Natural England Commissioned Report NECR119

Assessing and enabling climate change adaptation in Nature Improvement Areas

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Foreword

Natural England commission a range of reports from external contractors to provide evidence and advice to assist us in delivering our duties. The views in this report are those of the authors and do not necessarily represent those of Natural England.

Background

The adaptation of the natural environment to climate change is well developed in theory and adaptation principles have been published, including those developed under the England Biodiversity Strategy (Smithers *et al.,* 2008). There are, however, challenges in turning these principles into implementation of practical adaptation measures on the ground.

Nature Improvement Areas (NIAs) are major landscape scale conservation initiatives in twelve priority areas of England. They provide an opportunity to build climate change adaptation into major conservation initiatives at an early stage and at an appropriate scale, as well as an opportunity to learn how people and organisations can best work together to enable adaptation.

Recognising these opportunities, Natural England, working on behalf of a partnership including Defra, the Environment Agency and Forestry Commission, commissioned this project to assess and facilitate adaptation in NIAs.

In addition to informing NIA partnerships about climate change adaptation, the project aimed to test different approaches to understanding vulnerability and identifying adaptation measures at a landscape scale and obtain feedback on further support required.

The results in this report will be used by Natural England and partners to influence the development and communication of climate change adaptation information and tools.

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Further information
This report can be downloaded from the Natural England website: **www.naturalengland.org.uk**. For information on Natural England publications contact the Natural England Enquiry Service on 0845 600 3078 or e-mail **enquiries@naturalengland.org.uk**.

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Assessing and enabling climate change adaptation in Nature Improvement Areas

ATKINS

Plan Design Enable

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Executive summary

At a conceptual level, thinking on adaptation of the natural environment is well developed and robust 'adaptation principles' have been published, including those developed under the England Biodiversity Strategy (Smithers *et al*., 2008)[1]. There are however challenges in turning principles into implementation of practical adaptation measures on the ground.

Nature Improvement Areas (NIAs) are major landscape scale conservation initiatives in twelve priority areas of England. They provide an opportunity to build climate change adaptation into major conservation initiatives at an early stage and at an appropriate scale, as well as an opportunity to learn how people and organisations can best work together to enable adaptation. Recognising these opportunities, Natural England, working on behalf of a partnership including Defra, the Environment Agency and Forestry Commission, commissioned this project to assess and facilitate adaptation in NIAs. In addition to informing NIA partnerships about climate change adaptation, the project aimed to test different approaches to understanding vulnerability and identifying adaptation measures at a landscape scale, and to obtain feedback on further support required.

The project was carried out in three stages:

1. Review of NIA business plans to identify the extent to which climate change adaptation was considered during the planning phase of NIAs.
2. Facilitated workshops with NIA partnerships to introduce and gather feedback on some tools and methods for understanding vulnerability and identifying adaptation actions.
3. A survey and interviews with workshop participants to evaluate the tools and methods, as well as workshops as a means of engagement, and identify further support required.

At the NIA workshops, partners were introduced to NBCCV model as well as other tools, including the National Character Area vulnerability assessment method and tools developed by Natural England's partners.

An extension to the project enabled four regionally focused workshops to be run with Local Nature Partnerships (LNPs). These events aimed to provide LNP partners with an introduction to climate change and the need for adaptation in the natural environment. The workshops were not specifically focused on introducing and gathering feedback on the National Biodiversity Climate Change Vulnerability (NBCCV) model and other tools, but some informal feedback was collected and is referred to in this report where relevant. The agenda did include discussion sessions about barriers to adaptation and further support required and this feedback is represented in this report.

Based on the findings of each stage of the project, recommendations for Natural England and its partners have been identified.

National Biodiversity Climate Change Vulnerability Model

A pilot version of the NBCCV model and outputs from it were shared with NIAs during the workshops. Feedback on this version of the model and the outputs was collected during and after the events. Particular strengths of the model identified by participants included its consistent approach to vulnerability assessment and the potential to alter the model to suit local requirements / conditions using a software tool (although this was not available during the pilot phase).

The main limitations of the pilot model and the outputs shared at the workshops were concerned with the underlying datasets used in the pilot version of the model, rather than the structure or functionality of the model itself. Data limitations identified included: weakness of some national priority habitat inventory datasets; and a lack of national level datasets covering non-priority habitats (including water bodies and urban habitats). In some areas, the sensitivity of some habitats to the impacts of climate change did not match local perceptions of habitat sensitivity. However, through the software tool which should be available with the final version of the model, local evidence and data (where available) can be used to update the model locally.

[1] Smithers, R.J., Cowan, C., Harley, M., Hopkins, J.J., Pontier, H. and Watts, O. 2008. England Biodiversity Strategy Climate Change Adaptation Principles. Defra, London

Suggestions of changes required to the model to overcome some of these limitations were made. Potential uses of the model (once the software tool is available to allow users to make changes to the metrics and use local data) were identified, including:

- Informing high level conservation strategy.
- Assessing the vulnerability of NIA objectives and other plans to the impacts of climate change.
- Spatial identification and prioritisation of areas for habitat creation (including estimating the cost of actions).
- Testing the potential effects of adaptation actions or development scenarios on habitat vulnerability.
- Influencing agri-environment agreements to deliver benefits in terms of reducing vulnerability.
- Contributing to the evidence base for planning and for funding applications.
- Highlighting multiple benefits of conservation actions and providing justification for existing plans.
- Monitoring and evaluation of NIA objectives, particularly around connectivity.

Other tools and methods

The National Character Area (NCA) Vulnerability Assessment methodology was introduced to NIA partnerships that were not already familiar with it. In two of the NIAs, NCA vulnerability assessments had already been carried out. In one of these areas, the high level adaptation recommendations from the NCA vulnerability study were particularly useful when developing actions to include in the NIA business plan.

Particular strengths of the NCA Vulnerability Assessment method identified by participants included the applicability of the method at different scales and provision of a framework for discussing and agreeing adaptation priorities locally with non-conservation specialists. The subjective nature of the process was seen as a strength, in terms of bringing together stakeholders and building on local knowledge, but it was recognised that it could be time consuming and the results could be open to challenge by decision makers.

Of the other tools and methods introduced through the workshops, participants were most familiar with the England Biodiversity Strategy (EBS) Principles for Adapting Biodiversity in a Changing Climate. There was least awareness of the Climate Ready Support Service and the Forestry Commission's Ecological Site Classification tool, possibly due to the relative newness of these in comparison to the EBS Principles which were published in 2008.

Barriers and further support

A number of physical, institutional, communication, policy, knowledge and resource barriers to delivery of adaptation actions on the ground were identified. NIA partners suggested the further support and guidance they would like to see from Natural England and its partners to assist in overcoming these barriers, including:

- Guidance on making decisions about difficult adaptation issues at a local scale.
- Training modules on climate change, the NBCCV model and adaptation actions for Natural England staff and other organisations.
- Delivery of adaptation workshops for land owners, Local Enterprise Partnerships (LEPs), local authority officers and elected members.
- Identification of adaptation benefits through Higher Level Stewardship (HLS) measures.
- Guidance and methods for translating vulnerability and adaptation information into economic impacts and how to account for adaptation benefits in cost benefit analysis.
- Guidance and resources (possibly including visualisations) for presenting climate change adaptation messages to land owners, developers and other non-specialists.
- Adaptation advice on a habitat-by-habitat basis (including urban habitats).
- Strategic leadership on biodiversity offsetting to deliver a positive impact on biodiversity.
- Planning a range of engagement methods to launch and publicise the forthcoming Adaptation Manual.

There was significant support for local face-to-face workshops as a means of delivering information on climate change vulnerability and adaptation. A need to engage with organisations beyond the traditional conservation community was highlighted, particularly land owners, developers, LEPs, local authority officers and elected members. It is important that future engagement is focused on adaptation issues and challenges specific to a local area and organisations.

Recommendations

Specific recommendations relating to improving and rolling-out the NBCCV model are presented along with wider recommendations for Natural England and its partners when considering future research, engagement and guidance on adaptation.

Recommendations for Natural England include:

- Develop briefing notes on the importance of adaptation in the natural environment that are specifically aimed at local authority officers, elected members, developers and land owners.
- Provide practical adaptation advice on a habitat-by-habitat basis, illustrated with case studies.
- Consider undertaking research to develop guidance on topics including: difficult adaptation issues; adaptation of urban habitats; the role of environmental stewardship schemes in adaptation; and monitoring and evaluating adaptation in the natural environment.
- Develop a note for NIAs on potential funding sources for adaptation actions post-2015.

Recommendations for the wider Defra family include:

- Review and provide a high level summary of existing vulnerability and adaptation models and tools.
- Deliver workshops focusing on local vulnerability and adaptation actions, particularly for LEPs, land owners and representatives, developers and local authorities.
- Review how conservation designations are set and monitored with respect to climate change adaptation.
- Provide quarterly briefings to NIA partnerships (and other groups) which summarise recent publications, tools, methods and advances in knowledge about climate change projections and adaptation.
- Develop training modules on climate change adaptation for Defra family staff.
- Develop a position on biodiversity offsetting and the potential benefits for adaptation.

1. Introduction

1.1. Background to project

Natural England is the government's advisor on the natural environment and provides practical advice, grounded in science, on how best to safeguard England's natural wealth for the benefit of everyone.

Climate change will have impacts on the natural environment and the ecosystem services it provides in the short and long term. Adaptation at all scales, including landscape scale, is important. Environmental management also provides an opportunity to help society adapt to the impacts of climate change in a cost effective way.

At a conceptual level, thinking on adaptation of the natural environment is well developed and robust 'adaptation principles' have been published, including those developed under the England Biodiversity Strategy (Smithers *et al*., 2008)[2]. There are however challenges in turning principles into implementation of practical adaptation measures on the ground.

Nature Improvement Areas (NIAs) are major landscape scale conservation initiatives in targeted priority areas. NIAs form a component of government biodiversity policy and were set up following the recommendations of the Making Space for Nature review. NIAs are locally-led partnership initiatives although Natural England manages the overall programme on behalf of Defra. There are currently twelve NIAs in England, which were selected following a competition.

NIAs provide an opportunity to build climate change adaptation into major conservation initiatives at an early stage and at an appropriate scale. The partnership working approach of NIAs also provides an opportunity to learn how people and organisations can best work together to enable adaptation.

Recognising these opportunities, Natural England, with funding from Defra, commissioned this evidence and knowledge exchange project. The project focused on assessing and enabling climate change adaptation in NIAs through reviewing NIA business plans and engaging with partnerships through workshops and a survey. The Environment Agency and Forestry Commission also contributed to the project through membership of a steering group.

An extension to the project enabled four regionally focused workshops to be run with Local Nature Partnerships (LNPs).

1.2. Project aims

The aim of the project was to work with NIA partnerships to review the extent to which they have so far considered adaptation as well as to pilot and evaluate different approaches to understanding vulnerability and to facilitating practical adaptation measures at a landscape scale.

The objectives of the project were to:

- Assess the extent to which NIA business plans consider adaptation.
- Run knowledge transfer workshops to introduce tools and methods for understanding climate change vulnerability and incorporating adaptation in plans.
- Evaluate the effectiveness of these tools and methods in assisting NIAs with development of plans and delivery of adaptation action.
- Evaluate the effectiveness of workshops as a means of engaging with landscape scale initiatives.
- Develop recommendations for improving tools and the further support required to assist landscape scale conservation projects deliver adaptation.

One of the project outcomes was informing NIA partnerships about climate change adaptation and the tools and methods which are available to assist with planning adaptation action. However, outcomes of the project will also inform future climate change adaptation advice and support provided by Natural England and its partners, for example Natural England's forthcoming Adaptation Manual.

[2] Smithers, R.J., Cowan, C., Harley, M., Hopkins, J.J., Pontier, H. and Watts, O. 2008. England Biodiversity Strategy Climate Change Adaptation Principles. Defra, London

The project has added value for NIA partnerships in terms of helping them assess risks to achievement of their biodiversity objectives, and the benefits of planning adaptation, linking to the NIA Phase 2 monitoring and evaluation project[3].

There is a wider group of landscape scale partnership approaches beyond NIAs, and it is hoped that the findings of this project will also be applicable to them.

The LNP workshops aimed to provide an introduction to climate change and the need for adaptation in the natural environment for LNP partners. The workshops were not specifically focused on introducing and gathering feedback on the NBCCV model and other tools, but some informal feedback was collected and is referred to in this report where relevant. The agenda did include discussion sessions about barriers to adaptation and further support required, and this feedback is represented in this report.

1.3. Structure of the report

The remainder of the report is structured as follows:

- Section 2: Methods – describes the methods and techniques used during the project.
- Section 3: Results – summary of results from the different stages of the project.
- Section 4: National Biodiversity Climate Change Vulnerability model – discussion of feedback received and potential uses of the model.
- Section 5: Other tool and methods – discussion of feedback received about other tools and methods presented during the workshops.
- Section 6: Barriers and further support – discussion of barriers to adaptation and further support required by NIA partnerships, as well as methods for future engagement.
- Section 7: Lessons learnt – lessons learnt about carrying out knowledge exchange projects involving workshops, surveys and interviews.
- Section 8: Recommendations – collation of recommendations based on feedback received.
- Appendices: Data and notes generated during the project:
  - Business plan review pro forma
  - Workshop agendas
  - Workshop briefing note
  - Workshop notes
  - Survey and interview questions
  - Survey results
  - Interview notes.
  - LNP workshop report.

[3] An NIA Monitoring and Evaluation Framework has been developed by Defra. The approach is based on existing monitoring, surveillance and reporting initiatives at national and local levels. The Monitoring and Evaluation Framework being established identifies indicators with protocols in order to provide compatible results that can be summarised nationally. http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/funding/nia/monitoringandevaluation.aspx

2. Methods

2.1. Project overview

The project was carried out in three stages:

1. Review of NIA business plans – review of business plans to identify the extent to which climate change adaptation had been considered.
2. Workshops – facilitated workshops with NIA partnerships to introduce and pilot a number of tools and methods for understanding vulnerability and facilitating adaptation.
3. Evaluation – survey and interviews with workshop participants to evaluate the tools and methods as well as the workshops as a means of engagement.

Under the project extension, half-day workshops were held with representatives of LNPs.

The methodologies used during each stage of the project are described below.

2.2. Business plan review

In the first stage of the project NIA business plans (submitted to Defra as part of the competition to select NIAs) were reviewed. The aim of the review was to identify the extent to which NIA partnerships had considered the potential vulnerability of the natural environment to the impacts of climate change and had included adaptation measures (both explicitly and implicitly). The review also identified sources of information and guidance used by NIAs to consider climate change impacts and adaptation requirements.

In order to standardise the review of the twelve NIA business plans, a pro forma was used (a copy can be found in Appendix A). The pro forma was split into the following sections:

- Basic information – information about the NIA, including partners and description of main NIA objectives.
- Identification of climate change impacts – section to collect information about climate change impacts identified in the plan as well as methods and sources of information used to identify impacts. Impacts identified by the plan were categorised based on headline impacts reported in the UK Climate Change Risk Assessment (CCRA) Biodiversity sector report.
- Adaptation – section to collect information about adaptation actions identified by the plan (either explicitly or implicitly). Actions in the plan were screened against the England Biodiversity Strategy adaptation principles (Smithers *et.al.*, 2008)[4] to identify how they might contribute to adaptation.
- Links to other initiatives – section to collect information about other projects and initiatives that the NIA is working with, particularly where there are links to adaptation.
- Additional information – space to record further information such as any monitoring of impacts or adaptation actions specified in the plan as well as links to mitigation.
- Summary – summary of NIA business plan objectives and relationship to climate change impacts as well as approach to adaptation and apparent consideration of measures contributing to adaptation.

The twelve business plans were reviewed using the pro forma. The pro formas were analysed to identify common themes and key messages, which are summarised in the results section.

2.3. Workshops

The second stage of the project involved designing and delivering knowledge transfer workshops with NIA partnerships. Workshops were intended to be a two-way transfer of knowledge between the NIA and Natural England, focusing on the NIA plan and tools for facilitating adaptation.

[4] Smithers, R.J., Cowan, C., Harley, M., Hopkins, J.J., Pontier, H. and Watts, O. 2008. England Biodiversity Strategy Climate Change Adaptation Principles. Defra, London

The objectives of the workshops were to:

- Understand NIA experience of planning for adaptation.
- Improve the NIA partnership understanding of climate change impacts and types of adaptation action that could be taken.
- Introduce a small number of climate change adaptation tools and consider how they could be used to plan and deliver adaptation and benefits for the NIA.
- Encourage discussions and feedback on the tools to understand what further knowledge exchange, tools, data and products would help stakeholders plan for climate change.

2.3.1. Workshop planning

Workshops were offered to all twelve NIAs: ten accepted; one declined (Marlborough Downs); and one was unable to fit a workshop in during the timescale of the project – as it did not fit with their programme of works (South Downs).

For the ten NIAs which accepted the workshop offer, bespoke events were designed, depending on their level of prior engagement with Natural England on adaptation and the findings of the business plan review. Each workshop involved a mixture of presentations from the NIA, Atkins and Natural England and discussion sessions. The specific aims of each workshop were identified and the discussion sessions designed in consultation with a contact from the NIA (either the Natural England contact or the NIA Project Manager).

Broadly speaking, NIAs fell into two categories:

- NIAs with little prior involvement with Natural England on adaptation and the tools and methods available (Dark Peak, Morecambe Bay, Humberhead Levels, Nene Valley, Meres and Mosses of the Marches, Dearne Valley and Birmingham and the Black Country); and
- NIAs who had previously been introduced to some of Natural England's tools and methods for identifying vulnerability and planning adaptation (Wild Purbeck, Northern Devon, Greater Thames Marshes) .

For NIAs in the first category, a higher level, introductory workshop was developed with presentations and discussion sessions tailored to meet local requirements, including linking to other initiatives. For the NIAs in the second category, workshops focused in more detail on application of the tools and models.

The basic structure of the introductory workshop is shown in Table 2-1. Detailed workshop plans for each NIA are included in Appendix B.

Prior to the workshops, a briefing note was sent to workshop participants to explain the aim of the event and provide links to sources of information on climate change impacts and adaptation as well as the tools and methods introduced on the day. A copy of the briefing note can be found in Appendix C.

2.3.2. Workshop structures

Birmingham and the Black Country – introductory workshop structure followed.

Dark Peak – introductory workshop structure followed.

Dearne Valley Green Heart – introductory workshop structure followed.

Greater Thames Marshes – the Greater Thames Marshes NIA has been involved in the development of the NBCCV model prior to the commencement of this project. Through this project, a presentation on the NBCCV model was given to the NIA Advisory Group as part of a wider workshop to discuss funding opportunities. Potential uses of the model as part of the evidence base for funding applications were discussed.

Humberhead Levels – introductory workshop structure broadly followed but the NCA session covered the output of the Humberhead Levels National Character Area Climate Change Assessment, rather than introducing the method. An additional session was held, focusing on an ongoing project, the Natural England Transport Corridors project, and possible uses on the NBCCV model within it.

Meres and Mosses of the Marches – introductory workshop structure followed.

Morecambe Bay – introductory workshop structure broadly followed but the NCA session covered the output of the Morecambe Bay National Character Area Climate Change Assessment, rather than introducing the method. An additional session was held, focusing on an ongoing project, the Natural England Transport Corridors project, and possible uses on the NCCCV model within it.
Northern Devon – Northern Devon had already engaged with Natural England on the NBCCV model so the workshop focused on how the model could be used, in conjunction with other tools and approaches (including the Forestry Commission Ecological Site Classification tool and Strategic Nature Mapping). The workshop involved presentations from Natural England, the Forestry Commission, the Met Office and Devon County Council with discussion focusing on how to use a combination of tools to plan an ecological network in the NIA.

Nene Valley – introductory workshop structure followed.

Wild Purbeck – there had already been some engagement with Wild Purbeck on the NBCCV model so there was less focus on explaining how the model worked. However, the model output was shared with the group and discussed in some detail. A discussion session focusing on undertaking a climate change vulnerability assessment for the NIA, based on the RSPB reserve vulnerability approach, was chaired by the RSPB.

Table 2–1 Structure of introductory workshop

Session	Session led by	Description
NIA presentation	NIA partnership representative	Introduction to the NIA business plan, including objectives and extent to which climate change impacts and adaptation were considered in its preparation. Also highlighting sources of information and methods used to consider climate change and links to other initiatives.
Climate change presentation and Q+A	Natural England	Introduction to climate change impacts and the need to consider adaptation in the natural environment. Highlighting a number of tools, methods and sources of information on impacts and adaptation measures.
National Biodiversity Climate Change Vulnerability (NBCCV) Model: presentation and discussion	Natural England	In-depth look at the Natural England NBCCV model, including introduction to how the model works and presentation of model output (maps) for the NCA. Also suggestions of how the output could be used to plan adaptation measures, relating to the Lawton principles. Discussion focusing on initial reaction and feedback about the model as well as ideas of how the model could be used within the NIA.
National Character Area (NCA) methodology for assessing vulnerability: presentation and discussion	Atkins	In-depth look at the Natural England NCA vulnerability assessment method. Step-by-step presentation of the method as well as discussion of how the approach could be used within the NIA.
Barriers to adaptation and additional support required – discussion	Atkins	Discussion about wider barriers to delivering adaptation action on the ground as well as suggestions of what NIAs would find useful from Natural England and partners in terms of further engagement and support.

Following the workshop, notes were distributed to participants along with GIS data and output from the NBCCV model. Participants were asked to review the material and consider how they might wish to use the data, maps and methods shared with them at the workshop, as part of the evaluation phase.

2.4. Evaluation

The third stage of the project was the evaluation. The evaluation focused on three areas:

- Evaluating the NBCCV model, including suggestions of how it would be used amongst NIA partners and recommendations for improving it;
- Evaluating the other methods and tools presented, including suggestions of how they could be used by NIA partners;
- Gathering information on additional adaptation support required by NIAs; and
- Evaluating the workshops as a means of communicating with NIAs on adaptation.

The aim of the evaluation was to provide Natural England and its partners with feedback and recommendations from the NIAs on all of the above points.

The evaluation was conducted using a mixture of social science research methods. In addition to the facilitated discussion session held during the workshops, a survey and semi-structured telephone interviews were conducted.

2.4.1. Survey

Following the workshops, a survey was prepared using Survey Monkey and distributed to workshop attendees. The aim of the survey was to collect feedback from participants on the three topics listed above.

In some cases the survey was sent out via the Natural England contact or NIA Project Manager (Dark Peak, Meres and Mosses of the Marches, Morecambe Bay). In other cases the survey was sent out by Atkins (Humberhead Levels, Dearne Valley, Wild Purbeck, Birmingham and the Black Country, Northern Devon). The survey was not sent to the Greater Thames Marshes NIA, as their workshop was rather different to the others. Feedback from the Greater Thames Marshes was collected through an interview (see below).

Table 2–2 Types of question used in the survey

Type of question	Example from the evaluation survey
Demographic	Which event did you attend?
Multiple choice	Which of the following (if any) do you consider to be barriers to adaptation in the NIA? • Understanding potential impacts of climate change • Understanding adaptation actions required • Communicating the need to adapt to politicians • Communicating the need to adapt to land owners and managers • Demonstrating the economic value of ecosystem services • Accessing funding for delivery of adaptation • Current conservation policy and designations • Current planning policy • Public understanding of climate change and adaptation • Land values • Current land use • Monitoring and evaluating adaptation
Dichotomous	Would you be interested in running the model locally (e.g. with local data sets or amendments to the metrics)?
Comparative rating scale	Please rate the usefulness of different elements of the workshop in assisting with planning for adaptation: • Introductory presentation on climate change • Vulnerability model presentation and discussion • NCA methodology presentation and discussion • Discussion of adaptation barriers
Open ended	What ideas do you have for using the data and maps you have seen so far? If you have already used the data, please describe what you have used it for.

The survey was structured around the three evaluation topics, with questions split into the following sections:

- Basic information – demographic questions about the event attended and organisation represented.
- Workshop feedback – questions designed to elicit how useful people found the workshop sessions.
- NBCCV model feedback – questions designed to elicit feedback on the model including how it could be used and suggestions for improvement.
- NCA methodology feedback – questions designed to elicit feedback on the method including how it could be used.
- Other information – questions designed to elicit the level of prior knowledge of other tools and information sources, as well as interest in using them in future.
- Barriers – questions designed to elicit barriers to adaptation and suggestions of further support required.

Survey responses were collated and analysed using summary statistics (for multiple choice, dichotomous and comparative rating scale questions) and by identifying key terms and common themes for the open ended questions.

2.4.2. Interviews

In addition to the survey, semi-structured interviews with Natural England NIA contacts or the NIA Project Manager were undertaken. Six interviews were held with representatives from the following NIAs: Dark Peak, Humberhead Levels, Dearne Valley Green Heart, Nene Valley, Wild Purbeck and Greater Thames Marshes. The aim of conducting interviews was to get more in-depth feedback from a smaller number of people who had been involved with the planning and delivery of the workshops. Interviews provided an opportunity to collect more detailed feedback than it was possible to collect through the survey as well as to check understanding of the feedback received. NIA Project Manager and Natural England NIA contacts were also more likely to have looked at the NBCCV model data and maps following the workshop, so it was useful to collect their feedback on how they could be used in their NIA.

Questions to cover during the interview were drafted and sent to interviewees in advance of the interview. The questions were used to structure the interview, although they were not used as a script.

Interviews were undertaken by Nikki van Dijk from Atkins. When seeking feedback on a project through interviews, it can be beneficial for the interviewer to be independent of the project, to avoid biasing responses. Although Nikki had been involved in delivery of the workshops, she had not been involved in development of the NBCCV model. Interviewees were aware of Nikki's involvement in the project.

Notes were taken during the interviews but interviews were not transcribed verbatim. Interview responses were analysed by identifying key terms and identifying common responses. Specific suggestions for improvements to the NBCCV model were also identified.

2.5. Project extension

An extension to the project enabled four workshops to be run with Local Nature Partnerships (LNPs). Regional events were held in London, Bristol, Warrington and Leeds and were attended by representatives of LNPs and associated colleagues. The aim of the workshops was to:

- Provide a summary of the latest climate science and projections, and the risks to the natural environment.
- Explain the principles of adaptation in biodiversity management.
- Help plan simple steps for adaptation to climate change through the Local Nature Partnerships.

Whilst the LNP workshops were not specifically focused on introducing and gathering feedback on the NBCCV model and other tools, some informal feedback was collected and is referred to in this report where relevant. The agenda did include discussion sessions about barriers to adaptation and further support required, and this feedback is represented in this report. The agenda for the LNP workshops is included in Appendix B.

3. Results

3.1. Business plan review summaries

Each of the twelve NIA business plans were reviewed using the pro forma described in Section 2. Summaries of each NIA business plan are provided below as well as key messages and common findings from the review.

3.1.1. NIA business plan summaries

Birmingham and the Black Country

The Birmingham and Black Country NIA is a large urban area including a number of significant settlements. The focus of the business plan is on the socio-economic benefits that can be realised from improving biodiversity and ecosystem services. The plan recognises the contribution of biodiversity and the wider natural environment to ecosystem services, urban and economic regeneration and adaptation to the impacts of climate change. Whilst socio-economic benefits are at the heart of the plan, actions focus on biodiversity and are split into spatially identified delivery areas.

The plan does not appear to have been informed by a detailed climate change impact assessment but it recognises climate change as one of a range of pressures faced by the area. Whilst not explicitly driven by adaptation principles, many of the proposed actions should contribute to adaptation (according to the EBS Principles) and the plan explicitly recognises the contribution of well functioning ecosystem services to adaptation (e.g. temperature regulation, drainage).

Dark Peak

Dark Peak is an area of moorland, woodland and blanket bog surrounded by farmland and urban conurbations in the Peak District. The plan aims to improve and buffer high quality habitats, resulting in biodiversity improvements as well as delivery of ecosystem services such as carbon sequestration, water resources and access. The plan aims to deliver its objectives through habitat creation, restoration and connection and targeted advice to land owners.

The plan recognises the impacts of climate change on ‘northern’ habitats and species. Whilst actions are not designed specifically to address adaptation requirements, their contribution to a more resilient landscape which can adapt to the impacts of climate change is noted. The core area and buffering approach is intended to increase the resilience of priority species and habitats to climate change. However, there also appears to be an acceptance of change within the landscape – the contribution of well managed habitats to adaptation is recognised in terms of allowing ‘southern’ species to move northwards. Adaptation appears to be a significant driver for the plan and the adaption benefits of planned outcomes are recognised.

The plan also recognises the benefits it will have in terms of mitigation through carbon sequestration in peat soils.

Dearne Valley

The Dearne Valley NIA is located between Doncaster and Barnsley. The NIA aims to restore the biodiversity of a post-industrial landscape as well as encourage people to re-connect with the local environment. There is a strong focus on the value of biodiversity and ecosystem services in regeneration and improving socio-economic conditions in the area. As such, the plan is closely linked to the local planning system.

The plan does not appear to be informed by a consideration of the potential impacts of climate change. However, many of the proposed actions are likely to contribute to adaptation (according to the EBS Principles) and improving the resilience of the natural environment to the impacts of climate change. There are also likely to be multiple benefits in terms of biodiversity, ecosystem services and adaptation, e.g. reducing flood risk.

The plan focuses more on mitigation than adaptation and recognises the benefits the NIA can offer in terms of reducing carbon emissions and moving towards low carbon lifestyles.

Greater Thames Marshes

The Greater Thames Marshes NIA is a marshland and estuary landscape facing pressures from development, urban regeneration and climate change. The focus of the plan appears to be reducing the vulnerability of the area to these multiple pressures. The objectives of the plan follow the recommendations

of the Lawton review, i.e. making habitats bigger, better and more joined up. There seems to be an emphasis on improving biodiversity through linking with the planning system.

Whilst the business plan does not appear to have been informed by a detailed climate change impact assessment, it recognises the vulnerability of the area to the impacts of climate change in the context of south east England. Adaptation to climate change is considered intrinsically in the objectives and actions although it is recognised as just one of the pressures facing the area. Whilst not explicitly driven by adaptation principles, many of the proposed actions should contribute to adaptation, particularly conserving, extending and connecting areas of current biodiversity value. One of the main initiatives is to map pressures and opportunities and use this to prioritise future activities.

Humberhead Levels

The Humberhead Levels NIA is an agricultural area with significant areas of peat soils. The focus of the plan is on improving and connecting wetland habitats and related ecosystem services, such as flood management, particularly in response to sea level rise. Objectives focus on enhancing biodiversity and realising socio-economic benefits from the natural environment, whilst improving resilience to climate change.

The plan recognises sea level rise as one of the major pressures facing the area. The impacts of climate change on species movement and biodiversity are also considered and actions planned to improve resilience. Many of the actions will contribute to adaptation and follow the EBS adaptation principles. There is also a strong focus on mitigation benefits as a result of re-wetting peat soils and increasing carbon sequestration. Adaptation and mitigation of climate change appear to be significant drivers of the plan.

Marlborough Downs

The Marlborough Downs NIA lies to the south of Swindon and within the North Wessex Downs AONB. It is predominately an agricultural area containing a variety of habitats. The business plan represents a farmer led partnership and takes a bottom up approach to increasing and maintaining biodiversity. The focus of the plan is to connect and buffer existing habitats (e.g. dew ponds) and involve local people within the landscape. Delivery of the objectives is mainly through farmer led projects with ‘start-up’ funding from the NIA.

The plan does not appear to have been informed by a climate change impact assessment however climate change is recognised as a pressure facing the area, particularly in terms of water availability. Many of the proposed actions will contribute to adaptation although they are not explicitly driven by adaptation principles. The plan does recognise that it will have multiple benefits in terms of adapting to a range of environmental pressures, including climate change.

Meres and Mosses of the Marches

The Meres and Mosses of the Marches NIA straddles the Shropshire and Cheshire border. The NIA is a wetland area interspersed with intense agricultural land use. The plan focuses on halting the decline of biodiversity in the area and addressing diffuse pollution from farming. Agri-environment schemes and farm advice are central to the plan’s delivery and the partnership aims to work with major landowners to deliver its objectives. The plan also links to the planning system and hopes to establish a biodiversity offsetting scheme.

The plan does not appear to have been informed by a detailed climate change impact assessment but it does recognise climate change as a long term pressure facing the area, especially relating to the River Perry. Whilst not explicitly driven by adaptation principles, proposed actions are likely to improve the resilience of biodiversity and local people to climate change through improving connectivity, reducing non-climate pressures and encouraging more naturally functioning floodplains. The plan recognises its contribution to mitigation through carbon sequestration by peat soils.

Morecambe Bay

Morecambe Bay is predominately a rural area containing a wide variety of habitats including wetlands and grasslands. The plan is very community driven, focusing on getting local people and businesses involved in habitat connectivity. The plan aims to improve biodiversity and deliver social benefits through well functioning habitat networks. There are strong links to the planning system, particularly focusing on green space.

The plan has been informed by a consideration of climate change impacts and a number of specific studies have informed the development of the plan (including one of Natural England’s NCA vulnerability projects). A range of impacts are highlighted including coastal change, hydrological changes which could affect the

vulnerability of wetland habitats and changes to species composition. However, the relative resilience of the area to the impacts of climate change is noted, particularly due to the variety of habitats and topography.

The plan explicitly sets out to deliver multiple benefits, including adaptation and improved resilience to climate change. Actions focus on improving connectivity and buffering existing habitat, considering the requirements of specific species including woodland birds and pearl bordered fritillary butterfly.

Nene Valley

The Nene Valley NIA follows the river Nene through its catchment from Daventry to Peterborough, and is dominated by intensive agriculture. There are significant urban areas with extremely high planned growth rates. As a result, the plan is heavily focused on planning policy and maximising the benefits of ecosystem services. The plan sets out to create a habitat network along the Nene to reduce biodiversity loss and benefit local communities.

The plan recognises the impact of climate change on species and habitats alongside other environmental and land use pressures. Identified impacts include pressure on water resources for public water supply and winter drought.

Adaptation is a stated aim of the Nene ecological network. A habitat opportunity map will be drawn up and plans developed spatially – adaptation is likely to be considered in more detail at this stage. The adaptation benefits associated with green infrastructure planning are also recognised.

Northern Devon

The Northern Devon NIA sits within the North Devon Biosphere Reserve and targets the River Torridge catchment. The focus of the plan is water (quantity and quality) as well as associated habitats and species. The plan aims to improve biodiversity through the Lawton Principles of more, bigger, better, joined.

The plan identifies a number of climate change impacts including flooding from rapid river discharge, habitat fragmentation and long term drying out of wetland habitats. Further work on identifying the impacts of climate change on wetland habitats and developing appropriate adaptation responses is part of the plan. Climate change modelling will be carried out through a partnership with the Met Office.

Adaptation actions are not specified to respond to identified impacts directly but the contribution of the suite of proposed actions to adaptation and improved resilience is recognised. One of the outcomes of the plan is for flagship species to be more robust to the impacts of climate change.

