter of 2013/14. Together these weather events meant that the reporting period was notable for both the frequency and severity of flooding. The weather also meant the ground was particularly saturated at times and this together with the winter 2013/14 storms resulted in a number of coastal erosion incidents.

Following the coastal floods of winter 2013/14, the Minister for Natural Resources and Food commissioned Natural Resources Wales to undertake a review of the flooding. This review will be used to inform what actions need to be taken to improve Wales' resilience to storms of this kind in the future.

Published in two phased reports during January and April 2014 the review assessed the damage caused by the storms. The review's findings showed that for the majority of the Welsh coastline, the defences and the emergency response performed well. However, the storms seriously tested the defences, the response and the resilience of Wales' coastal areas. The review also identified that Wales is particularly vulnerable to storms of this kind and climate change projections indicate that the risk will increase due to more extreme weather in the future.

The review therefore assessed the requirements to meet the challenges posed by this increased risk and identified 47 recommendations, compiled with the help of Wales' coastal Lead Local Flood Authorities. These have been summarised into six priority areas and the recommendations are being considered by the Minister. The Minister has asked Natural Resources Wales to set out a delivery plan which will assess the work needed to implement the recommendations should they be accepted.

- Sustained investment in coastal risk management, including in flood forecasting, warning, response and recovery plus investment in flood defences
- Improved information on coastal flood defence systems, the areas they protect and on other structures that provide a defence function, e.g. promenades.
- Greater clarity of roles and responsibilities of agencies and authorities, including enabling more efficient and effective delivery for communities.
- Assessment of skills and capacity to determine if and where gaps exist in RMAs or emergency response services.
- More support to enable communities to become more resilient, and help manage their flood risk in the future with support from relevant agencies.
- Delivery of locally developed plans for coastal communities that increase understanding of and adaptation to flood risk and climate change.



Figure 14 Aberystwyth during the winter storms 2014. Photograph courtesy of The Daily Telegraph (www.telegraph.co.uk)

Lead Local Flood Authorities also have a duty under Section 19 of the Flood and Water Management Act (2010) to investigate flood events that occur within their area. Lead Local Flood Authorities have reported that up to the end of March 2014, there had been at least 397 local flood incidents deemed significant enough to trigger such an investigation, although the trigger levels for carrying out an investigation varies between Authorities.

Natural Resources Wales collates data which focuses on flooding from rivers and the sea. Combined available information indicates that at least 1000 properties were flooded during the reporting period, some on multiple occasions.

There were also impacts upon infrastructure particularly road and rail transport, with regular localised road closures due to surface water flooding and more long term disruption such as the closure of the north Wales main railway line for over a week and sections of the Cambrian line for over four months.

Amongst the many instances of flooding that occurred, the weather conditions described led to four very large flooding incidents in Wales during the reporting period:

- North Ceredigion - 8th & 9th June 2012¹⁶, intense rainfall falling on already saturated ground causing flooding to communities including Tal-y-bont and Aberystwyth;
- North Wales rivers - 26th & 27th November 2012¹⁷, intense rainfall falling on already saturated ground causing flooding to communities including St Asaph and Ruthin;
- North Wales coast - 4th & 5th December 2013, coastal storm surge causing flooding to communities including Rhyl and major rail and road networks;
- West and South Wales – 3rd to 6th January 2014¹⁸, coastal storm surge causing flooding to communities including Aberystwyth, Cardigan and Newport.

During the reporting period Dŵr Cymru Welsh Water responded to 298 confirmed internal flooding incidents and 5,792 external flooding incidents from public sewers. They also attended 119 confirmed internal and 2,854 external flooding incidents from 'transferred sewers' that were formerly in private ownership prior to the private sewer transfer in October 2011.



Figure 15 Caravans at Porthkerry Leisure Park. Photograph courtesy of BBC online

The particularly wet conditions led to high water tables and waterlogging of soils and rock. In places this caused coastal cliffs to become unstable and led to a number of coastal erosion incidents during the reporting period. For example in the Vale of Glamorgan there were cliff falls at Porthkerry (November 2011) and Penarth (May 2012 and March 2014). The

¹⁶ http://www.ceredigion.gov.uk/utilities/action/act_download.cfm?mediaid=43372&langtoken=eng

¹⁷ <https://moderngov.denbighshire.gov.uk/documents/s8855/Glasdir%20Flooding%20Report.pdf?LLL=0>

¹⁸ Wales Coastal Flooding Review Phase 1 Report – Assessment of Impacts (NRW undertook Phase 1 of the S19 investigation of December 2013 and January 2014 North Wales coastal storm on behalf of all Coastal Local Authorities)
<http://www.naturalresourceswales.gov.uk/alerts/flood-warnings/wales-coastal-flooding-report>

winter 2013/14 storms also led to widespread incidents of coastal erosion around the coast of Wales such as at Llandanwg and Morfa Bychan in Gwynedd and Freshwater West, Barafundle and Broadhaven in Pembrokeshire.

6.4 Preparedness

Planning ahead to prepare for flooding or erosion is integral to the effective management of incident. The focus for joint-agency emergency planning in Wales is through the four Local Resilience For a (LRF). During the reporting period, all four have developed multi-Agency/LRF Emergency Flood Plans from which individual Lead Local Flood Authorities have developed local level detailed flood plans e.g. the Vale of Glamorgan, Troedyrhiw, Tintern and Llandudno.

Many Lead Local Flood Authorities indicate that they have evacuation plans in place, including provision for transport arrangements. Most also report that Mutual Aid Protocols are either in progress or agreed with their LRF partners. Thirteen Lead Local Flood Authorities have confirmed they have identified suitable respite accommodation.

Several Lead Local Flood Authorities including Blaenau Gwent County Borough Council, Caerphilly County Borough Council, Cardiff City Council and Powys County Council also make specific reference to Reservoir Plans and both Gwent and Cardiff LRF Emergency Plans consider reservoirs.

