

Historic Environment and Climate Change in Wales

Sector Adaptation Plan Monitoring



Interim Report of Activity: Year 3, 2022

Historic Environment Group
Climate Change Subgroup

August 2023

The Historic Environment Group (HEG) is a high-level forum set up by the Welsh Ministers in 2004 to take a strategic overview of issues and opportunities in the historic environment and to promote common approaches. The group is made up of representatives from the major organisations in Wales with historic environment interests.

The HEG Climate Change Subgroup (HEGS) is charged with assessing and reporting to HEG on how the historic environment sector in Wales should address the challenge of climate change.



Cover photograph: Pembroke Town Walls. Clearance and repair work being undertaken by volunteers as part of the Pembroke Town Walls Trust long-term management strategy.

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1. Introduction

In 2020, the Historic Environment Group (HEG) published *Historic Environment and Climate Change in Wales Sector Adaptation Plan* (SAP), building on the high-level strategic actions identified in the Welsh Government's adaptation plan *Prosperity for All: A Climate Conscious Wales*.

You can [download the Historic Environment and Climate Change in Wales Sector Adaptation Plan, published in 2020, from the Cadw website](#)

You can [download the Prosperity for All: A Climate Conscious Wales, published in 2019, from the Welsh Government website](#)

The SAP identifies the risks and opportunities of climate change for the historic environment of Wales and sets out the headline actions needed to adapt to the impact of these changes. The actions are arranged around the three overarching and linked objectives of increasing our knowledge, increasing our capacity, and building our resilience.

The *SAP Monitoring and Evaluation Framework* sets out the five-year timeline for evaluating progress against the published SAP actions and the Welsh Government indicators in *A Climate Conscious Wales*.

| Year | Outcome | Timeline | Status |
|------|--|----------|-----------------------|
| 0 | Historic Environment Group (HEG) published the Historic Environment and Climate Change in Wales Sector Adaptation Plan | 2020 | Complete |
| 1 | 2020 Sector Adaptation Plan Actions and Activities #1 consultation survey | 2020-21 | Complete |
| 1 | 2020 interim report of activity | 2020-21 | Published Summer 2022 |
| 2 | 2021 Sector Adaptation Plan Actions and Activities #2 consultation survey | 2021-22 | Complete |
| 2 | 2021 Interim report of activity | 2021-22 | Published Summer 2022 |
| 3 | 2022 Sector Adaptation Plan Actions and Activities #3 consultation survey | 2022-23 | Complete |
| 3 | 2022 Interim report of activity (this report) | 2022-23 | Published Summer 2023 |
| 4 | 2023 Sector Adaptation Plan Actions and Activities #4 consultation survey Full monitoring and evaluation report | 2023-24 | |
| 5 | Updated SAP | 2024-25 | |

You can [download the SAP Monitoring and Evaluation Framework, published in 2021, from the Cadw website](#)

The HEG Climate Change Subgroup is charged with formally requesting and collating evidence of activity to help evaluate progress against the published actions, and to identify gaps and priority areas that require further attention.

This is the third interim report of activity covering the year 2022, as set out in the Monitoring and Evaluation Framework. It will help inform the formal monitoring and evaluation report that will be submitted to the Welsh Ministers in 2024.

This report describes the call for evidence and reviews it against the SAP action plan and *A Climate Conscious Wales* indicators (see section 2 for details of the indicators and actions). Selected case studies are included to illustrate a range of historic assets and adaptation activity that has been used to combat the risks of climate change. These are intended as examples of various projects; other equally important work is still ongoing.

You can [download the Sector Adaptation Plan Monitoring: Interim Report of Activity: Year 1, 2020, from the Cadw Website.](#)

You can [download the Sector Adaptation Plan Monitoring: Interim Report of Activity: Year 2, 2021, from the Cadw Website.](#)

You can [access an online case study resource showcasing adaptation activity from across the historic environment sector, from the Cadw website.](#)

2. Indicators and Actions

Indicators in Prosperity for All: A Climate Conscious Wales

Caring for the historic environment

HE1. Knowledge: Complete and publish the Historic Environment and Climate Change Sector Adaptation Plan.

HE2. Knowledge: Improve understanding of the threats and opportunities for the historic environment from a changing climate.

HE3. Capacity: Develop the methodologies, tools and guidance needed to build adaptive capacity.

HE4. Resilience: Increase resilience of the historic environment by implementing actions to respond and adapt to the risks.

Protecting our coasts and seas

MC1. Resilience: Improve the resilience of habitats and heritage in Wales's coastal zones from the impacts of climate change.

MC4. Knowledge: Carry out research to better understand the impact of climate change on marine ecosystems, ecosystem services and marine heritage.

Actions identified in the Historic Environment and Climate Change in Wales Sector Adaptation Plan

The headline actions in the SAP are grouped into seven themes under three overarching and linked objectives. Full details of the outputs and broad outcomes for each action are listed in the SAP table in section 4.

Knowledge: Increase our knowledge and understanding of the threats and opportunities for the historic environment from a changing climate

1. Knowledge exchange/collaboration
2. Mapping and monitoring the resource
3. Research priorities

Capacity: Develop the methodologies, tools and guidance to work with others and build adaptive capacity

4. Dissemination and promotion
5. Collaborative working
6. Training and guidance

Resilience: Increase resilience of the historic environment by implementing actions to respond and adapt to the risks

7. Taking action

3. Call for evidence

The HEG Climate Change Subgroup called for evidence for this report over a 4-week period between 16 January – 10 February 2023. This was an open invitation evidence gathering exercise, shared with a wide range of organisations including HEG and other delivery partners. Links to background information and the online survey was circulated via email and over social media. Background information, hosted on the Cadw website, included a PDF introducing the published SAP action table with examples of relevant activities captured in 2021, and instructions on how to submit new evidence. The online survey, hosted by Pembrokeshire Coast National Park Authority, was provided for the submission of evidence.

In addition to the submission of evidence, the 2023 online survey asked 3 additional questions:

1. If you do not have any relevant activities to report, is there a reason for this?
2. Do you think the historic environment sector could do more?
3. Do you think there are any barriers preventing the delivery of actions from the Sector Adaptation Plan headline action table?

Analysis of the survey responses shows that:

- 28 individuals associated with 26 organisations, groups and projects working in Wales, and 2 members of the public responded.
- A mixture of public, private, third sector, community and society organisations submitted evidence. This included universities, national parks, government bodies, county and community councils and charitable trusts.
- Respondents included those from officer to more senior levels within an organisation.
- Respondents included those operating at a national, regional and local level.
- The responses provided evidence of activities across all 7 priority action areas as follows:
 - 1 Knowledge exchange/collaboration: 18 activities.
 - 2 Mapping and monitoring the resource: 20 activities.
 - 3 Research priorities: 16 activities.
 - 4 Dissemination and promotion: 4 activities.
 - 5 Collaborative working: 12 activities.
 - 6 Training and guidance: 32 activities.
 - 7 Taking action: 47 activities.
- Activities cover a broad spectrum of historic environment assets, landscapes and environments, resulting in new case studies from across Wales and the sector (see section 5).

In relation to the 3 additional survey questions outlined above:

- There were 2 responses in relation to Question 1: *If you do not have any relevant activities to report, is there a reason for this?* Both respondents did provide activity evidence for 2022

and outlined that the non-heritage focus of their organisation and difficulties obtaining information from across their organisation as reasons why they had not submitted previously.

- In relation to Question 2: *Do you think the historic environment sector could do more?*, the majority of respondents said Yes. Where more details were given, lack of resourcing (human and financial) was identified as the main cause, with greater collaborative working and co-ordinated action highlighted by several respondents as a priority. Other specific comments included the need for increased erosion monitoring and survey of areas likely to be inundated; the promotion of the vernacular and its relationship to environmental sustainability; improved and consistent professional training, guidance, and advice; more emphasis on landscape and the link between natural and cultural heritage, and the need to articulate more about past climate patterns, historic adaptation, and response.
- As with question 2, most respondents said Yes to Question 3: *Do you think there are any barriers preventing the delivery of actions from the Sector Adaptation Plan headline action table?* Where additional details were given lack of funding was noted multiple times as the main barrier. The profile of the heritage sector, the profile of the SAP within and beyond the sector, and public understanding was also raised.

4. Progress against Sector Adaptation Plan actions

The table in the Annex sets out the SAP headline actions across the 7 priority areas. The activity column in this table captures the survey responses, outlining the individual activities undertaken in 2022.

Progress against each action is summarised below.

Knowledge exchange and collaboration

1.1: Members of the HEG Climate Change Subgroup (HEGS) continue their collective and individual efforts to engage a wider audience and raise awareness of the SAP and the challenges posed by climate change to the historic environment.

Activities include the publication of the 2020 and 2021 interim reports of activity and the creation of resources for Wales Climate Week, such as the 'Heritage Responds' film by RCAHMW and new content on the Cadw website. The actions identified in the SAP are also reflected in the Bannau Brycheiniog National Park Authority's draft Historic Environment Action Plan.

Cadw continues to act as a link between the Subgroup and the Welsh Government Climate Adaptation team, helping to ensure a good flow of information and regular updates. Progress has, however, been slower than anticipated on the development of a Communications Strategy due to staff resourcing issues across Subgroup members and the lack of a dedicated Climate Change Adaptation Manager.

1.2 and 1.3: Cadw continues to work with partners from across the home nations to pool research and expertise. This includes the UK Heritage Agency Work Group, which is focussing on peatland restoration, and the formal launch of the UK Heritage Adaptation Partnership. The latter is now developing a collaborative work programme, which includes the next stage of the hazard mapping project.

The organisations involved in CHERISH are also seeking ways to maximise the project's legacy and to build on established partnerships and funding opportunities. A full evaluation of the project will be undertaken in 2023. The tools developed during the project and the lessons learnt from the evaluation will be widely disseminated to help build capacity in the sector.

Mapping and monitoring

2.1: There was significant action in relation to the improvement of baseline data during 2022, particularly with regards to marine, coastal and riverine environments. For example, the record

enhancement exercises funded by Cadw, in recognition that historic environment assets are either poorly represented on records or are lacking up-to-date information. This work is being undertaken by the Welsh Archaeological Trusts and will improve relevant information in the regional Historic Environment Records, feeding into development management advice and specific management strategies, such as Shoreline Management Plans.

With respect to wide-scale surveys of terrestrial environments, most notable are the RCAHMW's ongoing aerial reconnaissance programme and the increasing potential and application of lidar data. Of the former, 2022, as one of the hottest UK summers on record, was a very productive year for aerial reconnaissance, with extensive parchmarks recorded. Lidar data has helped enhance regional HER and NMW records in Wales for a number of years, but specific programmes using Welsh Government's 1m data (e.g. AHRC-funded PhD study in Eryri National Park) or higher resolution data commissioned through specific projects are further enhancing this. During 2022, the Carneddau Landscape Partnership Scheme continued to develop its 0.25m lidar data in preparation for the launch of a public portal in 2023; professional transcription of 3 x 4 square kilometre areas (1570 feature polygons transcribed). In both cases (aerial reconnaissance and lidar) a significant aspect of data derived from these sources is the spatial extent (i.e. polygons) of recorded assets; this facilitates both monitoring and the assessment of potential climate-change related impacts, for example through cross-analysis with wider datasets. This is in contrast to the traditional point-based data of both regional and national records.

Detailed work, focussed on specific locations and involving original research and the application of new or emerging technologies, have also responded to climate change concerns. In particular, the RCAHMW, in conjunction with CHERISH and through other work-flows, conducted 3D digital survey in marine, inter-tidal, coastal zone and small-island locations using a variety of techniques including lidar, UAVs, GNSS (GPS) and terrestrial laser-scanning. By significantly enhancing records, the work has established detailed baseline data for monitoring condition and change and assessing climate-change related impacts.

Expanding the profession's capacity to capture meaningful data through partnership across disciplinary boundaries (for example by collaboration with natural environment sector and academic colleagues) and working with the public more widely continued through 2022. For example CHERISH, the Carneddau Scheme (Eryri National Park and partners including University of Sheffield, GAT and NT) and Pembrokeshire Coast National Park Authority helped mobilise volunteers through excavation, survey and lidar analysis to generate significant new historic environment asset data.

2.2: In many cases data collection focussed on the establishment or repeat collection of condition data to monitor specific locations/historic assets. While Wales's largest targeted monitoring programmes to date, the CHERISH project, came to end in Summer 2023, through the application of specialist techniques (as outlined above), it has identified assets to be prioritised for action and has created detailed condition data against which future observations

will be compared to assess change and risk. Training and supporting volunteers to undertake or assist in condition monitoring data are becoming increasingly important as a means of collecting much needed data, at scale, in a sector with limited resources. Ongoing work of this kind by established groups of volunteers in the Pembrokeshire Coast National and Bannau Brycheiniog National Parks shows the value of this approach. During 2022, through the Carneddau Scheme, Parc Eryri provided volunteer training on the identification of historic assets from lidar and in the field, ready for data collection from 2023. In partnership with the University of Sheffield, again through the Carneddau Scheme, it undertook surveys with volunteers at historic assets as baseline records for repeat visits in subsequent years of the scheme.