South Downs Way Ahead

The South Downs Way Ahead NIA is based around the South Downs Way and the chalk geology and ecology which are characteristic of the area. There are a number of significant settlements nearby and the plan focuses on connecting the South Downs to these communities and improving ecological networks along a linear strip. The plan has ecosystem services (particularly access) at its core and one strand of the plan focuses on valuing ecosystem services.

The plan does not appear to have been informed by a detailed climate change impact assessment and there is little mention of it as a pressure in the area. However, whilst not explicitly addressing adaptation, many of the proposed actions should have adaptation benefits, particularly through extending the habitat network and catchment management.

Wild Purbeck

Wild Purbeck, in south east Dorset, is rural in character with significant areas under agricultural land use. The natural environment of the area is also a significant draw for tourists. The business plan is largely focused on improving biodiversity and realising socio-economic benefits from the natural environment. Actions are focused on habitat improvement and creation through engagement with land managers and local communities.

The NIA appears to be at an early stage of planning climate change adaptation. The adaptation focus appears to be on improving resilience to sea level rise and coastal flooding. One of the actions in the plan is to develop a climate change adaptation plan. It is envisaged that future activities will consider impacts and appropriate adaptation responses in more detail.

3.1.2. Key messages from business plan review

Impact and vulnerability assessment

The majority of the business plans do not appear to have been informed by a formal assessment of the likely impacts of climate change on the area or planned outcomes. As such, the majority of business plans do not appear to be driven by a need to adapt to specific impacts of climate change. However, most business plans have identified some impacts of climate change (such as sea level rise, movement of species and hydrological changes) and recognise climate change as one of many pressures facing biodiversity and ecosystem services.

Business plans that appear to have given relatively more consideration to vulnerability include Dark Peak, Humberhead Levels and Morecambe Bay (although has concluded it is less vulnerable than other parts of the country).

Adaptation actions

Whilst few business plans *explicitly* include adaptation as a goal for the NIA, improving resilience to a range of pressures (including climate change) is a major theme running through the plans.

Perhaps unsurprisingly, given the consideration of vulnerability, business plans that appear to have given relatively more consideration to adaptation include Dark Peak, Humberhead Levels and Morecambe Bay.

Most plans do not appear to have explicitly used the EBS Principles (or other adaptation principles) to plan conservation actions. Many business plans explicitly reference the Lawton principles of more, bigger, better, joined when planning their activities.

However, *all* business plans include actions which are likely to deliver some adaptation benefits (according to the EBS principles). Many plans explicitly recognise the adaptation benefits of their actions (e.g. Birmingham and the Black County, Dark Peak, Marlborough Downs, Morecambe Bay and Northern Devon). There is a strong focus on conserving/improving and buffering areas of existing high quality habitat and maintaining and establishing ecological networks through developing corridors, stepping stones and creating habitat. Reducing sources of harm not linked to climate change is also a key objective of many of the plans.

Whilst actions which are likely to deliver some of the EBS principles are evident in the business plans, there are gaps. Few plans explicitly reference the need to accommodate change, although the Dark Peak business plan was a notable exception.

Many business plans recognise the link between well functioning habitats, ecosystem services and adaptation, particularly flood protection, access and temperature regulation in urban areas (e.g. Birmingham and the Black County, Dearne Valley, Greater Thames Marshes, Meres and Mosses and Nene Valley).

A number of business plans include plans to develop better understanding of the impacts of climate change in the area and include adaptation in future actions, including Greater Thames Marshes (pressure and opportunity mapping), Nene Valley (habitat opportunity mapping), Northern Devon (work with the Met Office to understand impacts on wetlands) and Wild Purbeck (developing a climate change adaptation plan).

3.2. Workshop summary

Notes from the workshops are included in Appendix E. Summary statistics about the workshops and key messages from each event are provided below.

3.2.1. Summary statistics

Nine workshops were delivered and a presentation was given at one partnership meeting.

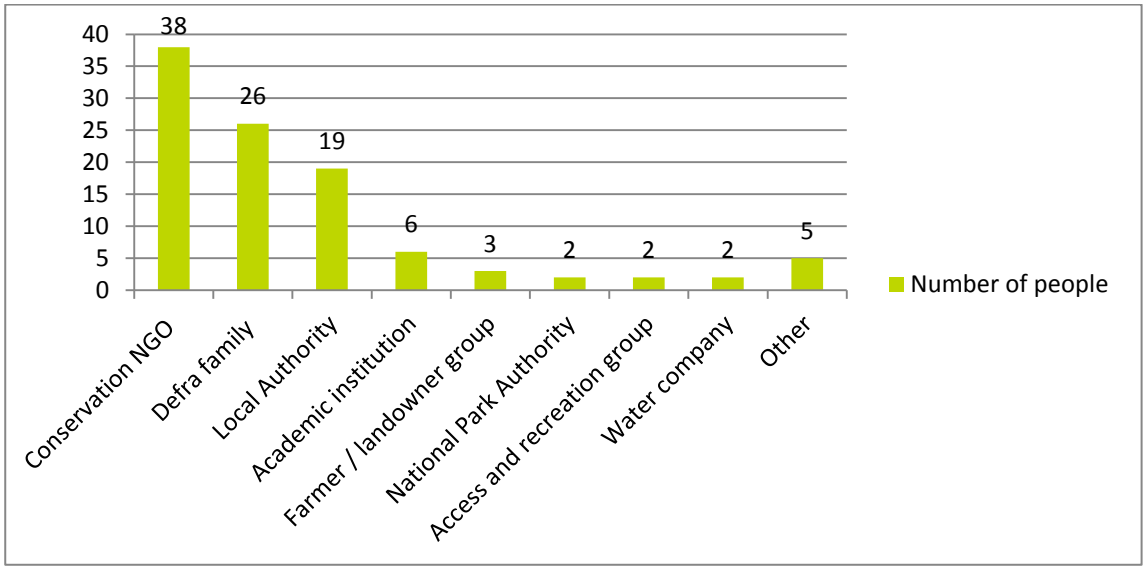
In total 103 people attended a workshop (another 33 people attended the partnership meeting). The breakdown of numbers per event is given in Table 3-1.

Workshop participants represented 31 organisations. A breakdown of organisation types represented at the workshops is shown in Figure 3-1.

Table 3–1 Workshop attendees

Workshop	Number of attendees
Birmingham and the Black Country	11
Dark Peak	11
Dearne Valley Green Heart	19
Greater Thames Marshes (presentation at Advisory Group meeting)	33
Humberhead Levels	7
Meres and Mosses of the Marches	9
Morecambe Bay	15
Nene Valley	12
Northern Devon	10
Wild Purbeck	9
Total	103* *Excluding Greater Thames Marshes

Figure 3–1 Types of organisations represented at workshops



3.2.2. Key messages from workshops

Notes from each event are included in Appendix E. Key messages from each workshop are summarised below.

Birmingham and the Black Country

The NIA incorporates all urban and non-urban habitats and green infrastructure is very important. This led to a general feeling that the NCA vulnerability assessment methodology could be more useful that the NBCCV model in assessing vulnerability of the NIA, as the pilot version of the model shared at the workshop did not show urban habitats. It was recognised that this is because no consistent national dataset on urban habitats exists at the moment and that the structure of the model does allow for local habitat data to be included if it is available. However, a lack of GIS resources in the NIA could be a barrier to using the model with local data. From the currently available maps, i.e. based on national priority habitat inventories, it appears that the NIA is not very vulnerable to climate change – but this is not necessarily the case. Urban areas (and habitats) could be very vulnerable as the consequences of climate change on ecosystem services will affect many people.

The NCA method could be used to structure conversations about vulnerability locally and to screen the NIA business plan in terms of climate change vulnerability.

The group felt that there is a general need for Natural England and its partners to consider urban habitats in the guidance and support it provides (not just in relation to adaptation). There is also a need for guidance on difficult adaptation decisions such as trade-offs and protecting species compared with accepting loss.

Dark Peak

Feedback about the NBCCV model and the potential to incorporate local data sets was generally positive. However, concern was raised that blanket bog did not appear highly vulnerable. The group would like the opportunity to change the metrics to represent local knowledge: blanket bog is likely to be more vulnerable if condition was represented differently e.g. by changing the condition metric to only include 'favourable' as much is classified as 'unfavourable recovering' but is still in a very poor condition. These changes will be possible when the software accompanying the model is available.

Output from the NBCCV model would have been useful when developing the NIA business plan. Objectives have now been set and money allocated to specific projects so there is little opportunity to use the model to plan current work. However, it could be useful for developing the next phase of work. It was felt that the NBCCV model could have a number of applications for Local Authorities, particularly providing them with an evidence base for their biodiversity duty and developing green infrastructure strategies.

Influencing politicians and policy makers was seen as one of the biggest barriers to adaptation. It is currently difficult to get politicians to look beyond economic impacts and benefits to recognise wider benefits of the natural environment and biodiversity.

Dearne Valley

There was a general feeling that the NBCCV model was an interesting tool but that it would not replace the importance of local knowledge in developing conservation plans. Particular issues with the data used in the pilot version of the model were identified which could restrict the use of current outputs in the NIA: firstly, that the model is based on the national priority habitat inventory which does not include the very small patches of urban habitats and green infrastructure that the NIA is focusing on; and secondly, that hydrology is not particularly well represented in the model. The group recognised that these issues are more to do with the quality of underlying national datasets than the structure of the model and that there is potential to run the model with local data. The NIA would be keen to act as a pilot area for trialling local runs of the model using the software tool, when it is available.

The NCA vulnerability assessment method was thought to be potentially useful as it draws heavily on local knowledge to determine relative vulnerability of different aspects of the natural environment. It would be useful for LNPs and LEPs to be introduced to this methodology.

Greater Thames Marshes

There was a lot of interest in the NBCCV model outputs as well as the potential to run the model using local datasets. The group was interested in how the model could be used to support funding applications and develop and implement an adaptation action plan for the NIA. It was recognised that funding is available for projects with an adaptation/resilience element and that these sources of funding could be used to help deliver some of the NIA objectives. The NBCCV model would be an important part of the evidence base required to develop funding bids.

The model could be adapted to look at how different scenarios of habitat creation and management might influence vulnerability to climate change, or to explore the potential costs of different approaches to tackling fragmentation e.g. buffering, extending existing core habitats or introducing stepping stones.

Humberhead Levels

Natural England carried out an NCA vulnerability assessment in the Humberhead Levels but it has not yet been published.

The group felt that the way the pilot NBCCV model is configured does not provide useful outputs for the Humberhead Levels. For example, in this NIA, the topographic variation metric is not relevant as the whole area is low and flat: it would be more useful to know the relative vulnerability of habitats excluding this metric. Given the importance of water in the NIA, it would be useful to include hydrological data such as non-main rivers, drains and to consider the proximity of habitats to water. The quality of underlying priority habitat inventory data used in the model was questioned and the group felt that much of it is out of date.

Whilst a number of limitations to the pilot version of the model and the underlying datasets were identified, the ability to update metrics and use local datasets once the accompanying software tool is available (subject to resources) was acknowledged. However, the group felt that it would be unlikely to use the

NBCCV model during the lifetime of the NIA but that it may be useful when reviewing the wider partnership's 10-year delivery plan.

Meres and Mosses of the Marches

The group felt that whilst they already have a good idea about what will be done in the NIA, the NBCCV model could be used alongside opportunity mapping to explore action in the white space on the maps and check opportunity areas have not been missed. The group felt that the model could also be used for targeting environmental stewardship. Similarly to the Humberhead Levels, water is important in the NIA and it would be useful to include non-priority habitat water assets such as canals and ponds and to consider connectivity of habitats to water when the software tool is available.

One of the main barriers to delivery of adaptation actions is short-term funding. Funding is usually for 2-5 years but wetland creation takes much longer. It would be useful to have longer term HLS agreements for wetland areas. A current concern is biodiversity offsetting – the group felt that there seems to be a lack of strategic planning for biodiversity offsetting.

Morecambe Bay

The findings of the Morecambe Bay NCA vulnerability assessment were used to develop the actions which have been included in the NIA business plan. As such, good information about the possible vulnerability of the NIA to the impacts of climate change exists, although there was a feeling that it is useful to see it expressed spatially using the NBCCV model.

There is good GIS capability within the NIA and there was interest in using the NBCCV model locally. The group felt that it would be useful to have single habitat runs of the model which could be used to identify priority areas for action on a habitat by habitat basis. There was interest in using the model to develop a habitat connectivity indicator (required by Defra's NIA monitoring framework).

Communicating climate change vulnerability and the need for adaptation to landowners in a way that makes them take action was highlighted as a challenge. It is important that Natural England's HLS advisors are aware of the need to adapt as well as having a good understanding of Natural England's own tools and methods for understanding vulnerability.

Nene Valley

There was a lot of interest in both the NBCCV model and the NCA vulnerability assessment method as tools to improve understanding of vulnerability in the NCA. One of the strengths of the model was thought to be that it is based on established principles and verified national datasets so has credibility with developers and politicians.

Good local data exists on the condition of local wildlife sites and the group was interested in incorporating this information into the model when the software tool is available. The model could be used for prioritising actions on the ground, but single habitat runs would be more useful for this than the current all-habitats run. There was a lot of interest in using the fragmentation metric to develop a connectivity indicator – which is required as part of Defra's NIA monitoring framework.

The main barrier to adaptation identified at the workshop is communicating the need to adapt to policy makers, land managers and developers. There is a need to find a way to express costs and benefits of biodiversity and adaptation action. The group felt that a review of the various climate change models and tools with a summary for users describing uses, strengths and weaknesses, data requirements, software requirements, etc. would be useful, as well as some examples of how models have been used by conservation organisations.

Northern Devon

This workshop focused on how to use the outputs of different models and initiatives to deliver NIA objectives, including planning an ecological network for Northern Devon. The group decided that a decision support tool, rather than simply a map, is required. The tool needs to relate to NIA outcomes, i.e. guiding achievement and helping to monitor results. For this, overlaying combinations of data would be useful, e.g. current agreements, timescale of agreements, future targeting. It was felt that the NBCCV model could be used with local data to develop networks for specific species but also to trial network and habitat creation scenarios. Maps can also be used to help identify longer-term opportunities (including for funding).

Wild Purbeck

The RSPB has assessed climate change vulnerability at a landscape scale in the Poole Harbour area using a methodology based on the Reserve Vulnerability Assessment. The NIA is looking to do something similar

for the NIA and was interested to find out how Natural England's tools and model could help. The Reserve Vulnerability Assessment method is similar to the NCA vulnerability assessment.

There was considerable interest in overlaying local GIS data with the NBCCV model output, e.g. landscape permeability mapping and Strategic Nature Area data. Wessex Water were interested in using the model with information from the Frome and Piddle Catchment to provide further evidence of multiple benefits of habitat creation to land owners. The Forestry Commission were interested in using the model to assist in forest design planning in terms of where to prioritise effort to reduce vulnerability to climate change.

Monitoring and evaluating adaptation was identified as a challenge and something NIAs need further support with. Also, limitations of HLS in addressing adaptation were raised as a barrier. Current HLS was not thought to address adaptation well, although it has the potential to do so if longer agreements were possible and adaptation benefits of measures identified.

3.3. Survey summary

Raw, anonymised data from the survey is included in Appendix F. Summary statistics about respondents to the survey are presented here but responses to specific questions about the NBCCV model, other tools and further support are discussed in the following chapters.

Twenty-four surveys were returned, giving a response rate of 16%[5]. Response rates by workshop are summarised in Table 3-2. The highest response rate was from Birmingham and the Black County, the lowest response was from Morecambe Bay[6].

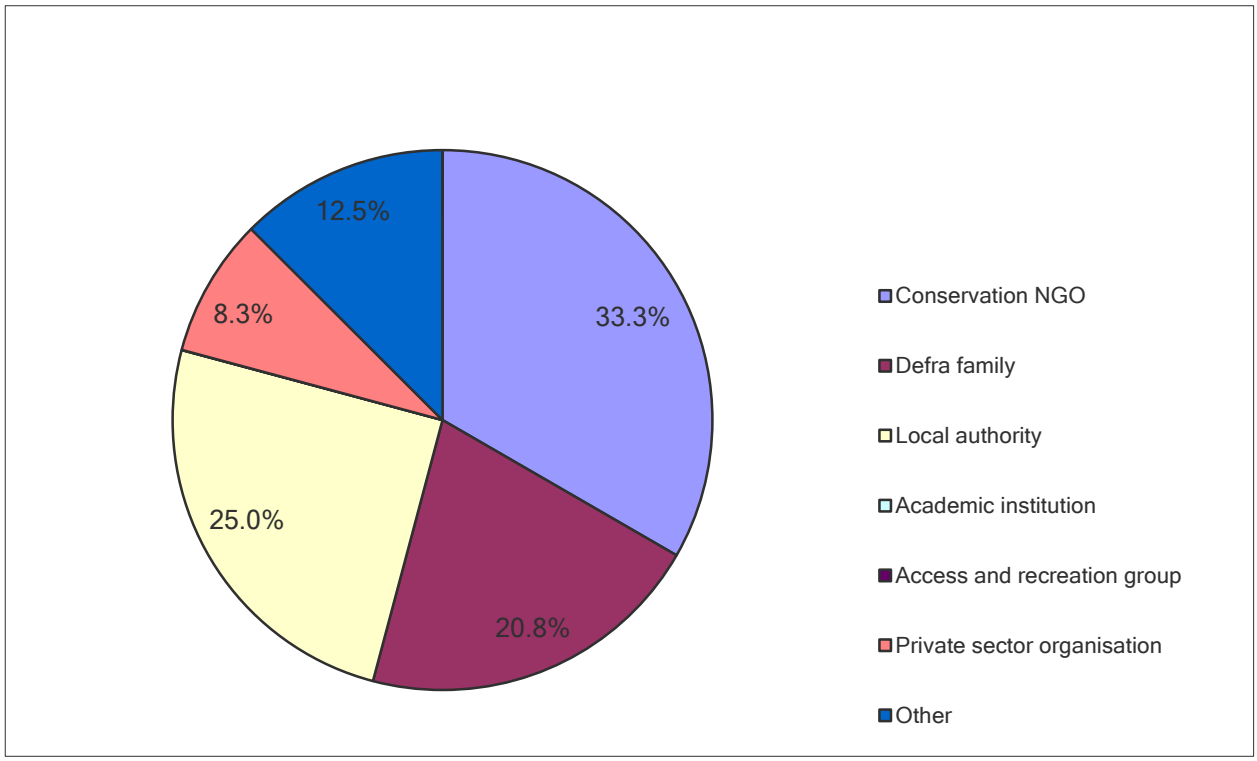
Responses came from a range of organisations, with the majority from conservation NGOs and statutory bodies (see Figure 3-2).

Table 3–2 Response rate by workshop

Workshop	Surveys returned	Response rate
Birmingham and the Black Country	5	45%
Dark Peak	4	36%
Dearne Valley	4	21%
Humberhead Levels	3	43%
Meres and Mosses of the Marches	1	5%
Morecambe Bay Limestones	0	0%
Nene Valley	2	17%
Northern Devon	1	10%
Wild Purbeck	4	40%
Total	24	16%

[5] The survey was not sent to Greater Thames Marshes as engagement was via a presentation at an Advisory Group meeting rather than a Natural England facilitated workshop.
[6] The Natural England representative for the NIA was late in sending the survey to workshop participants.

Figure 3–2 Survey responses by type of organisation



3.4. LNP workshop summary

The LNP workshops were not specifically focused on introducing and gathering feedback on the NBCCV model and other tools but some informal feedback was collected. Specific feedback about barriers to adaptation and further support is still required. The workshop report summarising the findings of the four LNP events is in Appendix H.

All LNPs had experienced a range of climatic events over recent years, including heavy rainfall and flooding, drought, high temperatures and extreme winter weather.

LNP workshop participants were asked what adaptation actions they felt were necessary in their local areas (and beyond), unconstrained by challenges in funding and delivering actions. We then asked participants to indicate what they thought the role of the LNP should be in terms of influencing others to ensure delivery. For the majority of actions, participants felt that LNPs had a role in influencing multiple stakeholders, including LNP partners, but particularly LEPs.

Some of the main adaptation actions identified included:

- Local monitoring of habitat and species to identify climate change impacts.
- Understanding economic benefits of adaptation in order to make the business case for adaptation.
- Setting up a ‘dating agency’ to match funding to projects.
- Raising awareness of issues related to climate change impacts and promoting the Lawton principles.
- Tree planting and woodland management.
- Developing and implementing green infrastructure strategy.
- Water management – identifying opportunities to provide space for water storage.
- SUDs, green roofs and walls.
- Undertaking local adaptation risk assessments.
- Influencing landowners and farmers – providing advice on land use change and new diseases and pests and connecting agri-environment agreements across different holdings.

The main barriers to adaptation action by LNPs were resources and the lack of clarity over the role of LNPs. It was felt that there is an imbalance in the perceived importance of LNPs in relation LEPs and that the LNP remit is vague (and not funded). Difficulty in expressing the benefits of the natural environment in economic terms was also seen as a barrier. When asked what further support on adaptation is required, the following were identified:

- Guidance and information on adaptation and the role of LNPs.
- A list of resources, toolkits and best practice, e.g. a quarterly briefing.
- Outputs from the Natural England NBCCV model for LNP boundaries.
- Information on the costs of adaptation and costs of not adapting.
- Advice on role of the natural environment in social regeneration and economic development.
- Case studies of good practice and examples of where investment has paid off.
- Direction and leadership – e.g. making adaptation mandatory for local authorities and championing risk assessments at a local level.

4. National Biodiversity Climate Change Vulnerability Model feedback

One of the objectives of the project was to introduce NIA partnerships to tools and methods for understanding vulnerability and to evaluate their usefulness in assisting with adaptation planning and delivery.

One of the tools presented was a pilot version of the Natural England National Biodiversity Climate Change Vulnerability (NBCCV) model. Workshop participants were introduced to how the model works and example outputs before being asked to consider how they might use it in their work and to suggest changes which could improve the final version.

In this chapter, feedback on the NBCCV model from workshops, survey responses and interviews is presented. An example of how the model is currently being used by an NIA is given before feedback on the strengths and limitations of the pilot version of the model and the outputs shared at the workshops is summarised. Suggestions for improving the model and overcoming some of the limitations identified are described and potential uses of the final version discussed. Many of the limitations identified can be overcome once the software tool for updating the model is available and NIAs can use local data.

4.1. Example of the model in use

In NIAs with prior knowledge of the NBCCV model, workshop participants and survey respondents were asked to provide feedback on how they have already used the model and its outputs.

Ecological network modelling

In Northern Devon the model is being used alongside other models and tools to develop an ecological network map for the NIA. The model structure is being used with local data sets to add greater resolution and assist in developing locally specific habitat networks. A network map is seen as a key advocacy aid, but the objective is to develop a decision support tool which assists with longer term targeting (beyond 2 years).

The spatial expression of the Lawton principles, which can be provided by the NBCCV model, has been particularly useful in developing the ecological network map. The partners have found it useful to use the NBCCV model in combination with data from other sources by overlaying GIS layers with climate change vulnerability information.

4.2. Strengths and limitations of the model

Throughout the workshops, survey and interview, feedback has been collected on the strengths and limitations of the model and the data presented to NIAs. These strengths and limitations are summarised below.

4.2.1. Strengths

The following strengths of the model have been identified:

Provides additional evidence – for some, the additional evidence provided by the model and its ability to be used as a decision support tool was seen as a strength.

National level tool – for some, the fact that the model exists at a national scale, based on established principles and uses nationally verified data, was seen as a strength in terms of giving credibility to the outputs, particularly in the eyes of others. However, for some, the national scale of the model and underlying data was a weakness, as they felt that national habitat inventories were inaccurate and did not represent their NIA accurately.

Ability to alter the model to suit local requirements / conditions – for many people, the ability to alter the model, by tweaking metrics or using local datasets, was seen as an advantage. However, at this stage the software tool to allow these alterations to be made is not available and people commented that they would not know how useful the model was likely to be until it is available.

Range of data included – the broad range of datasets included in the model was recognised as a strength. However, there were suggestions for further data which could be added (see section 4.3).

Quality of visual outputs – the visual outputs (i.e. maps) were seen as a particular strength of the model and many felt that they would like to share the outputs with other partners. For people with colour blindness, it is very easy to change the colours used in the key using GIS.

4.2.2. Limitations

The following limitations of the model were identified:

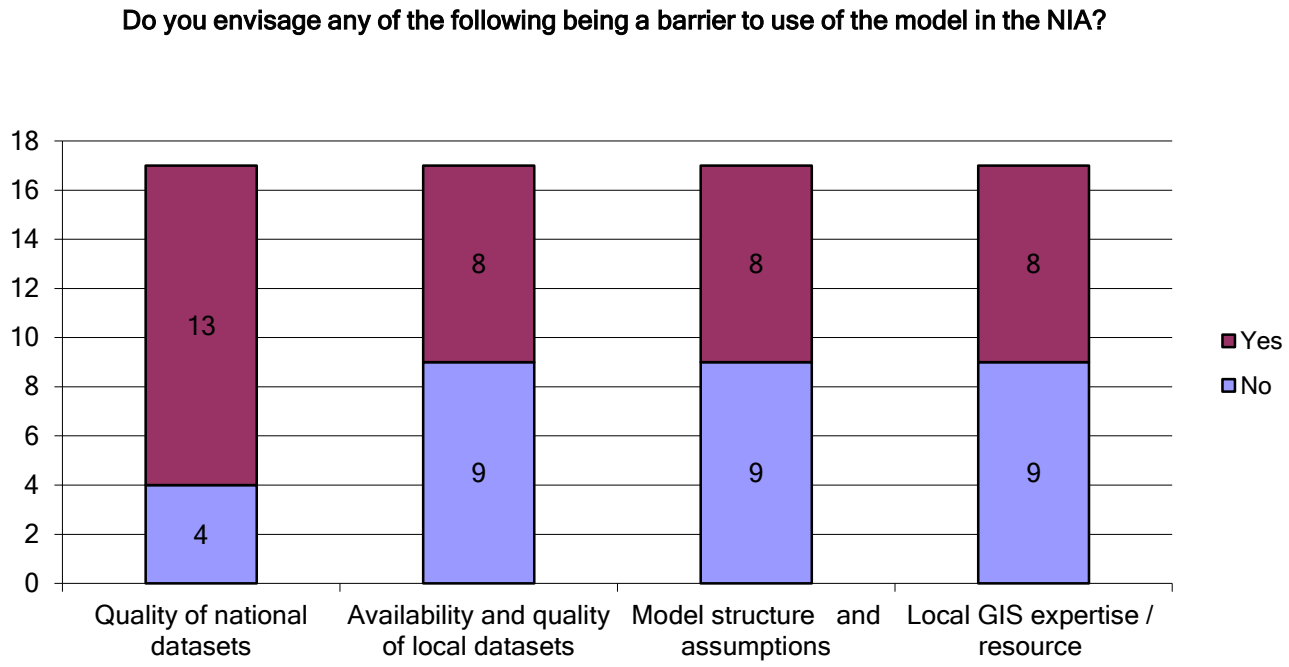
Weakness of national datasets – the main barrier to using the outputs of the NBCCV model shared at the workshops is the quality of national data, with more than half of survey respondents highlighting this as an issue (see Figure 4-1).

In some cases the poor quality of the underlying national priority habitat data affects the areas shown as vulnerable in the model: some vulnerable habitats appear to be missing, e.g. saltmarsh. It was felt that many of the priority habitat inventories are out of date and patches of habitat showing up on the vulnerability maps no longer exist. A similar issue exists with SSSI condition data: in some places, areas in favourable or unfavourable recovering condition were not picked up by the maps.

A specific issue for the Meres and Mosses of the Marches NIA is data coverage in Wales. The NIA boundary crosses the Wales-England border but priority habitat data seems to have been included for England only.

For some, the issue of national dataset quality affects the credibility of the model outputs which were shared at the workshops, and some participants felt reluctant to share these maps with other organisations. However, it may be possible to overcome some of the limitations of national datasets by running the model locally using the best available local data once the software tool is available.

Figure 4–1 Barriers to use of the NBCCV model



Representation of non-priority habitats – whilst use of priority habitats makes sense for many NIAs, it does not for all NIAs. In urban or peri-urban areas where there is little priority habitat, it was felt that it is not useful to base the model on national priority habitat inventories as very little habitat shows up. In these areas, habitats such as green infrastructure and gardens are of relatively high biodiversity importance and are the focus of NIA plans. These areas of habitat could be vulnerable to the impacts of climate change and the implications of this vulnerability could be significant in terms of ecosystem services; this is not currently

represented by the national priority habitat inventories (and, therefore, the outputs of the pilot NBCCV model shared with NIA partnerships at the workshops).

Non-priority habitats are currently not included in the national scale model as there is no national dataset covering green infrastructure and urban habitats. This limitation can be overcome at a local level if GIS data on green infrastructure exists and resources are available to run the model locally once the software tool is available. Local decisions would need to be made about the relative sensitivity of these habitats.

National level tool – for some, the fact that the outputs of the model shared at the workshops are based on national level datasets and assumptions was considered a limitation to their use locally. The sensitivity of some habitats to the impacts of climate change did not always match local understanding of habitat sensitivity within the boundary of the NIA. For example, the Dark Peak NIA partnership were concerned that blanket bog habitat did not show up as highly sensitive. There was a feeling that using the model with the national metrics and data sets could result in maps which challenge local conservation priorities and potentially undermine local efforts. However, it is possible to overcome these concerns to some extent by re-running the model with local data on habitat sensitivity and altering the condition metric (if supported by local evidence and data is available).

Lack of water body data – wetlands are important habitats and many of the NIAs have a wetland focus. Proximity to water is an important consideration for habitat condition and fragmentation and can be used to prioritise wetland habitat creation. The pilot version of the model does not include datasets on water bodies (they only show up if they are priority habitat) or information about the proximity of wetland habitats to water. The lack of water body data is partly due to lack of a national scale dataset on water bodies other than main rivers. However, this limitation can be overcome locally by including local GIS data on water bodies once the software tool is available (if data and resources exist locally).

The priority habitat classification only includes one category of river habitat. This does not reflect the great variety in river habitats that exists throughout England and as such, the model does not reflect the different sensitivities of river types to the impacts of climate change. This can be overcome by using local data sets on river habitats and making local decisions about the sensitivity of these habitats (to amend the sensitivity metric).

Permeability metric – at the moment, the model assumes all priority habitats are permeable to all other priority habitats but this is not the case. An update to the model is planned to address this. The permeability metric will be set up so it can look for a sub-set of priority habitats which are considered permeable to each habitat type.

Timing – whilst some NIA partnerships could see the usefulness of the model, it is too late for it to significantly influence NIA objectives and projects. It would have been useful to have information on relative habitat vulnerability when the NIA business plans were being developed. However, it could be useful for developing future plans as the timescale for NIAs runs far beyond this three year period.

Software compatibility – the model runs in ArcGIS but some users would find it useful to have a MapInfo version. This is easy to change and Natural England is looking into using open source software for complete accessibility.

4.3. Suggestions for improving the model

Participants were asked for suggestions of ways to improve the pilot model to overcome some of the limitations identified and enable it to be used in the NIA.

The following suggestions were made for updating the model:

Include water bodies – include a dataset to show national scale water bodies (if a suitable dataset exists) e.g. Environment Agency data on location of main rivers.

Update the permeability metric – update the permeability metric so that it looks for a sub-set of priority habitats which are permeable to the habitat in question. This is being progressed in the next round of model updates.

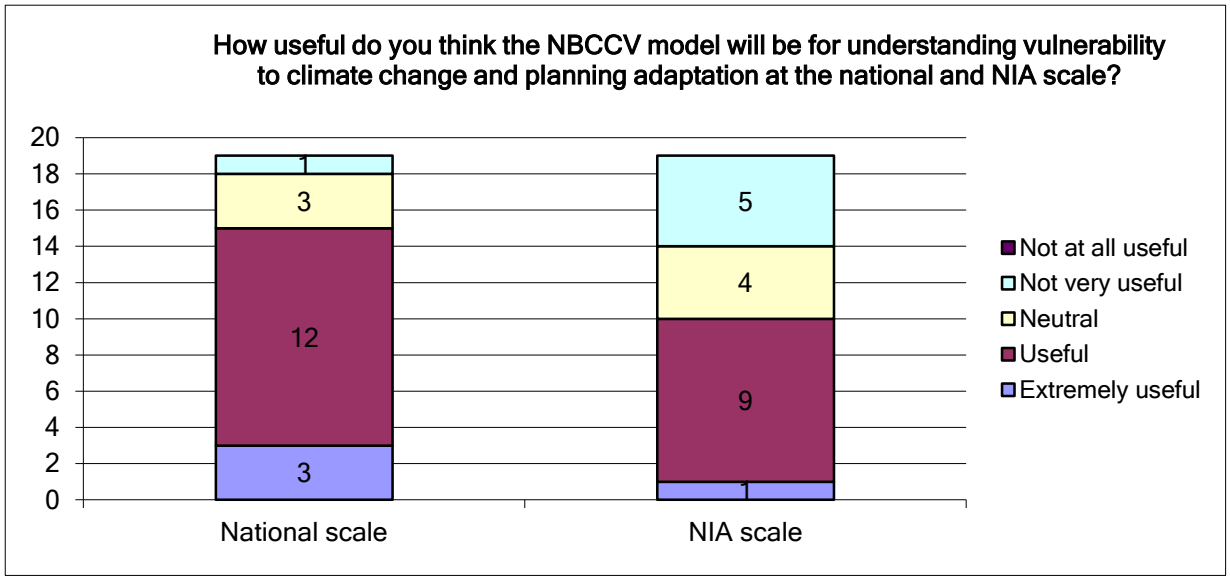
Update the connectivity metric for wetland habitats – for wetland habitats the connectivity metric could be updated to score proximity to a water source.

Change terminology in the 'value' metric – classifying any priority habitat as 'low' value is misleading and could result in misunderstanding of the value of habitats amongst non-specialists. The wording could be altered to 'high value', 'higher value', 'highest value' or remove the 'value' term and classify habitats as 'within internationally designated sites', 'within nationally designated sites', 'priority habitat not in a designated site'. It might be useful to ask local authority ecologists for advice on the best terminology to use in order to avoid misunderstanding of habitat value with local authority officers and elected members.

4.4. Potential use of the model

The majority of survey respondents felt that the NBCCV model and the outputs that they had seen so far would be useful at the national and NIA scale; although more people thought it would be useful at the national scale than thought it would be useful at the NIA scale, see Figure 4-2.

Figure 4–2 Usefulness of the NBCCV model at different scales



Having a national scale model with national level datasets was thought to be useful for planning nature conservation (and adaptation) at a strategic level and identifying vulnerable areas at a national scale. The model could inform development of future projects and help set boundaries for landscape scale initiatives. It is envisaged that using the model in this way will be most beneficial for national policy makers and government agencies.

At a local scale, setting conservation priorities and identifying adaptation actions relies more on local knowledge. Accepting that the model structure and underlying data can be adapted to suit local priorities, there was a feeling amongst some participants that the pilot version of the model would be more useful at a national scale than at a local scale.