During the reporting period, water companies were requested by Ofwat to include measures as part of their 2015/19 business planning process to assess and improve the resilience to flooding of their water supply and sewerage treatment infrastructure.

During the reporting period one national scale multi-agency Flood Exercise, 'Exercise Berwyn' was carried out (described below).

Through the Wales Flood Group, a national coastal evacuation exercise is currently being scoped. The exercise, which will test multi-agency plans for mass evacuation, is planned to take place in the first quarter of 2015.

A number of exercises at the local level have also taken place throughout Wales during the reporting period. Powys County Council held a 'Live Emergency Rest Centre' exercise for the Rhyader area in October 2013 and residents of Talybont, Ceredigion undertook an emergency exercise in November 2013. This followed on from the flooding in June 2012 which resulted in around 26 properties being flooded.

Natural Resources Wales organised a multi-agency flood simulation exercise to test the Talybont community flood plan, which involved the local community, Ceredigion County Council, Dyfed Powys Police and Mid and West Wales Fire and Rescue. As part of this exercise, the community was presented with a flood scenario which allowed them to put their plans and preparations in place, including installing individual property protection supplied by Natural Resources Wales. This exercise enabled the community identify where their flood plan could be improved.

Exercise Berwyn

On 10th April 2013, over 200 specialists from 17 different rescue agencies including the Wales Inland Water and Flood Rescue Group, Fire and Rescue Services, North Wales Police, the RNLI, RAF Search and Rescue, NRW, Gwynedd Council, Welsh Ambulance Services NHS Trust, the RSPCA, Severn Area Rescue Association, Maritime and Coastguard Agency, Automobile Association, and North Wales Mountain Rescue Association participated in a series of flood rescue exercises.

Flood rescues were staged for 20 simulated casualties in challenging conditions around the Bala area in Gwynedd. The aim was learn from recent flooding incidents, and test resilience. The scenarios were based on a wide range of actual experiences in Wales, including the rescue of people from flooded holiday caravans, the rescue of casualties from vehicles trapped in fast flowing water and the rescue of livestock and canoeists. The exercise was also preceded by a community awareness initiative designed to engage with the local community and to promote flood emergency awareness and preparedness.

The initiative was particularly successful in engaging with local schools. A record of the exercise can be viewed on YouTube¹⁷.

6.5 Recovery

The National Strategy sets out a number of specific measures which are required to improve the speed and quality of flood recovery. By the end of the reporting period, of the 22 Lead Local Flood Authorities, at least 18 have finalised or are developing procedures to deal with recovery from incidents and carry out any repairs which are their responsibility. 16 also confirm they have arrangements in place for the clearance of debris.

Some specific actions that have been reported include: the development of *Guidance on Recovery from Major Incidents* by the Dyfed Powys LRF; identification of specific roles for assistance in clean-up operations in the Ceredigion County Council Emergency Response Plan, and; the production of *Site Clearance Guidance* by Gwynedd Council with an Interdepartmental Working Group specifically set up.

As a result of Lead Local Flood Authority investigations carried out into flood events a series of site specific short term and long term measures have been proposed following each flood event. These include increasing the uptake of flood warnings in areas where available, expanding the flood warning service coverage to communities not yet serviced, providing flood protection measures where appropriate, providing mitigation through targeted and appropriate maintenance and increasing flood resilience measures. Work to progress these recommendations will continue over the next reporting period.

Following the June 2012 flood events in North Ceredigion, Natural Resources Wales worked closely with Ceredigion County Council to hold flood surgeries in the affected communities such as Aberystwyth, Capel Bangor, Borth, Dol y Bont and Talybont. The flood surgeries were well attended and provided an opportunity for flood affected individuals to discuss their experiences and receive advice on matters such as flood repairs, insurance and other types of support. Similar flood surgeries were held after other flood events including St Asaph (November 2012), Solva (January 2013) and Cardigan (January 2014). The Fire Service

¹⁷ <http://www.youtube.com/watch?v=cUyGuEPsggw>

and Dŵr Cymru Welsh Water also supported these surgeries as did the National Flood Forum, a national charity dedicated to supporting communities at risk of flooding.

In relation to sewer flooding, Dŵr Cymru Welsh Water issue Floodcare Packs to customers who are affected, providing information on what they will do in the event of sewer flooding and who the customer should contact. They have a commitment to attend the site of flooding within 4 hours of the incident and commit to provide recovery and repair updates to customers after 48 hours, 10 days and 30 days. In the event of a large scale flooding event, They have the potential to use the mass text facility that is currently used to inform customers of supply interruptions. To date, it has not been necessary to implement this service.

7. Sustainable Development

7.1 Introduction

As described in Chapter 1, Welsh Government has made a commitment to legislate to make sustainable development the central organising principle of the devolved public services in Wales. To accompany their National Strategy, Welsh Government produced their *Sustainable Development: Guidance to Risk Management Authorities, 2011*¹⁹ describing how RMAs should apply sustainable development to their flood and coastal erosion risk management duties.

In addition, the Welsh Local Government Association has produced a report on integrating climate change thinking into decision making and service delivery in their 2013 report *Leading practice in sustainability for Local Authorities*²⁰. This chapter provides examples of how the three pillars of sustainable development - social, economic, and environmental – are being applied by RMAs in their work.

7.2 Social sustainability

During the reporting period, flooding in Wales has caused both injuries and fatalities, and therefore had a devastating impact upon individuals and communities. The implications of flooding and coastal erosion have short-term, immediate effects on physical and mental health and well-being, as well as significant longer-term impacts..

During the reporting period, Public Health Wales has provided advice for frontline responders and the public during flood events, as well as advice on how to clean up safely following floods and how to cope without mains water²¹. In addition, research was published which explored the impacts of flooding on mental health ^{22 23 24}.