Research priorities

3.1: A body of evidence has been gathered by heritage and academic organisations over the year, some a continuation of existing projects monitoring the condition of historic assets (National Park Authorities), and collecting baseline data (CHERISH), and some new initiatives to model future impacts of changing weather on the historic environment (National Trust, Exeter University, Bangor University). Cadw is also working at cross-department level within Welsh Government to implement the recommendations from the research carried out by the Climate Resilience Embedded Researcher investigating the resilience and adaptation of buildings.

Notwithstanding the progress outlined above, there remain gaps within the identified research priorities which need to be addressed, and a better understanding of the evidence is needed to provide guidance to improve management of the historic environment. It would also be useful to ensure that the SAP survey is adequately capturing all the work that is being carried out.

3.2: The projects mentioned above are also providing a quantity of evidence to improve knowledge of past and present climate change impacts, in particular the work carried out as part of the CHERISH project around the Welsh coast, and the general public are also contributing to this body of work. There are opportunities here for further analysis of the evidence to provide better understanding and knowledge of the issues and to provide meaningful recommendations.

3.3 and 3.4: Within the reporting period no projects have been identified to address these research priorities; looking at the impact of the changing seasons on the historic environment, or the opportunities for the historic environment and the economy, however again it would be pertinent to question whether this is a reflection of the survey's reach, or if this is a genuine gap in research work which needs to be addressed.

Dissemination and promotion

4.1: Progress made during 2020 and 2021 with the publication of the *SAP Monitoring and Evaluation Framework* helped greatly towards the delivery of this action. During 2022 further milestones came with the publication of the interim reports covering SAP activities for 2020 and 2021. These reports were approved by HEG and published on the Cadw website. HEGS also

undertook a mid-term review of SAP progress during the year, of which an overview was presented to HEG.

Regular meetings of HEGS and the promotion of the SAP by its membership continue and are essential in the coordination of its delivery, but also provide opportunities to share knowledge and expertise and prioritise work. An example is the initiation of twice-yearly meetings between HEGS, Cadw and WATs to learn more about the Cadw funded WAT work and to discuss and inform future projects.

4.2: Welcomed progress was made with this action as discussions commenced between HEGS and HEG on the creation of a Climate Change Adaptation Manager Post. A job description for the role has also been drafted by HEGS and this will now be a priority area going forward.

Collaborative working

5.1: A number of activities show that steps are being made to encourage engagement and partnership working across the sectors. It is hoped that links made by HEGS in 2022 with the Welsh Government Student Placement Programme will result in positive action going forward both within government and across the university sector. Cadw's ongoing work with the Climate Resilience Embedded Researcher stands out as the main activity delivering this action and it is hoped that this can be used as an exemplar for other activities in the future.

SAP activities across multiple actions show clear evidence of work to raise awareness of the historic environment across the wider sector, just one example noted here was the installation of the CHERISH travelling exhibition at the Senedd which was officially opened at a reception hosted by the Climate Change Minister Julie James. Figures indicate it was viewed by almost 6,000 people during its month-long residence.

There remains more work to be done to encourage more stakeholder engagement within and across the sector. It has always been a goal of HEGS to hold stakeholder events to promote and improve collaborative working but resourcing issues across Subgroup members has made this difficult. It is hoped that this can be addressed in future years.

5.2: There is clear evidence of progress against this action. With Cadw acting as a link between HEGS and the Welsh Governments Climate Adaptation team, the historic environment features in *Prosperity for All: A Climate Conscious Wales*, with case studies from CHERISH and other historic environment work appearing in the 2022 progress report. Also of note is the progress being made by the Welsh Archaeological Trusts in their Cadw-funded work programme updating the historic environment record in relation to the refreshed Shoreline Management Plans.

HEGS has also responded to national consultations to ensure the SAP and the historic environment play a key part.

5.3: This action was delivered in 2022 with the launch of the [Adaptation Case Study Resource](#) by HEGS. The resource in Story Map format, is accessible through the Cadw website and draws

together case studies from across the sector. It is important that this continues to be maintained and updated.

Other case study resources were also noted from others across the historic environment, for example National Trust Cymru, in collaboration with Arts Council of Wales, has commissioned work to produce artistic content that showcases community experience of climate change through the medium of art.

Training and guidance

6.1: A range of events have raised awareness and provided specialist training on the impacts of climate change and adaptation of the historic environment; training events linked to river restoration and the National Peatlands Action Programme have been cross sector. Wales Climate Week provided an opportunity to raise awareness to a broader audience; the online stakeholder event and panel discussion on 'Building maintenance as the first step towards climate resilience and energy efficiency' was well attended.

Dissemination of work arising from the Climate Resilience Embedded Researcher at conferences and events continues. Funding has been secured for a second Cadw linked Fellowship for 2023 linked to the Adaptation Pathways approach to climate change adaptation. Further guidance and training for policymakers, asset owners and practitioners in the historic environment sector will be developed, reaching a wide-ranging audience.

Interagency collaboration, the Welsh Government cross-departmental steering group and the collaborative work programme of the UK Heritage Adaptation Partnership all benefit from the sharing of expertise and research. However, there is a continuing need to embed climate change into historic environment work, making it a natural part of the day job and work planning.

6.2: The CHERISH project, Carneddau Landscape Partnership Scheme and Ardudwy historic rural dwellings and farmsteads project have all successfully included community groups and volunteers to monitor, survey or undertake practical work on historic assets at risk. The capacity to include, and appeal to and draw in volunteers to structured large scale projects is noticeable.

Ensuring adaptation opportunities are recognised, and that they are sensitive to the historic environment, is critical for proactive and progressive cross sector adaptation action. Targeted training talks, workshops, and courses to work towards achieving this include working with coastal engineering groups, heritage masonry skills, peat restoration and reviving traditional land management skills such as hedgerow laying.

The provision of Marine Planning Advice for Marine Development, and the production of a Marine Area Statement on the Historic Environment and Natural Resources, ensures that bespoke advice and guidance is provided as well as training. Input and advice on consultations such as land management strategies, woodland creation, riparian improvements, and peatland restoration is also an important case by case element.

Inspiring individuals and organisations into action and taking on board the promotion of key messages can be difficult to assess as these important changes may be subtle and unrecorded. Yet inspirational work is occurring, from the Lyrical Landscapes project inspiring young people to take action against climate change by connecting to nature, history, the outdoors and poetry, to the NBGW promoting sustainable horticultural and land management to its 160,000 visitors per annum, or the children at Bodnant Garden who learnt about the effects of Storm Arwen. The sharing of what they have seen, learnt and enjoyed with others may incidentally increase adaptation actions that benefit the historic environment.

6.3: The publication of the National Trust's *Climate Change Adaptation Guidance*, Wales Slate World Heritage Site's *Slate Communities of Gwynedd: Care and Conservation*, and ongoing work and briefing notes by Cadw's Climate Resilience Embedded Researcher on the resilience of buildings to challenges associated with climate change increase our knowledge and understanding to help build the resilience of the historic environment to climate change. Guidance is also in progress including *CHERISH Sharing Our Practice: Investigating Heritage and Climate Change in Coastal and Maritime Environments: A Guide to the CHERISH Toolkit*, NRW guidance for woodland managers on adapting forests and woodlands to improve resilience to climate change and UK Heritage Agency Work Group checklist guidance for peatland restoration works and the historic environment. The climate change section of the Cadw website has new accessible content, including the new case study resource, advice on building maintenance and a Heritage Responds video produced by the HEGS.

Taking action

7.1 2022 saw a significant increase in reporting for this action. Adaptation/management plans across a wide range of asset types were continued or came into play. A number of long-term, sustainable restoration and management plans incorporating adaptation measures for built structures were evidenced. Holistic approaches to water management, from large scale river catchment management plans to smaller scale garden rainwater collection systems and improving capacity of rainwater goods on historic buildings were evidenced. Land and woodland management plans that include adaptive measures for the historic environment were evidenced and planning applications involving adaptation to historic buildings are being encouraged.

7.2 No new place-based character assessments were published in 2022. The work of the Clwydian Range and Dee Valley AONB and NRW "Landscape and Nature Recovery in a Changing Climate" reported in 2021 was recognised by the Landscape Institute Awards, finalist in Excellence in Tackling Climate Change category.

7.3 A wide range of activities were reported relating to historic assets at risk. This included excavations in advance of loss; monitoring, maintenance, and stabilization of both built structures and archaeological sites; record enhancement and research in the intertidal and coastal zone using a range of survey techniques. Much of this work is being undertaken in partnership and a number of projects have a community element. Cadw is seeking to ensure that work

undertaken to address other priorities is also helping to build the resilience of historic assets to climate change.

7.4 Strong stakeholder and community group engagement were evidenced. The National Parks, CHERISH, RCAHMW and Malvern Archaeological Diving Unit report undertaking condition monitoring of monuments and shipwrecks along with targeted recording and conservation (scrub clearance) of assets at risk.

7.5 2022 saw a significant increase in reporting for this action. Organisations are adapting planting schemes to favour deep rooted plants for drought resilience. Horticultural practices are being adjusted with regard to water and energy use. Robust plant health and compliance policies are being implemented to prepare for new and emerging pests and diseases. Hedgerow and meadow management techniques are being promoted along with new tree planting regimes e.g., low density scattered tree planting along water corridors and amongst craggy and scrub covered slopes respecting historic tree presence/providing succession for existing mature trees (Carneddau Landscape Partnership Scheme).

7.6 Organisations continue to adapt to new ways of working post COVID 19 pandemic. Reduced vehicle use, remote and hybrid working are now accepted. RCAHMW has an internal Future Generations Group and published in 2022 A Biodiversity and Resilience of Ecosystems Duty Report and Forward Plan 2022 – 24:

5. Case studies

The following selection of case studies present evidence of adaption activity undertaken during 2022 and submitted during the call for evidence. They encompass a variety of historic assets across Wales.

Each case study sets out the risk or opportunity and the adaptation activity. The risk codes refer to those identified in the SAP (Tables 1 and 2, pages 8-11). The headline adaption actions each case study covers are also noted together with the *Climate Conscious Wales* indicator code as set out in Section 2 of this report.

Other case studies are included in the Interim Reports of Activity for Year 1 (2020) and 2 (2021). 2022 also saw the launch of a publicly available online case study resource (SAP action 5.3).

You can [access this case study resource from the Cadw website](#).

We hope these examples will inspire all stakeholders in our historic environment to review and implement appropriate adaptation action in response to the threats and opportunities posed by climate change.

CASE STUDY 1: Buildings and Settlements

A Community Response - Future Proofing St Michael's Church, Llanfihangel y Creuddyn, Ceredigion

Risks

- Wind driven rain and increased humidity impacting the health of the building fabric, EX1
- Frequent high winds, storms and heat/cold events, EX2

Climate change is increasing the risks to building fabric, and at the Grade II* Listed medieval church of St Michael's in Llanfihangel y Creuddyn, Ceredigion increased rain led to water ingress through the church tower into the main body of the church and caused serious problems of damp. The water ingress affected the church electrics, and this, combined with an ineffective oil heating system - the boiler of which was housed in the church tower and added to the damp issues due to the condensation it created - resulted in the church having to close in 2017 for the safety and health of the congregation and visitors.

Adaptation Activity

- Resilience: 7 Taking action, HE4, MC1

The local community care greatly about their church and came together to initiate a community project to undertake repairs and improvements to futureproof the church. They raised money and successfully applied for funding from the National Lottery Heritage Fund, the National Churches Trust, the Wolfson Foundation, the Headley Trust and Ceredigion County Council.