The majority of discussion at the workshops focused on how the model and its outputs could be used at the NIA scale. It became clear that there are differences in how the model might be used. NIAs and partner organisations could:

- use the model and its outputs as it is currently, i.e. make no change to the metrics and use the national datasets that are currently in the model; or
- make changes to the model to suit local requirements, e.g. change metrics or include local datasets.

A staged approach to identifying how to use the model in NIAs was discussed at a number of workshops:

- **Stage 1** – identify uses of the data and maps presented from the vulnerability model as it is (i.e. use national scale data with no change to metrics).

- **Stage 2** – identify uses which would require further maps or changes to be made to the model.

    - **Stage 2a** – identify uses which could be progressed by making simple changes to the model, e.g. overlaying local data layers with output from the national model or changing the boundary of the maps.

- **Stage 2b** – identify uses which could be progressed by making more complex changes to the model once the full version and software is available, e.g. including local data sets, changing definitions used in the metrics or changing the relative weighting of metrics.

If changes are required to the model to suit local needs, there is a question over who would make these changes. If GIS resource is available within the NIA partnership, some changes to the model should be able to be made locally using the software tool which could accompany the final version. Where GIS resources are not available, it may be that dialogue with Natural England is required to determine what assistance can be provided.

4.4.1. Potential uses suggested by NIA partners

Just over half the respondents (55%) said they would be interested in running the model locally once the software tool is available (e.g. using local data or amending metrics). A wide range of suggestions of how the model could be used by NIAs and partner organisations were made. These suggestions are summarised below.

Informing high level conservation strategy

The model cannot make decisions about conservation strategy in the NIA but it can be used to inform these decisions and provide an evidence base. For example, the model could inform approaches to conservation and resource allocation, for example whether to focus on medium and low areas of vulnerability to retain and increase their resilience or whether to focus resources on reducing the vulnerability of the most vulnerable parts of the NIA.

Prompt discussions at local level about vulnerability and adaptation benefits

Linked to the point above, model output could be used to prompt discussions about difficult strategy decisions and the effects on the natural environmental in terms of increasing or reducing vulnerability to the impacts of climate change. One example highlighted at the workshops was the use of model outputs by LNPs as a tool to open up discussions with Local Economic Partnerships (LEPs) about the vulnerability of the natural environment and the potential benefits of adaptation action in terms of ecosystem service delivery. Model outputs could also be used to raise awareness among elected members.

Assessing the vulnerability of NIA objectives and other plans to the impacts of climate change

The model could be used to screen other conservation plans to investigate the vulnerability of outcomes to the impacts of climate change. The current configuration of the model (i.e. using national priority habitat inventories) could be used to assess the vulnerability of local and regional Biodiversity Action Plans.

In conjunction with other methodologies for assessing vulnerability

Outputs from the NBCCV model can be used as part of the evidence base for assessing local vulnerability to the impacts of climate change and identifying adaptation actions. For example, outputs from the model can be used in conjunction with the NCA vulnerability assessment method – which was also presented at the workshops. Information about relative vulnerability of habitats from the model can be used as part of the evidence base for assessing the vulnerability of biodiversity in landscape scale areas as part of the NCA method.

Planning the next stage of the NIA project

Whilst NIA objectives are already set and money allocated to specific projects over the next two years, model output could be used to develop plans for the next stage of the NIA initiative or its successors. However, NIAs represent longer term partnerships and initiatives and most expect to continue conservation work in the area once the NIA funding comes to an end. The model will provide information about the relative vulnerability of habitats within NIAs which can be used to inform future plans and set longer term conservation strategy for the area (see ‘informing high level conservation strategy’ above). The model can also be used to investigate potential adaptation actions (e.g. buffering habitats, creating stepping stones, joining up patches) and their effect on vulnerability before being developed into plans for the NIA areas (see ‘scenario testing’ below).

Spatial identification and prioritisation of areas for habitat creation

The model can be used to prioritise areas for habitat creation and develop spatial adaptation plans. Single habitat runs can be used to investigate relative vulnerability of habitats which can be used to inform adaptation plans and to direct effort. For example, the model could be used to assist with strategic targeting of woodland planting or for developing habitat restoration strategies.

The output of the vulnerability model can be overlaid with opportunity maps to identify priority areas for habitat creation. By overlaying the two sets of data, vulnerability and opportunity can be viewed together to target effort in areas where it is likely to be most successful.

Scenario testing

The model could be used to investigate the effect of potential actions on vulnerability of habitats. 'Synthetic data' sets can be run through the model to test the impact of potential actions on habitats. Actions might include possible adaptation strategies (e.g. buffering protected sites, linking up patches), in which case the model could be used to assess the extent to which the potential actions reduce habitat vulnerability. Alternatively, development scenarios or plans could be included in the model and the effect on habitat assessed in terms of fragmentation, extent or vulnerability to climate change. It may be possible to use this information as part of the evidence base for developing adaptation plans, assessing planning applications or developing a green infrastructure plan, with appropriate caveats.

Influence agri-environment agreements

It may be possible to use the model to inform and influence agri-environment agreements to deliver adaptation benefits. For example, the model could be used to target agri-environment agreements to areas of high vulnerability or could be used to tailor agreements to include measures beneficial to adaptation for specific habitats. For the model to be used in this way, it would need to be made available to Natural England advisors (including training in how to use it). The model could be used as part of Natural England's Holding Assessment Toolkit. At the Northern Devon workshop, it was suggested that an app could be developed for advisors which would give them a quick understanding of the relative vulnerability of habitats in their area.

Evidence base for planning

A number of potential uses for the model in a planning context were identified through the workshops and survey. Model outputs can be used to inform the development of planning strategy and provide part of the evidence base for policy making and planning decisions (with appropriate caveats). The model is likely to give more weight to biodiversity arguments in planning reviews as it is a national model based on established principles and nationally verified data.

Highlighting multiple benefits

It is often important to demonstrate multiple benefits of projects in order to secure funding and stakeholder buy-in. The model can help to highlight benefits of actions in terms of improving resilience to climate change impacts and reducing fragmentation. It may also be possible to use some habitat information as a proxy for some ecosystem services, e.g. bog habitat as a proxy for soil carbon storage, or floodplain grazing marsh for flood alleviation. This may help in expressing the benefits of adaptation action in terms of economic and health and well-being improvements.

Justification of existing projects and actions

The model can be used to provide additional justification of existing projects and actions by demonstrating their value in terms of improving resilience to the impacts of climate change, e.g. the value of upstream habitat creation in terms of improving the resilience of downstream areas to flooding.

Monitoring and evaluation

Use in monitoring and evaluating delivery of NIA objectives was considered to be a potential strength of the model. It may be possible to use the model (or elements of it) to monitor change in the NIA as a result of action taken. For example, the overall vulnerability layer could be used to show improvement in resilience as a result of actions taken during the NIA project.

More specific elements of the model could also be used in monitoring and evaluation. For example, it may be possible to use the habitat fragmentation metric to provide an indicator of habitat connectivity before and after the NIA initiative, as required by Defra in the NIA monitoring and evaluation framework.

However, this potential use of the model depends on the frequency with which underlying datasets are updated. It is likely that it would be more appropriate to use local data sets if the model was to be used for monitoring as NIA partners have more control over how these are updated.

Supporting funding applications

Many funding applications now require projects to demonstrate how they will contribute to climate change adaptation. The model can be used as part of the evidence base for applications, to demonstrate the need for the project (in terms of vulnerability to climate change) and show how the project could have adaptation benefits.

Estimating cost of adaptation actions

At the Greater Thames Marshes workshop the potential use of the model to estimate the cost of different adaptation actions was discussed. If information exists about the cost of potential actions locally (e.g. cost per hectare of creating different types of habitats or acquiring land around protected sites), this information could be expressed spatially as a layer within the NBCCV model. Different combinations of actions could be run alongside cost information to estimate the overall cost of plans. In this way the model could be used to apportion a given amount of money available. Cost information could also be used in combination with the vulnerability information to prioritise spending.

Specific suggestions of potential uses of the model gathered during the workshops and through the survey are shown in Table 4-1.

Table 4–1 Specific suggested uses for the NBCCV model

Suggested use	NIA	Using existing output	Local changes required to the model to support suggested use
Updating the Sheffield Nature Conservation Strategy, particularly focusing on green corridors. Prioritise action in the Rights of Way improvement plan.	Dark Peak	No	Add local green infrastructure datasets. Run model with local authority boundary.
Planning the next three years of the NIA programme (after 2015).		No	Change the sensitivity and condition metrics for peat bog. Use local habitat data.
Reviewing and updating the Humberhead Levels Partnership's 10 year delivery plan	Humberhead Levels	No	Need to include local habitat data sets and waterways.
Prioritise action for wetland sites based on vulnerability	Morecambe Bay	Yes (but single habitat run)	Run model with LNP boundary (which coincides with the RSPB Futurescape project).
Target areas which could contribute to 'allowable solutions' to mitigate carbon emissions e.g. woodland planting, wetland creation.	Nene Valley	Yes	
Identify projects with multiple benefits as part of Green Infrastructure delivery plans		No	Include local data on Local Wildlife Site condition. Run model with local authority boundaries.
Add vulnerability information to Wessex Water's GIS for the Frome and Piddle Catchment to provide evidence of multiple benefits of habitat creation to land owners and to target areas for land use change.	Wild Purbeck	Yes	
Forest design planning – the model could help show where to prioritise effort in terms of reducing vulnerability to climate change.		No	Incorporate local habitat inventory data and Forest Research work in the south west.
Incorporating vulnerability information into an NIA climate change adaptation plan.		No	Incorporate GIS layers from landscape permeability work. Also local data on HLS, Strategic Nature Area, local habitat inventory data.

4.4.2. GIS capacity

Many of the uses suggested by the NIA partners involve alterations to the model, either changes to the metrics or the use of local datasets. The final version of the model will be accompanied by a software tool which will enable users to make changes to the metrics and the underlying datasets used, where the appropriate expertise exists. However, making these changes locally will require a degree of GIS expertise and resource. About half of respondents to the survey indicated that local GIS capacity could be a barrier to using the model (see Figure 4-1).

In the staged approach discussed at some of the workshop (see Section 4.3), NIAs were encouraged to consider whether they had GIS capacity to make simple or more complex changes to the model. Where NIAs identify that assistance would be required, they were advised to contact Natural England to discuss support which could be provided, noting that – at present – there is no dedicated resource within Natural England to support NIAs with GIS.

Specific maps and model alterations identified by NIA partners at workshops and through the survey are summarised in Table 4-2 below.

Table 4–2 Maps and model alterations required

NIA	Map / alteration requested	Local GIS capacity?
Dark Peak	Single habitat vulnerabilities for each of the habitats covered by the NIA objectives (bog, grassland, heathland and woodland).	Yes
	Local Authority boundary.	
	Limit condition metric to 'favourable' or use local data on blanket bog condition (Moors For the Future data).	
	Local data sets overlaid on top of the existing model output: green infrastructure strategy, rights of way, HLS, re-wilding of urban parks, CEH wetland vulnerability tool output.	
	Local overlay to show NIA project delivery.	
Dearne Valley	New Dearne Valley Green Heart NIA boundary	Yes – although boundary sent to Natural England to update model
Humberhead Levels	Single habitat runs, particularly for wetland habitats.	No
	Maps of the wider Humberhead Levels Partnership boundary	
	Include baseline information on water in this NIA – location of main rivers and drainage infrastructure.	
	Change the proximity score for water habitats in this NIA to show proximity to water sources.	
Greater Thames Marshes	Single habitat vulnerability maps	Yes
Morecambe Bay	Single habitat maps (overall vulnerability and Lawton maps)	Yes
	Maps of the NIA and LNP boundary (which coincides with the RSPB Futurescape project).	
Nene Valley	Re-do maps with the Northamptonshire county boundary and catchment boundary.	Yes
	Single habitat vulnerability maps	
	Include local data on County Wildlife Sites and condition.	
	Split 'rivers' into different river habitats and assign sensitivities based on local assessment	
Northern Devon	Single habitat vulnerability maps runs	Yes
Wild Purbeck	GIS layers from the landscape permeability work layered with the vulnerability model output. Other local datasets which could be overlaid include HLS and Strategic Nature Area data.	Potentially
	Use local habitat inventory data.	

5. Other tools and methods feedback

In addition to the NBCCV model, workshop participants were introduced to other tools and methods for understanding vulnerability and identifying adaptation actions, including the Natural England National Character Area (NCA) vulnerability assessment method and tools developed by Natural England's partners. Feedback about awareness and potential uses of these tools and methods was collected through the workshop discussion sessions, the survey and interviews, and is summarised in this chapter.

5.1. NCA Vulnerability Assessment Method

The National Character Area (NCA) Vulnerability Assessment methodology was introduced to NIA partnerships who were not already familiar with it. Workshop participants were introduced to the steps in the method (and findings of local NCA vulnerability assessments where appropriate) before being asked to consider how they might use it in their work. In section 5.1 feedback on the NCA vulnerability method from workshop discussions sessions, survey responses and interviews is presented.

5.1.1. Strengths and limitations

Throughout the workshops, survey and interview, feedback has been collected on the strengths and limitations of the NCA Vulnerability Assessment method. These strengths and limitations are summarised in Table 5-1 below.

Table 5–1 Strengths and limitations of the NCA Vulnerability Assessment method

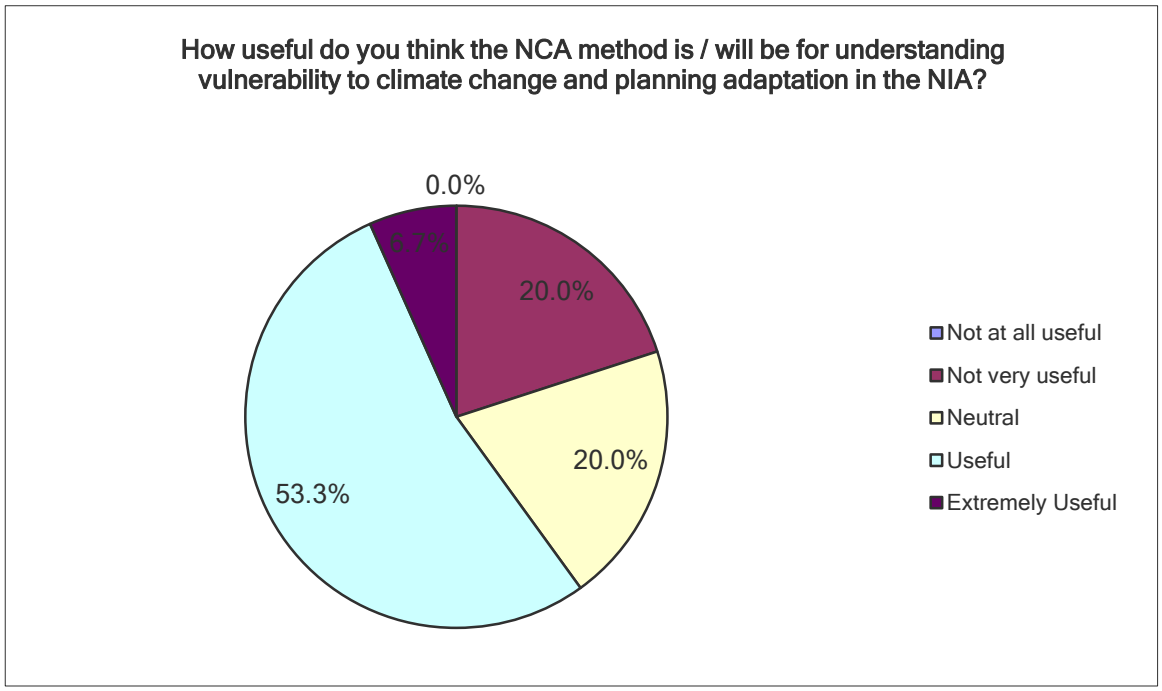
Strengths	Limitations
• The method can be applied at different scales – can be applied within any boundary (e.g. NCA, NIA, local authority, National Park) boundary and does not rely on national datasets. • The approach complements the GIS model approach – the method is more practitioner and local knowledge based. Allows local knowledge to compensate for gaps in formal datasets. • Provides a disciplined approach to conversations with local stakeholders (including non-experts) about vulnerability. Works well with partnerships. • Simple method for estimating vulnerability • A framework for bringing data together on a range of subjects (biodiversity, access and recreation, historic environment etc). • Subjective – for some, the subjectivity of the method was considered a strength. • The method starts from a positive position i.e. what is in the landscape and what it delivers in terms of services, before thinking about vulnerability, rather than starting with impacts. • It should be relatively easy to update the assessment as new information becomes available as there is no need to wait for datasets to be updated.	• Amount of time required to bring stakeholders together and agree vulnerability ratings. • Subjective – for some, the subjectivity of the method was a weakness. The method could be challenged by decision makers (e.g. local planners). • The method only considers vulnerability to direct impacts of climate change. It could be strengthened if it considered indirect impacts and impacts of human responses to climate change.

5.1.2. Uses of the NCA vulnerability assessment method

The feedback about the NCA Vulnerability Assessment method was broadly positive. Sixty per cent of survey respondents who answered the question about usefulness of the NCA methodology[7] felt that it would be useful or extremely useful in understanding vulnerability to climate change and planning adaptation in the NIA (see Figure 5-1).

[7] Not all respondents answered this question as the NCA methodology was not discussed in all workshops.

Figure 5–1 Usefulness of NCA vulnerability method



NCA vulnerability assessments have been carried out in Morecambe Bay and Humberhead Levels NCAs, the boundaries of which overlap significantly with the NIAs. The findings of the Morecambe Bay NCA vulnerability assessment (as well as a regional climate change vulnerability assessment for the North West) were used to develop the NIA business plan. High-level adaptation actions from the NCA vulnerability assessment report are reflected in the business plan objectives, including:

- Reducing harm not linked to climate change, e.g. diffuse pollution.
- Catchment management, e.g. Leighton Moss.
- Multifunctional wetlands, e.g. Lythe Valley.
- Enhance the habitat mosaic.

The steps in the NCA methodology are similar to the RSPBs Reserve Vulnerability Assessment methodology. The RSPB has developed this reserve based method to apply to landscape scale conservation initiatives and is currently rolling it out to its own landscape scale initiatives, RSPB Futurescapes. The RSPB have carried out a climate change vulnerability assessment of the Isle of Purbeck Futurescape, the findings of which were used in the development of the Wild Purbeck NCA plan.

In those NIAs where NCA vulnerability assessments have not been carried out, workshop participants were asked to consider how they might be able to use the NCA method. The following suggestions were made:

Planning management of protected sites – the method could be used to highlight where changes in management might be required in order to improve resilience of protected sites and maximise adaptation benefits. This could link to the RSPB reserve vulnerability assessment which uses a similar method.

Developing adaptation action plans at different scales – the method can be used to develop adaptation action plans at a landscape scale (e.g. NIAs) but also smaller scales, potentially down to the scale of individual land holdings. It could be useful to split actions by assets type (i.e. biodiversity, access and recreation, geodiversity, historic environment etc.) or by actor (e.g. statutory bodies, conservation NGOs, local authorities etc.). One of the objectives of the Wild Purbeck NIA is to develop a NIA climate change adaptation plan. The NCA approach could be used to develop this plan although the partnership is likely to use the RSPB approach, building on the work done for the Purbeck Futurescape adaptation plan.

Screen objectives of landscape plans – the method could be used to screen objectives of other plans to identify how they might be vulnerable to the impacts of climate change. For example, NIA business plans are based on the Lawton Review principles but it could be useful to re-consider objectives in terms of climate change vulnerability and maximising adaptation benefits beyond connectivity. The NCA method could be used to assist with this by scoping in NCA objectives at Step 1.

Use in conjunction with the NBCCV model – the NCA method could be used to ground-truth or locally test the sensitivity classification of habitats in the vulnerability model. For example, in Dark Peak where blanket bog areas are shown as moderately vulnerable on the NBCCV maps at a national scale, a decision to amend the sensitivity classification of that habitat type could be taken locally, informed by a discussion based on the NCA method.

Conversely, outputs of the NBCCV model could be used to inform the vulnerability assessment of biodiversity in the NCA method.

Raise awareness of vulnerability and adaptation with other groups – the method provides a framework for having local conversations about different elements of the natural environment beyond biodiversity. The subjective nature of the method and the emphasis on drawing stakeholders together could be useful for discussing vulnerability and adaptation with non-conservation specialists. For example, the steps in the method could be used to introduce LNPs and LEPs to the importance of adaptation in the natural environment and help identify where adaptation could bring multiple benefits for nature and the economy. Health and Wellbeing Boards might be interested in looking at the access and recreation aspect of the method. The method may also be a useful tool for local authorities, particularly for thinking about ecosystem services. It is possible to run through the steps to look at ecosystem services without running the biodiversity aspect.

Local planning – the NCA vulnerability assessment approach could be used as part of the Neighbourhood Planning Process. The emphasis on bringing stakeholders together to discuss vulnerability of locally important natural environment assets lends itself to local planning.

Landscape character assessment – the approach could be used to inform development of future landscape character assessments which should include consideration of climate change impacts.

5.2. Other tools, methods and sources of information

In addition to the NBCCV model and the NCA Vulnerability Assessment method, a number of other tools, methods and sources of information about climate change and the natural environment were presented to NIA partners through this project. The briefing note sent to participants before the workshops summarised a number of tools and methods (see Appendix A). These tools and methods were also highlighted during the introductory workshop presentation. Tools and methods introduced (in addition to the NBCCV model and the NCA Vulnerability Assessment method) were:

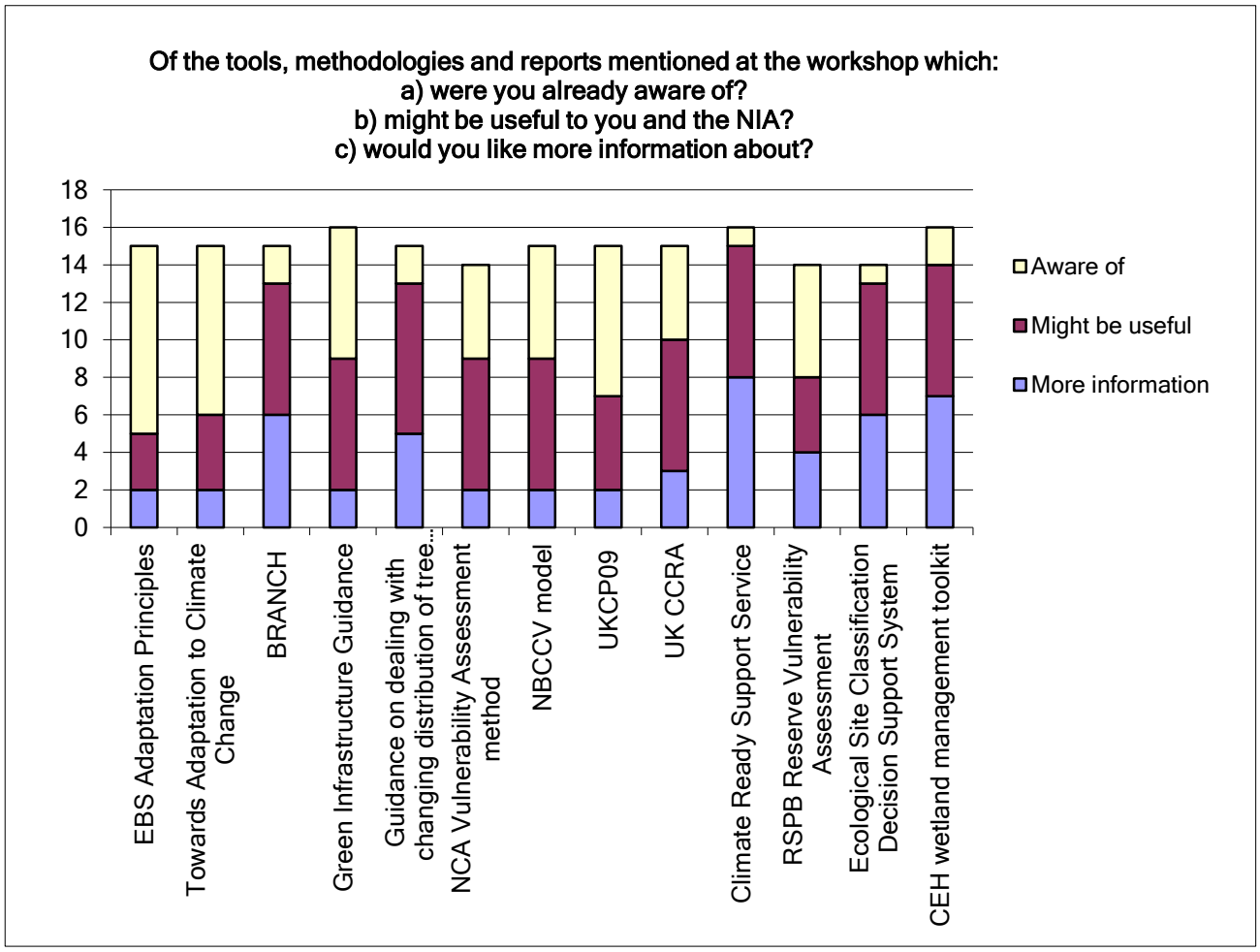
- England Biodiversity Strategy Climate Change Adaptation Principles
- Towards Adaptation to Climate Change, England Biodiversity Strategy
- The BRANCH project
- Green Infrastructure Guidance, Natural England
- Guidance on dealing with changing distribution of tree species, Natural England
- UKCP09 climate change projections
- UK Climate Change Risk Assessment (CCRA)
- Climate Ready Support Service, Environment Agency
- RSPB Reserve Vulnerability Assessment
- Ecological Site Classification Decision Support System, Forest Research
- Wetland Management toolkit, Centre for Ecology and Hydrology

Of the tools and methods introduced at the workshop (or in the briefing note), the greatest awareness was of the England Biodiversity Strategy documents, *Principles for Adapting Biodiversity in a Changing Climate* (63% of respondents aware) and *Towards Adaptation to Climate Change* (56% of respondents aware)[8]. There was also fairly high awareness of the UKCP09 climate change projections (50% of respondents aware). See Figure 5-2.

There was least awareness of the Climate Ready Support Service and the Forestry Commission's Ecological Site Classification tool (6% of respondents aware of each of these). See Figure 5-2.

[8] It is possible that some respondents confused these two documents for each other.

Figure 5–2 Awareness of tools and methods for assessing vulnerability and planning adaption



Of the tools and methods introduced, 50% of respondents felt that the Natural England note '*Guidance on dealing with the changing distribution of tree species'* could be useful. Forty-four per cent of respondents also felt that the BRANCH project, Natural England's Green Infrastructure Guidance, the UK CCRA, the Climate Ready Support Service, the Forestry Commission's Ecological Site Classification tool and the CEH climate change and wetland tool could be useful. See Figure 5-2.

6. Barriers to adaptation and further support required

One of the aims of the project was to identify further support required by NIA partnerships to plan and deliver adaptation action on the ground. Through the workshops, the survey and interviews, barriers to adaptation for NIA partnerships have been identified and are summarised in this chapter. Suggestions of further support required by NIA partner organisations to overcome these barriers are then presented.

6.1. Barriers

NIA partners and LNP workshop participants were asked what they considered to be barriers to adaptation in a workshop discussion session and also through the survey and interviews. There was a significant degree of commonality in the barriers identified, and they have been grouped into the following categories:

- Physical barriers;
- Institutional barriers;
- Communication barriers;
- Knowledge barriers;
- Policy barriers; and
- Resource barriers.

Physical barriers

Sources of harm not related to climate change – in some places, the ability of the natural environment to adapt to the impacts of climate change is impeded by non-climate related pressures, e.g. weirs and canalised channels which are a barrier to fish movement. However, effort to reduce these pressures in the short term should improve the resilience of the natural environment in the longer term.

Institutional barriers

Disconnect between national and local staff – there was a feeling at some workshops that communication of climate change within organisations is not always very good. Whilst research and reports are being produced by organisations at a national level, the findings and recommendations do not always seem to filter down to local staff working on the ground, e.g. HLS advisors, staff responding to planning applications. In some cases it might help if local staff are more involved throughout the development of research projects, as they can help shape what is required in terms of outputs and guidance to enable adaptation to be delivered on the ground.

Setting up partnerships – this was identified as a barrier by LNPs who found that setting up partnerships is difficult because of the multiple viewpoints involved. Securing time and resources for partnerships was also identified as a challenge. LNPs also found that partnership working is made difficult due to constant organisational change and changing staff roles.

Communication barriers

Communicating the need to adapt and the socio-economic benefits of adaptation to others – a lack of understanding of the need to adapt and the benefits it can bring amongst non-conservation stakeholders was seen as a major barrier to delivery of adaptation on the ground. The main groups identified were local authorities, land owners and developers. Whilst useful for NIA partners, many respondents felt that climate change adaptation workshops needed to be addressed to different audiences, including land owners and their representative organisations, local authority officers, local authority Chief Executives and elected members, and LEPs. In general, conservation organisations are aware of the impacts of climate change and are working to deliver adaptation but more could be achieved through engaging with local government, land owners and business.

The current focus of local government and land owners on economic development and growth means that it can be difficult to persuade them of the need to adapt the natural environment and the socio-economic benefits this could bring. There is often a perception that ‘environment equals a brake on development’ and there can be unwillingness to engage with conservation organisations. The difficulty of translating the

economic value of the natural environment and adaptation benefits is a major barrier to engaging with these groups.

Public understanding of climate change and the need for adaptation – there is still a significant degree of scepticism about the need to invest in adaptation of the natural environment amongst the general public. For example, people generally want to see hard defences built as an adaptation to increased flood risk, rather than soft engineering and green infrastructure approaches. There is a general lack of awareness of how the natural environment works, the benefits it provides people and the need to take action to protect these benefits as a result of the impacts of climate change.

Knowledge barriers

Uncertainty of climate change projections – uncertainty over the magnitude and timing of climate change is still a barrier to taking specific adaptation actions, despite general agreement that something needs to be done. Uncertainty over future rainfall patterns is a particular challenge in terms of adapting to flood risk and planning wetland habitat networks.

Recent weather patterns have not helped in terms of getting the messages from UKCP09 across to landowners and elected members. The long term direction of travel shown in the UKCP09 projections (i.e. hotter drier summers, warmer wetter winters) is hard for people to understand when they've experienced a series of wet summers and cold winters. However, recent weather events have provided an opportunity to talk about the need for adaptation action to improve resilience to change (whatever the direction of that change).

Understanding what needs to be done differently as a result of climate change – whilst there is awareness that climate change is likely to have impacts on the natural environment, it is not always clear whether conservation management needs to change as a result. In many cases, continuing with good conservation practice will have adaptation benefits. However, in some cases different management might be appropriate but it is not always clear to advisors and land managers what they should be doing differently for the habitats they are managing. This is particularly an issue when considering the need for transformational change, such as translocation of species.

Keeping track of new information – information, tools and methods for understanding vulnerability and identifying adaptation actions come from a lot of different sources and new material is always being produced. It is very difficult for practitioners to keep up to date with the latest climate change information. There is a role for Climate Ready to provide organisations with up-to-date information about climate change adaptation.

Making difficult decisions – it is not easy to determine the 'right' answers in terms of adaptation and conservation; often there will be a series of choices and trade-offs which will have to be made, for example: deciding which species to abandon and which to welcome; deciding whether to prioritise effort to focus on specialists (i.e. maximise biodiversity) or focus on generalists; and whether to translocate species. These are often very political questions and NIA partners do not always feel well equipped to answer them. Whilst it is recognised that many of these decisions will need to be made locally, a lack of guidance on difficult issues from national and statutory organisations can be a barrier to progressing difficult decisions.

Policy barriers

Legislation – whilst the UK Climate Change Act sets statutory emissions reductions targets and makes provision for climate change adaptation, there was a feeling amongst respondents that adaptation is not currently mainstreamed throughout policy and legislation at different scales. At one workshop, it was suggested that, like health and safety, thinking about climate change adaptation and mitigation needs to become embedded in everything we do.

Static conservation designations – in designated sites, processes, possible courses of action and desired outcomes are often quite fixed, e.g. by SSSI notifications and the rigidity of definitions. This can be a barrier to adaptation when conditions at these sites are expected to change. It can also make land managers reluctant to try new approaches to management. A more outcome based approach (and more specifically, a flexible outcome based approach) and regular reviews of desired outcomes for designated sites could help overcome this barrier.

Lack of recognition of the value of non-traditional habitats – there was a feeling that, in general, conservation organisations and the statutory bodies focus their attention on rural habitats. There seems to be a lack of recognition of the importance of non-traditional habitats for biodiversity, not just in terms of

adaptation but in general across conservation research and policy. In some areas, green infrastructure, brownfield sites and private gardens provide a significant biodiversity resource and they will play an important role in adaptation of urban areas to the impacts of climate change. This lack of recognition is a barrier to adaptation as relatively less information about the potential vulnerability and appropriate actions is available. It is also more difficult to persuade stakeholders of the need to adapt these habitats as statutory bodies appear not to be focusing on them.

Uncertainty in accounting for adaptation in cost benefit analysis (CBA) – CBA is being used more and more to justify actions but it can be difficult to measure and quantify the costs and benefits of taking adaptation action. Whilst there are methods for doing this, many workshop participants and survey respondents felt that these methods are imperfect. They highlighted a range of uncertainties:

- The benefits of adaptation action in the natural environment are unlikely to be seen for some time – how do you factor long term benefits into CBA?
- The benefits of adaptation are often costs avoided – how do you measure something that has not happened, e.g. the benefit of creating a wetland in terms of reducing flood risk?
- The intrinsic value of biodiversity is difficult to quantify, in cost benefit terms.
- Quantifying benefits associated with natural environment approaches to adaptation in comparison to traditional approaches is difficult, e.g. it is difficult to quantify reduction in flood risk as a result of soft engineering works in terms of number of properties protected (which is one way of measuring the benefits of hard defences).

Monitoring and evaluating adaptation – organisations are under significant pressure to demonstrate the value of their actions and monitoring and evaluation is increasingly important. However, it is particularly difficult to monitor and evaluate the effectiveness of adaptation actions for many of the same reasons described under the cost benefit assessment point. It is also very difficult to attribute change to specific actions which can make it difficult to monitor actions. Rather, it is better to monitor progress towards desired outcomes. A lack of baseline monitoring prior to actions being taken is also a major barrier to evaluating effectiveness.

Clarity of roles – specifically identified as a barrier by LNPs, a lack of clarity over the role of LNPs in adaptation (and their role more generally) is preventing them from taking action. The relationship between LNPs and LEPs was felt to be unequal – LEPs have a clear remit (jobs and growth now) and funding, whereas the LNP role is unclear and often perceived as less important. There needs to be a clearer understanding and demonstration of the added value of LNPs as well as communication of their role to other organisations and initiatives.

Resource barriers

Funding for delivery of adaptation measures – funding is required to deliver adaptation, although benefits can be realised through existing funding mechanisms. For example, it should be possible to deliver adaptation benefits through agri-environment schemes. However, in most cases, agreements are too short for benefits to be realised and little work has been done to identify multiple benefits for adaptation through HLS measures. CAP reform provides an opportunity to identify the potential multiple benefits of agri-environment schemes and to develop a scheme which delivers adaptation actions on the ground.