In 2011 the Welsh Government produced a Community Engagement Toolkit²⁵, which primarily focused on communicating the risks of flooding. Welsh Government also produced a report in 2013 on *Flood Advocacy and Support Service for Communities in Wales*²⁶. This report provides an objective overview of what makes a difference to communities before, during and after flood incidents. It also puts forward recommendations for a flood support framework and suggestions for a support service for Wales. Further work to assess the recommendations and, if appropriate, how they may be implemented is underway.

¹⁹ Welsh Government, 2011. Sustainable Development: Guidance to Risk Management Authorities.

<http://wales.gov.uk/topics/environmentcountryside/epq/flooding/nationalstrategy/guidance/sdguidance/?lang=en>

²⁰ WLGA 2013. *Leading practice in sustainability for local authorities* <http://www.wlga.gov.uk/sustainable-development/leading-practice-in-sustainability-for-local-authorities/>

²¹ <http://www.wales.nhs.uk/sitesplus/888/page/43887>

²² Health Protection Agency, 2011. *The effects of flooding on mental health* http://hpa.org.uk/webw/HPAweb&HPAwebstandard/HPAweb_C/1317131788841

²³ Stanke, C., Murray, V., Amlot, R., Nurse, J., Williams, R., 2012, *The effects of flooding on mental health: outcomes and recommendations from a review of the literature*, PLOS: Current disasters

²⁴ Lock, S., Rubin, G.J., Murray, V., Rogers, M.B., Amlot, R., Williams, R., 2012. *Secondary Stressors and Extreme Events and Disasters: A Systematic Review of Primary Research from 2010-2011*, PLOS: Current disasters

²⁵ <http://wales.gov.uk/topics/environmentcountryside/epq/flooding/communities/toolkit/?lang=en>

²⁶ Welsh Government, 2013. *Flood Advocacy and Support Service for Communities in Wales*.

<http://wales.gov.uk/topics/environmentcountryside/epq/flooding/studies/advocacyandsupport/?lang=en>

The way in which RMAs prioritise where they focus their efforts in managing flooding and coastal erosion is based upon the level of flood risk. Therefore RMAs implement measures to manage flood risk across all communities across Wales, regardless of income levels or other measures of social deprivation or advantage.

7.3 Economic sustainability

Effective management of flooding and coastal erosion helps maintain local economies and ensure communities at risk remain viable and attractive locations for businesses to invest in. Such management is also fundamental in minimising the cost of flooding to individuals and the public, private and third sectors in Wales.

Initial assessments of the cost of the winter storms 2013/14 suggest the total will exceed £43 million. This figure comprises of damages to:

- approximately 300 properties (using an estimated average insurance claim of £40,000 for each property)
- flood defence structures (£8.1million)
- transport infrastructure including Network Rail assets (current estimates of costs to rail infrastructure alone is approximately £20 million)²⁷
- agricultural land
- pavements and street furniture (£3.3million)
- the Wales Coastal Path (£340,000)²⁸

In addition is the estimated £28m cost from approximately 700 properties flooded in June and November 2012. These four flood events alone therefore resulted in a total cost likely to exceed £71 million .

However, costs many times greater were avoided as a result of the investment made in flood defences and other risk management measures. An analysis of the winter 2013/14 floods alone showed that less than 1% of properties at risk actually flooded and indicated that the financial damages therefore avoided came close to £3bn and allowed the local economies to recover more quickly.

7.4 Environmental sustainability

Maintaining the natural resources of Wales for present and future generations is the third pillar of sustainable development. The natural environment can also play a crucial role in managing flooding, often in ways that are equally or more cost effective than manmade measures.

Caldicot and Wentlooge Levels Internal Drainage Board worked with a range of partners including the RSPB and Gwent Wildlife Trust to deliver biodiversity benefits as part of its work. Examples include water level management for the Newport Wetlands reserve and watercourse maintenance for a number of Wildlife Trust reserves including Solutia Meadows

²⁷ Network Rail Wales

²⁸ NRW, 2014. Wales Coastal Flooding Review Phase 1 Report – Assessment of Impacts
<http://naturalresourceswales.gov.uk/alerts/flood-warnings/recent-flooding-incidents/wales-coastal-flooding-report/?lang=en>

and Magor Marsh. Adjusting practises, such the timing and extent of mowing regimes has also helped to maximise environmental benefits.

Since its formation, Natural Resources Wales has been looking at how innovative approaches to flood risk management by working with natural processes can be implemented. It began trialling natural resource management planning pilot approaches in the Rhondda, Tawe and Dyfi catchments whilst exploring the use of other techniques to store rain water by re-instating blanket bogs, or improving the absorbency of soils, and slowing the flow of water down through river catchments by woodland creation on floodplains and agricultural land. Such holistic approaches could also provide wider environmental benefits such as enhancing biodiversity, capturing carbon, reducing sedimentation and improving water quality. Natural Resources Wales is part of the England-Wales research programme looking at 'Working with Natural Processes'.

Llanrhidian Habitat Creation Project, North Gower



Figure 16 Llanrhidian. Gower

This project created 1 hectare of new habitat in addition to the 5 hectares created since 2010. Monitoring has shown a significant increase in the number of birds using the site and otters have also been seen there since the new habitat was created.

Since 2011 Natural Resources Wales has contributed over £200,000 towards the creation or enhancement of 125 hectares of water dependent habitat including floodplain meadow and pond at Ty'n y Cerrig in the Loughor Valley and wetland habitat at Llanrhiddian, Gower, illustrated below.

Compliance with environmental legislation

RMAs' flood and coastal erosion risk management activities need to comply with relevant environmental legislation such as the Conservation of Habitat and Species Regulations 2010 and the Water Framework Directive. It is important that such activities do not cause any detriment to the quality of Wales' natural habitats and resources and that opportunities to provide enhancement are created wherever possible.