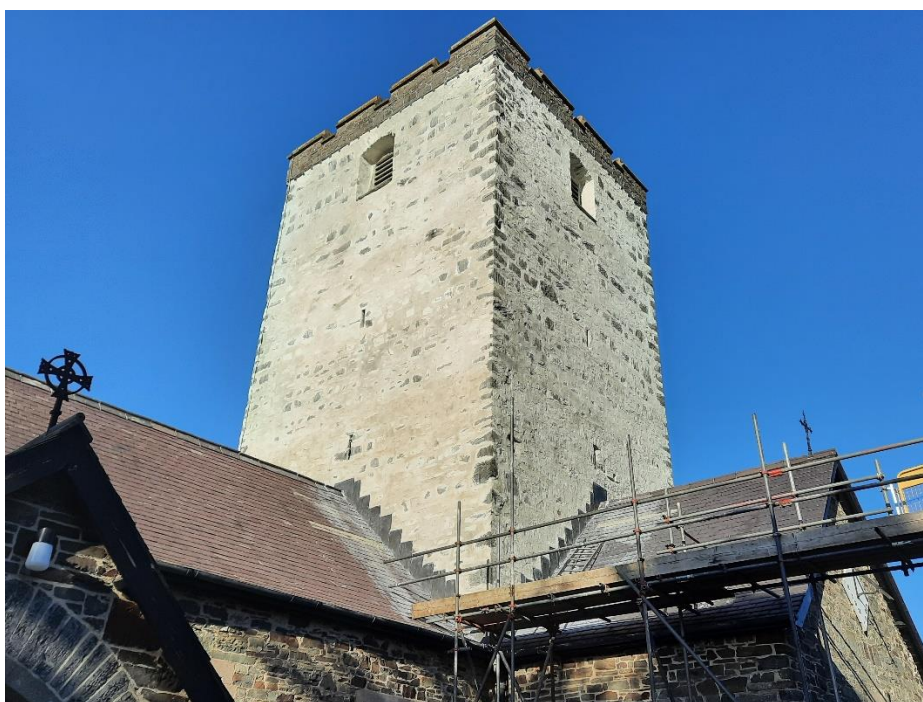
Between 2019 -2023 repair and improvement work was undertaken. This included removal of cement pointing, and the repointing and parging in hot lime (the same type of breathable material used in the original construction) of the south and west faces of the church tower - those ones which bear the brunt of the weather. Here, new deeper leadwork was also inserted.

Inside the church tower extensive repairs were made to the tower floors. The ends of some of the 500-year-old floor beams had started to rot where they were embedded in the damp, wet tower walls. These sections were cut out and replaced with new oak sections before new oak floorboards were laid. The new floors were then able to take the weight of a new stair providing safe public access up the remarkable medieval tower to its ancient belfry.

The old oil heating system was removed, the church rewired and is now heated and powered with green electricity. The church reopened in summer 2022.



Work was undertaken on the exterior of the church tower, during the summer and autumn 2021.
© Louise Barker



Case study by Louise Barker, Llanfihangel y Creuddyn Church and Community Project.

CASE STUDY 2: Marine and Coastal

Safeguarding Pembrokeshire Coast's Monuments – A Citizen Science Approach

Risks

- Submergence or loss of historic assets and landscapes through sea level rise, SL1
- Increased/spreading vegetation cover obscuring historic assets/accelerating decay of building materials, LGS1
- Increased visitor pressure, LE11
- Prolonged heavy rain leading to landslips, FL1
- Destabilisation and subsidence of historic assets and landscapes at the coast edge, FL1
- Frequent high winds, storms and heat/cold events, EX1 and EX2

Adaptation Activity

- Knowledge: 2 Mapping and monitoring the resource, 3 Research priorities, HE1, MC4
- Resilience: 7 Taking Action, HE4, MC1

In 2020, the Pembrokeshire Coast National Park Authority (PCNPA) established a volunteer monitoring programme for publicly accessible scheduled monuments. A total of 17 heritage volunteers were recruited and trained to visit allocated sites and submit information on identified issues via an online system called Survey123. This system allowed volunteers to record the extent of issues and submit photos. In total, 128 monuments are monitored, accounting for almost half of all scheduled monuments in the National Park area with 311 visits having taken place by the end of 2022.

The visits and information submitted have revealed that the majority of monuments are affected by some sort of issue, including those likely to be exasperated as a result of climate change. Specifically, almost three quarters of the monitored scheduled monuments are affected by scrub vegetation and almost a quarter by coastal erosion. As a result of this monitoring scheme, the National Park Authority has and continues to use the data to prioritise and target resources in relation to land management activities relating to archaeological heritage. To date, the information has been used to target scrub clearance activities and also explore ways to mitigate and adapt to the impact of coastal erosion at affected sites.



Scrub clearance at Tower Point Rath promontory fort near St Bride's
© PCNPA



First attempt by PCNPA of using a UAV to monitor a Tudor Watch Tower vulnerable to coastal erosion
© PCNPA

Case study by Tomos Jones, PCNPA



CASE STUDY 3: Buildings and Settlements

The Long-term Management of the Pembroke Town Walls

Risks

- Increased/spreading vegetation cover obscuring historic assets/accelerating decay of building materials, and leading to increased maintenance, LGS1
- Proliferation and expansion in range of invasive and non-native (INNS) species, PD2
- Increased rain and humidity impacting the health of the building fabric, EX1
- Frequent high winds, storms and heat/cold events, EX2

Pembroke's medieval town's perimeter and burgage plot walls have a wide range of owners and all are at least Grade II Listed and within a designated Conservation Area. The footprint of the Conservation Area includes several Scheduled Monuments, that are part of the Curtain Wall structure.

The walls are mostly in a bad state of repair, thickly covered with invasive vegetation, bordering long steep gardens. Some have been covered with cement screed that cannot breathe and the areas of gardens nearest the walls tend to be neglected with a build-up of soil and invasive overgrowth leading to the slow loss of the burgage walls bordering each plot.

The lime mortar used to originally build the walls is a great environment in which biodiversity can thrive and particularly encourages fungi, moss and lichen. However, it is also, an ideal environment for vegetation such as ivy and tree saplings, which, if not checked, will prize apart the stones and destabilise the walls.

The walls and their environment are becoming increasingly less resilient to the changes and intensity in the weather due to climate change. There is also a significant lack of builders with the skills to restore and manage the medieval structures, and a general lack of understanding of the historic importance of the walls and layout of Pembroke.

Adaptation Activity

- Resilience: 7 Taking Action, HE4, MC1

The Pembroke Town Walls Trust has worked to develop an innovative long-term management plan to restore and manage the deteriorating walls, explore and deliver solutions to the issues of sustainable funding for listed structures in multiple private ownership, address the significant lack of heritage construction skills training in Wales, and increase community engagement with and understanding of the town's important heritage.

In 2022 the Trust received funding to begin this work. They now have a generic Heritage Partnership Agreement in place that will enable them to work in partnership with wall owners, the local authority and Cadw to seek funding to start to restore sections of the wall and are

now working with Cadw to develop a “Pembroke recipe” for the lime mortar to be used that matches the original mortar.

Prior to this, over recent years the Trust have worked closely with the Pembrokeshire College Built Environment department, the Tywi Centre in Carmarthen and the Construction Industry Training Board to start a training course for students. This has delivered a 10-day course for Level 2 students involving them spending 6 days working on some of the burgage walls in Pembroke. There was also a further 10 days of work experience for one or two of the students with a professional stone mason.

The aim now is to develop a Level 3 course and apprenticeships, to offer training courses in heritage stone masonry to local builders and to offer owners training in heritage stone masonry and maintenance of their walls. To this end the Trust has established the Pembrokeshire Built Heritage Community Interest Company (CIC), a social enterprise that will deliver the training and build a portfolio of stone masons to carry out the restoration of the walls. The Trust is the asset locked body to the CIC and has shared Trustees and Directors.



The Trust also work seasonally with the help of volunteers of the West Wales Wildlife Trust and the Pembrokeshire Coast National Park to clear the walls of ivy and tree saplings. This involves regular communication with the Local Authority to ensure meadow planting under the walls is not disturbed.. Taking advice from the Local Authority some of the burgage walls are now being capped with meadow turf.

©The Pembroke Town Walls Trust.

Case study by Elizabeth Gossage, Pembroke Town Walls Trust



CASE STUDY 4: Marine and Coastal

Dinas Dinlle Hillfort - Preserving the Evidence.

Risks

- Rise in sea levels, SL1
- Increased ground moisture and precipitation, FL1
- Frequent high winds, storms and heat/cold events, EX1
- Changes in lifestyle and leisure patterns, LWI 1

Dinas Dinlle is a coastal hillfort located at the head of the Llyn Peninsular on the west coast of Gwynedd. It is a site of national importance protected as a Scheduled Monument but is also a Site of Special Scientific Interest for its geological significance. The hillfort is constructed on a mound of glacial moraine which is of particular interest and readily accessible for geological study. The hillfort likely dates from the Iron age, with strong evidence for continuation of occupation or re-occupation into the Roman period.

Desk top research of historic maps by the EU-funded CHERISH project to chart past rates of erosion suggests that between 20 and 40 metres of the western side of the hillfort has been lost over the last 100 years. Climate change projections suggest that the rate of erosion is set to increase with the possibility of losing the whole monument over the next few centuries.

Adaptation Activity

- Knowledge: 3 research priorities HE1, MC4
- Capacity: 5 Collaborative working, HE3
- Resilience: 7 Taking action, HE4, MC1

Subsequent to the application of the CHERISH [toolkit approach](#) to monitor and understand the past, present and near-future impacts of climate change at Dinas Dinlle and the recognition that the monument will be lost, a practical approach to adaptation, to recover as much information and understanding as possible, is underway.

Building on an evaluation excavation undertaken in 2019 two further seasons of excavation were undertaken in 2021 and 2022 to examine key features close to the eroding cliff edge. With funding from Cadw, National Trust, CHERISH and the Llyn Area of Outstanding Natural Beauty, the work led by Gwynedd Archaeological Trust, has involved local communities and school groups, Bangor University students and the public in a truly collaborative project. The body of evidence gathered is currently being analysed but will do much to increase our understanding of what life was like inside the hillfort.

With support from Cadw, the National Trust's Neptune Fund and CHERISH, a key excavated feature, a substantial roundhouse was chosen for consolidation and display following the 2022

excavation. Advice was taken from a monument conservation specialist on a suitable methodology and an experienced contractor employed to undertake the work. Gaps in the roundhouse wall were reinstated, saved turf was used to plug gaps and create a soft topping. Stone pitching was added to the entrance to guard against foot erosion and protect the deposits beneath, which were left in situ. A certain level of back filling and landscaping was undertaken with excess spoil being removed and used to fill in erosion scars elsewhere on the site. Biodegradable erosion control matting was used to support areas around the roundhouse, and these were re-seeded. Interpretation boards will be installed which draw on the various strands of research work undertaken and raise awareness of the present and future impacts of climate change at the site.



Dinas Dinlle roundhouse under excavation
© National Trust



Dinas Dinlle roundhouse after consolidation
© Gwynedd Archaeological Trust

Case study by Kathy Laws, National Trust



CASE STUDY 5: Marginal and Upland

Lake Vyrnwy Peatland Restoration by the RSPB

Risks

- Proliferation and expansion in range of invasive and non-native (INNS) species, PD2.
- Drying out causing destabilisation/erosion of earth structures, embankments and cuttings, DRY 2
- Lowering of water table causing loss of paleoenvironmental evidence; changing decay and survival of organic artefacts., DRY 3
- Increased risk of erosion and subsequent loss of peat as a paleoenvironmental record resulting from fire damage to surface vegetation and its protective effect, WF2

Lake Vyrnwy is the largest RSPB reserve in England and Wales, consisting of over 10,000 hectares of pasture, plantation, woodland and moors surrounding the Vyrnwy reservoir. There are extensive upland peat deposits in the west and north of the reserve. Drainage ditches cut into the peat, mostly excavated in the 20th century, have eroded to form hags and gullies that decrease water retention and increase erosion. In future, higher temperatures, lower summer rainfall and more frequent storm events will contribute to erosion and cause peat shrinkage.

The uplands around Lake Vyrnwy contain a range of archaeological assets including Bronze Age barrows, a deserted Medieval settlement and agricultural landscape features. Although the area has been extensively surveyed (and the results recorded in the Historic Environment Record), many assets are poorly understood and there are many unrecorded or unknown features; these include visible earthworks, buried archaeological remains and palaeo-environmental information. These are all crucial to our understanding of the historic use of the uplands.

Adaption Action

- Knowledge: 2 Mapping and monitoring of the resource, HE2
- Capacity: 6 Training and guidance, HE3
- Resilience: 7 Taking action, HE4, MC1

The RSPB has been carrying out peat restoration in selected upland locations at Lake Vyrnwy for several years, funded largely by Hafren Dyfrdwy and the NRW National Peatland Action Programme (NPAP), and carried out in accordance with the Peatland Code. It is a long-term project – the current plan will complete in 2055.

The RSPB has organised on-site training days at Lake Vyrnwy and remote training for those in the organisation involved in peat restoration. The training includes how to integrate heritage in restoration projects and how to recognise heritage features on the ground. This ensures that heritage is considered at an early stage and allows minor changes to be made by staff on site during works, thereby minimising delays.

Existing archaeological data has been supplemented by site visits by the RSPB archaeologist and any additional features will be added to the CPAT HER. Restoration proposals are discussed with the RSPB Archaeologist and plans can be adapted to avoid impact on heritage assets.

The gradual re-wetting of the peat is slowing and could potentially stop the degradation of known and unknown heritage assets in the upland areas. This project is an example of nature focussed climate adaption that has had significant benefits for heritage.



Peat erosion at the edge of channels at Lake Vyrnwy
© RSPB



Pools created by bunds at Lake Vyrnwy. A previously unrecorded archaeological feature, a bank of unknown date is in the background.