Funding is often very short term, e.g. NIA funding for three years. This is a barrier to implementing actions which take a long time to complete and for the benefits to be realised (e.g. habitat creation).

GIS resource – many tools and models (not just relating to climate change impacts and adaptation) require GIS capacity which does not exist in all NIAs.

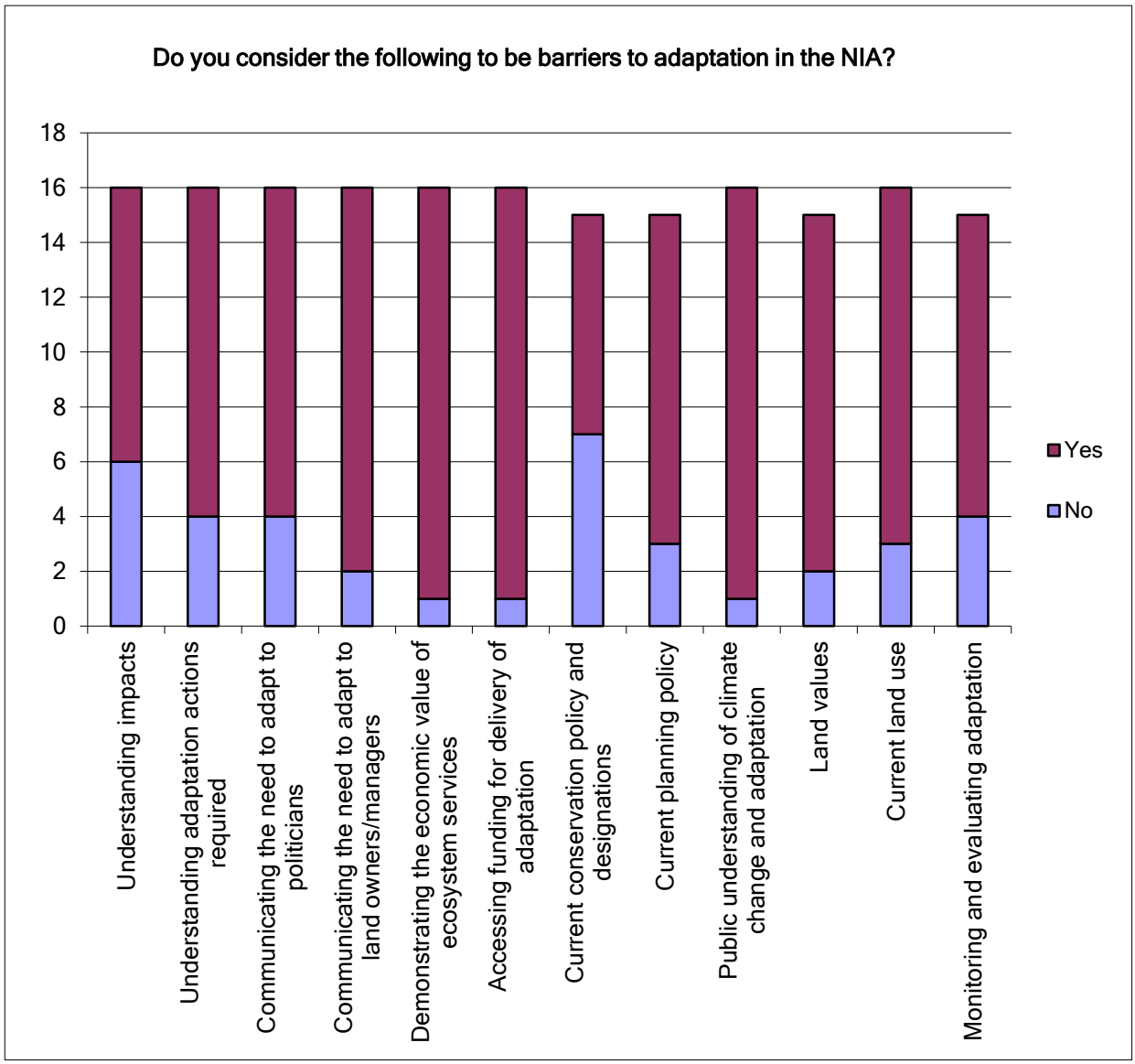
Land values – the value of land (both high and low values) can be a barrier for delivery of adaptation actions. In areas with high land values competition for land use can be a significant barrier and land use for conservation or adaptation purposes cannot compete with higher value uses. In areas with low land values, it is particularly difficult to encourage developers to invest in adaptation actions (such as green infrastructure of SUDs) because the return on their investment is low.

Of these barriers, the survey results show that the three most commonly identified by respondents were (all highlighted as barriers by 94% of respondents):

- Demonstrating the economic value of ecosystem services;
- Accessing funding for delivery of adaptation; and
- Public understanding of climate change and adaptation.

Other significant barriers are: communicating the need to adapt to land owners and managers (highlighted by 87% of respondents); and, land values and land use (both highlighted by 81% of respondents). See Figure 6-1.

Figure 6–1 Barriers to adaptation



6.2. Further support required

Following the discussion of barriers to adaptation, workshop participants were asked for suggestions of further information and support they require to overcome the barriers. This was also followed up by questions in the survey and interviews which focused on what else NIA partners need to enable them to deliver adaptation action.

Suggestions included:

- **Guidance on difficult adaptation issues** such as deciding to protect or accept species loss and translocations.
- Better **communication of tools and methods developed nationally to local staff** within Natural England and other Defra organisations. Training modules on climate change, the vulnerability model and adaptation actions would be useful for Natural England staff and other organisations.
- Greater **coordination between Defra organisations** on climate change adaptation and possible central publication of information and resources.
- Delivery of similar **workshops for LNPs, LEPs, local authority officers and elected members**, focusing on the need to adapt the natural environment and the economic benefits of adaptation

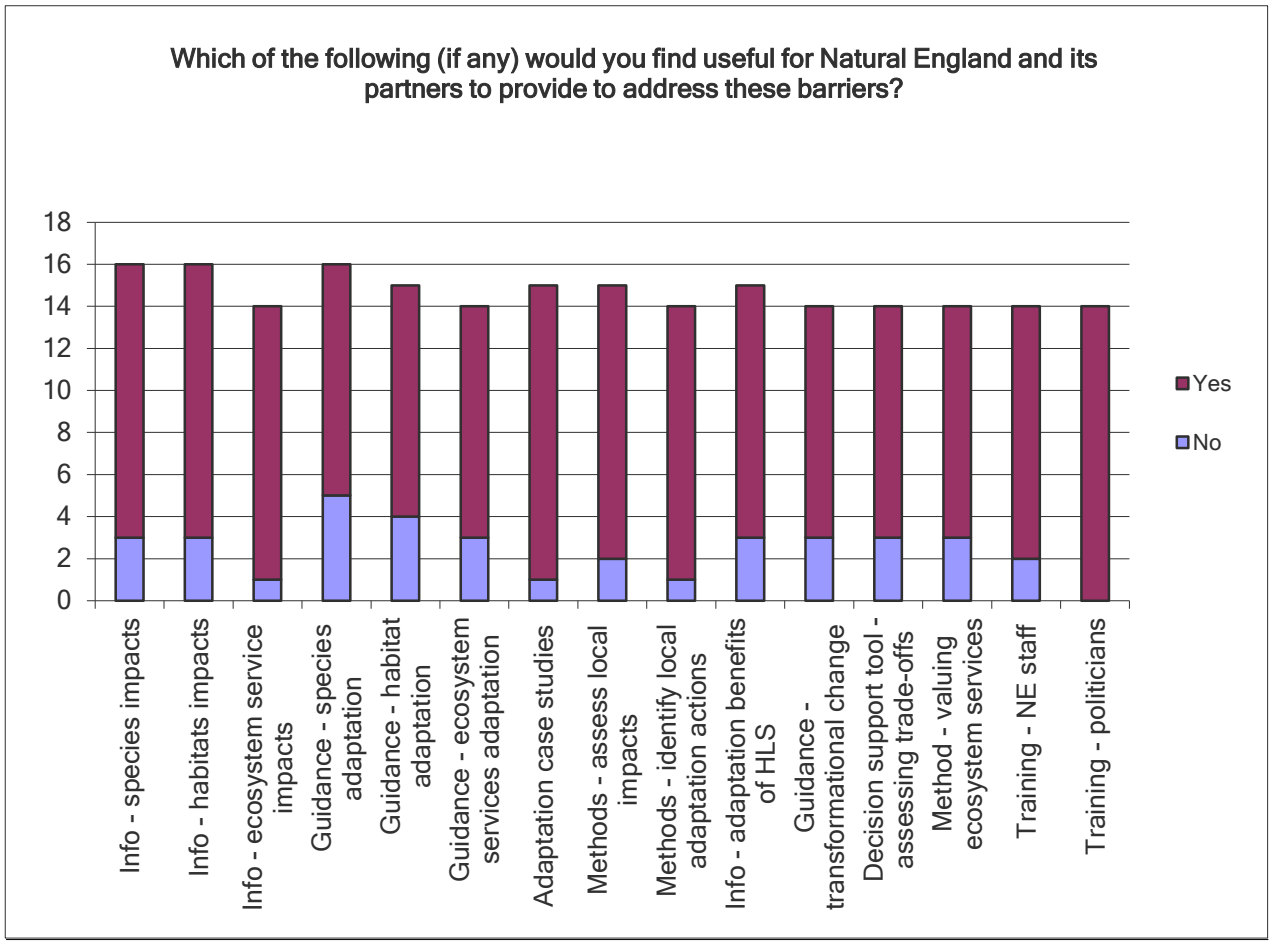
- **Guidance on adaptation of urban habitats.**
- **Identification of adaptation benefits through HLS** measures. Screening of HLS measures to identify how they can contribute to adaptation. Engagement with CAP review to improve ability of agri-environment schemes to deliver adaptation benefits.
- **Guidance and methods for translating vulnerability information into economic impacts** and how to account for adaptation benefits in cost benefit analysis.
- **Guidance and resources for presenting climate change adaptation messages** to land owners and other non-specialists. Also tailored information about climate change impacts and adaptation actions that can be used by developers.
- **Adaptation advice on a habitat-by-habitat basis** and at a local scale which can be used to help land owners and managers take action on the ground. For example, information on planting regimes for forestry and guidance of what should be done differently due to climate change. If no changes to management are required, this should also be stated so that conservation managers have confidence that their actions are beneficial for adaptation.
- **Visualisations** for communicating the potential effects of climate change.
- **Strategic leadership on biodiversity offsetting** to deliver positive impact on biodiversity.
- **Public awareness raising** of the importance of adaption, e.g. engagement in schools.
- **Funding** for pilots and established partnerships to resource adaptation planning and delivery. Funding is required for coordinator posts as well as project delivery.
- More detailed **webinar to introduce LNPs to the NBCCV model.**

In addition to specific resources and guidance requirements, there was a request that Natural England and its partners involved NIAs during the development of such resources. NIA partners welcomed the opportunity to comment on the NBCCV model during the pilot phase and would welcome further opportunities to input to projects before final versions of reports and tools are published.

Suggestions of reports, methods and guidance required to support NIA partners in addressing the barriers identified were drawn from feedback received at the workshops and used in the survey to find out what people most wanted to see from Natural England and its partners. All items were selected by at least two thirds of respondents but the items requested most frequently were (see Figure 6-2):

- Case studies of adaptation actions;
- Training on adaptation for politicians;
- Information on the impacts of climate change on ecosystem services; and
- Methods for identifying adaptation actions locally.

Figure 6–2 Support required from Natural England and partners



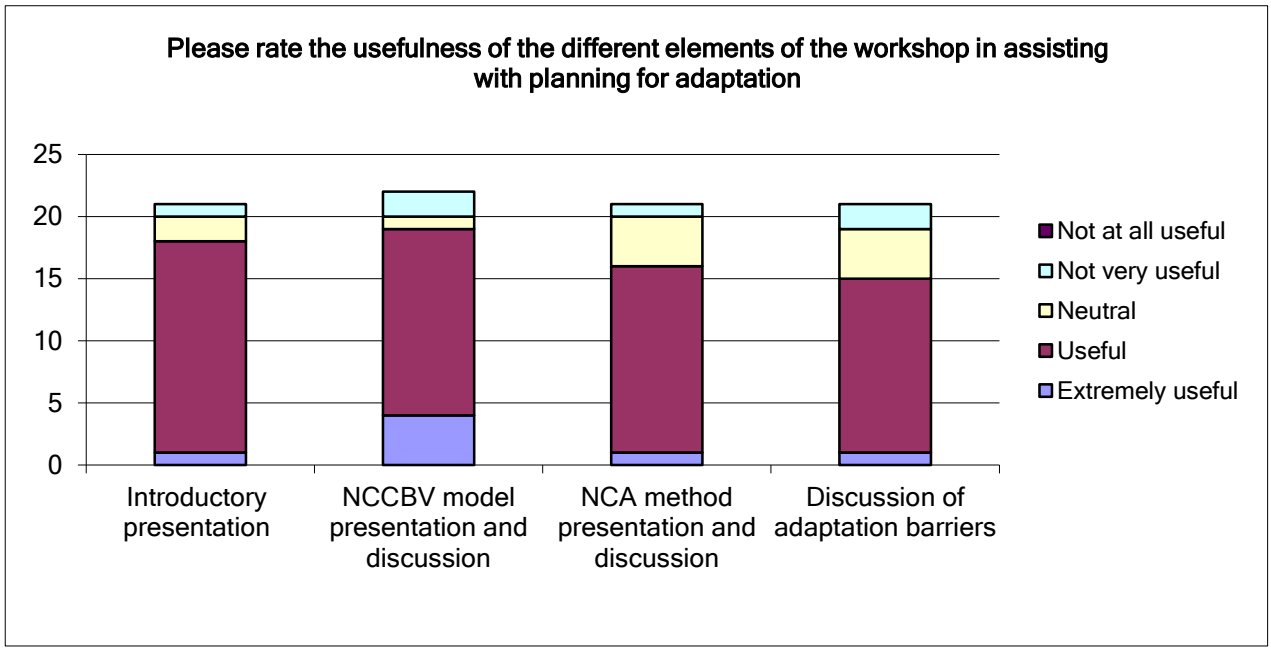
6.3. Engagement methods

6.3.1. Workshop feedback

Both during the workshops and in interviews, participants were very supportive of face-to-face workshops with local partnerships. In general, there was a feeling that it was useful for Natural England national specialists to present their work to partnerships in a local context, focusing on specific issues in each of the NIAs. The opportunity to bring local stakeholders together to discuss adaptation was also seen as useful although some felt that other organisations (such as LEPs and landowner representatives) should have been involved. Partnerships welcomed being involved in the pilot phase of the NBCCV model as this should help to ensure that the final model meets the needs of potential users.

The survey results show which elements of the workshop participants found most useful. Whilst all the sessions appear to have been useful to some extent, the NBCCV model presentation and discussion session was found to be most useful, see Figure 6-3.

Figure 6–3 Usefulness of workshop elements



Specific feedback on the benefit of local workshops as a means of engagement on the topic of climate change adaptation included:

> *"Getting NIA partners around the table to actually discuss this stuff in a structured way was very useful".*
>
> *"New ideas were contributed from the partners about using other types of data i.e. watercourses data from the Environment Agency and engagement with Internal Drainage Boards and farmers...to develop practical solutions".*
>
> *"It was useful to understand the different approaches, work and tools being developed by other organisations".*
>
> *"Very useful catalyst to get a good range of partners thinking about these issues and how to address them from a strategic perspective."*

Part of the success of the workshops was down to planning workshop agendas in consultation with a representative of the partnership. For each NIA, a tailored agenda was put together based on the level of prior engagement with Natural England on adaptation and the NBCCV model as well as other initiatives and plans being developed in the NIA. As a result, each workshop aimed to address adaptation topics relevant to the partnership.

However, not all of the feedback about the workshops was positive and there are some areas for improvement if further workshops are planned. The workshops at least partly met expectations for the majority of respondents. However, some people felt that they did not meet their expectations at all, see Figure 6-4.

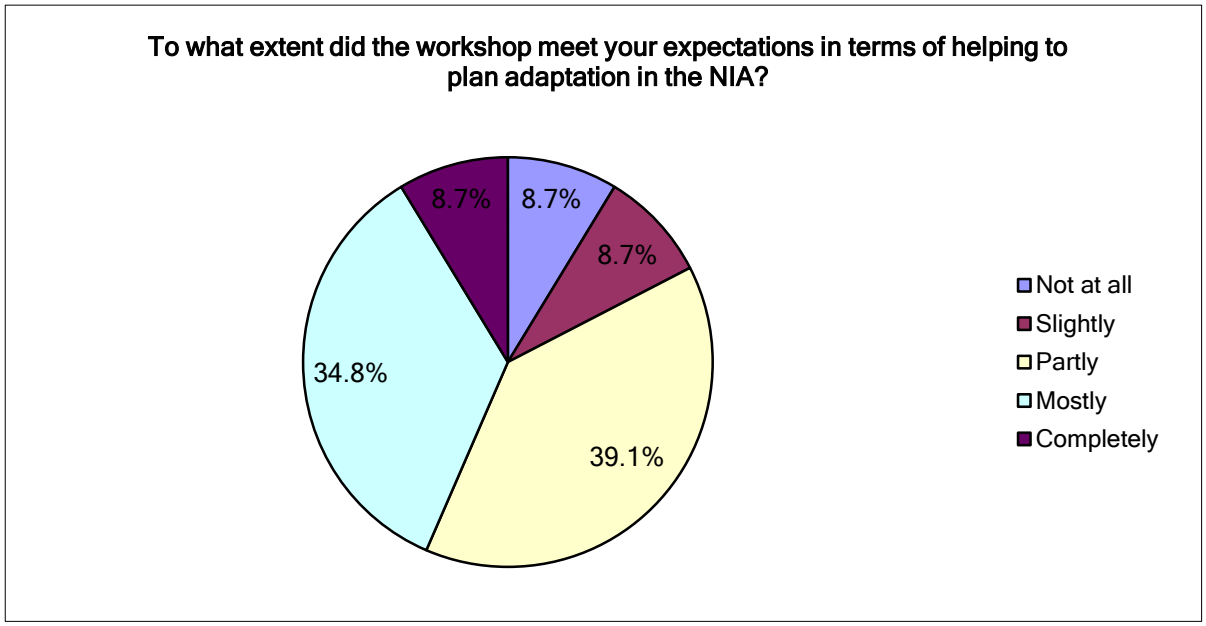
The reasons given for this mainly focus on limitations of the NBCCV model which are described in Chapter 4. Reasons given include:

> *"Poor model results for the NIA due to underlying data sets. Local knowledge gives better results."*
>
> *"Data used is old and needs to be updated."*
>
> *"Some parts of the discussion were not relevant to my work but were valid points of discussion for other parties".*

"I was the only representative from farmers and land owners and I do worry that any guideline coming from such a forum will not be balanced as to the financial consequences to land owners or farmers."

"The timing of the workshop felt to me to be late. There would have been benefit to having these workshops in the NIA application stage."

Figure 6–4 Extent to which workshop met expectations



6.3.2. Future engagement

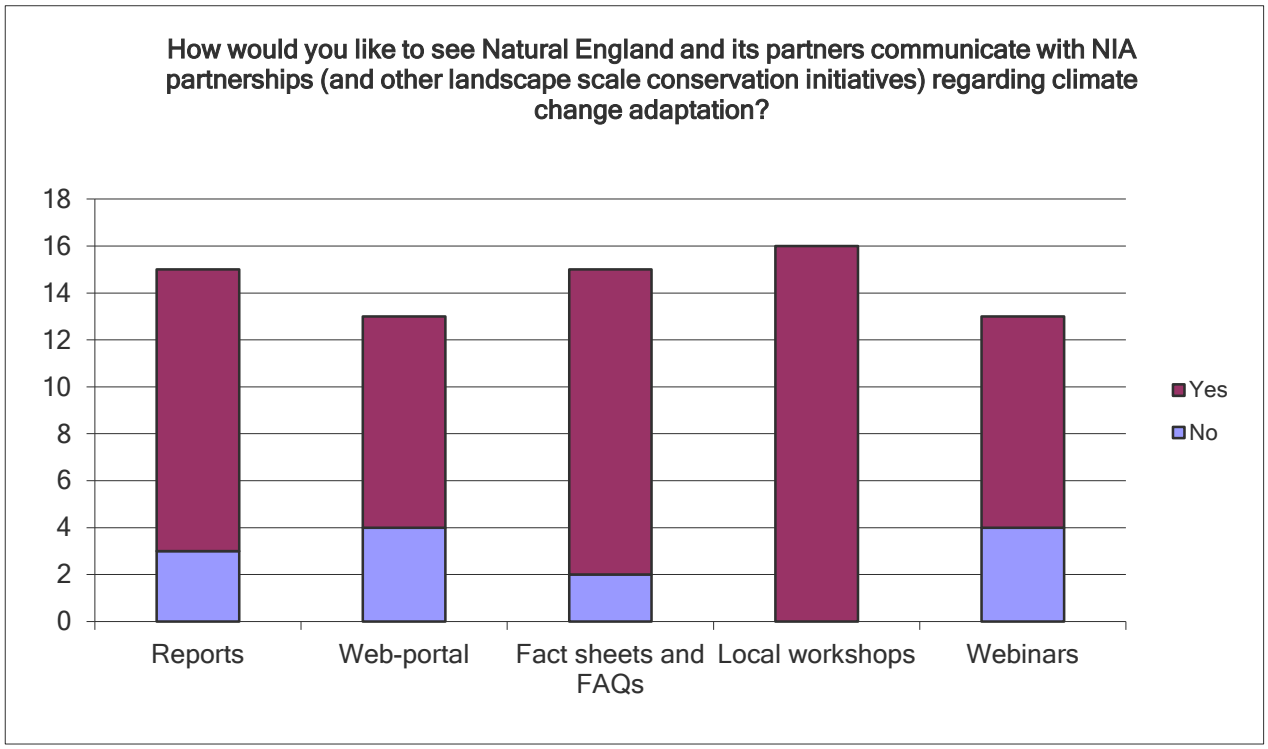
Support for local workshops was backed up through the survey results. In terms of how NIA partners would like to see adaptation support delivered, all respondents said that they would like to see local workshops, similar to those that were delivered through this project. Factsheets and FAQs sheets were also popular. Web-based communications, including web-portals and webinars, were marginally less popular. See Figure 6-5.

6.4. Who to engage with

This project focused on providing adaptation advice and support to NIA partner organisations, but there are many other parties with a role to play in delivering adaptation in the natural environment. Some of the feedback received about the workshop was that it would be useful to get other parties involved. Suggestions of who to engage on this subject were collected through the survey and included:

- Communities – it is important to increase understanding of the benefit of ecosystem services.
- Education groups and schools.
- Health and Wellbeing Boards.
- LEPs.
- The insurance industry – increase understanding of non-traditional approaches to flood risk management and the benefit of adaptation in the natural environment.
- Land managers and land agent organisations.
- Local authorities – particularly planning departments.
- Other conservation NGOs, e.g. the National Trust, Woodland Trust, CPRE.
- Large landowning organisations, e.g. Crown Estate, MoD, agri-business.

Figure 6–5 Future engagement methods



7. Lessons learnt

In the previous chapters feedback on the tools and methods presented at the workshops, as well as feedback on the workshops themselves, has been presented. This chapter collates the practical lessons learnt during the project about how to carry out engagement with NIA partnerships and similar landscape scale initiatives.

Experiences and lessons for future engagement are summarised in Table 7-1.

Table 7–1 Lessons learnt

Experience	Lesson for future engagement
A one-page project description was developed and was sent out to NIAs along with a letter inviting them to take part in the project. The one-page summary was a useful document for briefly introducing the project.	Develop a brief project description which can be used to quickly explain the project.
The majority of NIAs responded to say they would like to take part in the project but one declined the offer of a workshop due to other commitments and time pressures. However, presentations given at the workshops can be provided to this NIA alongside this project report.	Expect that some groups will turn down the offer of face-to-face engagement. Provide written documents as a means of engaging with these groups.
As this project was led by Natural England, it was appropriate to make initial contact with NIA partnerships through Natural England representatives. This is important from a communications perspective and to ensure a joined-up approach from Natural England.	Endeavour to make contact with landscape scale conservation initiatives through contacts within the organisation leading the engagement project. Ensure the local contact is briefed about the aims of the project and what it entails so they can respond to queries from other partnership members.
In some cases the Natural England NIA contact was not the best person to make workshop arrangements and it made sense for the project team to liaise with representatives from other organisations (often the NIA programme manager).	In consultation with the initial contact, identify early in the project if the NE representative is the best person to liaise with or whether it makes sense for others to be involved.
Business plans to review were requested from NIA contacts. Business plans are available on the Defra website but it was important to ask partnerships' permission to review them to avoid the impression that Natural England was judging them.	Explain the rationale for reviewing plans and ask permission from the partnership to review their plan, even if the plan is in the public domain. Include feedback on the findings of the review at the workshop.
Natural England NIA contacts were asked to find a suitable date for the workshop with their NIA partnership. Whilst it was beneficial for the request to partners to come from someone familiar within Natural England, it took quite a long time to set dates. In some cases, Natural England contacts were slow in sending a request for dates to partnership members.	Consider whether the request for workshop dates should come from the Natural England NIA contact or from the project team. Consult with Natural England contacts early in the project with suggested dates for workshops.
Workshop agendas were tailored to the requirements of each NIA in consultation with the Natural England contact or other main contact. This was critical to the success of the workshops. It is unlikely that a standard workshop agenda would have been as successful.	Take time to tailor the presentations and discussion sessions at the workshop to the needs and interests of the relevant partnership. Consider previous level of engagement on adaptation as well as other initiatives ongoing in the area to develop a bespoke agenda.
A briefing note was sent to participants before workshops to introduce them to the project, set out the project aims, and provide a guide to further information on adaptation which could be consulted before or after the events.	A briefing note is useful and sets expectations for the workshop as well as providing a resource after the event.

Experience	Lesson for future engagement
Locations for workshops were chosen by the NIA contact and were usually in one of the partner organisations' premises. This reduced costs and meant that participants were familiar with the workshop location. In a small number of cases the venue was outside the NIA area (e.g. the Northern Devon and Humberhead Levels workshops). Although this did not appear to affect the event, it meant that people may have had to travel further distances.	Aim to find workshop venues in the premises of one of the partner organisations, within the NIA boundary.
One event had to be postponed due to bad weather.	Flexibility over workshop dates is required.
Two events were arranged around pre-existing partnership meetings.	Determine early in the project the timetable for other partnership meetings and see if workshops can be arranged before, during or after these meetings.
The number of people attending workshops varied from 7 to 19 Whilst the number of participants did not affect the quality of discussions, it was useful to have a range of organisations represented, including conservation organisations, statutory bodies and local government.	Aim to invite representatives from a range of organisations with different functions and roles within the partnership.
The amount of time allowed for each workshop varied between NIA but in general 4 – 5 hours was an appropriate amount of time for workshops.	Allow at least half a day for workshops.
Data and maps from the NBCCV model were sent to workshop participants after the event for them to review prior to receiving the survey. However, some people felt that the gap between the workshop and the survey was too long.	Consider whether it is useful to send a short feedback survey about workshops directly after the event with a more detailed survey about the tool and methods at a later date.
A link to the survey was sent to workshop participants either through the Natural England contact or a member of the project team. There was little difference in terms of response rate but reminders were required.	Reminders will be required to encourage people to send out and fill in the survey.

8. Recommendations

Based on the feedback received during the workshops, survey and interviews, recommendations for Natural England and its partners have been gathered. Recommendations have been split into two categories: National Biodiversity Climate Change Vulnerability model; and further adaptation support.

8.1. National Biodiversity Climate Change Vulnerability model

The following recommendations are for Natural England to consider when developing and rolling out the final NBCCV model and software tool.

Improving the model (national scale)

- Update the permeability metric so that it looks for a sub-set of priority habitats which are permeable to the habitat in question.

- Change terminology in the 'value' metric to avoid classifying any priority habitat as 'low' value. Alter the wording to 'priority habitat':
  - Within internationally designated sites;
  - Within nationally designated sites; and
  - Not in a designated site.

- Consider including underlying data on water bodies. Consult with the Environment Agency to determine what national level datasets exist for water. Also consider updating the connectivity metric for wetland habitats so that proximity to a water source is scored positively.

- Develop a plan for updating the model. Put together a timetable of expected updates to underlying datasets and agree a process for updating the model and alerting users. Also consider if reviews/updates of the sensitivity metric are required, as knowledge of the potential impact of climate change on habitats increases.

- Include a section on 'limitations' of the model in the user guide, with particular reference to constraints associated with underlying datasets (e.g. quality of priority habitat inventories).

- Consider how to represent non-priority habitats in the model. Investigate whether there are national level datasets which provide a spatial representation of non-priority habitats or whether habitat inventories exist at a national level for urban habitats. If no datasets exist, state this in the suggested 'limitations' section of the user guide.

- Whilst it will not be possible to provide guidance for using the model for all the purposes identified through this project, it would be worth spending time looking into a small number of specific uses which have been highlighted as particularly useful by multiple participants. For example, using the fragmentation metric as an indicator of connectivity to fulfil the NIA monitoring and evaluation and estimating the cost of adaptation actions. Identify how to use the model for these purposes, including step-by-step guides, and identify any changes required.

Rolling out the model

- Consider rolling out the software tool in a pilot phase with a small number of NIAs or other landscape scale initiatives. A pilot phase would allow the software tool to be run by a small number of organisations to identify how easy it is to use local datasets, its compatibility with different GIS software packages and any other usability issues which can be resolved prior to launch. Dearne Valley Green Heart NIA volunteered to pilot the model using local data.

- Launch the model internally prior to wider launch. Target specific groups of Natural England staff who should be aware of the model and who might be able to use it in their role, e.g. HLS advisors and staff dealing with planning applications. Run internal training sessions (could be web based) to introduce staff to the model, how it works and how they could use it.

- Create a website or page on the Natural England website to host the model and provide links to relevant documentation (e.g. user guide, technical report, licences etc). This would provide a focal point for organisations wishing to access the model and could act as a means of communication with users (e.g. to let users know when updates to the model have been made). Natural England may wish to consider

asking users to register to use the model (free registration but requiring a password) which would allow user organisations to be tracked. Natural England may also wish to consider whether it would like to include an area on the website for users to leave feedback. This might depend on resource availability to check and respond to comments.

- Hold webinars to accompany the launch of the model. There could be multiple webinars aimed at different audiences, e.g. one webinar to provide an introduction to the model, its structure and how to use it and another for participants who have already been involved in the pilot phase to explain changes that have been made and to discuss usage in more detail. Webinars aimed at specific user groups may also be useful when discussing how the model could be used, e.g. conservation practitioners, local authority officers, elected members and LEPs.

- Whilst it will not be possible to provide guidance for using the model for all the purposes identified through this project, it would be worth spending time looking into a small number of specific uses which have been highlighted as particularly useful by multiple participants. For example, using the fragmentation metric as an indicator of connectivity to fulfil the NIA monitoring and evaluation and estimating the cost of adaptation actions. Identify how to use the model for these purposes, including step-by-step guides, and identify any changes required.

- Develop guidance on good practice in the use of the model with local datasets. This could include guidance on how local datasets could be incorporated as well as potential limitations. This would also provide an opportunity to request that organisations wishing to use the model provide feedback to Natural England on what they have used the model for and their experience on using it. Natural England may wish to consider including a disclaimer around local use of the model to make it clear that local uses and outputs are the responsibility of the organisation using the model and that Natural England offers no warranty.

- Review resources available within Natural England to provide ongoing support to NIAs and other initiatives wishing to use the model locally. Agree, in advance of the launch, Natural England's capacity to support organisations with limited GIS resources and how requests will be dealt with. Communicate the level of support available to potential users via the website (or other media used to support the launch). Suggest that users follow the staged process described in section 4.3 and that requests for Natural England support are made by exception.

8.2. Further adaptation support

The following recommendations are for Natural England and its partners to consider when planning further adaptation support for NIAs and other landscape scale initiatives.

Recommendations for Natural England

- Publish the NCA methodology and previous (second round of pilot) NCA vulnerability studies (including Humberhead Levels and Morecambe Bay).

- Develop short (no more than two sides of A4) briefing notes on climate change impacts and the importance of adaptation in the natural environment specifically aimed at local authority officers, elected members, developers and land owners. The notes should include practical suggestions of actions these groups can take to adapt to climate change.

- Provide adaptation advice on a habitat-by-habitat basis, focusing on practical actions, illustrated with case studies. It is understood that this is being progressed through development of the Natural England Adaptation Manual.

- Consider undertaking projects to develop guidance on specific topics identified by respondents, including:
  - Difficult adaptation issues, e.g. deciding to protect or accept species loss and translocations.
  - Adaptation of urban habitats.
  - The role of environmental stewardship schemes in adaptation.
  - Translating vulnerability into economic impact and accounting for adaptation benefits in CBA.
  - Monitoring and evaluating adaptation in the natural environment.

- Review how urban and other non-traditional habitats are viewed and consider specific needs of non-traditional habitats in future guidance (not limited to climate change adaptation).

- Develop a note for NIAs on potential funding sources for adaptation actions post-2015 (and more generally).

- Consider undertaking the following when rolling-out the Natural England Adaptation Manual:
  - Brief Natural England staff (and staff from other organisations in the Defra family) about the content and purpose of the Adaptation Manual prior to any external launch. A briefing could be delivered through webinars and/or a short frequently asked questions style note distributed to advisors and local staff via email. Team Leaders could be asked to make their teams aware of the Manual at team meetings.
  - Launch the Adaptation Manual at a face-to-face meeting (suggest a half day in London) where contributors and users are brought together to hear how the Manual has been developed, the content of the Manual and suggested uses of the information. Stream the event on the internet to encourage wider participation.
  - Run regional launch events or a launch road-show to support the main launch event.
  - Set up a feedback area on the Adaptation Manual website so practitioners can comment on how they have used the manual and what else they would like to see (this would assist in the ongoing development of the manual and would help to ensure it is relevant to practitioners). This will require resources to review and potentially respond to feedback.
  - Provide a Natural England contact for each section of the Adaptation Manual so practitioners can get in touch with the relevant specialists (depending on resource availability).
  - Publicise the manual using existing communication channels of the other Defra family organisations, e.g. Climate Ready email newsletters.
  - Develop an Adaptation Manual app which could be used by advisors when speaking to landowners.
  - Publicise the Adaptation Manual at practitioner events such as NIA Forums, Catchment Pilot Learning Events and through publications likely to be read by practitioners e.g. British Wildlife.
  - Secure ongoing resource and clarify responsibility within Natural England for updating the manual so it remains current and relevant to practitioners.

Cross-cutting recommendations for Defra family

- Review existing models and tools for identifying vulnerability and prioritising adaptation actions and provide a high level summary setting out intended uses (potentially including case studies), ability to use with local datasets and GIS software requirements.