Strategic Environmental Assessments were also undertaken on strategic plans such as the Lead Local Authorities Shoreline Management Plans. Water companies such as Severn Trent Water have published a Water Framework Directive report to set out how

environmental legislation can be implemented in a way that delivers significant environmental improvements whilst keeping water bills affordable²⁹.

Habitat Creation as part of the Fairbourne Flood Alleviation Scheme

The flood alleviation scheme at Fairbourne, Gwynedd, completed during winter 2013/14 involved both river and tidal works and reduced the risk of flooding to 410 houses and 10 businesses

The scheme significantly increased the community's standard of flood protection as well as delivering biodiversity benefits. The tidal works included bringing embankments up to current NRW standards by strengthening some sections that were made of poor quality materials, widening the crest and reducing the side slope gradients. NRW also purchased land to allow two sections of the Fairbourne embankment to be set back in order to create up to 1.3ha of new saltmarsh habitat that had been lost due to the scheme.



Figure 17 Fairbourne Flood Alleviation Scheme

During the reporting period, steps have also been taken to help reverse the decline in the European eel stock, classed as an unsustainable fishery by the International Council for the Exploration of the Sea. For example the IDBs and Natural Resources Wales removed obstacles in some of their gauging weirs, sluice gates and pumping stations to allow eels to move more easily upstream to spawn.

²⁹ <http://www.severntrent.com/water-framework-directive>

8.Resources

8.1 Introduction

Investment in resources is fundamental to maintain and enhance the capability of Wales' RMAs to manage the risks of flooding and coastal erosion. During the reporting period there has been a significant investment in a range of elements – financial, staff, training, tools and information. There was a particular focus on investment for RMAs to implement their new legal roles and responsibilities under the Flood and Water Management Act 2010 and the Flood Risk Regulations 2009. This Chapter describes the types and amounts of investment made during the reporting period to manage flooding and coastal erosion.

8.2 Current Funding

Between 2011 and 2014 around £165 million has been invested in flood and coastal erosion risk management in Wales. A significant proportion of the funding is Welsh Government Grant Aid provided to Lead Local Flood Authorities and Grant in Aid to Natural Resources Wales to deliver capital projects. This programme of works include the construction of new flood and coastal defences, significant maintenance works, modelling improvements, environmental mitigation/enhancement works and developing shoreline management plans.

Other Welsh Government sources of funding include the Wales Infrastructure Investment Plan (WIIP). This programme aims to co-ordinate the delivery of major infrastructure investments and make a significant contribution to the long term economic, social and environmental wellbeing of people and communities in Wales.

In addition, funding has been provided from the European Regional Development Fund (ERDF). Between April 2011 and March 2014, £19.5 million was drawn down from ERDF to support projects run by Natural Resources Wales, Lead Local Flood Authorities and Dŵr Cymru Welsh Water. During the reporting period, 12 such schemes were completed, with 20 more ongoing. The completed schemes have provided a reduced flood risk to over 3300 properties.

Flood and Coastal Erosion Risk Management Funding in Wales			
Natural Resources Wales		Lead Local Flood Authorities	
£88.1 million	GIA	£26.3 million	GA
£7.8 million	ERDF	£11.7 million	ERDF
£5.7 million	WIIP	£19.4 million	WIIP
£2 million	Other WG sources	£4 million	Other WG sources

Table 5 Funding invested between April 2011 and March 2014

Welsh Government also funds (circa £135k per annum) the Wales Coastal Monitoring Centre hosted by Gwynedd Council.

Investment by IDB' between April 2011 and March 2014 was approximately £3.9m, derived from agricultural drainage funding from landowners and a special levy on Local Authorities.

In terms of water company investment in flood risk management, Dŵr Cymru Welsh Water invested a proportion of its total £40 million asset management programme running from

2010-15 to reduce the risk of sewer flooding to properties within its operating area. They also made additional expenditure from the £11million RainScape programme to reduce property flooding from surface water.

8.3 Investment in skills and capacity

The implementation of the Flood and Water Management Act 2010 and Flood Risk Regulations 2009 placed significant additional requirements on RMAs. RMAs have invested in staff, technical skills and tools to meet these requirements in addition to their existing resourcing of flood and coastal erosion risk management work. Some RMAs such as Anglesey County Council, Gwynedd Council and Wrexham County Borough Council have created new posts to help deliver their duties.

Natural Resources Wales and the Environment Agency, supported by the Welsh Government and Welsh Local Government Authority ran a programme of workshops and online learning modules for Welsh Lead Local Flood Authorities to develop knowledge and understanding of their new responsibilities and duties. Three Regional Flood Risk Management Groups (North, South East & South West Wales) were established to pool resources and share technical knowledge between Lead Local Flood Authorities, Natural Resources Wales, Dŵr Cymru Welsh Water, Welsh Local Government Authority and other partners. Dŵr Cymru Welsh Water also established a Surface Water Management Group to specifically address and manage their duties as an RMA. Natural Resources Wales also began consolidating its technical knowledge of reservoir flood risk management in anticipation of its forthcoming new duties under the Flood and Water Management Act.

In May 2012, the Welsh Local Government Authority undertook a skills and capacity audit to understand the current level of skills and capacity within each Lead Local Flood Authorities. The results of this survey identified that a good level of knowledge had been developed for certain aspects however some significant gaps remained, for example in understanding sustainable drainage, reservoirs and Flood Risk Management Plans. The survey was carried out relatively early in the reporting period and it is likely that knowledge levels have increased as work on these topics progressed in 2012 and 2013. However, the recent Wales Coastal Flooding Review³⁰ identified the need for a further national audit of skills and capacity in relation to management of coastal erosion and flooding and to develop options to address issues identified.