© RSPB

Case study by Matthew Williams, RSPB



CASE STUDY 6: Marine and Coastal

Palaeoenvironmental evidence for landscape change along the Caernarfon Bay coast.

A long-term perspective on risks and change

- More flooding events, increased ground moisture and precipitation, FL1
- Frequent high winds, storms and heat/cold events, EX1
- Rise in sea level, SL1, SL2

Rising sea levels, increased storminess and flooding are all expected to impact coastal heritage sites around Wales. To help evaluate the threats that future climate change may pose, evidence from palaeoenvironmental records provides valuable insights into long term climate variability and the frequency and magnitude of past extremes (e.g. periods of storminess). The sedimentary archives of coastal wetlands, lagoons, dune systems and intertidal areas all have the potential to provide important information about the long-term evolution of coastal landscapes and past climatic and environmental change. Collectively, these records of past environmental change may be integrated with archaeological evidence to increase understanding of coastal heritage assets before they are lost.

Palaeoenvironmental evidence

The impact of climate change on the coastal environment around Wales has been a key focus of the EU-funded CHERISH project (2017-2023). Working in partnership with the Royal Commission on the Ancient and Historical Monuments of Wales, scientists from the Department of Geography and Earth Sciences at Aberystwyth University have undertaken palaeoenvironmental and chronological research to:

- reconstruct climate change, sea level change and storm activity at coastal and intertidal sites;
- investigate the timing and rate of development of coastal spits and sand dune complexes, improving our understanding of the history of extreme events;
- determine the timing of sand inundation at specific archaeological sites.

Working at a number of sites around Caernarfon Bay, the CHERISH team have provided new evidence of long-term landscape development and climate change extending back millennia. These include Llyn Maelog, Rhosneigr; Llyn Coron, Aberffraw; Rhuddgaer early Medieval settlement (in partnership with Gwynedd Archaeological Trust); Morfa Dinlle and Dinas Dinlle (in partnership with GAT and National Trust).

Sediment cores retrieved from Llyn Maelog demonstrate that around 7,000 years ago, the present-day freshwater lake was a marine environment. Radiocarbon dated peat exposures on the foreshore at Traeth Llydan confirm this timing.

A prominent feature of the coastline of Caernarfon Bay is the extensive sand dune systems which are known to have buried archaeological evidence. The prevailing narrative is that sand encroachment resulted from storm activity in the 13th-14th century. However, new evidence from multiple sites, has demonstrated that these coastal landscapes were besanded multiple times during the last 3,000 years and that sand inundation during the medieval period began earlier. These examples highlight the dynamic nature of the wider coastal landscape, providing new information for the interpretation of archaeological sites and evidence for changing natural habitats, relevant for conservation management. Throughout history and pre-history, communities around Caernarfon Bay have faced significant environmental changes. This longer-term, place-based, perspective on climate change provides a valuable basis for discussions about future adaptation.



Llyn Maeiog and the coastal community of Rhosneigr. Geophysical survey has revealed that the lake sediments extend part way underneath the sand dunes. A four-metre core retrieved from the lake extends back 12,000 years and preserves marine sediments dated to c. 7,000-7,500 years ago.

© CHERISH project



Sand layers preserved in the sediments of Llyn Coron, a lake impounded by the sand dune system at Aberffraw. Sediment cores provide evidence of episodes of sand mobilisation over the last 3,000 years.

© CHERISH project

Case study by Sarah Davies, Aberystwyth University: Department of Geography and Earth Sciences

CASE STUDY 7: Designed Landscapes, Parks and Gardens

The National Botanic Garden of Wales (NBGW)

Risks

- Migration of pests and diseases and invasive species PD2 and 3
- Increased ground moisture and precipitation FL1, 2 and 3
- Drying out, desiccation, shrinkage and erosion DRY3 and 4
- Frequent extreme weather events EX1 and 2

The National Botanic Garden of Wales (NBGW) is a modern botanic garden established to mark the new millennium, which occupies a historic parkland landscape (Cadw Grade II*). NBGW is therefore uniquely placed to combine cutting edge scientific plant research and sustainable horticulture with traditional land management practices, recognising their combined value to biodiversity, heritage and environmental sustainability. NBGW shares this work with 160,000 visitors per year, as well as through its website, across its social media platforms and through outreach and education programs.

Adaptation Activity

- Knowledge: 3 Research priorities, HE2, MC4
- Capacity: 5 Collaborative working, HE3, 6 Training and guidance, HE3
- Resilience: 7 Taking action, HE4

NBGW is transitioning its living collections to ensure they are appropriate for future climatic scenarios. Using tools available in the botanic gardens network, such as the open source Climate Assessment Tool (<https://www.bgci.org/resources/bgci-hosted-data-tools/climate-assessment-tool/>), informed decisions on future tree species choice can be made along with consideration of how the current tree collection will fare.

NBGW is implementing a robust Plant Health and Compliance Policy to prepare for new and emerging pests and diseases, resulting from changing climate. This includes a more stringent approach to the acquisition of material and its entry onto the site. A plant reception facility has been built to allow all new plant material to be isolated, quarantined and inspected before being introduced into the collections. Regular monitoring for priority pests and disease is undertaken by the Plant Health and Seed Inspectorate.

NBGW is working to implement more sustainable practises with regards to its on-site horticulture. Reduction in use of chemicals and fertilisers, reduced mowing regimes, the removal of peat from all growing media and the establishment of plantings for pollinators to promote biodiversity are all included. Sustainable water capture and usage is being explored, focusing on harvesting water from the Great Glasshouse roof, associated tank storage and reuse of water from the on-site filtration pond for watering collections and flushing toilets.

A simple method of reducing the sites energy footprint has been to turn down the temperature in the Great Glasshouse. Reducing minimum temperatures from 13 °C to 5 °C, still allows the

Mediterranean collections to be maintained. NBGW is now working on adjusting the plant collections in its Tropical House to represent plants from tropical montane regions allowing the minimum running temperatures to be reduced from 18°C to 12°C.

The glasshouses are heated with biomass boilers, using woodchip as the main fuel. A carbon audit for the site is currently considering the potential for growing this woodchip on-site and the implications this would have on the landscape and organic farm, and the viability of such a solution.

A new composting facility allows all green waste material arising from work within the garden to be composted on site for reuse as a mulch and soil ameliorant on site. The composting facility has an underground sump tank allowing all leachate to be captured and this is spread on the silage fields for the organic farm.

NBGW recently led the Welsh Government funded 'Dyffryn Tywi – Hanes Tirwedd Ein Bro' project, with 15 network partners representing key interests for the natural and cultural environments across the middle Tywi Valley (project boundary defined by Cadw/ Icomos Historic Landscape Character Area 'Dyffryn Tywi' - Llandeilo to Carmarthen section).

The project aimed to support locally specific 'nature-based solutions' based on historic landscape evidence, as innovative ways to tackle climate change whilst supporting the local historic environment.

In this largely rural area, the traditional skills that shaped the land created a strong cultural heritage that is still woven into the fabric of the local landscape and defines its unique character. The project demonstrated that understanding the specifics of past land management can inform current strategies to adapt to and mitigate against climate change.

The focus was on traditional rural skillsets. Hedgerows, meadows, parkland and orchards were chosen to represent the area's key historic landscape components, and to reflect peoples' past interaction with the local environment and relationships with nature.

The project ran training to revive the use of these traditional management skills across project partner sites and highlighted the current relevance of maintaining them. Hedgerows, meadows and orchards all sequester carbon and help to slow down water run-off.



NBGW plant reception facility
© NBGW



NBGW wastewater filtration pond
© NBGW



Waun Las Upper Hay Meadow
© NBGW



Haymaking at the Bishop's Park and Garden
© Tywi Gateway Trust

Case study by Helen Whitear and Alex Summers, NBGW

The Dyffryn Tywi project received funding through the Welsh Government Rural Communities - Rural Development Programme 2014-2020, which is funded by the European Agricultural Fund for Rural Development and the Welsh Government



6. Conclusions

The 2022 call for SAP activity evidence, drew the biggest response thus far, compared with the calls for evidence in 2020 and 2021. This is very positive, as is the increased response from organisations outside the heritage sector.

As with the 2020 and 2021 interim conclusions, more work remains to be done to promote and target the sphere of influence of the SAP, especially with the university sector, whose responses remain limited. It had been hoped that a communication plan by the HEG Climate Change Subgroup would help with this, however the limited staff resources available to subgroup members continues to be a serious concern. This meant that a plan could not be delivered in 2022, though work was undertaken towards the creation of one and subgroup members did meet with the Welsh Government student placement programme officer.

Despite resource issues, several positive steps were made by the subgroup in 2022, including the publication of the Interim Reports of Activity for 2021 and 2022, and the launch of the Adaptation Case Study Resource (SAP action 5.3) during Wales Climate Week.

The creation of a dedicated Climate Change Manager post (SAP action 4.2) supported by appropriate budgets, is now the key priority for 2023, and becoming more urgent as we move into the final phase of the SAP and start looking forward. Next steps include an external evaluation of the SAP, which will help inform the creation of a new plan to be launched in 2025. We also need to continue to coordinate our efforts and maintain the profile of the historic environment across the wider sector, for example, in the next iteration of Welsh Government's adaptation plan *Prosperity for All: A Climate Conscious Wales* and in the forthcoming Climate Change Committee (CCC) independent assessment of the status and effectiveness of climate adaptation planning and action in Wales.

Looking specifically at the activity evidence for 2022, this interim review demonstrates that a growing range of climate change adaptation activities continued or were initiated during the year. Activities span most types of historic asset, and all contribute towards meeting the headline actions identified in the SAP and the related historic environment sub-actions in *Prosperity for All: A Climate Conscious Wales* (see Section 2). Moving forward more consideration will need to be given to how successfully the outputs and outcomes associated with each action have been met.

Progress has continued during the year to increase our knowledge and understanding of the threats and opportunities for the historic environment. Much of this effort has focussed on identifying and recording good quality baseline data, resulting in an enhancement of the Historic Environment Record. Two Cadw-funded thematic projects on the survey of historic features associated with rivers and other fresh-water sources and shoreline management plans being undertaken by the Welsh Archaeological Trusts are an important example of this, alongside the

RCAHMW work in the intertidal zone and the volunteer condition monitoring programmes across the three Welsh National Parks.

Partnership and collaborative projects such as CHERISH and Carneddau funded through Europe and the National Lottery Heritage Fund continue to deliver against a number of the headline actions in 2022. It remains crucial that new partnership projects are developed and funding is sourced to continue such proactive work. Projects such as these, alongside research work undertaken by the National Trust and Cadw's embedded researcher and the joint UK Heritage Agency Work Group are crucial in developing the methodologies, tools and guidance that will build capacity and increase the resilience of the sector. Positive evidence that this is starting to happen can be seen in this interim report, but it is important that this output continues to grow in future years.

Finally, 2022 also saw a significant increase in the number of activities reported to increase the resilience of the historic environment and encompassed a wider range of actions, for example, survey and excavation, building maintenance, as well as changes in planting regimes and horticultural practices. These provide valuable case studies going forward, and an improved evidence base that will translate into better management practice.

7. Abbreviations

AC-NMW: Amgueddfa Cymru – National Museum Wales

AU: Aberystwyth University – Department of Geography and Earth Sciences

BBNPA: Bannau Brycheiniog National Park Authority

BCBC: Bridgend County Borough Council

BU: Bangor University – School of Ocean Science

CBAW: Council for British Archaeology: Wales

CIW: Church in Wales

CITiZAN: Coastal and Intertidal Zone Archaeological Network.

CPAT: Clwyd-Powys Archaeological Trust

CRDV AONB: Clwydian Range and Dee Valley Area of Outstanding Natural Beauty

DP: Discovery Programme, Ireland

DfC (NI): Department for Communities (Northern Ireland)

DTP: Dyffryn Tywi Project

DV: DigVentures

EA: Environment Agency

ENPA: Eryri National Park Authority

EH: English Heritage

FPAN: Florida Public Archaeology Network.

GAT: Gwynedd Archaeological Trust

GC: Gwynedd Council

GGAT: Glamorgan-Gwent Archaeological Trust

GNSS: Global Navigation Satellite System

GSI: Geological Survey Ireland

HE: Historic England

HEG: Historic Environment Group

HEGS: Historic Environment Group Climate Change Subgroup

HES: Historic Environment Scotland

LTC: Llandeilo Town Council

LYC: Eglwys a Threftadaeth – Llanfihangel y Creuddyn – Church & Heritage

MADU: Malvern Archaeological Diving Unit

NBGW: National Botanic Garden of Wales

NAS: Nautical Archaeology Society

NRW: Natural Resources Wales

NT: National Trust

NTC: National Trust Cymru

NTS: National Trust Scotland

PCNPA: Pembrokeshire Coast National Park Authority

PTWT: Pembroke Town Walls Trust

RCAHMW: Royal Commission on the Ancient and Historical Monuments of Wales

RSPB: Royal Society for the Protection of Birds

SAP: Sector Adaptation Plan

SCAPE: Scotland's Coastal Heritage at Risk Project

TTC: Tredegar Town Council

UAV: Unmanned Aerial Vehicle

WATs: Welsh Archaeological Trusts

WCMC: Wales Coast Monitoring Centre

WG: Welsh Government

8. Links to Resources

Cadw – Maintenance Matters!