- Delivery of climate change adaptation information through local workshops was strongly supported although there was a feeling that wider audiences should be targeted. Consider running similar local events focusing on understanding vulnerability and identifying adaptation actions for other landscape scale conservation initiatives and other groups, particularly LEPs, Health and Wellbeing Boards, land owners and representatives, developers, local authority officers and elected members. To ensure maximum impact, ensure workshop agendas are tailored to local requirements and adaptation issues. This is important in terms of building capacity and delivering adaptation action.

- Review how conservation designations are set and monitored. Consider a more flexible, outcome driven approach to delivery of outcomes. Also consider whether policy is required to cover difficult adaptation issues, e.g. deciding to protect or accept species loss and translocations.

- Given the feedback received during this project, it is suggested that the audiences listed above are introduced to the NCA vulnerability assessment method and that this tool is used to structure conversations through facilitated workshops.

- Provide succinct quarterly briefings to NIA partnerships (and other groups) which summarise recent publications, tools, methods and advances in knowledge about climate change projections and adaptation. This would go some way to help overcome the issue of partnerships not being aware of much of the adaptation work that is being done by Defra family organisations and others. This could be led by Climate Ready.

- Develop training modules on climate change adaptation for Defra family staff. Training could be web-based and should focus on the importance of mainstreaming adaptation into other activities and introducing staff to tools and methods which might be useful to them.

- Coordinate Defra family organisations to develop a position and strategic leadership on biodiversity offsetting and the potential benefits for adaptation.

Appendix A. Business plan review pro forma

A.1. Blank pro forma

NIA name		
NIA partners		
Brief description of NIA aims and focus (e.g. biodiversity, networks, access, planning etc)		
Does adaptation appear to be a main goal?		
Identification of climate change impacts		
Have potential impacts of climate change / vulnerability of the NIA to climate change been assessed? If yes, how?		
Have any specific tools or data sets been used to identify the impacts of climate change?	E.g. UKCP09 output, UKCIP tools, NE tools, RSPB vulnerability assessment etc.	
Have any other sources of information or guidance been used to identify impacts?	E.g. expertise within the NIA, expertise from outside the NIA, published material	
If an assessment has been done, what impacts have been identified?	Increased soil moisture deficits and drying	
	Coastal evolution impacts.	
	Increased risks from pests	
	Increased risks from diseases	
	Species unable to track changing climate space	
	Climate mitigation measures (positive/negative)	
	Major coastal flood/reconfiguration	
	Changes in soil organic carbon	
	Changes in species migration patterns	
	Increased water temperature and stratification of water bodies	
	Generalists favoured over specialists (e.g. ruderal spp.)	
	Increased risk of wildfire	
	Increased water pollution risk and eutrophication	
	Impacts of low flows	
	Flooding	
	Increased societal water demand	
	Major drought events	
Have impacts / vulnerabilities been prioritised in any way? If so, how?		
Adaptation		
Does the plan set out actions to adapt to specific impacts / vulnerabilities? If yes, what?	E.g. maintaining existing populations, increasing connectivity, enabling new species to become established, actively changing ecosystems	

Does the plan specify conservation measures which contribute to adaptation in the following ways (based on Smithers et al., 2008)?	Conserving existing biodiversity, protected areas and all other high quality habitats	
	Reducing sources of harm not linked to climate	
	Conserving the range and ecological variability of habitats and species	
	Maintaining / establishing existing ecological networks	
	Creating buffer zones around high quality habitats	
	Taking action to control spread of invasive species	
	Accommodate change	
	Making space for the natural development of rivers and coasts	
	Translocation and ex-situ conservation	
	Discussion / notes on use of adaptation Principles in plan	
Are there any apparent gaps in terms of adaptation?		
Links to other initiatives		
Does the NIA business plan make links to other projects or initiatives focused on adaptation? If so, what?		
Does the plan make links to planning policy in relation to adaptation?	E.g. biodiversity offsets, greenspace strategies	
Additional information		
Does the plan specify monitoring which will be used to review future plans and update actions?		
Is there any evidence that impacts have been identified and/or adaptation has been planned spatially?		
Are there synergies with climate change mitigation?		
Summary		

A.2. Birmingham and Black Country

NIA name	Birmingham and the Black Country	
NIA partners	Wildlife Trust for Birmingham and the Black Country Birmingham City Council, Dudley Council, Sandwell Council, Walsall Council and Wolverhampton City Council Black Country Consortium British Waterways Natural England, Environment Agency, Forestry Commission English Heritage RSPB, Woodland Trust West Midlands Sustainability Forum, Birmingham FoE Black Country Geological Society CLA and NFU Ackers Trust and Wildside Centre Wolverhampton and Birmingham Universities	
Brief description of NIA aims and focus (e.g. biodiversity, networks, access, planning etc)	Strong socio-economic and urban conservation focus - role of natural environment in urban regeneration, ecosystem services and green infrastructure. Focus on the benefits of biodiversity and the wider natural environment to people. The plan gives considerable consideration to geodiversity as well as biodiversity. Objectives focus on biodiversity and are based around the Lawton Principles of bigger, better, more and joined.	
Does adaptation appear to be a main goal?	Adaptation does not appear to be a main goal but the contribution of well functioning biodiversity, green infrastructure and ecosystem services to adaptation is recognised.	
Identification of climate change impacts		
Have potential impacts of climate change / vulnerability of the NIA to climate change been assessed? If yes, how?	It doesn't appear that a climate change impact / vulnerability assessment has been carried out. The plan does reference climate change as a pressure facing the NIA but does not go into detail about specific impacts.	
Have any specific tools or data sets been used to identify the impacts of climate change? E.g. UKCP09 output, UKCIP tools, NE tools, RSPB vulnerability assessment etc.	None evident	
Have any other sources of information or guidance been used to identify impacts? E.g. expertise within the NIA, expertise from outside the NIA, published material	None evident	
If an assessment has been done, what impacts have been identified?	Increased soil moisture deficits and drying	
	Coastal evolution impacts.	
	Increased risks from pests	
	Increased risks from diseases	
	Species unable to track changing climate space	
	Climate mitigation measures (positive/negative)	

NIA name	Birmingham and the Black Country	
	Major coastal flood/reconfiguration	
	Changes in soil organic carbon	
	Changes in species migration patterns	
	Increased water temperature and stratification of water bodies	
	Generalists favoured over specialists (e.g. ruderal spp.)	
	Increased risk of wildfire	
	Increased water pollution risk and eutrophication	
	Impacts of low flows	
	Increased societal water demand	
	Major drought events	
Have impacts / vulnerabilities been prioritised in any way? If so, how?	No prioritisation evident.	
Adaptation		
Does the plan set out actions to adapt to specific impacts / vulnerabilities? If yes, what? E.g. maintaining existing populations, increasing connectivity, enabling new species to become established, actively changing ecosystems	There are no *specific* goals in relation to reducing vulnerability or adapting to climate change but goals to improve green infrastructure and ecosystem services are recognised as having adaptation benefits. Adaptation is one of multiple benefits that the objectives of the plan are designed to deliver.	
Does the plan specify conservation measures which contribute to adaptation in the following ways (based on Smithers et al., 2008)?	Conserving existing biodiversity, protected areas and all other high quality habitats	Re-introduction of grazing on grasslands. Restore existing heathland sites. Improve quality of watercourses. Local scale improvements to benefit priority species, e.g. hibernacula for amphibians, nest boxes for bats and birds and creation of new ponds. Projects to increase semi-natural and priority habitat within existing wildlife sites.
	Reducing sources of harm not linked to climate	
	Conserving the range and ecological variability of habitats and species	Management of woodland structure and ground flora enhancement of young woodland plantations.
	Maintaining / establishing existing ecological networks	Habitat corridors e.g. grassland and heathland. Promote wildlife gardening. Wetland habitat creation along the waterways network. Management of stepping stone sites which increase permeability for metapopulations of mobile species (grassland, heathland).

NIA name	Birmingham and the Black Country	
	Creating buffer zones around high quality habitats	Habitat restoration on former heathland and brownfield sites. Wetland creation on amenity or semi-improved grassland. Expansion of native woodland to buffer & expand existing semi natural habitats. Restoration of unmanaged semi-natural grasslands within core grassland areas.
	Taking action to control spread of invasive species	Targeted control of invasive species.
	Accommodate change	
	Making space for the natural development of rivers and coasts	
	Translocation and ex-situ conservation	
	Discussion / notes on use of adaptation Principles in plan Objectives and actions do not appear to be driven by adaptation principles but as can be seen from above, there is scope for the identified actions to contribute to adaptation. There is clear use of the Lawton Principles in development of NIA objectives i.e. bigger, better, more, joined – but also a focus on people.	
Are there any apparent gaps in terms of adaptation?	It doesn't appear that the impact of climate change on the NIA or its objectives has been considered in detail. It might be useful to consider how impacts could affect delivery of objectives and identify adaptation actions. Could consider making room for the development of rivers – potentially a lot of constrained urban channels in the NIA area, could also offer benefits in terms of economic regeneration and ecosystem services.	
Links to other initiatives		
Does the NIA business plan make links to other projects or initiatives focused on adaptation? If so, what?	Not all specifically adaptation initiatives but most of the linked projects consider adaptation to some extent: Black Country Living Landscape Black Country Urban Park Tame Catchment Pilot Keen to work with Nene Valley NIA.	
Does the plan make links to planning policy in relation to adaptation? E.g. biodiversity offsets, greenspace strategies	Yes, explicit link made to Black Country Core Strategy and Birmingham Core Strategy.	
Additional information		
Does the plan specify monitoring which will be used to review future plans and update actions?	Not explicitly.	
Is there any evidence that impacts have been identified and/or adaptation has been planned spatially?	Delivery of NIA aims has been considered spatially – habitat types have been mapped and actions identified. Geographic areas where delivery will be focused have been mapped – together the delivery themes cover the whole NIA. However, there is no evidence that the impact of climate change or necessary adaptation actions have been planned spatially.	
Are there synergies with climate change mitigation?	The plan notes the contribution of green infrastructure and ecosystem services to mitigation.	

NIA name	Birmingham and the Black Country
Summary	
The Birmingham and Black Country NIA is a large urban area including a number of significant settlements. The focus of the business plan is on the socio-economic benefits that can be realised from improving biodiversity and ecosystem services. The plan recognises the contribution of biodiversity and the wider natural environment to ecosystem services, urban and economic regeneration and adaptation to the impacts of climate change. Whilst socio-economic benefits are at the heart of the plan, actions focus on biodiversity and are split into spatially identified delivery areas. The plan does not appear to have been informed by a detailed climate change impact assessment but it recognises climate change as one of a range of pressures faced by the area. Whilst not driven by adaptation principles, many of the proposed actions should contribute to adaptation and the plan explicitly recognises the contribution of well functioning ecosystem services to adaptation.	

A.3. Dark Peak

NIA name	Dark Peak	
NIA partners	RSPB, National Trust, Peak District National Park Authority, United Utilities, British Mountaineering Council, Sheffield City Council, Sheffield Wildlife Trust, Moors for the Future and Natural England	
Brief description of NIA aims and focus (e.g. biodiversity, networks, access, planning etc)	The plan focuses on improving and buffering upland habitats to improve biodiversity and deliver ecosystem services such as carbon sequestration, water resources and access. The plan aims to deliver its objectives though habitat creation, restoration and connection and targeted advice to land owners.	
Does adaptation appear to be a main goal?	Improving the resilience of habitats to the impacts of climate change through connectivity and buffering core areas is a goal for the NIA. There seems to be a degree of acceptance of change in the NIA – southern species are expected to arrive.	
Identification of climate change impacts		
Have potential impacts of climate change / vulnerability of the NIA to climate change been assessed? If yes, how?	The plan recognises a number of high level climate change impacts but does not appear to have been informed by a detailed impact or vulnerability assessment.	
Have any specific tools or data sets been used to identify the impacts of climate change? E.g. UKCP09 output, UKCIP tools, NE tools, RSPB vulnerability assessment etc.	None evident	
Have any other sources of information or guidance been used to identify impacts? E.g. expertise within the NIA, expertise from outside the NIA, published material	United Utilities / RSPB Sustainable Catchment Management Programme.	
If an assessment has been done, what impacts have been identified?	Increased soil moisture deficits and drying	Drying of peat soils
	Coastal evolution impacts.	
	Increased risks from pests	
	Increased risks from diseases	
	Species unable to track changing climate space	Range shift may increase ‘southern’ species presence in the NIA and reduce ‘northern’ species’ presence.
	Climate mitigation measures (positive/negative)	
	Major coastal flood/reconfiguration	
	Changes in soil organic carbon	Erosion of the blanket bog means that it is currently an exporter rather than sequester of carbon.
	Changes in species migration patterns	
	Increased water temperature and stratification of water bodies	
	Generalists favoured over specialists (e.g. ruderal spp.)	
	Increased risk of wildfire	

NIA name	Dark Peak	
	Increased water pollution risk and eutrophication	
	Impacts of low flows	
	Increased societal water demand	
	Major drought events	
Have impacts / vulnerabilities been prioritised in any way? If so, how?	No evidence of prioritisation.	
Adaptation		
Does the plan set out actions to adapt to specific impacts / vulnerabilities? If yes, what? E.g. maintaining existing populations, increasing connectivity, enabling new species to become established, actively changing ecosystems	The plan does not set our specific adaptation actions in response to identified impacts but improving resilience is a stated objective. The plan also recognises the contribution of biodiversity actions and improving connectivity to resilience and adaptation, particularly facilitating the movement of southern species northward.	
Does the plan specify conservation measures which contribute to adaptation in the following ways (based on Smithers et al., 2008)?	Conserving existing biodiversity, protected areas and all other high quality habitats	SPA, SAC, SSSI will be focus of core area and habitat improvement measures. Blanket bog enhancement Improvement of wet and dry heathland habitat Habitat creation on site of felled conifers Moorland planting
	Reducing sources of harm not linked to climate	Visitor payback scheme
	Conserving the range and ecological variability of habitats and species	Cattle grazing on heathland Rotational heather cutting programme to enhance structural and species diversity
	Maintaining / establishing existing ecological networks	Deciduous woodland as ecological corridors and stepping stones between existing wildlife site, moorland and the farmland. 210ha of sessile oak will be planted as corridors and 62ha of resorted hay meadow and species rich pasture will decrease fragmentation. Habitat mosaics formed of successional scrub, woodland and heathland.
	Creating buffer zones around high quality habitats	Restoration and creation of heathland, blanket bog and unimproved grassland, especially around the edge of blanket bog. Valley side woodlands to buffer water flows Create succession scrubland on moorland edge
	Taking action to control spread of invasive species	
	Accommodate change	The plan accepts that southern species will move northwards. The plan aims to facilitate this by improving habitats.
	Making space for the natural development of rivers and coasts	Valley side woodlands to buffer water flows, reducing flooding downstream

NIA name	Dark Peak	
	Translocation and ex-situ conservation	
	Discussion / notes on use of adaptation Principles in plan It does not appear that the EBS principles have informed the development of the plan. However, the plan makes explicit reference to the NIA principles, including adaptation.	
Are there any apparent gaps in terms of adaptation?	Whilst not explicitly driven by the EBS Principles, the Dark Peak business plan contains many actions which should deliver adaptation benefits – there are fewer gaps in coverage of the Principles than for many other plans.	
Links to other initiatives		
Does the NIA business plan make links to other projects or initiatives focused on adaptation? If so, what?	Yes – the following projects/partnerships include a consideration of adaptation, although are not specifically driven by it. The Sheffield Moors Partnership – PDNPA, NE, Sheffield City Council, SWT, NT and RSPB working on 56 six square kilometres of public land on the edge of Sheffield The UU/RSPB Partnership – working to deliver benefits for people, water and wildlife on the 8,000 hectare UU Southern Estate The PDNPA/NT/RSPB Eastern Moors Partnership (with support from BMC) – working to create a model example of how uplands of the future can be managed for people and wildlife on the 2,700 hectare PDNPA Eastern Moors Estate.	
Does the plan make links to planning policy in relation to adaptation? E.g. biodiversity offsets, greenspace strategies	Yes – Sheffield City Council are on the NIA partnership. Specifically, the NIA will deliver the Sheffield Moors Master Plan - NIA partners to fund a Project Officer to develop a habitat, landscape and access master plan for the 56km² Sheffield Moors area.	
Additional information		
Does the plan specify monitoring which will be used to review future plans and update actions?	Monitoring is planned in considerable detail but it is not clear if this will be used to refine future plans. Reference is made to NIA M+E project.	
Is there any evidence that impacts have been identified and/or adaptation has been planned spatially?	There are maps which represent the proposed habitat and access restoration projects spatially (although not specifically related to climate change adaptation, these actions are likely to have adaptation benefits).	
Are there synergies with climate change mitigation?	Yes – plan recognises contributions to carbon sequestration peat soils.	
Summary		
Dark Peak is an area of moorland, woodland and blanket bog surrounded by farmland and urban conurbations. The plan aims to improve and buffer high quality habitats, resulting in biodiversity improvements as well as delivery of ecosystem services such as carbon sequestration, water resources and access. The plan aims to deliver its objectives though habitat creation, restoration and connection and targeted advice to land owners. The plan recognises the impacts of climate change on ‘northern’ habitats and species. Whilst actions are not designed specifically to address adaptation requirements, their contribution to a more resilient landscape which can adapt to the impacts of climate change is noted. The core area and buffering approach is intended to increase the resilience of priority species and habitats to climate change. However, there also appears to be an acceptance of change within the landscape - the contribution of well managed habitats to adaptation is recognised in terms of allowing ‘southern’ species to move northwards. Adaptation		

NIA name	Dark Peak
appears to be a significant driver for the plan and the adaption benefits of planned outcomes are recognised. The plan also recognises the benefits it will have in terms of mitigation through carbon sequestration in peat soils.	

A.4. Dearne Valley Green Heart

NIA name	Dearne Valley Green Heart NIA	
NIA partners	Natural England, RSPB, Environment Agency, Garganey Trust Local Authorities of Barnsley and Rotherham, Forestry Commission, Groundwork Dearne Valley, Dearne Valley EcoVision	
Brief description of NIA aims and focus (e.g. biodiversity, networks, access, planning etc)	The aim of the plan is to regenerate a post-industrial area into a landscape which is rich in biodiversity. There is a strong focus on reconnecting local people with the landscape and realising socio-economic benefits and reducing deprivation through enhancement of ecosystem services. The plan is strongly linked to the local planning system.	
Does adaptation appear to be a main goal?	Adaptation does not seem to be a major driver or focus of the plan although many of the proposed actions will deliver adaptation benefits (particularly through improved ecosystem services). There is generally a greater focus on mitigation benefits of the plan rather than adaptation.	
Identification of climate change impacts		
Have potential impacts of climate change / vulnerability of the NIA to climate change been assessed? If yes, how?	No evidence of an impact assessment. Little mention of potential impacts of climate change, even at a high level. Sensitivity to flooding is noted – the area experienced flooding in 2007 – although the impact of climate change on flood risk is not considered explicitly.	
Have any specific tools or data sets been used to identify the impacts of climate change? E.g. UKCP09 output, UKCIP tools, NE tools, RSPB vulnerability assessment etc.	None evident	
Have any other sources of information or guidance been used to identify impacts? E.g. expertise within the NIA, expertise from outside the NIA, published material	None evident	
If an assessment has been done, what impacts have been identified?	Increased soil moisture deficits and drying	
	Coastal evolution impacts.	
	Increased risks from pests	
	Increased risks from diseases	
	Species unable to track changing climate space	
	Climate mitigation measures (positive/negative)	
	Major coastal flood/reconfiguration	
	Changes in soil organic carbon	
	Changes in species migration patterns	
	Increased water temperature and stratification of water bodies	
	Generalists favoured over specialists (e.g. ruderal spp.)	
	Increased risk of wildfire	
	Increased water pollution risk and eutrophication	

NIA name	Dearne Valley Green Heart NIA	
	Impacts of low flows	
	Increased societal water demand	
	Major drought events	
Have impacts / vulnerabilities been prioritised in any way? If so, how?	No evidence of prioritisation.	
Adaptation		
Does the plan set out actions to adapt to specific impacts / vulnerabilities? If yes, what? E.g. maintaining existing populations, increasing connectivity, enabling new species to become established, actively changing ecosystems	The plan does not set out actions to adapt to *specific* impacts, neither are the actions explicitly driven by the need to adapt. However, many of the actions can be mapped against the EBS adaptation principles (see below) and are therefore likely to contribute to adaptation. The plan recognises the benefits of habitat restoration and creation for ecosystem services, particularly managing flood risk, which will contribute to adaptation.	
Does the plan specify conservation measures which contribute to adaptation in the following ways (based on Smithers et al., 2008)?	Conserving existing biodiversity, protected areas and all other high quality habitats	Create and restore floodplain habitat and deliver flood storage schemes. Restore woodland and farmland habitats through advisory work and Environmental Stewardship. Establish a core of 1300ha of reedbed, fen, wet grassland, wet woodland and woodland. Measures for eels, otters and water voles.
	Reducing sources of harm not linked to climate	Establish a Dearne Valley Farm and Land Management Advisory Service
	Conserving the range and ecological variability of habitats and species	
	Maintaining / establishing existing ecological networks	Develop an Integrated Habitat Network (IHN) - Dearne Valley Ecological Network modelling with Forest Research to define the area of habitats targeted as part of the ecological network.
	Creating buffer zones around high quality habitats	NIA split into core, buffer, restoration and corridor areas. Buffer area of 2690ha - mix of farmland, amenity grasslands, parklands, and reclaimed industrial areas. Stepping stones along the river corridors and in the magnesium limestone areas.
	Taking action to control spread of invasive species	
	Accommodate change	
	Making space for the natural development of rivers and coasts	Restore the ecological functionality of the river and its floodplain. Flood management techniques linked to habitat creation.
	Translocation and ex-situ conservation	
	Discussion / notes on use of adaptation Principles in plan	

NIA name	Dearne Valley Green Heart NIA
Are there any apparent gaps in terms of adaptation?	The plan does not appear to have considered how the impacts of climate change might affect the ability to deliver outcomes. It may be useful to consider how climate change might have an impact on what the plan sets out to do and identify adaptation actions.
Links to other initiatives	
Does the NIA business plan make links to other projects or initiatives focused on adaptation? If so, what?	Yes, links are made to other initiatives that consider climate change (but are not focused on it): Don WFD pilot South Yorkshire LNP
Does the plan make links to planning policy in relation to adaptation? E.g. biodiversity offsets, greenspace strategies	Yes, the plan is strongly linked to local planning. One of the aims is to embed the NIA principles in Local Planning Policy. The NIA partnership includes local planning authorities and the Dearne Valley Ecovision Partnership and has a planning policy working groups with local authorities. Barnsley Council has undertaken to consider the Dearne Valley NIA in all planning applications. The NIA is linked to the Barnsley biodiversity offsetting group – the council will use biodiversity offsetting principles in employment zone planning.
Additional information	
Does the plan specify monitoring which will be used to review future plans and update actions?	The plan sets out a detailed monitoring plan to compare measures to a baseline.
Is there any evidence that impacts have been identified and/or adaptation has been planned spatially?	Whilst the plan has not explicitly considered impacts or adaptation spatially, there is a strong spatial element to development of the plan. The plan's objectives and identification of actions has been based on mapping of ecoscapes and multi-functional landscape analysis. This has been used to identify the core area with greatest connectivity and develop a vision to enhance and strengthen these areas. Areas with least functionality have also been identified and prioritised for intervention and Environmental Stewardship. One of the actions is to develop an Integrated Habitat Network (IHN) to further refine where conservation effort could be undertaken to reduce the deleterious effects of habitat fragmentation and enhance existing habitats. This is based on focal species models and is a spatial approach to managing the NIA.
Are there synergies with climate change mitigation?	Yes, the plan recognises the contribution it can make to mitigation. There is an ambition for the plan to contribute to low carbon communities through promoting sustainable transport, carbon sequestration and raising awareness of low carbon living. Contribution to mitigation will be monitored.
Summary	
The Dearne Valley NIA aims to restore the biodiversity of a post-industrial landscape as well as encourage people to re-connect with the local environment. There is a strong focus on the value of biodiversity and ecosystem services in regeneration and improving socio-economic conditions in the area. As such, the plan is closely linked to the local planning system. The plan does not appear to be informed by a consideration of the potential impacts of climate change. There is little evidence that impacts have been considered, even at a high level. However, many of the proposed actions are likely to contribute to adaptation and improving the resilience of the natural environment to the impacts of climate change. There are also likely to be benefits for ecosystem services, e.g. habitat restoration and creation may reduce flood risk. The plan focuses more on mitigation than adaptation and recognises some of the benefits the NIA can offer in terms of reducing carbon emissions and moving towards low carbon lifestyles.	

A.5. Greater Thames Marshes

NIA name	Greater Thames Marshes	
NIA partners	Thames Estuary Partnership, Medway Council, Thames Gateway South Essex Partnership (TGSEP), Greening the Gateway Kent Medway (GGKM), RSPB, London Borough of Havering (LBH), Environment Agency and Natural England.	
Brief description of NIA aims and focus (e.g. biodiversity, networks, access, planning etc)	High level aims are: More wildlife More public understanding and enjoyment of the environment Greater resilience by the natural world to the changes brought about by climate change and development. Focus is on working with the planning system to achieve urban regeneration and green infrastructure benefits through improving biodiversity.	
Does adaptation appear to be a main goal?	Understanding vulnerability and improving resilience to climate change does seem to be a main goal of the plan (although it is considered alongside other pressures).	
Identification of climate change impacts		
Have potential impacts of climate change / vulnerability of the NIA to climate change been assessed? If yes, how?	Reference is made to Natural England's South East Biodiversity Climate Change Vulnerability Assessment (2011) which identifies the Greater Thames Marshes as one of the most vulnerable areas in the region to the impacts of climate change. Can't see evidence of a specific climate change impact / vulnerability assessment for the NIA. Some high level impacts of climate change have been identified (coastal squeeze and drying out of freshwater wetlands).	
Have any specific tools or data sets been used to identify the impacts of climate change? E.g. UKCP09 output, UKCIP tools, NE tools, RSPB vulnerability assessment etc.	Natural England vulnerability mapping has been used at a high level to justify choice of Greater Thames Marshes for consideration as an NIA. TE2100 study – sea level rise and planned habitat replacement.	
Have any other sources of information or guidance been used to identify impacts? E.g. expertise within the NIA, expertise from outside the NIA, published material	None evident.	
If an assessment has been done, what impacts have been identified?	Increased soil moisture deficits and drying	
	Coastal evolution impacts	Sea level rise will squeeze intertidal habitat area and lead to further loss or degradation
	Increased risks from pests	
	Increased risks from diseases	
	Species unable to track changing climate space	
	Climate mitigation measures (positive/negative)	
	Major coastal flood/reconfiguration	
	Changes in soil organic carbon	
	Changes in species migration patterns	

NIA name	Greater Thames Marshes	
	Increased water temperature and stratification of water bodies	
	Generalists favoured over specialists (e.g. ruderal spp.)	
	Increased risk of wildfire	
	Increased water pollution risk and eutrophication	
	Impacts of low flows	Maintaining water levels in freshwater wetlands
	Increased societal water demand	
	Major drought events	
Have impacts / vulnerabilities been prioritised in any way? If so, how?	Can't see any evidence of prioritisation of impacts.	
Adaptation		
Does the plan set out actions to adapt to specific impacts / vulnerabilities? If yes, what? E.g. maintaining existing populations, increasing connectivity, enabling new species to become established, actively changing ecosystems	Goals / objectives have not been set in relation to *specific* climate change impacts. However, responding to the impacts of climate change and other pressures is a driver for developing objectives. Objectives are designed to address all pressures.	
Does the plan specify conservation measures which contribute to adaptation in the following ways (based on Smithers et al., 2008)?	Conserving existing biodiversity, protected areas and all other high quality habitats	Habitat improvement projects focus on invertebrates and breeding waders. Extend bird disturbance project to understand why trend in winter bird numbers is declining. Habitat creation, improvement and management projects.
	Reducing sources of harm not linked to climate	Task to identify and map pressures on the NIA (not just CC). Engagement with 5 development areas. Biodiversity offsetting. Programme of advice to farmers – NIA Farm Conservation Advisor
	Conserving the range and ecological variability of habitats and species	Higham Marsh wetland scheme – mix of new habitats, hydrological regimes
	Maintaining / establishing existing ecological networks	Linking core habitats for threatened red data book species. Connect areas where there is active biodiversity management.
	Creating buffer zones around high quality habitats	Plans for delivery of buffer zones post 2015
	Taking action to control spread of invasive species	
	Accommodate change	
	Making space for the natural development of rivers and coasts	
	Translocation and ex-situ conservation	

NIA name	Greater Thames Marshes
	Discussion / notes on use of adaptation Principles in plan The above actions are not specifically designed to address climate change vulnerability but address multiple pressures – however, many of the actions are likely to contribute to adaptation and can be classified under the Principles. There is evidence that the findings of the Lawton review have driven development of the plan – bigger, better, more joined up. Evidence based decisions – initial task to collate existing datasets into a GIS mapping system which will be used to support decision making and prioritisation of opportunities and future initiatives.
Are there any apparent gaps in terms of adaptation?	Given the estuarine nature of the area, consideration could have been given to the adaptation principle '*make space for the natural development of rivers and coasts'*.
Links to other initiatives	
Does the NIA business plan make links to other projects or initiatives focused on adaptation? If so, what?	Reference to Natural England's South East Biodiversity Climate Change Vulnerability Assessment (2011). Links to other initiatives (not necessarily primarily adaptation driven but most consider it at some level): RSPB Futurescapes
Does the plan make links to planning policy in relation to adaptation? E.g. biodiversity offsets, greenspace strategies	Yes, links with the following planning initiatives: Essex County Council Biodiversity Offsetting Pilot Medway and Swale SMP Greening the Gateway Piloting the use of biodiversity offsetting is one of the objectives of the plan. The plan envisages that the area will be known for innovation in biodiversity offsetting.
Additional information	
Does the plan specify monitoring which will be used to review future plans and update actions?	Monitoring and evaluation for each objective is specified. There is also a specific objective regarding the NIA legacy and post-2015 investment. Biodiversity offsetting is recognised as an innovative approach which will be monitored and lessons learnt used to inform future projects.
Is there any evidence that impacts have been identified and/or adaptation has been planned spatially?	Natural England vulnerability mapping has been used at a high level to justify choice of Greater Thames Marshes for consideration as an NIA. Mapping of pressures and opportunities is one of the first proposed tasks for the NIA and the intention is to develop prioritised responses based on this spatial analysis.
Are there synergies with climate change mitigation?	Not explicitly identified.
Summary	
The Greater Thames Marshes NIA is a marshland and estuary landscape facing pressures from development, urban regeneration and climate change. The focus of the plan appears to be reducing the vulnerability of the area to these multiple pressures. The objectives of the plan follow the recommendations of the Lawton review, i.e. making nature bigger, better and more joined up. There seems to be an emphasis on actions to improve biodiversity through linking with the planning system (particularly biodiversity offsetting) and agriculture. Whilst the plan does not appear to have been informed by a detailed climate change impact assessment, it recognises the vulnerability of the area to the impacts of climate change in the geographical context of the	

NIA name	Greater Thames Marshes
south east. Adaptation to climate change is considered intrinsically in the objectives and actions although it is recognised as just one of the pressures facing the area. Whilst not explicitly driven by adaptation principles, many of the proposed actions should contribute to adaptation, particularly conserving, extending and connecting areas of current biodiversity value. Future actions will be evidence led: one of the main initiatives is to map pressures and opportunities and use this to prioritise future activities.	

A.6. Humberhead Levels

NIA name	Humberhead Levels	
NIA partners	Humberhead levels Partnership which includes: Yorkshire/Lincolnshire/Nottinghamshire Wildlife Trusts RSPB Burnet Trust Thorne and Hatfield Moors conservation forum Coop Farms Ltd Sandtoft Tiles Ltd Polybell Organic Farms Ltd Environment Agency Forestry Commission Natural England Ouse and Humber Drainage Board Isle of Axholme and North Notts Water Level Man Board Shire Group Internal Drainage Board Friends of Oakhill North Lincs/ Doncaster MB/ East Rising of Yorks Council	
Brief description of NIA aims and focus (e.g. biodiversity, networks, access, planning etc)	Focus is wetlands and water – aims to create an internationally renowned, unique wetland landscape by developing connectivity via rivers and drains. Delivery is focused on working with agricultural land owners to deliver biodiversity and ecosystem service benefits (water quantity and quality, flood management, food provisioning, carbon sequestration, recreation and enjoyment).	
Does adaptation appear to be a main goal?	Yes – it is one of the Humberhead Levels Partnership's goals. The plan is focused on both mitigation and adaptation. The plan is based around integrated land use to make the area more resilient to the impacts of climate change (particularly sea level rise). Carbon sequestration in newly formed and restored peat and wetland soils is a major part of the plan.	
Identification of climate change impacts		
Have potential impacts of climate change / vulnerability of the NIA to climate change been assessed? If yes, how?	Impacts of climate change are highlighted although it is unclear how these have been identified.	
Have any specific tools or data sets been used to identify the impacts of climate change? E.g. UKCP09 output, UKCIP tools, NE tools, RSPB vulnerability assessment etc.	None evident although the area was one of Natural England's Character Area Climate Change Project pilot NCAs - *Responding to the Impacts of Climate Change in the Natural Environment: Humberhead Levels* (draft report 2010).	
Have any other sources of information or guidance been used to identify impacts? E.g. expertise within the NIA, expertise from outside the NIA, published material	Wetland Vision Pilot (2008-2011) which included climate change adaption, the preservation of lowland peatlands and food security, water resources and flood risk management. Humberhead Levels Partnership research examining the potential of landscape-scale wetlands to deliver carbon sequestration and the potential impacts of climate change across the landscape. *Landscapes of Climate Change: Visualising the potential impacts of climate change on rural landscapes in the Humberhead Levels*. March 2005, University of East Anglia.	
If an assessment has been done, what impacts	Increased soil moisture deficits and drying	Peatlands are drying (exacerbated by invading birch).

NIA name	Humberhead Levels	
have been identified?	Coastal evolution impacts	The area is considered to be very vulnerable to rising sea levels as most of the area lies at or below sea level.
	Increased risks from pests	
	Increased risks from diseases	
	Species unable to track changing climate space	The area is located where northern species at their southern extreme meet southern species (large heath butterfly) at their northern extreme (e.g. nightingale).
	Climate mitigation measures (positive/negative)	Exposed peatlands release carbon which climate change could exacerbate.
	Major coastal flood/reconfiguration	
	Changes in soil organic carbon	
	Changes in species migration patterns	Recognition that some priority species e.g. otter and bittern, need a large range to thrive.
	Increased water temperature and stratification of water bodies	
	Generalists favoured over specialists (e.g. ruderal spp.)	
	Increased risk of wildfire	
	Increased water pollution risk and eutrophication	
	Impacts of low flows	
	Increased societal water demand	Recognised – risk of over abstraction for public supply and irrigation.
	Major drought events	
Have impacts / vulnerabilities been prioritised in any way? If so, how?	Impacts have not been prioritised formally; however vulnerability to sea level change is an obvious priority. The change in habitat quality and extent also seems quite high on the list of impacts.	
Adaptation		
Does the plan set out actions to adapt to specific impacts / vulnerabilities? If yes, what? E.g. maintaining existing populations, increasing connectivity, enabling new species to become established, actively changing ecosystems	Yes – actions are intended to improve resilience to the impacts of climate change. However, actions are not related to specific identified impacts but are intended to contribute to overall resilience of the area to the impacts of climate change.	
Does the plan specify conservation measures which contribute to adaptation in the following ways (based on Smithers et al., 2008)?	Conserving existing biodiversity, protected areas and all other high quality habitats	All protected sites will be conserved with particular emphasis placed upon connections for the compact inner estuary along drains and rivers. Restore priority habitat.
	Reducing sources of harm not linked to climate	Reduce water abstraction in over abstracted areas.
	Conserving the range and ecological variability of habitats and species	10 types of habitat are listed as occurring within the NIA, all of which are being conserved for the benefits of the species reliant on each habitat.