8.4 Investment in research

There is a joint Defra/Environment Agency/Welsh Government/Natural Resources Wales Flood and Coastal Erosion Risk Management Research and Development Programme. It has continued to run throughout the reporting period and is designed to undertake a suite of projects to inform the development of policy and strategy and to identify operational best practice. In early 2014 the programme's aims and representation was revised to include greater focus on Welsh aspects. It is arranged into Thematic Advisory Groups:

³⁰ NRW 2014. Wales Coastal Flooding Review Phase 2 Report <http://naturalresourceswales.gov.uk/our-work/news/major-report-identifies-ways-improve--wales-resilience-coastal-flooding/?lang=en#.U2DbWDf4b1U>

- Policy, Strategy and Investment – including economics, social science, coastal and inland overview, partnership working, growth and development, flood insurance and project appraisal.
- Asset Management – including the design, build, maintenance and decommissioning of assets, including reservoirs, whole life costing, mitigating climate change and compliance with environmental legislation.
- Incident Management - including meteorology, emergency planning, preparedness, forecasting, warning, response and recovery.

In addition to these three themes, there are four topics which cut across the whole programme: Working with Natural Processes; Coastal; Reservoir Safety; Local Flood Risk.

Outputs from this research are available on the R&D programme website³¹, and include research reports, guidance documents, conference papers, seminars and scientific journals.

³¹<http://evidence.environment-agency.gov.uk/FCERM/en/Default/HomeAndLeisure/Floods/WhatWereDoing/IntoTheFuture/ScienceProgramme/ResearchAndDevelopment/FCRM.aspx>

9. Planning Ahead

9.1 Introduction

What is the most sustainable way over the next 50 to 100 years to manage a changing coastline? How can a new development be best located and designed to avoid it being at flood risk over its whole lifetime? These are some of the questions that effective forward planning should answer to better inform the decisions our society takes which will have consequences lasting many decades. A summary of the main forward planning initiatives during the reporting period is provided below.

9.2 Strategic planning

9.2.1 Coastal erosion and coastal flooding

The reporting period saw the completion of the second round of Shoreline Management Plans (SMP2s) in Wales, produced by the Welsh and cross-border Coastal Groups. The SMP2s were approved by all coastal Lead Local Flood Authorities prior to submission to the Welsh Government for Habitat Regulations Assessment sign off. The Severn Estuary and North Wales & North West England SMP2s had been submitted to the Welsh Government before the reporting period, Swansea Bay & Carmarthen Bay SMP2 was submitted in December 2012, and West of Wales SMP2 in May 2013.

The plans identify the preferred policies (Hold the Line, No Active Intervention, Managed Realignment, Advance the Line) over three epochs: the next 20 years, 20-50 years and 50-100 years. The aim of the plans is to secure a more sustainable shoreline management approach in the longer term, which is more resilient to climate change, particularly sea-level rise.

The plans provide a wide range of valuable information including:

- current and future sediment movement patterns;
- predicted locations and rates of erosion;
- the gains and losses in coastal habitats;
- the effect of sea level rise on flood risk, and;
- the costs and options for managing how all these factors combine to influence each stretch of coastline.

Subject to final Welsh Government approval, RMAs, infrastructure operators and others now have comprehensive information on

coastal processes on which to base future decisions and identify where more medium/long term planning is needed. For example, in Fairbourne, a Multi-Agency Project Board chaired by Gwynedd Council with representatives from Welsh Government, Natural Resources Wales, Dŵr Cymru Welsh Water, Network Rail, Arthog Community Council and the County

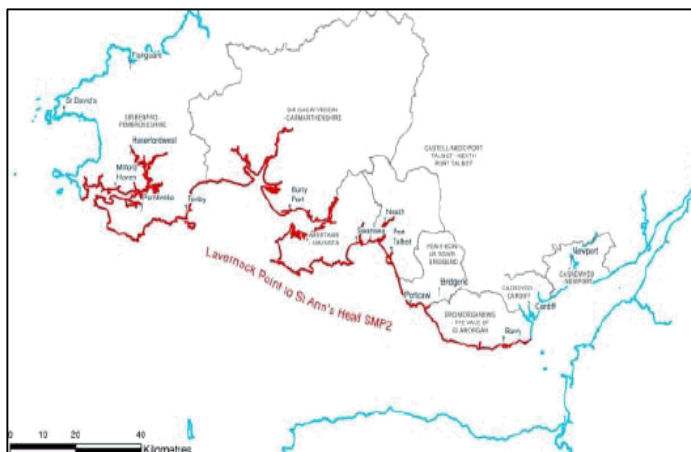


Figure 18: Extract from Lavernock Point to St Ann's Head SMP

Councillor is engaging with representatives from the local community to consider how to best maintain vibrant communities in the short to medium term, whilst planning ahead for predicted increased coastal flood and erosion risk in the long term.

9.2.2 Surface water, ground water and minor watercourses

Following the floods in England in 2007 it was recognised strategic planning to manage local sources of flooding such as surface water, was equally important to that for rivers and the coast. Welsh Lead Local Flood Authorities were therefore required to develop a Local Flood Risk Management Strategy with the aim of enabling better management and coordination of that flood risk, whilst aligning with the over-arching objectives of the National Strategy

As of March 2014, of the 22 Lead Local Flood Authorities in Wales, 15 had completed and published their Local Flood Risk Management Strategies, with the remainder going through final approval procedures.

Under the Flood Risk Regulations 2009, Lead Local Flood Authorities are also responsible for undertaking an assessment and where necessary, a management plan for the management of surface water, ground water and ordinary watercourses. All 22 Lead Local Flood Authorities had published their Preliminary Flood Risk Assessments by December 2011 and by October 2013 all 22 Lead Local Flood Authorities confirmed their intention to produce a Flood Risk Management Plan. By March 2014, Lead Local Flood Authorities work on scoping these management plans was well underway and the plans will be consulted on and published during the next reporting period.