<https://cadw.gov.wales/maintenance-matters>

Carneddau Landscape Partnership Scheme:

<https://www.snowdonia.gov.wales/looking-after/carneddau-partnership>

CHERISH Climate Change and Coastal Heritage project:

<http://www.cherishproject.eu/en/>

Clwydian Range & Dee Valley AONB - Landscape and Nature Recovery in a Changing Climate:

<https://www.clwydianrangeanddeevalleyaonb.org.uk/wp-content/uploads/2016/06/Landscape-Nature-Recovery-ENG-Interactive.pdf>

Fit for the Future Network:

<https://www.fff.org.uk/home>

Historic Environment and Climate Change in Wales Sector Adaptation Plan:

<https://cadw.gov.wales/sites/default/files/2020-02/Adaptation%20Plan%20-%20FINAL%20WEB%20-%20English%20%281%29.pdf>

Historic Environment and Climate Change in Wales Sector Adaptation Plan Monitoring and Evaluation Framework:

<https://cadw.gov.wales/sites/default/files/2021-10/Historic%20Environment%20and%20Climate%20Change%20in%20Wales-Sector%20Adaptation%20Plan%20Monitoring%20and%20Evaluation%20Framework-June-2021.pdf>

Historic Environment and Climate Change in Wales Sector Adaptation Plan Monitoring. Interim Report of Activity: Year 1, 2020

<https://cadw.gov.wales/sites/default/files/2022-08/SAP%20Interim%20Report%201%202020%20FINAL%20ENGLISH.pdf>

Historic Environment and Climate Change in Wales Sector Adaptation Plan Monitoring. Interim Report of Activity: Year 2, 2021

<https://cadw.gov.wales/sites/default/files/2022-08/SAP%20Interim%20Report%202%202021%20FINAL%20ENGLISH.pdf>

Historic Environment and Climate Change in Wales – Case study Resource

<https://storymaps.arcgis.com/stories/b862abb4f5264a3f8693583770e4088b>

Historic Environment and Climate Change in Wales – Heritage Responds

<https://www.youtube.com/watch?v=2B5msvwx9g>

National Trust – Climate change adaptation guidance

<https://www.into.org/new-national-trust-climate-change-adaptation-guidance/>

Natural Resources Wales – Pioneering tree felling operation successfully preserves ancient goldmines

<https://naturalresources.wales/about-us/news-blog-and-statements/news/pioneering-tree-felling-operation-successfully-preserves-ancient-goldmines/?lang=en>

Pembrokeshire Coast National Park Changing Coasts project:

<https://www.pembrokeshirecoast.wales/get-involved/changing-coasts/>

RCAHMW - The Biodiversity and Resilience of Ecosystems Duty Report and Forward Plan 2022-24

<https://rcahmw.gov.uk/about-us/corporate-information/future-generations/biodiversity-report-and-forward-plan-2022-24/>

Eryri National Park Authority – Carneddau Landscape Partnership

<https://snowdonia.gov.wales/protect/conservation-work/carneddau-landscape-partnership/>

Wales Slate World Heritage Site - Slate Communities of Gwynedd: Care and Conservation

<https://indd.adobe.com/view/6fb37302-819e-4c6a-b721-8cdcad240645>

Welsh Government climate change adaptation plan - Prosperity for all: A climate conscious Wales

<https://gov.wales/prosperity-all-climate-conscious-wales>

Welsh Government climate change adaptation plan - Prosperity for all: A climate conscious Wales: Progress report

<https://www.gov.wales/prosperity-all-climate-conscious-wales-progress-report>

Welsh Government – Resilience of buildings to challenges associated with climate change: report

<https://www.gov.wales/resilience-buildings-challenges-associated-climate-change-report>

Annex: Headline action table and evidence of activity for 2022

Details of any abbreviations and links to resources in the text can be found in Sections 7 and 8.

| Knowledge: Increase our knowledge and understanding of the threats and opportunities for the historic environment from a changing climate | | | | | |
|---|--|--|--|--|--|
| | Description of the action | Output(s) from the action | Broad outcome/impact | Activity 2022 | CCW Indicator |
| I. Knowledge exchange/collaboration | | | | | |
| 1.1 | Dissemination, promotion and stakeholder engagement of the Historic Environment and Climate Change Sector Adaptation Plan. For example: <ul style="list-style-type: none"> Communication Strategy. Stakeholder engagement with politicians and senior decision-makers. Monitor and evaluate strategy. | <ul style="list-style-type: none"> Publication of the Historic Environment and Climate Change Sector Adaptation Plan. Secured resources and practical actions to deliver the plan. | <ul style="list-style-type: none"> Raised awareness of the challenges posed by climate change on the historic environment. Direct action to improve our knowledge, build capacity and increase the resilience of the historic environment to climate change. Provision of a strategic framework to take forward adaptation actions. | <ul style="list-style-type: none"> HEGS – Group continued work and activities with representation from Cadw, NRW, RCAHMMW, GAT, NT, PCNPA, ENPA, GGAT, DAT, CPAT, AC-NMW. HEGS – SAP Action Plan activity survey for 2021 initiated January 2022 and closed February 2022. HEGS - Two Interim Reports of Activity against the SAP action plan covering 2020 and 2021 published. HEGS – Continued promotion and awareness raising of SAP e.g. Paper published in CBAW Archaeology Wales 60 (2022) <i>Introducing The Historic Environment And Climate Change In Wales Sector Adaptation Plan</i>, social media activities during Wales Climate Week and the creation of a short film written and produced by the Royal Commission 'Heritage Responds'. HEGS – Work continues towards developing a Communication Strategy. BBNPA – Inclusion of SAP within Historic Environment Action Plan (public consultation in 2023). RCAHMMW, AU, DP, GSI – CHERISH project Contribution to delivery of the SAP incorporated into project initiatives and workplan. RCAHMMW – Contribution to delivery of the SAP incorporated into Operation Plan and reported against. Cadw - New content has been added to the climate change section of the Cadw website. This includes a new case study resource; advice on building maintenance as the first step towards climate resilience and energy efficiency, and hosting of the Heritage Responds video. (5.3, 6.3) Cadw – Continues to be a member of the WG Climate Change Network. It also acts as a link between the subgroup and the WG Climate Adaptation team. This includes providing WG colleagues with annual reports and other updates on progress against the actions in Prosperity for all: A climate conscious Wales and the SAP. (5.2) | <ul style="list-style-type: none"> HE1 |
| 1.2 | Establish a knowledge exchange group(s) for researchers and practitioners to share ideas, information and good practice, and to help identify future research and funding opportunities in Wales. For example: <ul style="list-style-type: none"> Establish a climate and heritage management group. Establish a spatial mapping group. | <ul style="list-style-type: none"> Knowledge exchange group(s) established and active. Identification of future research priorities for Wales. | <ul style="list-style-type: none"> A coordinated approach, maximising knowledge and resources, leading to capacity building and more successful adaptation. | <ul style="list-style-type: none"> Cadw - Continues to work with partners from across the home nations HES, HE, EH, NT, NTS and DfC NI to pool research and expertise. The UK Heritage Adaptation Partnership was formally launched in the summer. The group is now developing a collaborative work programme. (1.3, 2.1, 3.1, 6.1, 6.3) RCAHMMW, AU, DP, GSI – CHERISH project Looking to post-CHERISH future (2023 on) building on established partnership and new funding opportunities. HEGS, WATs, Cadw – Exchange group meetings held to discuss Cadw funded WAT projects. TTC – Established a Climate change Adaptation Programmes sub-committee, a heritage sub-committee. Have Elected Member representation on the Blaenau Gwent Heritage Forum and the VVP/Tredeggar Heritage Initiative and work collaboratively with partner agencies, e.g. Blaenau Gwent CBC and Valleys that Changed the World. | <ul style="list-style-type: none"> HE2 MC4 |
| 1.3 | Participation from Wales in established UK and wider climate heritage groups and networks. For example: <ul style="list-style-type: none"> Fit for the Future network. Historic Environment Adaptation working group. Climate Heritage Network. | <ul style="list-style-type: none"> Welsh attendance at climate heritage groups and networks. | <ul style="list-style-type: none"> Collaborative working maximising knowledge and resources, leading to capacity building and more successful adaptation. | <ul style="list-style-type: none"> Cadw - Continues to work with partners from across the home nations HES, HE, EH, NT, NTS and DfC NI to pool research and expertise. The UK Heritage Adaptation Partnership was formally launched in the summer. The group is now developing a collaborative work programme. (1.2, 2.1, 3.1, 6.1, 6.3) Cadw - The Joint UK Heritage Agency Work Group (representatives from the four UK historic environment bodies, plus NT and Natural England) continues to meet quarterly to discuss and share developments in peatland restoration in relation to the historic environment. RCAHMMW, AU, DP, GSI – CHERISH project Continue to Participate and liaise with other networks and bodies in relation to climate change and coastal heritage e.g. SCAPE, CITiZAN, FPAN. RCAHMMW – continue as members of the Fit for the Future, Climate Heritage Network and from 2022 Climate Cymru. | <ul style="list-style-type: none"> HE2 MC4 |

| | Description of the action | Output(s) from the action | Broad outcome/impact | Activity 2022 | CCW Indicator |
|--|---|---|--|---|--|
| 2. Mapping and monitoring of the resource | | | | | |
| 2.1 | <p>Improving baseline data. Develop standardised methodologies and assessment tools to both identify historic assets and prioritise those at risk. For example:</p> <ul style="list-style-type: none"> Wales spatial mapping work including environment/asset specific mapping and analysis. Data enhancement programmes. Use of soil moisture indexes to target aerial reconnaissance during dry periods. | <ul style="list-style-type: none"> Improved baseline data sets. Improved consistency and comparability of data. Publicly available and regularly updated central repository of spatial mapping datasets. | <ul style="list-style-type: none"> Improved understanding of the threats and opportunities for the historic environment from a changing climate. Improved evidence base for monitoring, statutory protection, decision-making and adaptation strategies. | <ul style="list-style-type: none"> Cadw - Coast & Shoreline / Shoreline Management Plans. These refreshed plans include 928 actions detailing how the shoreline will be managed in the short term, medium term, and long term. The historic environment is a consideration of shoreline management, however, HER data which informs SMPs is not current, with the condition of most historic environment assets not updated since the Trust's coastal surveys of the mid-1990s. Cadw is funding GGAT, GAT and DAT to update data on historic assets in the areas covered by the action plans. (5.2, 6.3) Cadw – Rivers. Climate change and efforts to mitigate its impact have the potential to impact significantly on the historic environment, especially in areas where assets are poorly recorded or understood. Work in 2020-21 by DAT, followed in 2021-22 by pan-Wales project, identified rivers and riparian environments as being particularly vulnerable. Cadw is funding three projects with GGAT, DAT and CPAT that will continue to identify and record good quality baseline data, resulting in the enhancement of the HER for future land management and development control. EA -Developing mapping and data in relation to the River Severn catchment. RCAHMW - Continuation of work to enhance records of historic assets located in the inter-tidal and coastal zone, through 3D digital survey. It is intended that this survey work will provide much improved baseline information for future assessment of any impact from climate change, as well as providing a much enhanced record of the historic asset (2.2, 7.3) MADU – Continued research on shipwrecks including Welsh Wreck Research Project. RCAHMW, AU, DP, GSI – CHERISH project continues. Targeting specific study areas in coast zone (includes seabed, intertidal, island and coast edge environments) to improve baseline data through technologies such as lidar, UAVs, GNSS, terrestrial laser scanning, marine survey for baseline and condition/change monitoring of coast zone. Includes data enhancement and archiving of freely available data and event reporting of project work to NMRW as central repository of data. (2.2, 3.1-2, 6.3, 7.3-4) RCAHMW – Met Office soil moisture indexes purchased annually for targeted aerial reconnaissance programme. 2022 was one of hottest summers on record. Targeted aerial reconnaissance took place across Wales with notable discoveries across the extensive parchmarks recorded in central and eastern Wales. NT, 3 Keel - matching NT HBSMR data with EA eroding coast data to analyse which monuments are most at risk (includes Wales). NT - Climate Change GIS Browser developed based on NT Hazzard Map – will ultimately be largely publicly available. Cadw - Ongoing work with the Climate Resilience Embedded Researcher and WG cross-departmental steering group to implement the recommendations from the Fellowship. This includes development of mapping and guidance tool (pilot to be tested by Registered Social Landlords) (3.1, 5.1, 6.3) Cadw - Continues to work with partners from across the home nations HES, HE, EH, NT, NTS and Communities NI to pool research and expertise. The UK Heritage Adaptation Partnership was formally launched in the summer. The group is now developing a collaborative work programme. (1.2, 1.3, 3.1, 6.1, 6.3) Cadw: Awarded funding for a second Fellowship. which is likely to commence in the Summer of 2023. The Fellowship is an opportunity to develop and test the Adaptation Pathways approach to climate change adaptation and to develop guidance and training for policymakers, asset owners and practitioners in the historic environment sector. (6.1, 6.2, 6.3) ENPA – Carneddau Landscape Partnership Scheme continues. Community and volunteer work included lidar project training days. | <ul style="list-style-type: none"> HE2 MC4 |
| 2.2 | <p>Establish and implement targeted monitoring regimes on identified historic assets.</p> <p>For example:</p> <ul style="list-style-type: none"> Develop and publish case studies to outline different monitoring approaches to | <ul style="list-style-type: none"> Targeted monitoring programme and condition data. Best-practice guidance document/technical notes for monitoring assets at | <ul style="list-style-type: none"> Improved understanding of the threats for the historic environment from a changing climate. Provision of data for historic assets to assist the development of | <ul style="list-style-type: none"> PCNPA – Continues to monitor the condition of scheduled monuments within the National Park using volunteers (system set up in 2020). (3.1-2, 7.4) PCNPA – Continuation of Changing Coasts project using fixed point photography. Communities/public submit photographs at specific coastal path points to monitor change and erosion (see 3.1-2, 7.3-4). RCAHMW - Continuation of work to enhance records of historic assets located in the inter-tidal and coastal zone, through 3D digital survey. It is intended that this survey work will provide much improved baseline | <ul style="list-style-type: none"> HE2 MC4 |