NIA name	Humberhead Levels	
	Maintaining / establishing existing ecological networks	Improve ecological connectivity between two internationally important wetlands, the Humber estuary and Humberhead Peatlands. Improve habitat of drains to provide an ecological network across the farmed landscape. Habitat creation – wetland, wet woodland. Secondary stepping stone wetland habitats.
	Creating buffer zones around high quality habitats	Re-create Lagg Fen as a buffer around the edge of intact raised mires.
	Taking action to control spread of invasive species	Felling invasive birch to use for woodfuel.
	Accommodate change	Creating natural washlands.
	Making space for the natural development of rivers and coasts	Thorne Water Level Management Plan will allow shallow retention of water to form peatland. Wetland habitat creation in the river valleys. Flood alleviation measures – natural washlands.
	Translocation and ex-situ conservation	
	Discussion / notes on use of adaptation Principles in plan Objectives and actions are driven by the need to adapt to climate change and follow the EBS adaption principles.	
Are there any apparent gaps in terms of adaptation?		
Links to other initiatives		
Does the NIA business plan make links to other projects or initiatives focused on adaptation? If so, what?	Would like to use the partners who are working on more than one NIA to exchange successes, failures and lessons learnt. For example the RSPB and Environment Agency. Link to other research and projects being undertaken by the Humberhead Levels Partnership.	
Does the plan make links to planning policy in relation to adaptation? E.g. biodiversity offsets, greenspace strategies	Yes - commitment received from the local authorities within the NIA boundary. This will enable the HLP to inform planning and regulatory functions and ensure strategic alignment between the NIA and other Local Authority policies and programmes.	
Additional information		
Does the plan specify monitoring which will be used to review future plans and update actions?	There is monitoring specified per objective and targets set for beyond 2015.	
Is there any evidence that impacts have been identified and/or adaptation has been planned spatially?	Yes. As part of the development of the plan, potential projects were mapped in each of the Opportunity Areas and themed according to biodiversity, landscape, heritage, access or climate change.	
Are there synergies with climate change mitigation?	Yes, plan is strongly focused on re-wetting peat soils and improving carbon sequestration. Also the use of birch for woodfuel.	

NIA name	Humberhead Levels
Summary	
The Humberhead Levels NIA is an agriculture area with significant areas of peat soils. The focus of the plan is on improving and connecting wetland habitats and related ecosystem services such as flood management, particularly in response to sea level rise. Objectives focus on enhancing biodiversity and realising socio-economic benefits from the natural environment, whilst improving resilience to climate change. The plan recognises sea level rise as one of the major pressures facing the area. The impacts of climate change on species movement and biodiversity are also considered and actions planned to improve resilience. Many of the actions will contribute to adaptation and follow the EBS adaptation principles. There is also a strong focus on mitigation benefits as a result of re-wetting peat soils and increasing carbon sequestration. Adaptation and mitigation of climate change appear to be significant drivers of the plan.	

A.7. Marlborough Downs

NIA name	Marlborough Downs	
NIA partners	Wiltshire Council Farmers Game and Wildlife Conservation Trust	
Brief description of NIA aims and focus (e.g. biodiversity, networks, access, planning etc)	The NIA has two aims: improve the condition and connectivity of the ecological network; and to connect people to the landscape. Much emphasis is placed on the fact that it is led by farmers who are committed to the project and want to involve the community in the improvement of biodiversity within the Downs. Objectives focus on biodiversity and are based around the Lawton principles of bigger, better, more and joined.	
Does adaptation appear to be a main goal?	Adaptation is not a main goal but the plan recognises that it will have multiple benefits in terms of mitigating a range of environmental pressures, including climate change.	
Identification of climate change impacts		
Have potential impacts of climate change / vulnerability of the NIA to climate change been assessed? If yes, how?	The plan refers to climate change as a pressure facing the area but specific impacts are not identified.	
Have any specific tools or data sets been used to identify the impacts of climate change? E.g. UKCP09 output, UKCIP tools, NE tools, RSPB vulnerability assessment etc.	None evident	
Have any other sources of information or guidance been used to identify impacts? E.g. expertise within the NIA, expertise from outside the NIA, published material	A table of possible threats to the area were identified by UKBAP Lead partners in 2008 - global warming was identified. However, it does not appear that the plan has been informed by a more detailed consideration of impacts.	
If an assessment has been done, what impacts have been identified?	Increased soil moisture deficits and drying	Water is recognised as scarce in the Downs.
	Coastal evolution impacts.	
	Increased risks from pests	
	Increased risks from diseases	
	Species unable to track changing climate space	
	Climate mitigation measures (positive/negative)	
	Major coastal flood/reconfiguration	
	Changes in soil organic carbon	
	Changes in species migration patterns	
	Increased water temperature and stratification of water bodies	
	Generalists favoured over specialists (e.g. ruderal spp.)	
	Increased risk of wildfire	

NIA name	Marlborough Downs	
	Increased water pollution risk and eutrophication	
	Impacts of low flows	
	Increased societal water/food demand	Increasing demand for food is mentioned as a constraint/pressure on the area. .
	Major drought events	
Have impacts / vulnerabilities been prioritised in any way? If so, how?	No prioritisation evident.	
Adaptation		
Does the plan set out actions to adapt to specific impacts / vulnerabilities? If yes, what? E.g. maintaining existing populations, increasing connectivity, enabling new species to become established, actively changing ecosystems	No, actions are not related to identified impacts or a need to adapt. However, improved connectivity (which is driven by biodiversity requirements) is recognised as having benefits in terms of adaptation. Adaptation to climate change is mentioned once within the objectives in relation to enabling species to colonise and re-colonise non-contiguous area.	
Does the plan specify conservation measures which contribute to adaptation in the following ways (based on Smithers et al., 2008)?	Conserving existing biodiversity, protected areas and all other high quality habitats	Nectar rich habitat for the declining butterfly population (Duke of Burgundy and marsh fritillary). Survey protected sites and make suggestions for improvement. Plant/restore hedgerows for farmland birds.
	Reducing sources of harm not linked to climate	Target point source pollution from run-off by creating buffer zones around arable fields. Reduce damage to chalk grasslands from adjacent land practices, e.g. spraying hedgerows, increasing connectivity.
	Conserving the range and ecological variability of habitats and species	Maintenance of stubble over winter Restoration of improved grassland Planting nectar rich grassland and hedgerows. Creation of dew ponds.
	Maintaining / establishing existing ecological networks	Structural connectivity between wildlife sites leading to increased functional connectivity. Grassland restoration. Necklace of traditional clay lined dewponds as stepping stones for wildlife and corridors of wildflower-rich habitat.
	Creating buffer zones around high quality habitats	Buffer zones planned to surround the River Kennet – focus on improving water quality. Buffer strips planned around the 30 local wildlife sites.
	Taking action to control spread of invasive species	
	Accommodate change	
	Making space for the natural development of rivers and coasts	Improve water quality in the R.Kennet through catchment management
	Translocation and ex-situ conservation	

NIA name	Marlborough Downs
	Discussion / notes on use of adaptation Principles in plan Aims and objectives are not focussed upon adaption principles however most of their proposed actions will contribute to adaption, especially regarding protecting existing sites and increasing connectivity. The actions are driven by Lawton principles of bigger, better, joined.
Are there any apparent gaps in terms of adaptation?	As an agricultural landscape, changes in pests and diseases as a result of climate change could be an issue.
Links to other initiatives	
Does the NIA business plan make links to other projects or initiatives focused on adaptation? If so, what?	Yes – links to projects which can help with monitoring and surveying.
Does the plan make links to planning policy in relation to adaptation? E.g. biodiversity offsets, greenspace strategies	The business plan has taken into account local plans when developing objectives and actions but there doesn't appear to be a strong link to the planning system in terms of delivery.
Additional information	
Does the plan specify monitoring which will be used to review future plans and update actions?	Yes- the objectives are associated with detailed monitoring plans and management will be reviewed depending on the results. Most monitoring focuses on biodiversity recording. It does not appear that monitoring will be used to develop future adaptation responses.
Is there any evidence that impacts have been identified and/or adaptation has been planned spatially?	Maps of the area are used to present information. Maps will be used to illustrate aspiration and delivery of each objective although none are specifically related to climate change adaption.
Are there synergies with climate change mitigation?	Some farmers are considering willow planting to use as a biomass fuel.
Summary	
The Marlborough Downs is predominately an agricultural area containing a variety of habitats. The business plan represents a farmer led partnership and takes a bottom up approach to increasing and maintaining biodiversity. The focus of the plan is to connect and buffer existing habitats (e.g. dew ponds) and involve local people within the landscape. Delivery of the objectives is mainly through farmer led projects with 'start-up' funding from the NIA. The plan does not appear to have been informed by a climate change impact assessment however climate change is recognised as a pressure facing the area, particularly in terms of water availability. Many of the proposed actions will contribute to adaption although they are not explicitly driven by adaptation principles. The plan does recognise that it will have multiple benefits in terms of mitigating a range of environmental pressures, including climate change.	

A.8. Meres and Mosses of the Marches

NIA name	The Meres and Mosses of the Marches	
NIA partners	Shropshire and Cheshire Wildlife Trusts Community council of Shropshire RSPB Natural England Shropshire Council Environment Agency	
Brief description of NIA aims and focus (e.g. biodiversity, networks, access, planning etc)	The main focus of the NIA is wetland habitats, improving ecological connectivity and ecosystem services.	
Does adaptation appear to be a main goal?	Adaption does not appear to be a main goal. Some impacts of climate change are identified but they are not specifically targeted by actions. Adaptation is viewed as a long term issue whereas the plan has a short term (5 year) focus.	
Identification of climate change impacts		
Have potential impacts of climate change / vulnerability of the NIA to climate change been assessed? If yes, how?	The potential impacts of climate change have not assessed in detail but some impacts are highlighted.	
Have any specific tools or data sets been used to identify the impacts of climate change? E.g. UKCP09 output, UKCIP tools, NE tools, RSPB vulnerability assessment etc.		
Have any other sources of information or guidance been used to identify impacts? E.g. expertise within the NIA, expertise from outside the NIA, published material	Academic led Meres and Mosses Forum Wetland Vision	
If an assessment has been done, what impacts have been identified?	Increased soil moisture deficits and drying	Peat soils could dry out
	Coastal evolution impacts.	
	Increased risks from pests	
	Increased risks from diseases	
	Species unable to track changing climate space	
	Climate mitigation measures (positive/negative)	
	Major coastal flood/reconfiguration	
	Changes in soil organic carbon	Carbon capture and storage in the peat soils could be affected by drying
	Changes in species migration patterns	
	Increased water temperature and stratification of water bodies	
	Generalists favoured over specialists (e.g. ruderal spp.)	
	Increased risk of wildfire	

NIA name	The Meres and Mosses of the Marches	
	Increased water pollution risk and eutrophication	Research by B. Moss of Liverpool University shows habitat decline due to eutrophication from diffuse pollution.
	Impacts of low flows	
	Increased societal water demand	Over-abstraction.
	Major drought events	Drought alleviation for the towns and cities in the area through groundwater storage and release.
Have impacts / vulnerabilities been prioritised in any way? If so, how?	Not evident	
Adaptation		
Does the plan set out actions to adapt to specific impacts / vulnerabilities? If yes, what? E.g. maintaining existing populations, increasing connectivity, enabling new species to become established, actively changing ecosystems	There are no objectives in relation to reducing vulnerability or adapting to climate change directly. Climate change is mainly considered in relation to mitigation (carbon sequestration). However, there are objectives and actions which are likely to contribute to adaption even if not driven by a need to adapt.	
Does the plan specify conservation measures which contribute to adaptation in the following ways (based on Smithers et al., 2008)?	Conserving existing biodiversity, protected areas and all other high quality habitats	Bringing SSSIs into active conservation management and wildlife sites into positive management. Conserve the meres and the mosses to halt the continued loss of biodiversity. Measures for water voles, farmland wading birds and axiophytes.
	Reducing sources of harm not linked to climate	Reduce diffuse pollution by working on nutrient management plans with farmers. Work with milk buyers to influence the environmental practices of dairy farmers. Encourage the uptake of HLS schemes up to 900ha to reduce diffuse pollution.
	Conserving the range and ecological variability of habitats and species	Improving 15 peatlands and the floodplain of the river Perry. Conserving the meres and the mosses which are unique to the area and support local biodiversity.
	Maintaining / establishing existing ecological networks	Network of 3km corridors and 30 stepping stones linking core sites.
	Creating buffer zones around high quality habitats	Forming wetland buffer zones around 12 meres and mosses based upon the Cholmondeley Estate.
	Taking action to control spread of invasive species	
	Accommodate change	
	Making space for the natural development of rivers and coasts	Catchment group to be formed along 4km the river Perry focussing on sustainable river management in 400ha of its sub catchment. Plan to restore the river floodplain to a naturally-functioning system.

NIA name	The Meres and Mosses of the Marches	
	Translocation and ex-situ conservation	
	Discussion / notes on use of adaptation Principles in plan The objectives do not appear to be driven by the EBS adaption principles but there is scope for the actions to contribute towards adaption.	
Are there any apparent gaps in terms of adaptation?	It would be useful to consider hot the impacts of climate change may affect the outcomes of the NIA.	
Links to other initiatives		
Does the NIA business plan make links to other projects or initiatives focused on adaptation? If so, what?	The plan specifies visiting other NIAs and Landscape Partnership Schemes for inspiration. Although the links are not related to adaption, all of the projects consider adaption to some extent.	
Does the plan make links to planning policy in relation to adaptation? E.g. biodiversity offsets, greenspace strategies	Yes – want to set up a biodiversity offsetting pilot in Cheshire. The Community Infrastructure Levy is expected to support the NIA when funding ends in 2015. Place Plans are a pilot of planning at the local level which includes biodiversity projects - the NIA is linked to the pilot.	
Additional information		
Does the plan specify monitoring which will be used to review future plans and update actions?	Yes. The evaluation plan will be finalised when the NIA Monitoring and Evaluation Framework is in place to take into account additional requirements, although the plan does not specify that it will consider monitoring results in relation to adaptation.	
Is there any evidence that impacts have been identified and/or adaptation has been planned spatially?	Delivery of the NIA objectives has been considered spatially and is visually displayed using GIS maps. These include habitat priorities with an emphasis on developing an accurate local tool for mapping as well as contributing to the national data reserves. Targeted areas have been mapped however this does not account for impacts or adaption to climate change.	
Are there synergies with climate change mitigation?	The plan notes carbon sequestration within its peat bogs.	
Summary		
The Meres and Mosses of the Marches NIA is a wetland area interspersed with intense agricultural land use. The plan focuses on halting the decline of biodiversity in the area and addressing diffuse pollution from farming. Agri-environment schemes and farm advice are central to the plan's delivery and the partnership aims to work with major landowners to deliver its objectives. The plan also links to the planning system and hopes to establish a biodiversity offsetting scheme. The plan does not appear to have been informed by a detailed climate change impact assessment but it does recognise climate change as a long term pressure facing the area, especially relating to the River Perry. Whilst not explicitly driven by adaptation principles, proposed actions are likely to improve the resilience of biodiversity and local people to climate change through improving connectivity, reducing non-climate pressures and encouraging more naturally functioning floodplains. The plan recognises its contribution to mitigation through carbon sequestration by peat soils.		

A.9. Morecambe Bay Limestones

NIA name	Morecambe Bay	
NIA partners	Arnside & Silverdale AONB Partnership, Bay Tourism Association, Butterfly Conservation, Country Land and Business Association, Cumbria Wildlife Trust, Environment Agency, Forestry Commission, Lancashire Wildlife Trust, Morecambe Bay Partnership, National Trust, Natural England and RSPB.	
Brief description of NIA aims and focus (e.g. biodiversity, networks, access, planning etc)	The plan focuses on people – connecting people with nature and delivering socio-economic benefits through developing well functioning habitats. The aim is to create an ecological network resilient to climate change and restore >1000ha of limestone and wetland habitat.	
Does adaptation appear to be a main goal?	Yes, climate change adaptation and resilience to impacts is a significant consideration within the project. The adaption and resilience benefits of the proposed ecological network are recognised.	
Identification of climate change impacts		
Have potential impacts of climate change / vulnerability of the NIA to climate change been assessed? If yes, how?	Yes, the impacts of climate change appear to have been identified based on habitat type. The identified impacts have influenced objective setting. However, the relative resilience of the area to the impacts of climate change is noted, particularly due to the variety of habitats and topography.	
Have any specific tools or data sets been used to identify the impacts of climate change? E.g. UKCP09 output, UKCIP tools, NE tools, RSPB vulnerability assessment etc.	Natural England NCA vulnerability assessment method - Responding to the impacts of climate change in the Morecambe Bay Limestones NCA (LUC/Natural England, 2010)	
Have any other sources of information or guidance been used to identify impacts? E.g. expertise within the NIA, expertise from outside the NIA, published material	Habitat Recreation Strategies for Promoting Adaptation of Species to Climate Change, (Hodgson et al, Conservation Letters, 2011)	
If an assessment has been done, what impacts have been identified?	Increased soil moisture deficits and drying	Drying out of peat soils
	Coastal evolution impacts.	Coastal zone is around the point of isostatic equilibrium. The area is less sensitive to rising sea levels and could offset the coastal problems in South and East England.
	Increased risks from pests	
	Increased risks from diseases	
	Species unable to track changing climate space	
	Climate mitigation measures (positive/negative)	
	Major coastal flood/reconfiguration	Coastal habitats affected.
	Changes in soil organic carbon	
	Changes in species migration patterns	Variety of topography and habitats provides the potential for species to shift over time in response to the climate – less vulnerable.
	Increased water temperature and stratification of water bodies	Rising water temperature could be an issue for salmonids

NIA name	Morecambe Bay	
	Generalists favoured over specialists (e.g. ruderal spp.)	
	Increased risk of wildfire	
	Increased water pollution risk and eutrophication	
	Impacts of low flows	
	Increased societal water demand	
	Major drought events	Higher winter rainfall and drier summers affecting the resilience of wetland sites.
Have impacts / vulnerabilities been prioritised in any way? If so, how?	Not evident.	
Adaptation		
Does the plan set out actions to adapt to specific impacts / vulnerabilities? If yes, what? E.g. maintaining existing populations, increasing connectivity, enabling new species to become established, actively changing ecosystems	Adaption appears to have been considered when forming the NIAs objectives. Whilst specific impacts are not addressed by actions, the plan is based upon reconnecting habitats enhancing the ecological network of the area which is specifically designed to increase resilience to climate change. Adaption is one of multiple benefits that the plan is designed to deliver.	
Does the plan specify conservation measures which contribute to adaptation in the following ways (based on Smithers et al., 2008)?	Conserving existing biodiversity, protected areas and all other high quality habitats	Providing detailed information and hands on support to farmers to deliver high quality habitat priority habitat. Plant over 10 000 trees along riverbanks to provide riparian shading for salmonids, stabilise the banks and reduce erosion.
	Reducing sources of harm not linked to climate	Diffuse pollution in Leighton Moss, a diffuse water pollution plan has been formed. 15 water bodies classified as failing under the WFD due to diffuse agricultural pollution and heavy modification, NIA will address these failures.
	Conserving the range and ecological variability of habitats and species	Contains 32 habitats and 195 species from the S41 list of principle importance. Biodiversity hotspot for vascular plants, birds and Lepidoptera.
	Maintaining / establishing existing ecological networks	Connecting the fragments of woodland, wetlands and grassland to facilitate range expansion. Providing different connectivity requirements for different priority species, for example woodland birds and pearl bordered fritillary. Use agri-environment and woodland grant schemes as mechanisms to do so. Plant locally native wet woodland to act as stepping stones and corridors for migration.
	Creating buffer zones around high quality habitats	Buffering of wetlands according to national Wetland Vision opportunity maps. Use agri-environment and woodland grant schemes as mechanisms to do so.

NIA name	Morecambe Bay	
	Taking action to control spread of invasive species	
	Accommodate change	The need for space to allow natural systems to adapt to climate change is recognised.
	Making space for the natural development of rivers and coasts	Form river basin management plan for water bodies where salmonids or eels are present. The wetland buffering will expand the floodplain for some rivers in the area.
	Translocation and ex-situ conservation	
	Discussion / notes on use of adaptation Principles in plan Whilst the EBS principles have not been explicitly used to develop the plan, objectives are likely to have adaptation benefits.	
Are there any apparent gaps in terms of adaptation?	Coastal expansion and creation is noted as being important to offset the loss of coast in the South and east England. However this is not brought forward into objectives or actions – the plan could look more at coastal habitats.	
Links to other initiatives		
Does the NIA business plan make links to other projects or initiatives focused on adaptation? If so, what?	RSPBs Futurescapes Morecambe Bay Landscape Partnership scheme Headlands 2 Headspace which are focussed on supporting communities to take an active role in asset maintenance, part of which includes adaption.	
Does the plan make links to planning policy in relation to adaptation? E.g. biodiversity offsets, greenspace strategies	Yes – the plan is closely linked with the local planning system. One of the main objectives is to integrate planning policy and the NIA. There is an aspiration to form green infrastructure links through the Morecambe area action plan and scope biodiversity offsetting plans by 2013.	
Additional information		
Does the plan specify monitoring which will be used to review future plans and update actions?	There are measures of success for each action and monitoring plans are in place. The NIA will refine their approach where appropriate as result of monitoring.	
Is there any evidence that impacts have been identified and/or adaptation has been planned spatially?	Section 3.3.4 appears to take climate change impacts into account on a spatial scale.	
Are there synergies with climate change mitigation?	Yes – creation of carbon sinks is an objective. Sustainable, carbon neutral woodland management is considered by investigation into the woodfuel demand and supply chain. This would decrease emissions whilst tree planting would offset carbon. The rich peat skills are a store of carbon and there are plans to restore the hydrology of the lowland raised mires to ensure carbon is locked up in the soil.	
Summary		
Morecambe Bay is predominately a rural area containing a wide variety of habitats including wetlands and grasslands. The plan is very community driven, focusing on getting local people and businesses involved in habitat connectivity. The plan aims to improve biodiversity and deliver social benefits through well functioning habitat networks. There are strong links to the planning system, particularly focusing on green space. The plan has been informed by a consideration of climate change impacts and a number of specific studies have informed the development of the plan (including one of Natural England's NCA vulnerability projects). A range of impacts are highlighted including coastal change, hydrological changes which could affect the vulnerability of wetland habitats and changes to species composition. However, the relative resilience of the area to the impacts of climate change is noted, particularly due to the variety of habitats and topography.		

NIA name	Morecambe Bay
The plan explicitly sets out to deliver multiple benefits, including adaptation and improved resilience to climate change. Actions focus on improving connectivity and buffering existing habitat, considering the requirements of specific species including woodland birds and pearl bordered fritillary butterfly.	

A.10. Nene Valley

NIA name	Nene Valley	
NIA partners	Local authorities, academic institutions, land owners, local enterprise partnerships, Northamptonshire local nature partnership and wildlife charities. RSPB and Wildlife Trust are the only named partners.	
Brief description of NIA aims and focus (e.g. biodiversity, networks, access, planning etc)	The main aim is to establish a coherent ecological network at the landscape scale along the River Nene corridor. The plan focuses on improving water quality and other ecosystem services. There is a strong connection with planning policy due to the high growth rate of the area and the subsequent need for ecosystem services.	
Does adaptation appear to be a main goal?	Climate change is considered as a pressure facing the area and adaptation is one of the stated aims of the ecological network the plan hopes to create. The contribution of the plan to improving overall resilience to environmental pressures including climate change is noted.	
Identification of climate change impacts		
Have potential impacts of climate change / vulnerability of the NIA to climate change been assessed? If yes, how?	It does not appear that the plan has been informed by an assessment of climate change impacts.	
Have any specific tools or data sets been used to identify the impacts of climate change? E.g. UKCP09 output, UKCIP tools, NE tools, RSPB vulnerability assessment etc.	Not evident.	
Have any other sources of information or guidance been used to identify impacts? E.g. expertise within the NIA, expertise from outside the NIA, published material	Not evident.	
If an assessment has been done, what impacts have been identified?	Increased soil moisture deficits and drying	
	Coastal evolution impacts.	
	Increased risks from pests	
	Increased risks from diseases	
	Species unable to track changing climate space	
	Climate mitigation measures (positive/negative)	
	Major coastal flood/reconfiguration	
	Changes in soil organic carbon	
	Changes in species migration patterns	
	Increased water temperature and stratification of water bodies	
	Generalists favoured over specialists (e.g. ruderal spp.)	
	Increased risk of wildfire	
	Increased water pollution risk and eutrophication	

NIA name	Nene Valley	
	Impacts of low flows	
	Increased societal water demand	Yes, this is a major concern as the River Nene is a significant source of water for public supply.
	Major drought events	River Nene and the winter drought permit given by Anglian Water.
Have impacts / vulnerabilities been prioritised in any way? If so, how?	Not evident.	
Adaptation		
Does the plan set out actions to adapt to specific impacts / vulnerabilities? If yes, what? E.g. maintaining existing populations, increasing connectivity, enabling new species to become established, actively changing ecosystems	No – actions do not appear to have been specified in response to identified impacts but improved resilience to climate change is a goal for the ecological network the plan seeks to create.	
Does the plan specify conservation measures which contribute to adaptation in the following ways (based on Smithers et al., 2008)?	Conserving existing biodiversity, protected areas and all other high quality habitats	Plan to increase the area of protected habitat in active management Planned increased in priority habitat and no net loss of tier 1 and tier 2 sites.
	Reducing sources of harm not linked to climate	Strategic planning of resources and economic investment in terms of population growth. Catchment sensitive farming plans to improve diffuse pollution into the Nene.
	Conserving the range and ecological variability of habitats and species	
	Maintaining / establishing existing ecological networks	The main focus of the plan - ecological network formed with the Upper Nene Valley Gravel Pits SPA at its core. Nene Valley is identified as a wildlife corridor with plans to connect the core sites Improve connectivity through semi natural habitat stepping stones and take up of agri-environmental schemes.
	Creating buffer zones around high quality habitats	Plans to buffer sites created within the river Nene wildlife corridor.
	Taking action to control spread of invasive species	
	Accommodate change	
	Making space for the natural development of rivers and coasts	The Nene is separated from its floodplain due to flood prevention measures. Plan to reconnect the Nene to its floodplain.
	Translocation and ex-situ conservation	
	Discussion / notes on use of adaptation Principles in plan The objectives and actions do not appear to be driven by EBS or other adaption principles but there is significant scope for the ecological network to contribute to adaption. The objectives for the ecological network focus on the Lawton principles of bigger, better, joined up and more.	
Are there any apparent	Adaptation seems to be equated with connectivity – could take a broader look	

NIA name	Nene Valley
gaps in terms of adaptation?	at vulnerabilities and adaptation required to improve resilience.
Links to other initiatives	
Does the NIA business plan make links to other projects or initiatives focused on adaptation? If so, what?	Local pilot of the 'Rockingham Forest for Life' carbon sequestration project.
Does the plan make links to planning policy in relation to adaptation? E.g. biodiversity offsets, greenspace strategies	Yes – strongly linked to local planning system. Core strategies produced by Northamptonshire's Joint Planning Units and Peterborough City Council underpin sustainable growth and development. The NIA would like to influence and build upon: North Northamptonshire's Green Infrastructure Delivery Plan Northamptonshire's Environmental character and green infrastructure suite Peterborough's green grid strategy Biodiversity offsetting will be included in a Supplementary Planning Document, formed by the NIA and the planning offices. All of the plans noted above consider adaption to some extent.
Additional information	
Does the plan specify monitoring which will be used to review future plans and update actions?	Monitoring plans are in place for socio-economic and environmental outputs but there is no mention of reviewing future plans and refining actions in light of monitoring results.
Is there any evidence that impacts have been identified and/or adaptation has been planned spatially?	The impacts of climate change have not yet been planned spatially but will be in the near future. A habitat opportunities map will be completed in 2012 considering the challenges of a growing population, changing climate and the need to produce food. The map will show the complimentary benefits that form from a naturally functioning interlinked landscape.
Are there synergies with climate change mitigation?	Mitigation is planned within the urban areas but no detail is specified.
Summary	
The Nene Valley NIA follows the river Nene through its catchment which is dominated by intensive agriculture. There are significant urban areas with extremely high planned growth rates in the NIA. As a result, the plan is heavily focused on planning policy and maximising the benefits of ecosystem services. The plan sets out to create a habitat network along the Nene to reduce biodiversity loss and benefit to local communities. The plan recognises the impact of climate change on species and habitats alongside other environmental and land use pressures. Identified impacts include pressure on water resources for public water supply and winter drought. Adaption is a stated aim of the Nene ecological network. A habitat opportunity map will be drawn up and plans developed spatially - adaptation is likely to be considered in more detail at this stage. The adaptation benefits associated with green infrastructure planning are also recognised.	

A.11. Northern Devon

NIA name	Northern Devon	
NIA partners	Devon Wildlife Trust North Devon Biosphere Partnership Devon County Council and district councils Forestry Commission Natural England Environment Agency Exeter University South West Water The MetOffice Woodland Trust	
Brief description of NIA aims and focus (e.g. biodiversity, networks, access, planning etc)	Focus on water (quality, quantity, freshwater species e.g. pearl mussel) – boundary based on R.Torridge catchment. Focus on habitat restoration, improving connectivity and developing an ecological network.	
Does adaptation appear to be a main goal?	Adaptation does not seem to be a major driver for the plan but the contribution of the ecological network to resilience is noted. One of the outcomes of the plan is that flagship species populations will be more robust and better able to cope with the threats posed by climate change.	
Identification of climate change impacts		
Have potential impacts of climate change / vulnerability of the NIA to climate change been assessed? If yes, how?	Climate change is mentioned as one of a range of pressures facing the area. The plan does not appear to be informed by a detailed impact or vulnerability assessment but a number of potential impacts on the water environment are noted. Further work with the Met Office to understand the impacts of climate change on wetlands is proposed.	
Have any specific tools or data sets been used to identify the impacts of climate change? E.g. UKCP09 output, UKCIP tools, NE tools, RSPB vulnerability assessment etc.	None evident	
Have any other sources of information or guidance been used to identify impacts? E.g. expertise within the NIA, expertise from outside the NIA, published material	None evident	
If an assessment has been done, what impacts have been identified?	Increased soil moisture deficits and drying	Risk of wetland habitats drying out
	Coastal evolution impacts.	
	Increased risks from pests	
	Increased risks from diseases	
	Species unable to track changing climate space	
	Climate mitigation measures (positive/negative)	
	Major coastal flood/reconfiguration	
	Changes in soil organic carbon	
	Changes in species migration patterns	
	Increased water temperature and stratification of water bodies	

NIA name	Northern Devon	
	Generalists favoured over specialists (e.g. ruderal spp.)	
	Increased risk of wildfire	
	Increased water pollution risk and eutrophication	
	Impacts of low flows	
	Flooding	Yes, risk of flooding due to rapid river discharge in the Torridge catchment
	Increased societal water demand	
	Major drought events	
Have impacts / vulnerabilities been prioritised in any way? If so, how?	No apparent prioritisation.	
Adaptation		
Does the plan set out actions to adapt to specific impacts / vulnerabilities? If yes, what? E.g. maintaining existing populations, increasing connectivity, enabling new species to become established, actively changing ecosystems	The plan doesn't set out adaptation actions to address specific vulnerabilities but the overall plan aims to improve resilience of the area by improving connectivity.	
Does the plan specify conservation measures which contribute to adaptation in the following ways (based on Smithers et al., 2008)?	Conserving existing biodiversity, protected areas and all other high quality habitats	Restore and recreate priority habitat – particularly wetlands and Culm grassland. Woodland planting
	Reducing sources of harm not linked to climate	Advisory service to landowners and farmers – particularly about land uses which affect water
	Conserving the range and ecological variability of habitats and species	Grazing links service
	Maintaining / establishing existing ecological networks	Reconnecting a mosaic of habitats
	Creating buffer zones around high quality habitats	
	Taking action to control spread of invasive species	
	Accommodate change	
	Making space for the natural development of rivers and coasts	Catchment management Application of South West Water's Upstream Thinking approach to secure cost effective delivery of high quality water provision and flood attenuation
	Translocation and ex-situ conservation	
	Discussion / notes on use of adaptation Principles in plan EBS principles (or other adaptation principles) do not seem to have been used to inform the development of the plan however it is likely that there will be some adaptation benefits as some of the actions deliver the principles. The Lawton principles of bigger, better, joined drive the plan.	

NIA name	Northern Devon
Are there any apparent gaps in terms of adaptation?	One of the objectives is for flagship species to be more robust to the impacts of climate change but there doesn't appear to be an assessment of how climate change could affect these species. A detailed impact/vulnerability assessment could indicate whether this outcome is realistic or whether additional action is required.
Links to other initiatives	
Does the NIA business plan make links to other projects or initiatives focused on adaptation? If so, what?	Further work with the Met Office to understand the impacts of climate change on wetlands is proposed. Devon Wildlife Trust's Working Wetlands – not specifically addressing adaptation but part of delivering resilient landscape.
Does the plan make links to planning policy in relation to adaptation? E.g. biodiversity offsets, greenspace strategies	There are links to water company planning – AMP6 plans for catchment management.
Additional information	
Does the plan specify monitoring which will be used to review future plans and update actions?	Innovative techniques for habitat creation e.g. deep ploughing and soil stripping. These techniques have been reviewed and will be employed in the delivery of the grassland elements of the NIA project. Monitoring is generally based on biodiversity indicators and proxy indicators for ecosystem services. It is not clear how the results of monitoring will feed into subsequent development of plans.
Is there any evidence that impacts have been identified and/or adaptation has been planned spatially?	Yes, the plan aims to use high quality, high resolution datasets to ensure effective targeting and co-ordination of advisory services and practical work. A range of models/methods could be used and the partnership will be reviewing them to enable effective targeting of project resources to secure strategic biodiversity gains. E.g. targeting of farmer advice based on water resource and water quality data from Environment Agency monitoring stations and Water Framework Directive data. The plan includes sample maps which show how actions are being targeted spatially.
Are there synergies with climate change mitigation?	Yes, the plan notes the contribution of the plan to mitigation through carbon sequestration.
Summary	
The Northern Devon NIA sits within the North Devon Biosphere Reserve and targets the River Torridge catchment. The focus of the plan is water (quantity and quality) as well as associated habitats and species. The plan aims to improve biodiversity through the Lawton Principles of bigger, better, joined. The plan identifies a number of climate change impacts including flooding from rapid river discharge, habitat fragmentation and long term drying out of wetland habitats. Further work on identifying the impacts of climate change on wetland habitats area and developing appropriate adaptation responses is part of the plan. Climate change modelling will be carried out through a partnership with the Met Office. Adaptation actions are not specified to respond to identified impacts directly but the contribution of the suite of proposed actions to adaptation and improved resilience is recognised. One of the outcomes of the plan is for flagship species to be more robust to the impacts of climate change.	