9.2.3 River flooding

In 2009, Environment Agency Wales produced nine Catchment Flood Management Plans to cover all river catchments wholly or partly in Wales. These plans provide an overview of river flood risk within a catchment and set out the preferred approach for managing that risk in a sustainable manner over the next 50 to 100 years. Prepared in partnership with Local Planning Authorities, community and environmental groups and other partners, Natural Resources Wales continued implementing the Catchment Flood Management Plans into the reporting period.

Under the Flood Risk Regulations 2009, Natural Resources Wales is also required to produce statutory Flood Risk Management Plans across Wales for main rivers, the sea and reservoirs. Natural Resources Wales decided to integrate Catchment Flood Management Plan information and policy approaches, along with updated information, into the development of its new management plans. By March 2014 Natural Resources Wales' work to scope its Flood Risk Management Plans was well underway. These plans will be consulted on and published during the next reporting period.

9.2.4 Reservoirs

There are currently 203 large raised reservoirs in Wales subject the regulatory requirements of the Reservoirs Act 1975. The Act's purpose is to reduce the risk to the communities downstream of these reservoirs as a consequence of an uncontrolled release of water. It requires reservoir owners to register with the enforcement authority (in Wales this is Natural Resources Wales) and places supervision and inspection duties on the reservoirs owners

or managers. These reservoirs are owned by a range of bodies including water companies, Local Authorities, industry, private individuals and Natural Resources Wales. On-site reservoir flood plans have been developed for the highest risk reservoirs in Wales and/or where the inspecting engineer deems that an on-site plan is needed in the interests of safety. There is also guidance available for the development of on-site plans for other reservoirs. Off-site plans are developed by Lead Local Flood Authorities or via the Local Resilience Fora where the risk is considered to be significant enough to justify it. Gwent Local Resilience Forum and at least six Lead Local Flood Authorities have developed off-site reservoir plans.

9.2.5 Water Company plans

All water companies are required by the regulator (Ofwat) to develop business plans on a five year cycle to maintain customer services for water supply and sewerage treatment and to maintain and enhance the quality of the water environment. During the reporting period the water companies developed their business plans for the 2015-2020 period and included specific proposals for the management of sewer flooding and surface water and increasing the flood resilience of their assets.



Figure 19: Dŵr Cymru Welsh Water Business Plan 2015-2020 submitted to Ofwat for approval.

For example Severn Trent Water carried out extensive consultation on its proposed 2015-2020 business plan, and gained support for the move towards a more risk based approach to dealing with sewer flooding. Its business plan aims to reduce sewer flooding incidents by 1emphasis on partnership working to achieve this aim. Dee Valley Water has also included investment for the maintenance of dams and impounding reservoirs in its business plan. The investment includes provision for general maintenance of dams and required inspections.

9.2.6 Internal Drainage Boards

Internal Drainage Boards (IDBs) in Wales all have annual programmes to manage work within their Districts.

9.3 Spatial planning

Welsh Government's overarching aim is to guide development away from areas at high risk of flooding. This is most easily achieved at the strategic planning stage where alternative sites, at lesser risk of flooding, can be identified and allocated.

Planning Policy Wales and Technical Advice Note 15: Development & Flood Risk, July 2004 (TAN15) provide the precautionary framework to guide planning decisions. The policy framework is applied at the strategic planning scale by the local planning authority to their Local Development Plans (LDPs) as well as to individual planning applications.

By March 2014, 16 of the 25 LDPs in Wales were adopted and include policies that specifically address managing flood risk³². Whilst good progress has been made during the reporting period, a significant number of Wales' LDPs and their policies on flood risk remain to be adopted.

Planning decisions in areas at flood risk is the responsibility of the Local Planning Authority. As a statutory consultee on such matters, Natural Resources Wales provides flood risk advice to inform their decisions on both strategic and individual planning proposals. During the reporting period there were a small number of applications which were permitted against Natural Resources Wales advice.

In 2011/12, 9 planning proposals to which Natural Resources Wales raised an objection on flood risk grounds were granted approval. In 2012/13, this figure was 15. Data for 2013/14 is not yet available for inclusion in this report but will be collated for inclusion in the next report.

³² NRW 2013. High Level Target 13 (Hlt13) - Development and Flood Risk in Wales 2012 / 2013. Report to the Welsh Government by Natural Resources Wales in association with the Welsh Local Government Association.

Acknowledgements

This report has been developed with information from a range of sources, particularly the other RMAs in Wales and other professional partners. Natural Resources Wales would like to express its sincere thanks to these organisations for their contributions:

- All 22 Lead Local Flood Authorities
- The Welsh Local Government Association
- 3 Internal Drainage Boards (Caldicot & Wentlooge Levels, Lower Wye & Powysland)
- 5 Water and Sewerage companies operating in Wales (Albion Water, Dee Valley Water, Dŵr Cymru Welsh Water, Severn Trent Water, Scottish and Southern Energy)
- Welsh Government
- Coastal Groups
- Wales Coastal Monitoring Centre
- Wales Resilience Forum
- Local Resilience Fora
- Community Resilience UK

ANNEX 1- Summary of progress against all National Strategy Objectives

The main source of information to inform the table below is Welsh Government. Sources also include Natural Resources Wales, Lead Local Flood Authorities, Coastal Groups, Local Resilience For a and Community Resilience UK

Objective 1

Reducing the impacts on individuals, communities, businesses and the environment from flooding and coastal erosion