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| | <p>ensure consistency of data and approach.</p> <ul style="list-style-type: none"> Establish online/mobile application to record incidents/ impacts e.g. of pests and disease. Establish a link to scheduled monuments and listed buildings at risk monitoring work. | risk drawing on case studies. | management strategies and prioritisation. | <p>information for future assessment of any impact from climate change, as well as providing a much enhanced record of the historic asset (2.1, 7.3)</p> <ul style="list-style-type: none"> BBNPA – Continuation of volunteer condition monitoring programme ongoing (see 3.1-2, 7.4) RCAHMW, AU, DP, GSI – CHERISH project continues. Targeting specific study areas in coast zone (includes seabed, intertidal, island and coast edge environments) to improve baseline data through technologies such as lidar, UAVs, GNSS, terrestrial laser scanning, marine survey for baseline and condition/change monitoring of coast zone. Includes data enhancement and archiving of freely available data and event reporting of project work to NMRW as central repository of data. (2.1, 3.1-2, 6.3, 7.3-4) RCAHMW, AU, DP, GSI – CHERISH project continues. Repeat monitoring at a number of case-study sites, installation of permanent survey markers at 9 heritage sites for future monitoring (aligned and working with WCMC). (3.1) BU – PhD research (2021-24) 'Historic Shipwrecks and the Impacts of Climate Change' to address marine research priorities. Includes monitoring of 18 intertidal wrecks and patterns of uncovering and recovering in relation to beach profile changes. (3.1, 7.3) | |
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| | Description of the action | Output(s) from the action | Broad outcome/impact | Activity 2022 | CCW Indicator |
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| 3. Research priorities | | | | | |
| 3.1 | <p>Improve understanding of the interacting and cascading relationships, and cumulative impacts of climate risk factors. For example:</p> <ul style="list-style-type: none"> Building condition, location and socio-economic factors. Changing land use and redundancy of agricultural buildings resulting in a cumulative loss of historic landscape features and changed settings. Increases in invasive species that may impact on historic assets. Acidification of seawater and increase in marine species which pose potential threats to wrecks/timber structures in marine conditions. Measures to address chronic and acute pollution from historic mining. Risks to building fabric from increased humidity, moisture, wind and driving rain, and the knock-on impact on indoor air quality and the health of building occupants. Cumulative impact of successive extreme weather events on historic assets. The frequency, range and potential regional variations of extreme weather events and their impact on the historic environment. | <ul style="list-style-type: none"> Reports and recommendations. | <ul style="list-style-type: none"> Adaptive actions take inter-relationships and cumulative impacts into account, thereby minimising the potential for maladaptation, leading to improved management of historic assets and the creation of best-practice guidance. | <ul style="list-style-type: none"> PCNPA – Monitoring the condition of scheduled monuments within the National Park using volunteers (system set up in 2020). (2.2, 3.2, 7.4) PCNPA – Continuation of Changing Coasts project using fixed point photography. Communities/public submit photographs at specific coastal path points to monitor change and erosion (see 2.2, 3..2, 7..3-.4).. BBNPA – Continuation of volunteer condition monitoring programme (see 2.2, 3..2, 7.4). RCAHMW, AU, DP, GSI – CHERISH project continues. Targeting specific study areas in coast zone (includes seabed, intertidal, island and coast edge environments) to improve baseline data through technologies such as lidar, UAVs, GNSS, terrestrial laser scanning, marine survey for baseline and condition/change monitoring of coast zone. Includes data enhancement and archiving of freely available data and event reporting of project work to NMRW as central repository of data. (2.1-2, 3..2, 6.3, 7.3) RCAHMW, AU, DP, GSI – CHERISH project continues. Repeat monitoring at a number of case-study sites, installation of permanent survey markers at 9 heritage sites for future monitoring (aligned and working with WCMC). (2.2) NT - funded PhD looking at future wind/storm risk to veteran trees (Chirk Castle Registered Parkland) completed. Researcher also looked at climate magnified wildfire risks to peat (Migneint). NT, Exeter University - Research project correlating footfall at mansion properties with weather patterns to predict what visitor patterns might look like against future predicted weather patterns. BU – PhD research (2021-24) 'Historic Shipwrecks and the Impacts of Climate Change' to address marine research priorities. Includes coastal vulnerability assessment in relation to intertidal assets; mapping of predicted oceanic climate change trends for Welsh National Marine Plan area; and an ecological database of 27 underwater sites identifying species which are invasive or whose range is noted as changing with regard to warming seas. (2.2, 7.3) Cadw - Ongoing work with the Climate Resilience Embedded Researcher and WG cross-departmental steering group to implement the recommendations from the Fellowship. This includes development of mapping and guidance tool (pilot to be tested by Registered Social Landlords) (2.1, 5.1, 6.3). Further funding for additional monitoring to improve evidence base being sought. Cadw - Continues to work with partners from across the home nations HES, HE, EH, NT, NTS and DfC NI to pool research and expertise. The UK Heritage Adaptation Partnership was formally launched in the summer. The group is now developing a collaborative work programme. (1.2, 1.3, 2.1, 6.1, 6.3) | <ul style="list-style-type: none"> HE2 MC4 |
| 3.2 | <p>Research to improve knowledge of past and present climate change impacts on historic assets e.g. decay/erosion/accretion.</p> | <ul style="list-style-type: none"> Research results, case studies and recommendations. | <ul style="list-style-type: none"> Increased understanding of stages, timescales and outcomes leading to improved management and | <ul style="list-style-type: none"> PCNPA – Monitoring the condition of scheduled monuments within the National Park using volunteers (system set up in 2020). (2.2, 7.4, 3..1). PCNPA – Continuation of Changing Coasts project using fixed point photography. Communities/public submit photographs at specific coastal path points to monitor change and erosion (2.2, 3..1, 7..3-.4). | <ul style="list-style-type: none"> HE2 MC4 |

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| | | | adaptation interventions to build resilience. | <ul style="list-style-type: none"> BBNPA – Continuation of volunteer condition monitoring programme ongoing (2.2, 3.1, 7.4). RCAHMW, AU, DP, GSI – CHERISH project continues. Targeting specific study areas in coast zone (includes seabed, intertidal, island and coast edge environments) to improve baseline data through technologies such as lidar, UAVs, GNSS, terrestrial laser scanning, marine survey for baseline and condition/change monitoring of coast zone. Includes data enhancement and archiving of freely available data and event reporting of project work to NMRW as central repository of data. (2.1-2, 3.1, 6.3, 7.3) AU, RCAHMW, DP, GSI – CHERISH project continues. AU led work has focused on reconstructing coastal change, landscape development and climate variability at key sites around the Welsh coast. These include: Stackpole Warren, Cwm Dewi (Dinas Island), Cors Fochno and Ynyslas, Abersoch, Ynys Enlli, Dinas Dinlle, Morfa Dinlle, Llyn Coron / Aberffraw and Llyn Maelog / Traeth Llydan. Around Dinas Dinlle and Southwest Anglesey, our palaeoenvironmental research has provided new evidence for episodes of large scale sand movement and storm activity over the last three thousand years, including the more recent historical period. We have integrated, evidence of past sea level change, storminess and coastal landscape development with archaeological data. These records extending back millennia are a valuable basis for considering adaptation to climate change today. Member of Public - Undertaking research looking at Welsh history and the way that climate change may have shaped this in the past, focussing on the Iron age to the Middle Ages. | |
| 3.3 | Improve understanding of the positive and negative effects of a longer growing season on the maintenance and management of the historic environment. | <ul style="list-style-type: none"> Report and recommendations. | <ul style="list-style-type: none"> Improved long-term adaptation and maintenance programmes. | | <ul style="list-style-type: none"> HE2 MC4 |
| 3.4 | Work with UKCP18 projections to identify opportunities for the historic environment and the economy e.g. planting of woodland and forestry; establishment of new industries relating to adaptation; changing leisure opportunities; increased use of UK coastal resorts. | <ul style="list-style-type: none"> Identification of opportunities. | <ul style="list-style-type: none"> A combined beneficial response to adaptation will encourage uptake and identification of new opportunities, including tourism investment. | | <ul style="list-style-type: none"> HE2 |

| Capacity: Develop the methodologies, tools and guidance to work with others and build adaptive capacity | | | | | |
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| | Description of the action | Output(s) from the action | Broad outcome/impact | Activity 2022 | CCW Indicator |
| 4 Dissemination and promotion | | | | | |
| 4.1 | Creation of a steering group to oversee the delivery of the HEG SAP and to monitor and review progress. The steering group will establish and coordinate working/subgroups as necessary. | <ul style="list-style-type: none"> Steering group formed from representatives within Wales. | <ul style="list-style-type: none"> The provision of a strategic framework through which the action plan is delivered. | <ul style="list-style-type: none"> HEGS – Two Interim Reports of Activity against the SAP action plan covering 2020 and 2021 approved by HEG and published. HEGS – regular meetings to review SAP progress and coordinate promotion of the SAP. HEGS – Twice-yearly meeting with Cadw and WATS to discuss and inform Cadw-funded WAT projects. | <ul style="list-style-type: none"> HE3 |
| 4.2 | Creation of a dedicated (full-time equivalent) Climate Change Manager post for the historic environment sector in Wales. | <ul style="list-style-type: none"> Climate Change Manager in post. | <ul style="list-style-type: none"> Direct action to help steer and guide the delivery of the HEG SAP and to play a central role in raising the profile of the climate change work across the historic environment sector in Wales. | <ul style="list-style-type: none"> HEGS – Discussions began within group. Job description was drafted. | <ul style="list-style-type: none"> HE3 |
| 5. Collaborative working | | | | | |
| | Description of the action | Output(s) from the action | Broad outcome/impact | Activity 2022 | CCW Indicator |