A.12. South Downs Way Ahead

NIA name	South Downs Way Ahead	
NIA partners	South Downs National Park Authority, South Downs Land Management Group, Environment Agency, Brighton and Hove City Council, Lewes District Council, Hampshire & Isle of Wight Wildlife Trust, Sussex Wildlife Trust, National Trust, RSPB, Game & Wildlife Conservation Trust, Butterfly Conservation, Royal Botanical Gardens Kew, Hampshire Biodiversity Information Centre, Sussex Biological Records Centre	
Brief description of NIA aims and focus (e.g. biodiversity, networks, access, planning etc)	The aim is to conserve, enhance and reconnect a functioning ecological network encompassing the biodiversity and chalk geology along the South Downs Way. The focus of the plan is mainly upon socio-economic benefits that accompany biodiversity improvements, particularly access for coastal communities.	
Does adaptation appear to be a main goal?	Adaption does not appear to be a main goal but the role and importance of ecosystem services is recognised.	
Identification of climate change impacts		
Have potential impacts of climate change / vulnerability of the NIA to climate change been assessed? If yes, how?	It does not appear that an impact assessment has been carried out and there is little mention of climate change as a pressure facing the area.	
Have any specific tools or data sets been used to identify the impacts of climate change? E.g. UKCP09 output, UKCIP tools, NE tools, RSPB vulnerability assessment etc.	None evident	
Have any other sources of information or guidance been used to identify impacts? E.g. expertise within the NIA, expertise from outside the NIA, published material	None evident	
If an assessment has been done, what impacts have been identified?	Increased soil moisture deficits and drying	
	Coastal evolution impacts.	
	Increased risks from pests	
	Increased risks from diseases	
	Species unable to track changing climate space	
	Climate mitigation measures (positive/negative)	
	Major coastal flood/reconfiguration	
	Changes in soil organic carbon	
	Changes in species migration patterns	
	Increased water temperature and stratification of water bodies	Increased water temperature is mentioned
	Generalists favoured over specialists (e.g. ruderal spp.)	
	Increased risk of wildfire	

NIA name	South Downs Way Ahead	
	Increased water pollution risk and eutrophication	
	Impacts of low flows	
	Increased societal water demand	
	Major drought events	
Have impacts / vulnerabilities been prioritised in any way? If so, how?	Not evident	
Adaptation		
Does the plan set out actions to adapt to specific impacts / vulnerabilities? If yes, what? E.g. maintaining existing populations, increasing connectivity, enabling new species to become established, actively changing ecosystems	There are no specific actions relating to adaption but goals relating to ecosystem services will have adaption benefits, even if not explicitly recognised within the plan itself.	
Does the plan specify conservation measures which contribute to adaptation in the following ways (based on Smithers et al., 2008)?	Conserving existing biodiversity, protected areas and all other high quality habitats	Maintain, improve and reconnect 926ha of lowland calcareous grassland. Measures for chalkhill blue butterfly, duke of burgundy butterfly and the burnt orchid which are rare species. Stone curlew protection project.
	Reducing sources of harm not linked to climate	Modelling of groundwater pollution linked to land use change.
	Conserving the range and ecological variability of habitats and species	Grazing .
	Maintaining / establishing existing ecological networks	Habitat and species specific ecological network projects. The Chalk Grassland Ecological Network (CGEN) aims to reconnect the grassland by stepping stones and linear corridors. Wet woodland creation
	Creating buffer zones around high quality habitats	Buffer zones planned around the CGEN.
	Taking action to control spread of invasive species	
	Accommodate change	
	Making space for the natural development of rivers and coasts	Catchment management plan for the river Cuckmere. Restore floodplain meadows and downland for River Itchen.
	Translocation and ex-situ conservation	
	Discussion / notes on use of adaptation Principles in plan Actions do not appear to be informed by EBS or other adaptation principles but are likely to contribute to adaption. Plan is based on Lawton principles of bigger, better, joined.	
Are there any apparent gaps in terms of adaptation?	Climate change is not considered in detail. There is scope for the plan to consider the impacts of climate change on the desired outcomes as well as recognise the benefit of the specified actions for adaptation.	

NIA name	South Downs Way Ahead
Links to other initiatives	
Does the NIA business plan make links to other projects or initiatives focused on adaptation? If so, what?	Not all specifically adaption initiatives but most consider adaption to some extent: The other NIAs Brighton and Hove Biosphere Lewes Down Biosphere The Hampshire farmers Linking Landscapes NIA (failed to get funding) was mentioned as a group to work with due to their adaption strategies.
Does the plan make links to planning policy in relation to adaptation? E.g. biodiversity offsets, greenspace strategies	Yes – there are significant links to local planning authorities and a number of the objectives are focussed on planning, for example the 'Brighton and Hove city green network' which connects green spaces with the urban environment. Biodiversity offsets briefly mentioned.
Additional information	
Does the plan specify monitoring which will be used to review future plans and update actions?	Monitoring is specified for each objective and there is a sense that future plans will be informed by the outcomes of monitoring.
Is there any evidence that impacts have been identified and/or adaptation has been planned spatially?	It is not evident that objectives have been planned spatially.
Are there synergies with climate change mitigation?	Opportunities to use woodfuel are recognised.
Summary	
The South Downs Way Ahead NIA is based around the South Downs Way and the chalk geology and ecology which are characteristic of the area. There are a number of significant settlements nearby and the plan focuses on connecting the South Downs to these communities and improving ecological networks along a linear strip. The plan has ecosystem services (particularly access) at its core and one strand of the plan focuses on valuing ecosystem services. The plan does not appear to have been informed by a detailed climate change impact assessment and there is little mention of it as a pressure in the area. However, whilst not explicitly addressing adaptation, many of the proposed actions should have adaptation benefits, particularly through extending habitat network and catchment management.	

A.13. Wild Purbeck

NIA name	Wild Purbeck	
NIA partners	Dorset AONB Partnership National Trust, RSPB, Dorset Wildlife Trust, Natural England, Forestry Commission and Kingston Maurward College.	
Brief description of NIA aims and focus (e.g. biodiversity, networks, access, planning etc)	The plan appears to be mainly biodiversity focused, is on achieving long term biodiversity gains which are owned by the local community. Delivery is strongly focused on engaging land managers (particularly farmers) and communities to deliver biodiversity and socio-economic benefits.	
Does adaptation appear to be a main goal?	Adaptation doesn't appear to be a main goal of the plan. However, developing an adaptation plan is one of the actions in the plan and the need to improve resilience to future change is recognised. Adaptation focus is on sea level rise and coastal flooding. Responding to the impacts of climate change is seen as contributing to the rationale for larger, more integrated, more robust habitats.	
Identification of climate change impacts		
Have potential impacts of climate change / vulnerability of the NIA to climate change been assessed? If yes, how?	It doesn't appear that a climate change impact assessment has been carried out or has informed the development of the plan. Sea level rise is identified as a potential threat. However, developing an adaptation plan is one of the actions in the plan and it is anticipated that more detailed understanding of impacts and appropriate adaptation measures will result.	
Have any specific tools or data sets been used to identify the impacts of climate change? E.g. UKCP09 output, UKCIP tools, NE tools, RSPB vulnerability assessment etc.	None evident	
Have any other sources of information or guidance been used to identify impacts? E.g. expertise within the NIA, expertise from outside the NIA, published material	None evident	
If an assessment has been done, what impacts have been identified?	Increased soil moisture deficits and drying	
	Coastal evolution impacts	Sea level rise and coastal squeeze – loss of high quality habitat
	Increased risks from pests	
	Increased risks from diseases	
	Species unable to track changing climate space	
	Climate mitigation measures (positive/negative)	
	Major coastal flood/reconfiguration	Coastal flooding could lead to loss of high quality habitat
	Changes in soil organic carbon	
	Changes in species migration patterns	
	Increased water temperature and stratification of water bodies	
	Generalists favoured over specialists (e.g. ruderal spp.)	

NIA name	Wild Purbeck	
	Increased risk of wildfire	Climate change is expected to exacerbate fire risk.
	Increased water pollution risk and eutrophication	
	Impacts of low flows	
	Increased societal water demand	
	Major drought events	
	Other	Climate change might affect the outcomes of current and future conservation work, particularly the viability or costs/benefits of previously successful interventions
Have impacts / vulnerabilities been prioritised in any way? If so, how?	No prioritisation evident	
Adaptation		
Does the plan set out actions to adapt to specific impacts / vulnerabilities? If yes, what? E.g. maintaining existing populations, increasing connectivity, enabling new species to become established, actively changing ecosystems	There aren't any objectives relating to reducing the vulnerability of *specific* impacts but one of the delivery themes is '*Building resilience through strategic planning and research*' which includes climate change adaptation planning. Research under this theme is designed to support evidence based conservation activity and generate a strong understanding of the threats facing the area. Action under this theme includes developing an adaptation plan, establishing a baseline and monitoring programme.	
Does the plan specify conservation measures which contribute to adaptation in the following ways (based on Smithers et al., 2008)?	Conserving existing biodiversity, protected areas and all other high quality habitats	Introduce livestock grazing to ungrazed heathland. Site new woodland higher in the catchment to enhance water quality. Restoration and maintenance to reduce tree and scrub cover on sensitive 'open' habitats. Heathland re-creation. Wetland restoration work. Woodland creation. Create a new saline lagoon.
	Reducing sources of harm not linked to climate	Fire Management Planning (partly linked to climate but also access and land management). Visitor Management Planning.
	Conserving the range and ecological variability of habitats and species	
	Maintaining / establishing existing ecological networks	Landscape permeability planning.
	Creating buffer zones around high quality habitats	Wild Purbeck Land Management Advisory Service. Demonstrate a new way of buffering and linking habitats on the intensive grasslands.
	Taking action to control spread of invasive species	
	Accommodate change	

NIA name	Wild Purbeck	
	Making space for the natural development of rivers and coasts	Re-connect rivers with floodplains.
	Translocation and ex-situ conservation	
	Discussion / notes on use of adaptation Principles in plan It does not appear that the EBS adaptation principles have directly influenced the development of the plan but many of the actions will contribute to adaptation.	
Are there any apparent gaps in terms of adaptation?		
Links to other initiatives		
Does the NIA business plan make links to other projects or initiatives focused on adaptation? If so, what?	Yes - Living with a Changing Coast - help coastal regions plan, prepare and adapt to sea level rise. Poole Harbour and Studland are two of the project's focus sites.	
Does the plan make links to planning policy in relation to adaptation? E.g. biodiversity offsets, greenspace strategies	Community engagement is an important part of the plan and it envisages links to the neighbourhood planning process.	
Additional information		
Does the plan specify monitoring which will be used to review future plans and update actions?	Yes, a State of Wild Purbeck report will be compiled to establish an environmental baseline but also evaluate data on a landscape scale to inform future habitat management. The monitoring report will link to the climate change adaptation report. Research under the 'building resilience' theme will inform the development of future projects. A climate change adaptation plan will be developed under this theme which will be used to guide future activities. Monitoring and evaluation requirements will be set out as part of the plan.	
Is there any evidence that impacts have been identified and/or adaptation has been planned spatially?	No. However, some of the actions set out in the plan include mapping pressures and landscape permeability planning.	
Are there synergies with climate change mitigation?	None evident.	
Summary		
Wild Purbeck is rural in character with significant areas under agricultural management. The natural environment of the area is also a significant draw for tourists. The business plan is largely focused on improving biodiversity and realising socio-economic benefits from the natural environment. Actions are focused on habitat improvement and creation through engagement with land managers and local communities. The NIA appears to be at an early stage of planning climate change adaptation. The plan does not appear to have been informed by a detailed consideration of the impacts of climate change on the area or principles for adaptation but the need for greater consideration of resilience is recognised. One of the actions in the plan is to develop a climate change adaptation plan so it is envisaged that future activities will consider impacts and appropriate adaptation responses. The adaptation focus appears to be on improving resilience to sea level rise and coastal flooding.		

Appendix B. Workshop agendas

B.1. Birmingham and Black Country

Timing	Item	Description	Responsible
10.00	Welcome, housekeeping and aim of the day		Neil Wyatt / Nikki van Dijk
10.05	Context presentation	• The need to consider adaptation – vulnerability of the natural environment to climate change. • The need for tools/approaches that translate Principles into adaptation action. • Adaptation goes beyond connectivity. • Context of Natural England's climate change tools in terms of other NE work. • Other organisations' tools e.g. RSPB vulnerability assessment, Forest Research model etc.	Simon Duffield
10.30	NIA presentation	Brief introduction to business plan and how climate change adaptation has been considered in development of the plan. • Focus and objectives of NIA business plan. • Was the vulnerability of the NIA to climate change identified – how? • Was adaptation considered when developing objectives and actions – how e.g. EBS principles? • What are the additional adaptation benefits of the NIA objectives and actions? • How could climate change affect delivery of objectives?	NW
10.50	Vulnerability model presentation	Introduction to Natural England climate change vulnerability model. • Overview of how the model works. • Metrics it uses. • Outputs and how to interpret maps. • Potential uses of the data. Opportunity for Q+A at the end.	NvD
11.45	Vulnerability model discussion	Facilitated discussion. • How do you see the vulnerability model being used in the NIA? • What data / functionality would you find useful? • Will the model help overcome any barriers to adaptation? • How well will the model align with other tools/data sets? Are there any conflicts between them?	NvD
12.30	Lunch		
13.00	NCA vulnerability assessment method presentation and discussion	Brief overview of NCA vulnerability assessment methodology and potential uses within NIAs. Discussion to include: • How could the NCA vulnerability assessment method be used in the NIA? • Would it be useful to focus on elements of the natural environment in the NIA (biodiversity, geodiversity, historic environment, access etc)?	NvD

Timing	Item	Description	Responsible
13.30	Barriers to adaptation and next steps	Facilitated discussion. • Do you anticipate any barriers in applying the outputs of the models and tools in the NIA? E.g. time, resources, GIS capability etc. • What additional data, functionality or outputs from the models/tools would be useful? • Do you face any other barriers in planning climate change adaptation in general? E.g. knowledge of impacts, knowledge of actions, resources, guidance. • What additional assistance do you require to deliver adaptation?	SD
13.50	General Q+A	Chance for wider Q+A discussion about issues that have arisen during the day, climate change adaptation, NE tools, NIA business plans etc.	NvD
14.00	Wrap up and next steps	• What NE will do with feedback • Evaluation	Nikki van Dijk

B.2. Dark Peak

Timing	Item	Description	Responsible
10.30	Welcome, housekeeping and aim of the day		Sarah Taylor / Ross Frazer
10.40	Context presentation	• The need to consider adaptation – vulnerability of the natural environment to climate change. • The need for tools/approaches that translate Principles into adaptation action. • Adaptation goes beyond connectivity. • Context of Natural England's climate change tools in terms of other NE work. • Other organisations' tools e.g. RSPB vulnerability assessment, Forest Research model etc.	ST
11.10	NIA presentation	Brief introduction to business plan and how climate change adaptation has been considered in development of the plan. • Focus and objectives of NIA business plan. • How was the vulnerability of the NIA to climate change identified? • How was adaptation considered when developing objectives and actions? • What are the adaptation benefits of the NIA objectives and actions? • How could climate change affect delivery of objectives?	RF
11.30	Vulnerability model presentation	Introduction to Natural England climate change vulnerability model. • Overview of how the model works. • Metrics it uses. • Outputs and how to interpret maps. • Potential uses of the data. Opportunity for Q+A at the end.	ST
12.30	Lunch		
13.00	Vulnerability model discussion	Facilitated discussion • How might you use the vulnerability model? • What data / functionality would you find useful? • Will the model help overcome any barriers to adaptation? • How well will the model align with other tools/data sets? Are there any conflicts between them?	Nikki van Dijk
14.00	NCA vulnerability assessment method presentation and discussion	Brief overview of NCA vulnerability assessment methodology and potential uses within NIAs. • How could the NCA vulnerability assessment method be used in the NIA? • Would it be useful to focus on elements of the natural environment in the NIA (biodiversity, geodiversity, historic environment, access etc)?	NvD

Timing	Item	Description	Responsible
14.45	Barriers to adaptation and next steps	Facilitated discussion. • Do you anticipate any barriers in applying the outputs of the models and tools in the NIA? E.g. time, resources, GIS capability etc. • What additional data, functionality or outputs from the models/tools would be useful? • Do you face any other barriers in planning climate change adaptation in general? E.g. knowledge of impacts, knowledge of actions, resources, guidance. • What additional assistance do you require to deliver adaptation?	NvD
15.15	General Q+A	Chance for wider Q+A and discussion about issues that have arisen during the day, climate change adaptation, NE tools, NIA business plans etc.	ST
15.25	Wrap up and next steps	To cover: • Summary of feedback received during the day – chance to check with group. • What NE will do with feedback • Forthcoming publications – adaptation manual	ST

B.3. Dearne Valley Green Heart

Time	Item	Description	Responsible
11.30	Welcome, housekeeping and aim of the day		Mike Morecroft / Nicola Sims
11.40	Context presentation	• The need to consider adaptation – vulnerability of the natural environment to climate change. • The need for tools/approaches that translate principles into adaptation action. • Adaptation goes beyond connectivity. • Context of Natural England's climate change tools in terms of other NE work. • Other organisations' tools e.g. RSPB vulnerability assessment, Forest Research model etc.	MM
12.10	NIA presentation	Brief introduction to business plan and how climate change adaptation has been considered in development of the plan. • Focus and objectives of NIA business plan. • Was the vulnerability of the NIA to climate change identified – how? • Was adaptation considered when developing objectives and actions – how e.g. EBS principles? • What are the additional adaptation benefits of the NIA objectives and actions? • How could climate change affect delivery of objectives?	Pete Wall
12.30	Lunch		
13.00	Vulnerability model presentation	Introduction to Natural England climate change vulnerability model. • Overview of how the model works. • Metrics it uses. • Outputs and how to interpret maps. • Potential uses of the data. Opportunity for Q+A at the end.	Nikki van Dijk
13.45	Vulnerability model discussion	Facilitated discussion. • How do you see the vulnerability model being used in the NIA? • What data / functionality would you find useful? • Will the model help overcome any barriers to adaptation? • How well will the model align with other tools/data sets? Are there any conflicts between them?	NvD
14.30	NCA vulnerability assessment method presentation and discussion	Brief overview of NCA vulnerability assessment methodology and potential uses within NIAs. • How could the NCA vulnerability assessment method be used in the NIA? • Would it be useful to focus on elements of the natural environment in the NIA (biodiversity, geodiversity, historic environment, access etc)?	NvD

Time	Item	Description	Responsible
15.15	Barriers to adaptation and next steps	Facilitated discussion. • Do you anticipate any barriers in applying the outputs of the models and tools in the NIA? E.g. time, resources, GIS capability etc. • What additional data, functionality or outputs from the models/tools would be useful? • Do you face any other barriers in planning climate change adaptation in general? E.g. knowledge of impacts, knowledge of actions, resources, guidance. • What additional assistance do you require to deliver adaptation?	NvD
15.45	General Q+A	Chance for wider Q+A and discussion about issues that have arisen during the day, climate change adaptation, NE tools, NIA business plans etc.	MM
15.55	Wrap up and next steps	• Summary of feedback received during the day – chance to check with group. • What NE will do with feedback • Forthcoming publications – adaptation manual	NvD

B.4. Humberhead Levels

Time	Item	Description	Responsible
10.15	Registration and coffee		
10.30	Welcome, housekeeping and aim of the day		Sarah Taylor / Sue Plaxton
10.40	Context presentation	• The need to consider adaptation – vulnerability of the natural environment to climate change. • The need for tools/approaches that translate principles into adaptation action. • Adaptation goes beyond connectivity. • Context of Natural England's climate change tools in terms of other NE work. • Other organisations' tools e.g. RSPB vulnerability assessment, Forest Research model etc. • Link to Transport Corridors project in Humberhead Levels and Morecambe Bay NIAs • NCA project.	ST
11.00	NIA presentation	Brief introduction to business plan and how climate change adaptation has been considered in development of the plan. • Focus and objectives of NIA business plan. • Was the vulnerability of the NIA to climate change identified – how? • Was adaptation considered when developing objectives and actions – how e.g. EBS principles? • What are the additional adaptation benefits of the NIA objectives and actions? • How could climate change affect delivery of objectives?	SP
11.20	Coffee		
11.30	Vulnerability model presentation	Introduction to Natural England climate change vulnerability model. • Overview of how the model works. • Metrics it uses. • Outputs and how to interpret maps. • Potential uses of the data. Opportunity for Q+A at the end.	ST
12.30	Transport Corridors project	• Aim and objective of the project • Maps • Links to Vulnerability Model	Clare Warburton
12.45	Humberhead Levels NCA climate change project	• Method • Key findings • Links to other initiatives	Nikki van Dijk
1.00	Lunch		

Time	Item	Description	Responsible
1.30	Discussion	Facilitated discussion/ • How do you see the vulnerability model being used in the NIA? • How can the outputs of the vulnerability model and transport corridors project be used in conjunction? • What data / functionality would you find useful? • How can the outputs of the model help deliver adaptation? • How well will the model align with initiatives other than the transport corridors project? Are there any conflicts between them?	NvD
2.30	Barriers to adaptation and next steps	Facilitated discussion. • Do you anticipate any barriers in applying the outputs of the models and tools in the NIA? E.g. time, resources, GIS capability etc. • What additional data, functionality or outputs from the model would be useful? • Do you face any other barriers in planning climate change adaptation in general? E.g. knowledge of impacts, knowledge of actions, resources, guidance. • What additional assistance do you require to deliver adaptation?	NvD
3.00	Coffee		
3.10	General Q+A	Chance for wider Q+A and discussion about issues that have arisen during the day, climate change adaptation, NE tools, NIA business plans etc	ST
3.25	Wrap up and next steps	• Summary of feedback received during the day – chance to check with group. • What NE will do with feedback • Forthcoming publications – adaptation manual	ST

B.5. Meres and Mosses of the Marches

Timing	Item	Description	Responsible
10.30	Welcome, housekeeping and aim of the day		Sarah Taylor / Matt Jones
10.40	Context presentation	• The need to consider adaptation – vulnerability of the natural environment to climate change. • The need for tools/approaches that translate Principles into adaptation action. • Adaptation goes beyond connectivity. • Context of Natural England's climate change tools in terms of other NE work. • Other organisations' tools e.g. RSPB vulnerability assessment, Forest Research model etc.	ST
11.10	NIA presentation	Brief introduction to business plan and how climate change adaptation has been considered in development of the plan. • Focus and objectives of NIA business plan. • Was the vulnerability of the NIA to climate change identified – how? • Was adaptation considered when developing objectives and actions – how e.g. EBS principles? • What are the additional adaptation benefits of the NIA objectives and actions? • How could climate change affect delivery of objectives?	MJ
11.30	Vulnerability model presentation	Introduction to Natural England climate change vulnerability model. • Overview of how the model works. • Metrics it uses. • Outputs and how to interpret maps. • Potential uses of the data. Opportunity for Q+A at the end.	ST
12.30	Lunch		
13.00	Vulnerability model discussion	Facilitated discussion. • How do you see the vulnerability model being used in the NIA? • What data / functionality would you find useful? • Will the model help overcome any barriers to adaptation? • How well will the model align with other tools/data sets? Are there any conflicts between them?	Geoff Darch
14.00	NCA vulnerability assessment method presentation and discussion	Brief overview of NCA vulnerability assessment method and potential uses. • How could the method be used in the NIA? • Would it be useful to focus on elements of the natural environment in the NIA (biodiversity, geodiversity, historic environment, access etc)?	GD

Timing	Item	Description	Responsible
14.45	Barriers to adaptation and next steps	Facilitated discussion. • Do you anticipate any barriers in applying the outputs of the models and tools in the NIA? E.g. time, resources, GIS capability etc. • What additional data, functionality or outputs from the models/tools would be useful? • Do you face any other barriers in planning climate change adaptation in general? E.g. knowledge of impacts, knowledge of actions, resources, guidance. • What additional assistance do you require to deliver adaptation?	GD
15.15	General Q+A	Chance for wider Q+A and discussion about issues that have arisen during the day, climate change adaptation, NE tools, NIA business plans etc	ST
15.25	Wrap up and next steps	• Summary of feedback received during the day – chance to check with group. • What NE will do with feedback • Forthcoming publications – adaptation manual	ST

B.6. Morecambe Bay Limestones

Time	Item	Description	Responsible
10.15	Registration and coffee		
10.30	Welcome, housekeeping and aim of the day		Sarah Taylor
10.40	Context presentation	• The need to consider adaptation – vulnerability of the natural environment to climate change. • The need for tools/approaches that translate principles into adaptation action. • Adaptation goes beyond connectivity. • Context of Natural England's climate change tools in terms of other NE work. • Other organisations' tools e.g. RSPB vulnerability assessment, Forest Research model etc. • Link to Transport Corridors project in Humberhead Levels and Morecambe Bay NIAs	ST
11.00	NIA presentation	Brief introduction to business plan and how climate change adaptation has been considered in development of the plan. • Focus and objectives of NIA business plan. • Was the vulnerability of the NIA to climate change identified – how? • Was adaptation considered when developing objectives and actions – how e.g. EBS principles? • What are the additional adaptation benefits of the NIA objectives and actions? • How could climate change affect delivery of objectives?	Lucy Barron
11.20	Coffee		
11.30	Vulnerability model presentation	Introduction to Natural England climate change vulnerability model. • Overview of how the model works. • Metrics it uses. • Outputs and how to interpret maps. • Potential uses of the data. Opportunity for Q+A at the end.	ST
12.30	Transport Corridors project	• Aim and objective of the project • Maps • Links to Vulnerability Model	Clare Warburton
12.45	NCA climate change project	• Method • Key findings • Links to other initiatives	Nikki van Dijk
1.00	Lunch		

Time	Item	Description	Responsible
1.30	Discussion	Facilitated discussion. • How do you see the vulnerability model being used in the NIA? • How can the outputs of the vulnerability model and transport corridors project be used in conjunction? • What data / functionality would you find useful? • How can the outputs of the model help deliver adaptation? • How well will the model align with initiatives other than the transport corridors project? Are there any conflicts between them?	NvD
2.30	Barriers to adaptation and next steps	Facilitated discussion. • Do you anticipate any barriers in applying the outputs of the models and tools in the NIA? E.g. time, resources, GIS capability etc. • What additional data, functionality or outputs from the model would be useful? • Do you face any other barriers in planning climate change adaptation in general? E.g. knowledge of impacts, knowledge of actions, resources, guidance. • What additional assistance do you require to deliver adaptation?	NvD
3.00	General Q+A	Chance for wider Q+A and discussion about issues that have arisen during the day, climate change adaptation, NE tools, NIA business plans etc	NvD
3.20	Wrap up and next steps	• Summary of feedback received during the day – chance to check with group. • What NE will do with feedback • Forthcoming publications – adaptation manual	ST

B.7. Nene Valley

Time	Item	Description	Responsible
10.30	Welcome, housekeeping and aim of the day		Sarah Taylor
10.40	Context presentation	• The need to consider adaptation – vulnerability of the natural environment to climate change. • The need for tools/approaches that translate Principles into adaptation action. • Adaptation goes beyond connectivity. • Context of Natural England's climate change tools in terms of other NE work. • Other organisations' tools e.g. RSPB vulnerability assessment, Forest Research model etc.	ST
11.00	NIA presentation	Brief introduction to business plan and how climate change adaptation has been considered in development of the plan. • Focus and objectives of NIA business plan. • Was the vulnerability of the NIA to climate change identified – how? • Was adaptation considered when developing objectives and actions – how e.g. EBS principles? • What are the additional adaptation benefits of the NIA objectives and actions? • How could climate change affect delivery of objectives?	Heather Ball
11.20	Vulnerability model presentation	Introduction to Natural England climate change vulnerability model. • Overview of how the model works. • Metrics it uses. • Outputs and how to interpret maps. • Potential uses of the data. Opportunity for Q+A at the end.	ST
12.05	Vulnerability model discussion	Facilitated discussion. • How do you see the vulnerability model being used in the NIA? • What data / functionality would you find useful? • Will the model help overcome any barriers to adaptation? • How well will the model align with other tools/data sets? Are there any conflicts between them?	Nikki van Dijk
13.00	Lunch		
13.45	NCA vulnerability assessment method presentation and discussion	Brief overview of NCA vulnerability assessment methodology and potential uses within NIAs. • How could the NCA method be used in the NIA? • Would it be useful to focus on elements of the natural environment in the NIA (biodiversity, geodiversity, historic environment, access etc)?	NvD

Time	Item	Description	Responsible
14.30	Barriers to adaptation and next steps	Facilitated discussion. • Do you anticipate any barriers in applying the outputs of the models and tools in the NIA? E.g. time, resources, GIS capability etc. • What additional data, functionality or outputs from the models/tools would be useful? • Do you face any other barriers in planning climate change adaptation in general? E.g. knowledge of impacts, knowledge of actions, resources, guidance. • What additional assistance do you require to deliver adaptation?	NvD
15.00	General Q+A	Chance for wider Q+A and discussion about issues that have arisen during the day, climate change adaptation, NE tools, NIA business plans etc.	ST
15.15	Wrap up and next steps	• Summary of feedback received during the day – chance to check with group. • What NE will do with feedback • Forthcoming publications – adaptation manual .	ST

B.8. Northern Devon

Timing	Item	Description	Responsible
10.00	Registration and coffee		
10.30	Welcome, housekeeping and aim of the day		David Appleton
10.40	Context presentation – climate change impacts and the need for adaptation.	• The need for adaptation • Translating principles into action • Range of tools available	Sarah Taylor
11.00	NIA presentation – planning for climate change in the NIA.	Brief introduction to business plan and how climate change adaptation has been considered in development of the plan.	DA
11.20	Coffee		
11.30	Presentation of models and tools to assist in identifying vulnerability and habitat connectivity	10 min presentations of models / tools. • Natural England Climate Change Vulnerability Model • Forest Research tool • SNA and Nature Map • Biodiversity offsetting strategy	ST Kevin Watts Peter Burgess Andy Bell
12.10	Discussion of models and tools in the context of planning a Northern Devon ecological network.	Facilitated discussion. • How can outputs be used to plan an ecological network? • Strengths and weaknesses of tools • How can tools be used in conjunction? • Other applications for the tools	Geoff Darch
13.00	Lunch		
13.30	Discussion – develop an action plan for using the tools to develop a connectivity map for Northern Devon	Facilitated discussion with maps to arrive at a plan for using the outputs of the models/tools to plan a connectivity map for Northern Devon.	GD
14.30	Discussion – barriers and next steps	Facilitated discussion: • Barriers to using models / tools • Additional data, functionality or outputs • Other adaptation barriers • Additional assistance required	GD
15.15	Wrap up	Explain next steps of Natural England project – evaluation and write up.	ST

B.9. Wild Purbeck

Timing	Item	Description	Responsible
11.00	Welcome, housekeeping and aim of the day		Sarah Taylor / Alison Turnock
11.10	Context presentation	• The need for tools/approaches for translating climate change adaptation principles into action • NE thinking about climate change adaptation (and ecosystem services). • Context of tools in terms of other NE work, guidance, research reports etc. • Other organisations' tools e.g. RSPB vulnerability assessment, Forest Research model etc. • Brief description of the tools we are discussing today.	ST
11.35	NIA presentation	Brief introduction to how climate change adaptation has been considered in Wild Purbeck and in the development of the NIA. • Climate change focus and objectives in the NIA inc permeability study • Was the vulnerability of the NIA to climate change identified – how? • RSPB climate change adaptation work • What are the additional adaptation benefits of the wider NIA objectives and actions? • How could climate change affect delivery of wider objectives?	Paul Buckley
12.00	Feedback on Natural England tool	Reminder of vulnerability tools and data that has been shared with NIA. Discussion. • How might you be able to use the model output? • How well does the model align with other ways of considering climate change e.g. RSPB approach? • Is there anything about the model and the output you would like to change? • How useful are the maps you have? Are there other maps you would find useful? • Do you anticipate any barriers in applying the outputs of the models and tools in the NIA? E.g. time, resources, GIS capability etc.	ST
13.00	Lunch		
13.45	Adaptation planning in Purbeck	Discussion session. • How do we turn the current adaptation plan into what we need for wider Purbeck? • What needs to be done to take outputs of the vulnerability model and other work forward to plan adaptation? • Who is the work for, how do we consult over it? • What products should we aim to produce? • How do we set up longer term monitoring? • Who will do this work – small project team?	PB
15.00	Coffee		

Timing	Item	Description	Responsible
15.15	Outstanding issues/concerns	• Do you face any other barriers in planning climate change adaptation in general? E.g. knowledge of impacts, knowledge of actions, resources, guidance. • What additional assistance do you require to deliver adaptation?	Nikki van Dijk
15.30	Wrap up and next steps	• Summary of feedback received – chance to check with group. • What we will do with feedback • Next steps to deliver adaptation project in NIA • Forthcoming meetings and publications – adaptation manual	ST / PB

B.10. LNP workshops

Time	Item	Responsible
1300	Registration and lunch	
1400	Introductions	Julian Wright, Environment Agency
1405	**Ice breaker** Challenges facing LNPs	Nikki van Dijk, Atkins
1415	**Introduction to the day**	Julian Wright
1430	**Discussion session** Impact of weather events in LNP areas What happened and what were the impacts? What was done about it? By who? What was not done / could have been done?	Geoff Darch, Atkins
1500	**Climate change impacts and need for adaptation** Presentation and Q+A	Nikki van Dijk
1545	**Discussion session** Adaptation actions	Nikki van Dijk
1630	**Discussion session** Takeaways form the afternoon	Julian Wright
1700	Close	

Appendix C. Briefing note

Natural England NIA Climate Change Adaptation Project

Workshop Briefing Note

This note is intended to introduce NIA partnerships to the Natural England Climate Change Adaptation Project and set the scene for the forthcoming workshop. The note describes the aim of the workshop and provides background information on a range of adaptation tools and methodologies developed by Natural England and other organisations. Other sources of climate change impact assessment and adaptation information for the natural environment are also highlighted.

Project description

Natural England, working on behalf of a partnership including Defra, the Environment Agency and Forestry Commission, are undertaking a climate change knowledge exchange project with NIAs. The aim of the project is to work with NIA partnerships to pilot and evaluate different approaches to facilitating adaptation to climate change at a landscape scale.