Sub-Objective 1	Provide Strategic Leadership and Direction at a National Level	Delivery Deadline	Who will Lead Delivery	Progress
Measures				
1.1	The provision of overarching national policies for the management of flood and coastal erosion risk through a National Strategy and associated guidance.	End of 2011	Welsh Government	Completed. National Strategy published Nov 2011. Other guidance referenced below.
1.2	The provision of national guidance relating to sustainable development, when exercising flood and coastal erosion risk management functions.	End of 2011	Welsh Government	Completed. Published Nov 2011
1.3	The provision of national guidance on the preparation of Local Flood Risk Management Strategies by Lead Local Flood Authorities.	End of 2011	Welsh Government	Completed. Published Nov 2011
1.4	Development of a toolkit to assist in raising community awareness and preparation for of flood and coastal erosion risk	End of 2011	Welsh Government	Completed. Published October 2011
1.5	Development of National Standard for Sustainable Drainage Systems and accompanying guidance.	End of 2013	Welsh Government	Ongoing. Welsh Government is developing national standards and guidance. Once developed, these will go out to consultation
1.6	Undertaking of a review of national policies in relation to coastal risk management including research on the options for communities facing increased levels of risk.	End of 2013	Welsh Government	Ongoing. Coastal adaptation review underway in light of SMPs and 2014 Coastal Flooding Review.
1.7	Development of a national funding policy and prioritisation methodology for the assessment of	End of 2013	Welsh Government	Ongoing, Draft consultation document on National Programme of Investment being finalised for consultation Summer 2014.

	applications for funding for all flood and coastal erosion risk management activities funded from the Welsh Government.			
1.8	Establishment of a principle for ensuring access to buildings and contents flood insurance to replace the Statement of Principles.	June 2013	Welsh Government	Ongoing for implementation in 2015.
1.9	Drafting and commencement of legislation relating to flood and coastal erosion risk management as required through the life of this Strategy.	End of 2017	Welsh Government	Ongoing e.g. secondary legislation for reservoir safety scheduled for autumn 2014
1.10	Raising awareness of the implications of flood and erosion risk across all business sectors over the life of the Strategy	End of 2017	Welsh Government	Ongoing. Recent coastal storms of Dec 2013/Jan 14 has created more joined up working between government departments, particularly in terms of providing funding for damages sustained.
1.11	Delivery of a Climate Change Adaptation Knowledge Transfer Programme.	Ongoing	Welsh Government	Completed- Guidance issued 2011

Sub-Objective 2	Provide Strategic Leadership and Direction at a Local Level	Delivery Deadline	Who will Lead Delivery	Progress
Measures				
2.1	Delivery of a coastal erosion map for Wales	2012	NRW	Completed April 2012
2.2	Delivery of the second round of Shoreline Management Plans by 2012 with proportionate implementation over the life of the Strategy	2012	Coastal Groups	Ongoing. All SMP2s submitted to Welsh Government by May 2013 for approval.
2.3	Development of the National Habitats Creation Programme as part of the delivery of the Natural Environment Framework	2012 with proportionate implementation by 2017	NRW	Ongoing – detail provided in Chapter 7
2.4	Development of Local Flood Risk Management Strategies	Delivery by 2013 with proportionate implementation by 2017	Lead Local Flood Authorities	15 completed, 6 awaiting sign off, 1 due for consultation

2.5	Implementation of statutory responsibilities including those set out within the Flood and Water Management Act 2010 and the Flood Risk Regulations	2015 with proportionate implementation by 2017	Risk Management Authorities	Ongoing
2.6	Appropriate mapping of all sources of flood risk	2015	Welsh Government	Completed - Maps published March 2014
2.7	Proportionate implementation of the Catchment Flood Management Plans over the life of the Strategy	2017	NRW	Ongoing.

Sub-Objective 3	Develop policies for effective land use management and enhanced development control procedures where appropriate	Delivery Deadline	Who will Lead Delivery	Progress
Measures				
3.1	Development of Local Development Plans that include adequate provisions in respect of flood and coastal erosion risk	Ongoing	Local Planning Authorities	16 LDPs adopted by March 2014
3.2	Compliance with requirements of Planning Policy Wales and relevant Technical Advice Notes	Ongoing	Local Planning Authorities	Ongoing- Application of TAN 15
3.3	Provision of appropriate advice on flood and coastal erosion risk in relation to planning applications	Ongoing	Welsh Government	Ongoing- Application of TAN 15
3.4	Appropriate undertaking of Strategic Flood Consequence Assessments and their use to inform Local Development Plans	Ongoing	Local Planning Authorities	Ongoing
3.5	Approval and adoption of SuDS drainage systems by the SuDS Approving and Adopting Body	Ongoing from 2013	SuDS Approving and Adopting Body (Local Authorities)	Ongoing –Welsh Government developing proposals for implementing Schedule 3 of the Flood and Water Management Act
3.6	Provision of advice and guidance on appropriate land use management	Ongoing	Welsh Government	Ongoing. Literature review undertaken. Scoping of Welsh evidence needs started.

Sub-Objective 4	Establish regular maintenance schedules for flood and coastal erosion risk management assets	Delivery Deadline	Who will Lead Delivery	Progress
Measures				
4.1	Development of a register of natural and manmade structures or features likely to have an effect on flood risk by 2014	Ongoing	Lead Local Flood Authorities	Ongoing, at least 16 have a register
4.2	Establishment of a programme of regular and appropriate maintenance for flood and coastal erosion risk management assets	Ongoing	Risk Management Authorities (in relation to their own assets)	Ongoing- all have a programme
4.3	Designation of natural and manmade structures or features likely to have an effect in flood or coastal erosion risk over the life of the Strategy	Ongoing from 2012	NRW, Lead Local Flood Authority and Internal Drainage Boards	Ongoing. One designation under way in Rhonda Cynon Taf CBC.

Objective 2

Raising awareness of and engaging people in the response to flood and coastal erosion risk.