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| 5.1 | The steering group to coordinate and encourage stakeholder engagement and promote partnership working to ensure efficient use of resources across sectors. | <ul style="list-style-type: none"> Cross-sector partnerships and coordinated working will ensure resources are targeted effectively and efficiently. | <ul style="list-style-type: none"> Effective delivery of the HEG SAP actions. Raised awareness of the historic environment across the wider sector which will help prevent secondary damage and maladaptation to the historic environment. Improved cross-sector working. | <ul style="list-style-type: none"> RCAHMW, AU, DP, GSI – CHERISH project CHERISH project works cross-sector and with a variety of stakeholders and partners. The CHERISH exhibition was installed at the Senedd and officially opened by Julie James, Climate Change Minister, who hosted a reception and delivered a speech with the Irish Consulate. HEGS – Initial meetings and discussion with WG student placement programme about potential research opportunities and building links with Universities. Cadw - Ongoing work with the Climate Resilience Embedded Researcher and WG cross-departmental steering group to implement the recommendations from the Fellowship. This includes development of mapping and guidance tool (pilot to be tested by Registered Social Landlords) and targeted stakeholder engagement to try and embed climate change adaptation in standards and regulations, including Building Regulations, PAS2035, Net Zero Carbon Buildings Standard, etc. (2.1, 3.1, 6.3) | <ul style="list-style-type: none"> HE3 |
| 5.2 | The steering group/working group to work with officials across Wales to embed the HEG SAP in national and local government policy statements, plans and codes | <ul style="list-style-type: none"> The historic environment will feature in the Welsh Government Climate Change Adaptation Plan for Wales. The HEG SAP considerations will be linked and noted in, for example: <ul style="list-style-type: none"> Shoreline Management Plans. Relevant Planning Policy Wales supplements. | <ul style="list-style-type: none"> Help prevent secondary damage and maladaptation to the historic environment. | <ul style="list-style-type: none"> RCAHMW, AU, DP, GSI – CHERISH project Featured as a case study in WG progress report on Prosperity for All: A Climate Conscious Wales. HEGS – the SAP is embedded in the WG adaptation plan, Prosperity for all: A climate conscious Wales. Results from Action Plan activity survey 2020 and 2021 fed into WG progress report published in 2022. HEGS – Responded to consultations e.g. NHLF strategy and WG Draft strategy for engaging the general public in action on climate change. Cadw - Coast & Shoreline / Shoreline Management Plans. These refreshed plans include 928 actions detailing how the shoreline will be managed in the short term, medium term, and long term. The historic environment is a consideration of shoreline management, however, HER data which informs SMPs is not current, with the condition of most historic environment assets not updated since the Trust's coastal surveys of the mid-1990s. Cadw is funding GGAT, GAT and DAT to update data on historic assets in the areas covered by the action plans. (52.1, 6.3) Cadw – Continues to be a member of the WG Climate Change Network. It also acts as a link between the subgroup and the WG Climate Adaptation team. This includes providing WG colleagues with annual reports and other updates on progress against the actions in Prosperity for all: A climate conscious Wales and the SAP. (1.1) | <ul style="list-style-type: none"> HE3 |
| 5.3 | Provide, promote and maintain a publicly available case study resource to illustrate climate change risks and impacts affecting the historic environment and examples of adaptation. All should be able to contribute to this resource. | <ul style="list-style-type: none"> Case study resource. | <ul style="list-style-type: none"> Raised awareness of the challenges posed by climate change and adaptation on the historic environment. Demonstration of a range of practices and evidence of direct action. | <ul style="list-style-type: none"> HEGS – Adaptation Case Study Resource created and launched. The Story Map resource draws together a series of Case Studies from across the sector. Case studies also in the two Interim Reports of Activity (5.3) RCAHMW, AU, DP, GSI – CHERISH project study sites provide case study resources showcased on website, leaflets, through talks, blogs, CHERISH on-line 'chats', the travelling exhibition and films. Example Activity in 2022 working with PCNP to provide joint guided walks. NTC, Arts Council of Wales - commissioned artists Lauren Heckler and Alex Paveley, to engage Welsh communities in the Conwy catchment in conversation so we could build a picture of their experiences, thoughts, and concerns about the changing climate, and develop an understanding of how we might work together to adapt to these. A co-create film, exploring lived experiences of climate change and the environment combined workshop outcomes, interviews, and a record of the process, weaving together the landscapes, expressions and opinions of communities linked together by weather and water, was projected onto Conwy Railway Bridge. Cadw - New content has been added to the climate change section of the Cadw website. This includes a new case study resource; advice on building maintenance as the first step towards climate resilience and energy efficiency, and hosting of the Heritage Responds video. (1.1, 6.3) | <ul style="list-style-type: none"> HE3 |

| | Description of the action | Output(s) from the action | Broad outcome/impact | Activity 2022 | CCW Indicator |
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| 6. Training and guidance | | | | | |
| 6.1 | Identify and support the training of historic environment practitioners specialising in the impacts of climate change and adaptation of the historic environment. | <ul style="list-style-type: none"> Trained climate change historic environment practitioners. | <ul style="list-style-type: none"> Raising standards to embed climate change considerations in the historic environment. | <ul style="list-style-type: none"> NRW, WATs, Cadw - Peatland and historic environment training; National Peatlands Action Programme, Climate Change Emergency, priority action themes. NRW and partners - 2 River Restoration training and site-based seminar events. Cadw - Ongoing work with the Climate Resilience Embedded Researcher and WG cross-departmental steering group to implement the recommendations from the Fellowship. This includes dissemination of findings at conferences and other events. Cadw - Set up online stakeholder event with presentation and panel discussion for Wales Climate Week on the theme of 'Building maintenance as the first step towards climate resilience and energy efficiency' (6.2) | <ul style="list-style-type: none"> HE3 |

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| | | | | <ul style="list-style-type: none"> • Cadw - Continues to work with partners from across the home nations HES, HE, EH, NT, NTS and DfC NI to pool research and expertise. The UK Heritage Adaptation Partnership was formally launched in the summer. The group is now developing a collaborative work programme. (1.2, 1.3, 2.1, 3.1, 6.3) • Cadw: Awarded funding for a second Fellowship. which is likely to commence in the Summer of 2023. The Fellowship is an opportunity to develop and test the Adaptation Pathways approach to climate change adaptation and to develop guidance and training for policymakers, asset owners and practitioners in the historic environment sector. (2.1, 6.2, 6.3) | |
| 6.2 | <p>Climate change historic environment practitioners to provide training and support within and across sectors in the impacts of climate change and adaptation of the historic environment. For example:</p> <ul style="list-style-type: none"> • Produce an e-learning module on the historic environment and climate change. • Organise slots at meetings, training events and workshops with other sectors. | <ul style="list-style-type: none"> • Planners and developers can advise authoritatively through pre-application advice e.g. on the design and implementation of adaptation proposals. • Grant officers can ensure changes and adaptation actions are sensitive to the historic environment. • Owners can identify and implement management and adaptation opportunities. • Community groups established to develop programmes to identify, monitor and record historic assets at risk. | <ul style="list-style-type: none"> • Raised standards to embed climate change considerations in the historic environment. • Improved cross-sector working, knowledge and understanding, decision-making and the quality of adaptation actions. | <ul style="list-style-type: none"> • DAT - work with other organisations such as NRW and Coastal Engineering Groups to coordinate and help deliver aspects of the adaptation plan, including training. • PTWT - established short training courses in heritage masonry skills with students in construction at local Pembrokeshire College. Have a service level agreement with them to deliver these courses and develop and increase them in the future. Involved working with Cadw, the local authority and Tywi Centre. • RCAHMW – Provision of Marine Planning Advice for Marine Development to ensure that coastal/offshore development does not cause further impact on our cultural heritage. Collaborated with NRW to produce an area statement for marine historic assets and to provide training to enhance understanding of the marine historic environment and how it fits within the marine planning system, is impacted by climate change etc (6.3). • MADU – Providing talks and running educational training courses for the NAS. • RSPB - Peat Restoration at Lake Vrynwy and other sites. Have organised workshops and on-site visits to show how peat restoration can impact the historic environment, and also benefit it in the long term. • BBNPA – Response and input to consultations for developing land management strategies, woodland creation, riparian improvements, peatland restoration (see 6.3). • RCAHMW, AU, DP, GSI – CHERISH project continues. Work with community groups and individuals to monitor and records assets at risk (see 7.4). • NBGW - Promoting sustainable horticultural and land management practices to our 160,000 visitors per annum • NTC, Literature Wales - Lyrical Landscapes project inspiring young people across Wales to take action against climate change by connecting to nature, history, the outdoors and poetry. One site that really inspired was Bodnant Garden in Conwy where the children had the opportunity to go behind the scenes to learn more about the devastating effects of Storm Arwen in 2021, and the ongoing work to clear and restore this world-class garden. • Cadw - Set up online stakeholder event with presentation and panel discussion for Wales Climate Week on the theme of 'Building maintenance as the first step towards climate resilience and energy efficiency' (6.1) • Cadw: Awarded funding for a second Fellowship. which is likely to commence in the Summer of 2023. The Fellowship is an opportunity to develop and test the Adaptation Pathways approach to climate change adaptation and to develop guidance and training for policymakers, asset owners and practitioners in the historic environment sector. (2.1, 6.1, 6.3) • ENPA – Carneddau Landscape Partnership Scheme Community and volunteer work included scrub vegetation control at several scheduled monuments and lidar project training days. Volunteers and a group of MA and PhD students from the University of Sheffield undertook and measured survey, UAV and photogrammetry of historic environment features (7.4) • ENPA – Ardudwy historic rural dwellings and farmsteads project focussing on derelict and ruinous dwellings and farm buildings in the upland margins of Ardudwy. Working with local volunteers and will include messaging relating to marginality, settlement, climate change and land management in its engagement with local people. Project in development and pilot activities undertaken in 2022. • DTP - Teaching and reviving traditional land management skill sets e.g. hedgerow management and laying to encourage more take-up and benefit to the natural and cultural environment. <i>Newly reported activity from 2021.</i> | <ul style="list-style-type: none"> • HE3 |
| 6.3 | Work collaboratively across sectors to develop and disseminate joint guidance/ advisory notes that increase the | <ul style="list-style-type: none"> • Guidance/advisory notes produced and promoted. | <ul style="list-style-type: none"> • Improved cross-sector working, knowledge and understanding, | <ul style="list-style-type: none"> • RCAHMW – Provision of Marine Planning Advice for Marine Development to ensure that coastal/offshore development does not cause further impact on our cultural heritage. Collaborated with NRW to produce an area statement for marine historic assets and to provide training to enhance understanding of the marine | <ul style="list-style-type: none"> • HE3 |

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| | knowledge, understanding and resilience of the historic environment to climate change. | <ul style="list-style-type: none"> Inclusion of climate change adaptation into all aspects of heritage management. Heritage management and business plans with climate change adaptation embedded. Management practices undertaken that showcase climate change adaptation. | <p>decision-making and the quality of adaptation actions.</p> <ul style="list-style-type: none"> Prevention of secondary damage and maladaptation to the historic environment. Improved management of the historic environment. A well-managed and appropriate programme of adaptation measures. | <p>historic environment and how it fits within the marine planning system, is impacted by climate change etc (6.2).</p> <ul style="list-style-type: none"> NRW - Developing guidance for woodland managers on adapting forests and woodlands to improve resilience to climate change, applicable to ancient woodlands and historic landscapes. BBNPA – Response and input to consultations for developing land management strategies, woodland creation, riparian improvements, peatland restoration (see 6.2). RCAHMW, AU, DP, GSI – CHERISH project continues. Targeting specific study areas in coast zone (includes seabed, intertidal, island and coast edge environments) to improve baseline data through technologies such as lidar, UAVs, GNSS, terrestrial laser scanning, marine survey for baseline and condition/change monitoring of coast zone. Includes data enhancement and archiving of freely available data and event reporting of project work to NMRW as central repository of data. (see 2.1-2, 3.1-2,, 7.3) RCAHMW, AU, DP, GSI – CHERISH project Guidance e-document Cherish: Sharing Our Practice: Investigating Heritage and Climate Change in Coastal and Maritime Environments. A Guide to the CHERISH Toolkit. Written in 2022 and layout began. To be published/launched at CHERISH conference March 21 2023 NT - Climate Change Adaptation Guidance published October 2022 includes section on the Historic Environment GC - Wales Slate World Heritage Site. Publication of Slate Communities of Gwynedd: Care and Conservation. Sections offering practical advice on maintenance, repairs and improvements, showing how to preserve and restore the character of a building, covering not only houses, but also shops or former chapels, and their surroundings. Also includes a section on Energy and Environment.. Cadw - Ongoing work with the Climate Resilience Embedded Researcher and WG cross-departmental steering group to implement the recommendations from the Fellowship. This includes publication of an Evidence Briefing for policymakers, the development of mapping and guidance tool (pilot to be tested by Registered Social Landlords) and targeted stakeholder engagement to try and embed climate change adaptation in standards and regulations, including Building Regulations, PAS2035, Net Zero Carbon Buildings Standard, etc.. (2.1, 3.1, 5.1) Cadw - Continues to work with partners from across the home nations HES, HE, EH, NT, NTS and DfC NI to pool research and expertise. The UK Heritage Adaptation Partnership was formally launched in the summer. The group is now developing a collaborative work programme. (1.2, 1.3, 2.1, 3.1, 6.1) Cadw - The Joint UK Heritage Agency Work Group (representatives from the four UK historic environment bodies, plus NT and Natural England) developing a checklist guidance for peatland restoration works and the historic environment (by the NT), and toolbox videos / talks, which will be shared across the UK heritage bodies in order to provide improved standardised guidance. Cadw - New content has been added to the climate change section of the Cadw website. This includes a new case study resource; advice on building maintenance as the first step towards climate resilience and energy efficiency, and hosting of the Heritage Responds video. (1.1, 5.3) Cadw: Awarded funding for a second Fellowship. which is likely to commence in the Summer of 2023. The Fellowship is an opportunity to develop and test the Adaptation Pathways approach to climate change adaptation and to develop guidance and training for policymakers, asset owners and practitioners in the historic environment sector. (2.1, 6.1, 6.2) ENPA – Conservation, forestry and agricultural department. Peatland restoration projects via the National Peatland Action Programme. Conifer removal (former commercial plantation on peatland or invasive escapees onto adjacent peat) and ditch/grip blocking. Consultation and monitoring has been undertaken to ensure against unintended adverse impact on historic environment features. (7.2) | |
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| Resilience: Increase resilience of the historic environment by implementing actions to respond and adapt to the risks | | | | | |
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| | Description of the action | Output(s) from the action | Broad outcome/impact | Activity 2022 | CCW Indicator |
| 7. Taking action | | | | | |
| 7.1 | Prepare and implement emergency/adaptation plans (utilising the principles and methods developed for | <ul style="list-style-type: none"> Identification of significance, threat, vulnerability and adaptive action. | <ul style="list-style-type: none"> The prioritisation and effective management of resources. | <ul style="list-style-type: none"> PTWT – Developed a long term sustainable restoration and management plan for Pembroke’s medieval town walls. Met with wall owners to develop Heritage Partnership Agreements to jointly seek funding and work to restore their walls. | <ul style="list-style-type: none"> HE4 |