Sub-Objective 5	Ensure that by 2026 everyone who lives in a flood risk area understands the flood risk they are subject to, the consequence of this risk and how to live with that risk	Delivery Deadline	Who will Lead Delivery	Progress
Measures				
5.1	Continuation and development of Flood Awareness Wales	Ongoing	NRW	Ongoing, details provided in Chapter 5
5.2	Programme of community based awareness and engagement activities, utilising the Flood Risk Management Community Engagement Toolkit	Ongoing from 2012	NRW, Lead Local Flood Authorities	Ongoing- including more than 60 events by Lead Local Flood Authorities
5.3	Identification of at risk groups within communities, including vulnerable individuals	2017	Lead Local Flood Authorities	Ongoing, including Welsh Government Funded project on vulnerability
5.4	Development of a national Single Point of Contact for queries relating to flood risk	2013	Welsh Government	Ongoing - discussions between Welsh Government and Natural Resources Wales regarding Single Point of Contact and wider

5.5	Continuation and expansion of the Floodline Warning Direct Service over the life of the Strategy	2017	NRW	flood support. Extended Floodline Service trialled. Ongoing, details provided in Chapter 5
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Sub-Objective 6	Enhance property and community level resilience	Delivery Deadline	Who will Lead Delivery	Progress
Measures				
6.1	Ensure property level flood resilience measures and the requirements for SuDS are incorporated into Building Regulations	2017	Welsh Government	Not started. Welsh Government currently this unlikely to be progressed.
6.2	Enhanced awareness of property level resilience measures and guidance on their use	Ongoing	Welsh Government	Ongoing. Some measures have been installed by NRW, on a community basis. Guidance available via NRW & National Flood Forum
6.3	Development of a sustainable methodology for funding individual property level resilience measures	2014	Welsh Government	Ongoing. To be consulted upon as part of National Programme of Investment.
6.4	Provision of appropriate warnings in relation to all sources of flooding	Ongoing	NRW	Ongoing, improvements in flood warnings described in Chapter 3

Objective 3

Providing an effective and sustained response to flood and coastal erosion events

Sub-Objective 7	Ensure the preparation and testing of Emergency Plans	Delivery Deadline	Who will Lead Delivery	Progress
Measures				
7.1	Complete emergency plans for all sources of flood risk	Ongoing	Category 1 and 2 responders under the Civil Contingencies Act	Ongoing, development of numerous community level, LLFA and Local Resilience Forum plans– detail provided in Chapter 6
7.2	Development of community level emergency plans, as required by relevant communities	Ongoing	NRW	Ongoing. As above

7.3	A pan-Wales emergency exercise to test response and recovery arrangements by 2016	2016	Welsh Government	Ongoing. A coastal evacuation exercise task group is planning a large scale exercise along the Severn Estuary in Spring 2015.
7.4	Local level emergency exercises to test response and recovery arrangements over the life of the strategy	Ongoing	Category 1 and 2 responders under the Civil Contingencies Act	
Sub-Objective 8	Respond to events in a timely and appropriate manner	Delivery Deadline	Who will Lead Delivery	Progress
Measures				
8.1	Early and appropriate response to emergency events for all events	Ongoing	Category 1 and 2 responders under the Civil Contingencies Act	Ongoing – detail provided in Chapter 6 Ongoing, development of LLFA and Local Resilience Forum plans – detail provided in Chapter 6 Ongoing, as above Ongoing, at least 13 LLFAs report that they have identified suitable respite accommodation
8.2	Development and implementation of effective evacuation protocols for emergency events	Ongoing	Category 1 and 2 responders under the Civil Contingencies Act	
8.3	Development of mutual aid protocols for resources, equipment and respite for emergency events	Ongoing	Category 1 and 2 responders under the Civil Contingencies Act	
8.4	Identification and provision of suitable respite accommodation as appropriate over the life of the Strategy	Ongoing	Local Authorities	
Sub-Objective 9	Facilitate recovery from flooding within the shortest possible timescales	Delivery Deadline	Who will Lead Delivery	Progress
Measures				
9.1	Development of procedures for the effective clearance of debris	Ongoing	Lead Local Flood Authorities	Ongoing, at least 16 LLFAs have clearly defined procedures in place, 2 further report that this is work in progress

9.2	Development of repair schedules including provision for the installation of resilient measures by 2015	Ongoing	Lead Local Flood Authorities	Ongoing, at least 17 LLFAs have clearly defined procedures in place, 1 further LLFA reports that this is work in progress
9.3	Investigations into the causes of flooding to be undertaken where necessary within one month	Ongoing	Lead Local Flood Authorities	Ongoing, 397 investigations carried out during the reporting period. LLFAs report that there is variation in trigger levels for carrying out investigations.

Objective 4

Prioritising investment in the most at risk communities

Sub-Objective 10	Develop a National Programme for investment for flood and coastal erosion risk management	Delivery Deadline	Who will Lead Delivery	Progress
Measures				
10.1	Undertake research into the costs and benefits of softer engineering approaches including the use of natural processes to flood and coastal erosion risk management	2013	Welsh Government	Ongoing- supported by the Working with Natural Processes cross-cutting theme under the Defra/EA/Welsh Government/NRW research programme
10.2	Guidance on the comparative use of hard and soft engineering approaches to flood and coastal erosion risk management to be issued by 2013	End of 2013	Welsh Government	Ongoing. As above
10.3	Development of a national funding policy and prioritisation methodology for the assessment of applications for funding for all flood and coastal erosion risk management activities funded from the Welsh Government	End of 2013	Welsh Government	Ongoing, Draft consultation document on National Programme of Investment being finalised for consultation Summer 2014.
10.4	Development of a national priority schedule for flood and coastal erosion risk management schemes	2014	Welsh Government	Ongoing. As above
10.5	Development of a business case for the establishment of a single capital funding programme for Wales	2014	Welsh Government	Ongoing. As above

Sub-Objective 11	Increase the use of alternative sources of funding for flood and coastal erosion risk management	Delivery Deadline	Who will Lead Delivery	Progress
Measures 11.1	Development of a national policy on the use of contributions towards flood and coastal erosion risk management schemes, including the National Habitat creation Programme	2014	Welsh Government	Ongoing, Funding gap review undertaken by Flood Risk Management Wales Committee for Welsh Government. Options have been identified and the Minister has asked for specific detail on partnership-funding.



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