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| | conservation management plans) for vulnerable areas or sites as identified in 2.1 and 2.2. Plans to include multiple work streams if several agencies have identified the need for adaptation measures. | <ul style="list-style-type: none"> Partnership working with all agencies. | | <ul style="list-style-type: none"> PCNP – applications accommodated as much as possible involving adaptation to historic/listed buildings such as retrofitting, solar panels, double glazing timber windows etc. EA - Working in partnership to develop a holistic approach to water management in the River Severn catchment; employing Natural Flood Management, land-use change, and sensitive engineered water management structures CIW - Across each of the six Diocese' covering Wales, there are functioning Mission or Ministry Area structures including Property Committees with specific responsibility for the management and maintenance and inspection of our historic assets. Through this network that we intend to disseminate information about the effects of climate change on the historic environment, and associated guidance. NRW - Pioneering tree felling operation at Dolaucothi Goldmines, climate adaptation includes restocking with broadleaved trees, avoiding historic features. NRW - Stabilisation works at Venallt Iron works in the Vale of Neath. (7.3) AC-NMW - The capacity of rainwater goods on Llwyn yr eos (one of the historic buildings at St Fagans National Museum of History) have been increased to cope with the larger volumes of rainwater we are experiencing. RCAHMW – Has a priority recording and at-risk recording programme/strategy to respond to emergency. New thematic project 20th Century Wales. A Topography of Schools to deal with closure and demolition of this 'at-risk' building type, the result of new school building to meet WG decarb targets. Work includes enhancement of NMRW and recording of sites marked for demolition and those of architectural, historical and local significance. LYC - Community project to undertake repairs and improvements to futureproof the Grade II* church in Ceredigion. Work has included parging in hot lime and new deeper leadwork on 2 sides of the church tower, which was suffering from water ingress and had to be closed. The Project runs between 2019 -2023 and is funded by the National Lottery Heritage Fund, the National Churches Trust and the Wolfson Foundation, and Ceredigion County Council. (7.3) NBGW - Exploring more sustainable water capture and usage and improved management of water features within restored regency period water-park landscape. NBGW - Turning down the temperature in glass houses and adjusting collections accordingly, heating glass houses and other buildings on site using CHP; improving the maintenance practice on all our traditionally constructed buildings on site to utilise both more sustainable and appropriate materials. NTC, Cadw - Dinas Dinlle Hillfort. Consolidation of excavated roundhouse adjacent to eroding cliff edge to allow it to be left uncovered and viewable to demonstrate what we are about to lose. BCBC - New Inn Bridge, Merthyr Mawr (Scheduled Monument). Suffered with washout to the abutments within the river Ogmore, and adhoc vehicle strikes. A scheme is in design to in fill in and protect the washout under the abutments with a view to works ongoing summer 2023. ENPA – Carneddau Landscape Partnership Scheme continues. Land management and conservation work included peatland repair/restoration, progress with plans to exclude stock from 2 areas to improve Montane heath and low density scattered tree-planting. All work was undertaken with consultation and monitoring to avoid incidental impact on historic environment features. NTC - Powis Castle Registered Garden. In response to an increase in water scarcity and a failing borehole the rainwater collection system at Powis Castle nursery was upgraded to incorporate a 25,000 litre steel tank, increasing storage capacity to 32,000 litres and new deeper guttering better suited to sudden heavy downpours. <i>Newly reported activity from 2021.</i> BCBC – Overhaul and strengthening of the 19th Century Eastern Promenade Wall and Western Breakwater, Porthcawl to mitigate against long term flood risk and ensure the structures are strengthened to sustain future coastal impacts over the coming years. <i>Newly reported activity from 2021.</i> | |
| 7.2 | Undertake programme of landscape and urban characterisation to inform management of change in both rural and urban areas. | <ul style="list-style-type: none"> Produce characterisation reports for areas at risk, and feed results into conservation management plans | <ul style="list-style-type: none"> Improved conservation and management of change. | <ul style="list-style-type: none"> CRDV AONB & NRW – Landscape and Nature Recovery in a Changing Climate Guide Landscape Institute Awards finalist Excellence in Tackling Climate Change. Relevance historic landscape character | <ul style="list-style-type: none"> HE4 |

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| 7.3 | <p>Prioritised work programmes relating to historic assets at risk such as those identified through 7.1, spatial mapping work (2.1), baseline monitoring (2.2) and through other local and national adaptation plans e.g. shoreline management plans. Where possible to be preceded by a management plan. Direct actions could range from survey, record and monitoring through to maintenance and conservation measures, erosion control or moving significant vulnerable assets to a place of safety.</p> | <ul style="list-style-type: none"> • Work programmes underway. • Improved protection and preservation of historic assets. • Improved management of historic assets. | <ul style="list-style-type: none"> • Mitigation and improved resilience of the historic environment. • Acceptance of inevitable change. • Partnership working and cross sector coordinated response. | <ul style="list-style-type: none"> • Cadw - Work we do to address other priorities is also helping to build the resilience of historic assets to climate change. One example is the Historic Buildings Grant Programme, the aim of which is to help secure a sustainable, long-term use for listed buildings which are 'at risk' or vulnerable through neglect and decay. • GAT – Completion of community excavation of well-preserved large roundhouse identified in 2019-21 with Cadw and NT funding. Earlier CHERISH 2019 investigations reported in CBAW Archaeology in Wales Journal <i>Dinas Dinlle Hillfort, Llandwrog, Gwynedd. An Overview of Cherish Project Investigations 2019</i>. • TTC – Monitoring and maintenance of the Town Clock, The Circle (Tredegar) as a Grade II Listed monument., and the War Memorial, Bedwelty Park (Tredegar) as a Grade II Listed monument and the Memorial Gates • DAT – 5-week community excavation of Porth y Rhaw Promontory Fort, Pembrokeshire with Cadw funding and PCNP support.. Builds on 1990s, 2019 and 2021 excavations. • PCNPA – Continuation of Changing Coasts project using fixed point photography. Communities/public submit photographs at specific coastal path points to monitor change and erosion (see 2.2, 3.1-2, 7.4). • PCNPA – Carrying out maintenance work at sites at risk from climate change, including scrub clearance at scheduled promontory forts. • RCAHMW - Continuation of work to enhance records of historic assets located in the inter-tidal and coastal zone, through 3D digital survey. It is intended that this survey work will provide much improved baseline information for future assessment of any impact from climate change, as well as providing a much enhanced record of the historic asset (2.1, 2.2) • NRW - Early planning stages relating to managing and safeguarding historic assets on three sites with changing climate benefits. • NRW - Stabilisation works at Venallt Iron works in the Vale of Neath. (7.1) • BBNPA - Peatlands programme: 2022- 2023 of works ongoing, Archaeological Contractor appointed to inform and aid delivery of scheme. Paleoenvironmental assessment commissioned and completed. • BBNPA - Active conservation management at a number of sites to improve resilience and promote condition including Garn Goch, Clydach Ironworks, Pontneddfechan Gunpowder Works, Bryn Oer tramroad. • RCAHMW, AU, DP, GSI – CHERISH project continues. Targeting specific study areas in coast zone (includes seabed, intertidal, island and coast edge environments) to improve baseline data through technologies such as lidar, UAVs, GNSS, terrestrial laser scanning, marine survey for baseline and condition/change monitoring of coast zone. Includes data enhancement and archiving of freely available data and event reporting of project work to NMRW as central repository of data. (2.1-2, 3.1-2, 6.3) • LYC - Community project to undertake repairs and improvements to futureproof the Grade II* church in Ceredigion. Work has included parging in hot lime and new deeper leadwork on 2 sides of the church tower, which was suffering from water ingress and had to be closed. The Project runs between 2019 -2023 and is funded by the National Lottery Heritage Fund, the National Churches Trust and the Wolfson Foundation, and Ceredigion County Council. (7.1) • BU – PhD research (2021-24) 'Historic Shipwrecks and the Impacts of Climate Change' to address marine research priorities. Includes monitoring of 18 intertidal wrecks and patterns of uncovering and recovering in relation to beach profile changes. (2.2, 3.1) • DV - Crowd-funded community excavation and geophysical survey at Caerfai Promontory Fort, Pembrokeshire. | <ul style="list-style-type: none"> • HE4 • MC1 |
| 7.4 | <p>Establish stakeholder/community groups able to monitor assets and respond to significant events such as wild fires and storms to maximise the potential for the discovery of new historic assets and the recording and monitoring of them.</p> | <ul style="list-style-type: none"> • Stakeholder/community groups established. • Monitoring regimes in place. | <ul style="list-style-type: none"> • Improved knowledge, management and resilience of the historic environment. • Raised awareness and appreciation of the historic environment. | <ul style="list-style-type: none"> • PCNPA – Monitoring the condition of scheduled monuments within the National Park using volunteers (system set up in 2020) (see 2.2, 3.1-2). • PCNPA – Continuation of Changing Coasts project using fixed point photography. Communities/public submit photographs at specific coastal path points to monitor change and erosion (2.2, 3.1-2, 7.3). • MADU –Coflein Heritage Community Project pilot (working with RCAHMW) engaging NAS volunteers to visit, inspect and monitor shipwrecks. • BBNPA – Continuation of volunteer condition monitoring programme ongoing (2.2, 3.1-2). • RCAHMW, AU, DP, GSI – CHERISH project continues. Work with community groups and individuals to monitor and records assets at risk (6.2). • ENPA – Carneddau Landscape Partnership Scheme continues. Community and volunteer work included scrub vegetation control at several scheduled monuments and lidar project training days. Volunteers and a | <ul style="list-style-type: none"> • HE4 • MC1 |

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| | | | | group of MA and PhD students from the University of Sheffield undertook and measured survey, UAV and photogrammetry of historic environment features (6.2) | |
| 7.5 | Encourage and implement new planting regimes where trees and hedgerows form a key component of the historic environment to reduce the impact of the spread of disease and increased storminess. | <ul style="list-style-type: none"> New planting regimes that are responsive to plant health trends and are of suitable provenance. The preservation of traditional field boundaries. | <ul style="list-style-type: none"> Reduced impact of the spread of diseases and storms. Improved management and resilience of trees in the historic environment. Retention and survival of historic character and integrity. | <ul style="list-style-type: none"> LTC – Maintenance of parks, areas left to wildflower and replanting of trees. AC-NMW - Gardening team at St Fagans National Museum of History have adapted their planting schemes to favour deep-rooting plants for resilience against summer drought. NBGW - Developing and transitioning living collections to be appropriate for future climatic scenarios according to tools available in the botanic gardens network, adjusting horticultural practices with regards to water and energy usage. NBGW - Planting relevant taxa, implementing a robust plant health and compliance policy to prepare for new and emerging pests and diseases eg. pine processionary moth. ENPA – Carneddau Landscape Partnership Scheme continues. Land management and conservation work included low density scattered tree-planting along water corridors and amongst craggy and scrub covered slopes, respecting historic tree presence/providing succession for existing mature trees and aiming to help increase biodiversity and slow water-flow rate. NBGW - promoting meadow management techniques and spreading wildflower seed and green hay collected from Waun Las NNR (managed historic parkland) <i>Newly reported activity from 2021.</i> DTP - hedgerow management <i>Newly reported activity from 2021.</i> | <ul style="list-style-type: none"> HE4 |
| 7.6 | Build a resilient recovery from the COVID-19 pandemic. | <ul style="list-style-type: none"> Organisational climate and sustainability plans, policies and actions. | <ul style="list-style-type: none"> New ways of working that reduce emissions and prepare for climate change. | <ul style="list-style-type: none"> BBNPA - Changed working patterns, reduced vehicle use, remote working, reduced paper usage. RCAHMW – continues its Future Generations Group. A Biodiversity and Resilience of Ecosystems Duty Report and Forward Plan 2022-24 published in 2022. | <ul style="list-style-type: none"> HE4 |