Initially, the project involves a review of NIA business plans to identify how climate change adaptation has been considered (explicitly or implicitly) in the identification of objectives and actions. Following the review, workshops will be held with NIA partnerships to learn more about how climate change is being considered and to discuss the potential application of adaptation tools which have been developed by Natural England and other organisations. An evaluation of the tools discussed at the workshop and different approaches to delivering climate change adaptation information and guidance will be carried out after the workshops have taken place. This will help inform us about ways we could improve tools and knowledge exchange to assist in planning and implementation of adaptation.

In particular, outcomes of the project will inform future climate change adaptation advice and support provided by Natural England and its partners, for example Natural England's forthcoming Adaptation Manual, but we anticipate that it will have added value for NIA partnerships in terms assessing risks to achievement of their biodiversity objectives, and the benefits of planning adaptation, linking to the parallel NIA Phase 2 monitoring and evaluation project.

Workshop aim

The aim of the workshop is to introduce the NIA partnership to a small number of climate change adaptation tools and consider how they could be used within the NIA to plan and deliver adaptation. The day will include a mixture of presentations and facilitated discussion sessions. At the end of the workshop, NIA partnerships should have an appreciation of how they can use the different tools to understand the vulnerability of the NIA to the impacts of climate change and start to plan adaptation actions.

The aims of the workshop are to:

- Understand NIA experience of planning for adaptation;
- Introduce a small number of climate change adaptation tools and consider how they could be used to plan and deliver adaptation and benefits for the NIA;
- Improve NIA partnership understanding of climate change and potential impacts, the threats these may pose to achieving biodiversity outcomes and the types of actions that could be included in adaptation planning; and
- Encourage discussions and feedback on the tools to increase our understanding of what knowledge exchange, tools, data and products would help stakeholders to embrace planning for climate change.

Climate change adaptation tools for the natural environment

This section of the note briefly introduces a number of tools, models and methodologies which can be used to help understand the vulnerability of a landscape scale area to the impacts of climate change and start to plan adaptation actions. A number of the tools described here will be discussed at the workshop. Please note, this list is not comprehensive.

Climate Change Vulnerability Model. Natural England

A GIS-based model which spatially represents the relative vulnerability of habitats to climate change and can be used for a range or purposes, including prioritising areas for action, providing supporting evidence for decision making and monitoring the outcome of adaptation measures. As part of the project, Natural England will be sharing model outputs and data with each NIA. NIA partnerships will be asked for feedback on potential applications of the Natural England Climate Change Biodiversity Vulnerability Model as well as its usability.

National Character Area (NCA) Climate Change Vulnerability Assessment Methodology, Natural England

A qualitative methodology for understanding the vulnerability the natural environment at a landscape scale. The methodology was devised for use in NCAs but is applicable to any landscape scale area. The methodology provides a systematic approach for assessing the vulnerability of valued assets, considering their sensitivity, exposure and adaptive capacity to determine a relative vulnerability rating. The methodology can be applied to different classes of natural environment assets including, biodiversity, geodiversity, historic environment and access assets. The method can also be used to assess vulnerability of ecosystem services by considering proxy assets (e.g. peat soils, floodplains, wetland habitats etc.).

http://www.naturalengland.org.uk/ourwork/climateandenergy/climatechange/adaptation/naturalengland.aspx

If considering application at the NCA level, information on woodland and wider environmental context is available through the 'Woodland Potential Calculator'.

http://www.forestry.gov.uk/england-wpc.

Reserve Climate Change Vulnerability Assessment, RSPB

This assessment methodology evaluates the ecological and human response impacts as a result of an average rise of 2°C in global temperature. The method starts by predicting likely ecological effects although it is acknowledged that human responses and actions will be highly important. The method then considers the impact of these changes and possible responses to adapt conservation work. The emphasis is on climate *adaptation* although in places the method touches on local actions which may serve to mitigate climate impacts and support adaptation measures.

Ecological Site Classification Decision Support System, Forest Research

This model has been developed to provide guidance on species choice and native woodland suitability in Britain. The suitability of individual species for timber production is predicted on the basis of four climatic factors (temperature, moisture deficit, exposure and continentality) and two soil factors (soil wetness and soil fertility). The suitability of a given species for native woodland restoration can also be modelled. Changes to species' suitability are assessed for a range of climate change scenarios to the 2050s and 2080s. Current and future suitability (and timber productivity) are provided for any site (8 figure grid reference), using default soil variables. More detailed soil information based on field survey can also be input. A password is required.

http://www.forestry.gov.uk/website/forestry.nsf/byunique/infd-8mce2r

Pre-prepared national suitability maps are also available for a range of the most suitable broadleaved and conifer species.

http://www.forestry.gov.uk/fr/INFD-5ZXFSD

Other sources of information

UK Climate Projections (UKCP09)

Defra publishes the results of modelling which projects how the UK climate might change over the next century. The latest projections are United Kingdom Climate Projections 2009 (UKCP09). UKCP09 contains projections of average temperature and rainfall (annual and seasonal) as well as extremes for the UK at the scale of 25x25km grid squares. Headline messages are also available at the national, regional and river basin scale. Projections of sea level rise are presented separately.

http://ukclimateprojections.defra.gov.uk/

UK Climate Change Risk Assessment (CCRA), Natural Environment Sector

The Government published the UK Climate Change Risk Assessment in 2012. The CCRA is a review of the evidence for potential impacts of climate change across the UK and includes a report on biodiversity and ecosystem services. The biodiversity and ecosystem services CCRA concludes that climate change is already having a direct effect on biodiversity and that there are a number of key risks, including habitat loss as a result of flooding and coastal change, species movement unable to keep pace with climate change, wildfires and drying out of soils and habitats.

http://randd.defra.gov.uk/Document.aspx?Document=CCRASummaryBiodiversityandEcosystemServices.pdf

England Biodiversity Strategy Climate Change Adaptation Principles

The England Biodiversity Group's climate change adaptation workstream has developed a set of principles to support policy makers and practitioners in thinking about how they can ensure climate change and biodiversity are taken into consideration in their work. The principles are arranged in five categories: take practical action now; maintain and increase ecological resilience; accommodate change; integrate action across partners and sectors; and develop knowledge and plan strategically.

http://www.defra.gov.uk/publications/2011/05/24/pb13168-england-biodiversity-strategy/

Towards Adaptation to Climate Change, England Biodiversity Strategy

A review of the scientific evidence for the potential impacts of climate change on the biodiversity of England within each of the sectors of the England Biodiversity Strategy: Agriculture, Water and Wetlands, Woodland and Forestry, Coastal and Marine, Towns and Cities. The report highlights direct impacts and indirect ones resulting from human responses to climate change. It gives a brief overview of the main non-climatic pressures on biodiversity and their possible interactions with climate change. Principles and measures for adapting biodiversity policy and management to climate change are presented.

http://nora.nerc.ac.uk/915/1/Mitchelletalebs-climate-change.pdf

Climate Change and Forests, Forestry Commission

The Forestry Commission’s website on climate change contains information and links to reports about the impacts of climate change on the UK’s woodlands as well as information on the role of forest management in climate change adaptation.

http://www.forestry.gov.uk/climatechange and http://www.forestry.gov.uk/climatechangeengland

Climate Ready, Environment Agency

Climate Ready is a support service provided by the Environment Agency to help businesses, public sector and other organisations in adapting to a changing climate. The Climate Ready website includes pages on the natural environment.

http://www.environment-agency.gov.uk/research/139931.aspx

Climate Change, Wildlife and Adaptation, RSPB

A non-technical document which poses answers to a number of frequently asked questions about climate change adaptation, wildlife and conservation policy.

http://www.rspb.org.uk/Images/climatechange20questions_tcm9-170121.pdf

Adapting to climate change, Defra

Web pages containing information about Defra's role in adaptation. Links to Defra funded initiatives and project reports.

http://www.defra.gov.uk/environment/climate/adapting/

The BRANCH Project

The BRANCH project (Biodiversity Requires Adaptation in Northwest Europe under a CHanging climate) focused on promoting the importance of helping biodiversity to adapt to climate change using spatial planning systems. The project brought together spatial planners, policy makers and scientists from across North West Europe to, among other things: review existing spatial planning policies; model how wildlife might respond to climate change; develop planning options and tools for coastal areas; assess the impact of climate change on inland ecosystems; and engage stakeholders. http://webarchive.nationalarchives.gov.uk/20090703091708/http://www.branchproject.org/

The project mapped the future 'climate space' for 389 species under a range of climate change scenarios.

Climate change wetland management toolkit

As part of the Wetland Vision process CEH has developed a tool for assessing the sensitivity of UK wetlands to climate change.

http://www.ceh.ac.uk/sci_programmes/Water/WetlandsandClimate.html

Impacts of Europe's changing climate - 2008 indicator-based assessment

This report presents information the projected impacts of climate change for 40 indicators, including atmosphere and climate, the cryosphere, marine systems, terrestrial systems and biodiversity, agriculture and forestry, soil, water quantity (including floods and droughts), water quality and fresh water ecology, and human health.

http://www.eea.europa.eu/publications/eea_report_2008_4

Forthcoming resources

Climate Change Impact Report Cards – **Terrestrial Biodiversity** (due early 2013)

The Living With Environmental Change (LWEC) Partnership will publish climate change impact report cards for terrestrial biodiversity and the water environment in March 2013. The report cards will provide a high level summary of the observed and projected impacts of climate change on terrestrial biodiversity and the water environment. The cards will complement the Marine Climate Change Impacts Partnership (MCCIP) report card for the marine environment and are intended to be the first in a suite of report cards covering the sectors of the UK CCRA.

Natural England Climate Change Adaptation Manual - (due early 2013)

Natural England is preparing a manual to assist in the planning and delivery of climate change adaptation. The Manual aims to assist conservation and land managers in translating adaptation principles into action on the ground, delivering benefits for biodiversity and ecosystem services.

National Adaptation Plan

Defra is developing a National Adaptation Programme to address the risks set out in the UK CCRA. The first National Adaptation Programme will be published in 2013 and will focus on helping UK businesses, local authorities and civil society to become more resilient or 'Climate Ready' to climate change impacts. The National Adaptation Programme will be reviewed every five years to address the most pressing climate change risks to the UK.

http://www.defra.gov.uk/environment/climate/government/nap/

Appendix D. Survey questions

D.1. NIA adaptation project evaluation survey

Introduction

Natural England, working on behalf of a partnership including Defra, the Environment Agency and Forestry Commission, is undertaking a climate change knowledge exchange project with NIAs. The aim of the project is to work with NIA partnerships to pilot and evaluate different approaches to facilitating adaptation to climate change at a landscape scale.

This questionnaire forms part of the evaluation of the workshops and the tools shared at those events. Responses will be used to update the tools presented, particularly the vulnerability model which is still in a trial period, and inform future climate change adaptation advice and support provided by Natural England and its partners.

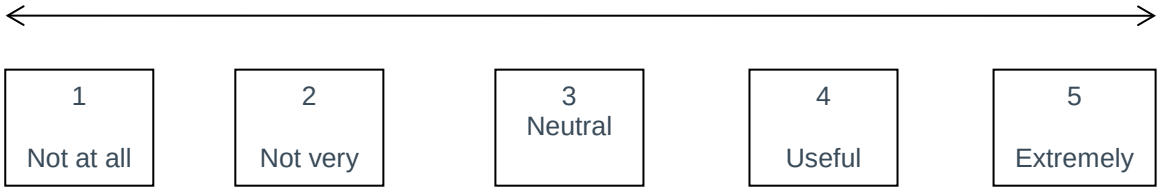
Thank you for attending the workshop and taking part in this survey.

Instructions for completing survey

The survey has five parts:

- Part 1 – Introduction
- Part 2 – Workshops
- Part 3 – National Biodiversity Climate Change Vulnerability Model
- Part 4 – Other tools and methodologies
- Part 5 – Barriers to adaptation and further support required

Where a 1-5 scale is used, the following applies:



Part 1 Introduction

1. Which event did you attend?

Birmingham and Black Country	
Dark Peak	
Dearne Valley	
Greater Thames Marshes	
Humberhead Levels	
Nene Valley	
Northern Devon	
Meres and Mosses of the Marches	
Morecambe Bay Limestones	
South Downs	
Wild Purbeck	

2. What sort of organisation do you represent?

Conservation NGO (e.g. Wildlife Trust, RSPB)	
Statutory body (e.g. Environment Agency, Natural England, Forestry Commission)	
Local authority	
Educational institution	
Recreation NGO	
Private sector organisation	
Other (please specify)	

Part 2 Workshop

The aim of the workshop was to introduce NIA partnerships to a small number of climate change adaptation tools and consider how they could be used to plan and deliver adaptation. For NIAs which had been introduced to the tools in advance of the workshop, the event was used to explore potential uses in more depth.

The objectives of the workshop were to:

- Understand NIA experience of planning for adaptation.
- Introduce a small number of climate change adaptation tools and consider how they could be used to plan and deliver adaptation and benefits for the NIA.
- Improve NIA partnership understanding of climate change and potential impacts and the types of actions that could be included in adaptation planning.
- Encourage discussion and feedback on what would help stakeholders to plan for climate change.

3. On a scale of 1-5, please rate the usefulness of the different elements of the workshop in assisting with planning for adaptation:

Introductory presentation on climate change and the need for adaptation	
Vulnerability model presentation and discussion	
NCA methodology presentation and discussion	
Discussion of adaptation barriers	

4. Were there any other aspects of the workshop that you found particularly useful? Please give details.

5. Were there any aspects of the workshop which you did not find useful? Please give details.

6. On a scale of 1-5, to what extent did the workshop meet your expectations in terms of helping to plan adaptation in the NIA?

Part 3 National biodiversity climate change vulnerability model

The National Biodiversity Climate Change Vulnerability Model (NBCCVM) is a GIS-based model which spatially represents the relative vulnerability of habitats to climate change. NIA partnerships were introduced to the model at the workshops in winter 2012/13 (or at previous events). The model is currently in a trial period and a first-cut of data and maps from the model were shared with NIA partners following the workshops.

7. On a scale of 1-5, how useful do you think the NBCCVM will be for understanding vulnerability to climate change and planning adaptation at:

a) national scale?

b) NIA scale?

8. What ideas do you have for using the data and maps shared so far (i.e. outputs at a national scale) in the NIA? If you have already used the data, please describe what you have used it for.

9. Do you have any suggestions for changing the model at a national scale? If yes, please give details.

10. Would you be interested in running the model locally (e.g. with local data sets or amendments to the metrics)?

Yes	
No	

11. If yes, what would you like to use the model for locally?

12. Do you envisage any of the following being a barrier to use of the model in the NIA?

Quality of national datasets	
Availability and quality of local datasets	
Model structure and underlying assumptions	
Local GIS expertise / resource availability	
Other (please give details)	

13. Based on what you have seen so far, what do you consider to be the strengths and weaknesses of the model?

a) strengths?

b) weaknesses?

Part 4 Other tools and methods

At the workshops a number of methods and reports developed by Natural England for understanding climate change vulnerability and adaptation actions were discussed, including the National Character Area (NCA) Climate Change Vulnerability Assessment Methodology.

14. On a scale of 1-5, how useful do you think the NCA method is / will be for understanding vulnerability to climate change and planning adaptation in the NIA?

15. How could the NCA vulnerability assessment method be used in the NIA or beyond?

16. What do you consider to be the strengths and weaknesses of the method?

a) strengths?

b) weaknesses?

17. Of the tools, methodologies and reports mentioned at the workshop (or in the briefing note) which:

- were you already aware of?
- might be useful to you and the NIA?
- would you like more information about?

Tool, method or report	**Organisation**	**Aware**	**Might be useful**	**More info**
Climate Change Adaptation Principles	England Biodiversity Strategy			
Towards Adaptation to Climate Change	England Biodiversity Strategy			
BRANCH project	Natural England and partners			
Green Infrastructure Guidance	Natural England			
Guidance on dealing with the changing distribution of tree species	Natural England			
NCA Vulnerability Assessment Method and pilot studies	Natural England			
National Biodiversity Climate Change Vulnerability Model	Natural England			
UKCP09 Climate Change Projections	United Kingdom Climate Impacts Programme			
UK Climate Change Risk Assessment, Natural Environment Sector	Defra			
Climate Ready Support Service	Environment Agency			
Reserve Climate Change Vulnerability Assessment	RSPB			
Ecological Site Classification Decision Support System	Forest Research			
Climate change wetland management toolkit	CEH			

Part 5 Barriers to adaptation and further support required

18. Which of the following (if any) do you consider to be barriers to adaptation in the NIA?

Understanding of the potential impacts of climate change	
Understanding the adaptation actions required to address impacts on the ground	
Communicating the need for adaptation to politicians	
Communicating the need for adaptation to land owners and managers	
Demonstrating the economic value of ecosystem services	
Accessing funding for delivery of adaptation	
Current conservation policy and designations	
Current planning policy	
Public understanding of climate change and the need for adaptation	
Land values	
Current land use	
Monitoring and evaluating adaptation – how to know if actions are effective	
Other (please specify)	

19. Which of the following (if any) would you find useful for Natural England and its partners to provide to address these barriers?

Information on the potential impacts of climate change on species	
Information on the potential impacts of climate change on habitats	
Information on the potential impacts of climate change on ecosystem services	
Guidance on potential adaptation actions for species	
Guidance on potential adaptation actions for habitats	
Guidance on potential adaptation actions for ecosystem services	
Case studies of adaptation actions (for species, habitats or ecosystem services)	
Methodologies to assess the potential impacts of climate change locally	
Methodologies to identify adaptation actions locally	
Information on the multiple benefits of HLS and other delivery mechanisms for adaptation	
Guidance on transformational change e.g. when to consider translocations, abandonment of species or habitats etc.	
Decision support tool for assessing trade-offs	
Methodology for valuing ecosystem services	
Training on climate change adaptation and the natural environment for local staff (e.g. HLS advisors, planning officers)	
Training on climate change adaptation and the natural environment for politicians	

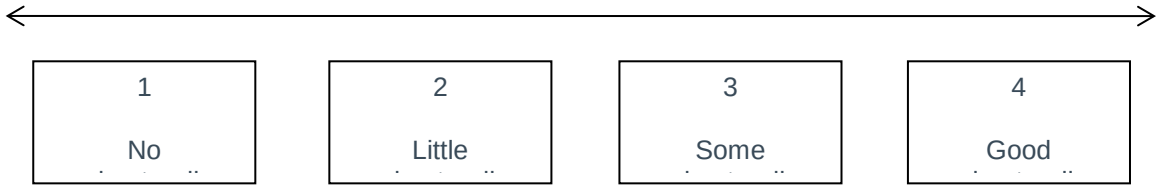
20. What else would you like to see from Natural England and its partners in terms of adaptation advice and support?

21. What other organisations or initiatives should be involved in adaptation? What support do they require?

22. How would you like to see Natural England and its partners communicate with NIA partnerships (and other landscape scale conservation initiatives) regarding climate change adaptation?

Reports	
Web-portal	
Fact sheets and FAQs	
Local workshops	
Webinars	
Other (please specify)	

23. On a scale of 1 – 4, how would you describe your understanding of climate change adaptation and the natural environment:



a) before taking part in this project?

b) after taking part?

Thank you very much for taking part in this survey.

If you have any queries about the survey or the NIA Climate Change Adaptation Project, please contact Nikki van Dijk on 01733 366919 or nikki.vandijk@atkinsglobal.com

D.2. Interview questions

1. What level of understanding of climate change impacts and adaptation actions existed in the NIA partnership prior to the workshop? To what extent do you think the workshop help to improve understanding?

2. Based on the workshop and the data shared after the event, what do you consider to be the strengths and weaknesses of the NBCCVM?

3. What ideas do you have for using the NBCCVM in the NIA?

4. What changes are required to use the model for these purposes? Are GIS resources and expertise available to the NIA partnership to use the model for these purposes?

5. Do you envisage the NCA Vulnerability Assessment method being useful in the NIA? How might you use the method?

6. Do you think any of the other tools, reports and sources of information mentioned during the workshop (or listed on the briefing note) might be of use in the NIA? Which ones and why?

7. What barriers to planning and delivering adaptation do you face in the NIA?

8. What sort of action, information, guidance or training might help overcome these barriers? What do you feel is needed to support adaptation action on the ground?

9. How would you like Natural England and its partners to engage with NIA partnerships (and other landscape scale conservation initiatives) on the subject of adaptation?

Appendix E. Workshop reports

E.1. Birmingham and Black Country

Project:	NIA Climate Change Adaptation workshop		
Subject:	Birmingham and the Black Country NIA workshop		
Date and time:	17th Dec, 10am – 2pm		
Meeting place:	Birmingham and Black Country Wildlife Trust, Edgbaston	**Minutes by:**	Nikki van Dijk

Introduction – points raised

- England Biodiversity Strategy Principles for Adapting to Climate Change - http://www.defra.gov.uk/publications/2011/05/24/pb13168-england-biodiversity-strategy/
- Natural England publications library – search 'climate change' to find climate change related reports, including NCA vulnerability assessment reports. http://www.naturalengland.org.uk/publications/publications/default.aspx
- Mediterranean plant species are being observed in the West Midlands – e.g. *Medicago arabica.* Evidence of the north and westward shift of species.
- Woodland could be susceptible to seasonal changes in climate, particularly ground flora. Bluebells may decline whilst early germinating species might increase.

NIA presentation - key points

- The need for climate change adaptation was taken as a given in developing the plan. The plan assumes that conditions will become more variable and there will be more extreme events.
- The NIA incorporates all urban and non-urban habitats – not just protected areas.
- Business plan incorporates Lawton principles of bigger, better, more and joined but also focuses on people.
- There is good local data on species and habitats – assisted in targeting the plan spatially around habitat types (grassland, woodland, heathland).
- Waterways are important features – good for connectivity but also pose a risk in terms of invasives.
- Green infrastructure is important in the NIA.
- Urban heat island is a significant issue in the NIA and could be exacerbated by climate change. The problem could be worse in Birmingham than London given the lack of large greenspaces. The NIA objectives aim to contribute to reducing UHI effect.
- The plan focuses on achieving multiple benefits for biodiversity, flood alleviation, reducing UHI effect etc. The NIA is not anti-development but wants to see development occurring in the right way and in the right places to have multiple benefits.
- Flooding is an issue – the landscape needs to be more porous to alleviate flooding.
- HS2 will run through the area – potential impacts on biodiversity but also opportunities for habitat creation.

NCA vulnerability assessment - feedback

- The method is useful as it provides a framework and a disciplined approach to local conversations – asks the right questions but is not prescriptive in terms of answers. The answers are intuitive – the method is nothing new but is useful for bringing together information and people locally to understand vulnerability. However, guidance on difficult issues such as deciding to protect or accept loss might be helpful.
- The method is subjective – but this is not necessarily a problem. It is explicitly subjective whereas other methods may appear more objective than they are.
- The method could be used to highlight where changes in management are required. The method could be used to assess implications of climate change for protected sites – link to RSPB reserve vulnerability assessment.
- Policy impact assessments would benefit from consideration of climate change adaptation – it would be useful for all assessments to consider impacts of climate change on the policy and how the policy might contribute to / conflict with adaptation. A 'climate change' statement could accompany all policy assessments.

- The method can be used to develop high level adaptation action plans e.g. Forest of Bowland AONB action plan http://www.forestofbowland.com/files/uploads/pdfs/FOB_climate%20adap%20REPORT%20May%202011.pdf and appendices http://www.forestofbowland.com/files/uploads/pdfs/FOB_climate%20adap%20Appendices%20May%202011.pdf
- The NIA business plan is based on Lawton principles but it might be useful to re-consider the plan in terms of climate change adaptation. This method could be used to assist with this. The NIA objectives could be scoped in at Step 1 of the method.
- Could include a climate change mitigation and adaptation criteria on the project application form and consider when assessing potential projects.
- Could recommend to partners that they consider adaptation in their management and project plans – could suggest using this methodology. Also LEPs.
- The method focuses on direct impacts of climate change – it could be strengthened if it considered in-direct impacts and impacts of human responses to climate change.
- The final step in the method is similar to that which has been used to assess the possible costs and benefits for ecosystem services of environmental opportunities in the updated NCA profiles. Approximately 30 profiles have been updated, including the one for the Arden NCA. Environmental opportunities are cross-checked against a range of ecosystem services and presented in a table. Available at http://publications.naturalengland.org.uk/category/587130

Vulnerability model – feedback and potential uses

- By choosing to use priority habitats, the model doesn't pick up a lot of important habitat in the urban context e.g. urban mosaic, green infrastructure. For this reason, the model (as it is with national priority habitat data) may not work as well in urban areas as in rural areas. In urban areas, non-classic habitats are very valuable e.g. buildings, wasteland, gardens but these are not picked up as national priorities.
- From the maps, it appears that urban areas are not very vulnerable to climate change but this isn't the case – urban areas (and habitats) could be very vulnerable as the consequences of climate change on ecosystem services will affect many people.
- In urban areas, ecosystem services and landscape function is very important – this is not represented by a biodiversity model.
- The model outputs appear objective but are actually subjective, depending on what you choose to input to the model in terms of habitat sensitivities, metric weightings, data sets etc.
- There's a risk that you could show the maps to people and they think that it's OK to build in the white squares – conversely, the maps could be used to put forward an argument for habitat creation in the white squares.
- It looks like some areas of priority habitat are not being picked up – woodland south of Halesowen. Also some SSSIs appear to be missing.
- Presentational issue – the choice of colours used is not good for people with red-green colour-blindness.
- The resolution of the model is very good – better than most datasets available.

Barriers to adaptation and additional support required

- It is not easy to determine the 'right' answers in terms of adaptation and conservation – there will be a series of choices and trade-offs which will have to be made. How do we make decisions about what to welcome? Do we aim to maximise biodiversity or cater for generalists? These are often very political questions. Some guidance on difficult issues such as deciding to protect or accept loss might be helpful.
- Climate change information and advice needs to be embedded in Natural England – tools and methods developed nationally need to be communicated to local staff e.g. those responding to planning applications.
- These workshops are 'preaching to the converted' in terms of the need for adaptation action – we need to get these messages across to planners and local authorities (particularly Chief Execs). There are three LEPs in the area – need to interact with them.
- Would like to see more support for urban habitats – recognition of the importance of non-classic habitats for biodiversity and specific guidance for adaptation of the natural environment in the urban context.

E.2. Dark Peak

Project:	NIA Climate Change Adaptation workshop		
Subject:	Dark Peak NIA workshop		
Date and time:	27th Nov, 11am – 3.30pm		
Meeting place:	Moorland Discovery Centre, Longshaw	**Minutes by:**	Nikki van Dijk

Introduction

- England Biodiversity Strategy Principles for Adapting to Climate Change - http://www.defra.gov.uk/publications/2011/05/24/pb13168-england-biodiversity-strategy/
- Natural England publications library – search 'climate change' to find climate change related reports, including NCA vulnerability assessment reports. http://www.naturalengland.org.uk/publications/publications/default.aspx

Vulnerability model – questions and feedback

- Which climate change projections have been used?
  The model doesn't use specific climate projections but considers the direction of travel for climate variables (e.g. temperature, rainfall). The range of scenarios and uncertainty means that direction of travel is a more useful approach than fixing the model to specific projections.
- How have climate impacts been considered in the model?
  Through the sensitivity metric. The sensitivity of priority habitats to the impacts of climate change is taken from an England Biodiversity Strategy document (Mitchell, R.J., Morecroft, M.D., Acreman, M., Crick, H.Q.P., Frost, M., Harley, M., Maclean, I.M.D., Mountford, O., Piper, J., Parr, T.W., Pontier, H., Rehfisch, M.M., Ross, L.C., Smithers, R.J., Stott, A., Walmsley, C.A., Watt, A.D., Watts, O. and Wilson E. (2007) '*England Biodiversity Strategy - towards adaptation to climate change*'. Final report to Defra for contract CRO327). The sensitivity classifications from this document were reviewed by Natural England habitat specialists and amended (and added to) where necessary.
- The sensitivity metric is a national metric: it does not take local sensitivity into consideration and could therefore be considered quite crude. The classification of habitat sensitivity could be altered in the model if local data is available.
- Blanket bog does not appear highly vulnerable on the overall vulnerability map of Dark Peak NIA – partners would be concerned if this output was used to identify relative vulnerability at a national level as it might appear that the Dark Peak area is not very vulnerable therefore not a priority are for action. The model output needs to be locally ground truthed and metrics tweaked to reflect local conditions: blanket bog is likely to be more vulnerable if the condition metric only includes 'favourable' rather than 'favourable' and 'unfavourable recovering' for SSSIs. Much of the bog is classified as 'unfavourable recovering' but it still in a very poor condition. It would be useful to see the map resulting from changing the condition metric to 'favourable' only. It would also be useful if local data on blanket bog could be included (e.g. Moors for the Future data or Biological Records Centre).
- The model does not include locally specific habitat sensitivities e.g. wildfire and bracken (unless this is considered in the sensitivity classification given by the EBS document). The model would be strengthened if local data sets can be added or overlaid.
- Can the resolution of the model be made finer? Can the grid be changed?
  There is potential to do this but you would need the software behind the model and GIS capability locally to make this change. The appropriate grid scale will depend on the data you want to include and the intended purpose of the outputs. For most applications, the 200x200m scale was thought to be appropriate.
- Have different grid sizes been tested?
  Not by Natural England although we think Burnley Council might be trialling this – we can share the results when they are available.
- Has the model been introduced to politicians/policy makers?
  For action to be taken on the ground, the model needs to be credible with politicians (at all levels – national to local). The fact that the model is based on best available science is useful for communicating with politicians and policy makers. The model has been introduced to Natural England planning staff and has been shared with a number of local authorities.

- How has the fragmentation mapping been done? Has any specific software been used?
  No, it has been mapped using ArcGiS and the proximity method shown in the presentation (i.e. looking at the presence or absence of habitat in neighbouring squares). It is therefore a simple measure of structural connectivity rather than functional connectivity which can be derived from least cost pathway modelling.
- Does the management metric include ESA agreements as well as HLS?
  There are a lot of ESA in Dark Peak. The metric includes 'beneficial options' (for biodiversity) under various agri-environment schemes. If there are 'beneficial options' in place in the square, it will be classified as 'managed' in the model.
- How regularly are underlying data sets updated?
  The model is underpinned by national data sets. Natural England can update the model when the data sets are updated. This could limit the use of the model for monitoring and evaluation - this would need data sets to be regularly updated if you want to see the outcome of actions taken. If NIAs want to use the model more locally and input local data, they can update this more regularly.
- The NIA plan is being delivered through local scale projects – the resolution of the model is too small to show these. It would need a local overlay to show NIA project delivery.
- Do the 'sources of harm' include pests and diseases?
  Not explicitly but could be considered through the sensitivity metric if it was identified as an issue by the EBS document.
- It would be useful to have ArcView and Map Info files (although it should be possible to change Arc files to Map Info).

Potential uses for the biodiversity vulnerability model

- **Informing high level conservation strategy** – abandon areas of high value and focus on medium and low? How to focus resources? The model tool won't make these decisions for you but it will provide more information for making those decisions.
- **Planning future landscape scale projects at a national scale** – national data means that you can see gaps e.g. between Dark Peak and Dearne Valley NIAs. The model could inform development of future projects and help set boundaries for landscape scale initiatives.
- **Planning the next stage of the NIA project** – objectives are already set for the NIA and the money allocated to specific projects. It would have been good to have this information when developing the business plan. However, it could be useful for developing the next phase of work (after 2015).
- **Prompt discussions at local level about vulnerability and priority actions**. Model output could be used to prompt discussions about difficult strategy decisions e.g. it could be used by LNPs as a tool to open up discussions with LEPs and champion vulnerability of the natural environment. Outputs could be used to raise awareness of vulnerability and importance of natural environment e.g. among elected members. For elected members it is important to link vulnerability to economic impact (link to ecosystem services).
- **Scenario planning** – 'fake data' could be used to test options for adding priority habitat e.g. habitat creation schemes. Also to test options where priority habitat might be lost e.g. development options.
- **Influence agri-environment** – the data is being made available to NE advisors to use when developing agreements.
- **Evidence base for planning** – specific Local Authority applications include:
  - Updating the Sheffield Nature Conservation Strategy, particularly focusing on green corridors.
  - Green Infrastructure Strategy.
  - Setting landscape strategy.
  - Rights of Way improvement plans – prioritise action.
  - Provides the evidence base for the biodiversity duty of Local Authorities.
- **Highlighting multiple benefits and ecosystem services** – the model can help to highlight where actions can have multiple benefits in terms of biodiversity, economic impact, recreation, health, flood alleviation etc. This is particularly evident in river corridors. This may help in accessing different sources of funding. It may also be possible to use some of the habitat information as a proxy for some ecosystem services e.g. bog habitat as a proxy for soil carbon storage, floodplain grazing marsh for flood alleviation. This might not be possible for all ecosystem services.
- **Justification of existing projects and actions** e.g. demonstrate the value of upstream action for mitigating downstream flooding. The model could be used to show change in vulnerability as a result of upstream habitat work.
- **Monitoring and evaluation** – depending on how regularly data is updated, the model could be used to look at the effect of actions over different timescales. This might also depend on the availability of local data to plug into the model.

Further maps / model runs identified as useful for Dark Peak NIA

A staged approach to taking the outputs of the model forward was discussed:

1. Identify uses of the data and maps presented from the vulnerability model as it is (i.e. using the national scale data with no change to metrics).

2. Identify uses which would require further maps or changes to the model. To progress this:
   i. Identify if there is local GIS capacity to make simple changes such as overlaying local data layers with output from the national model or changing the boundary of the maps.
   ii. Identify if there is local GIS capacity to make changes to the model once the full version and software is available e.g. use local data sets, change the definitions used in the metrics, change the relative weighting of metrics.
   iii. Identify where assistance would be required from Natural England at a national scale and use this to start dialogue to determine what can be provided.

To start this process, the following specific maps and changes were identified during the meeting:

- Single habitat vulnerabilities for each of the habitats covered by the NIA objectives (bog, grassland, heathland and woodland). Natural England will be running these maps in early 2013.
- Local Authority boundary. This is a simple change which could be done locally if GIS capability exists. Otherwise, please send the required boundary as a GIS file to Sarah Taylor.
- Limit condition metric to 'favourable' or use local data on blanket bog condition (Moors For the Future data). Depending on GIS capability, this could be done locally once the full version of the model and software has been shared.
- Local data sets which could be overlaid on top of the existing model output include: green infrastructure strategy, rights of way, HLS, re-wilding of urban parks, CEH wetland vulnerability tool output. This should be a relatively simple action that should be possible to do locally.
- Local overlay to show NIA project delivery. This should be a relatively simple action that should be possible to do locally.

If Partners have GIS capability they should be able to update the model, make changes to the metrics and weightings and produce different runs themselves, if this is the case, Natural England would ask that users feedback experiences of using the model and how the data is being used.

NCA vulnerability assessment - feedback

- The method could be useful for bringing stakeholders together to develop consensus around vulnerability.
- Qualitative method – could it be challenged by decision makers (e.g. local planners)? Yes, this is a challenge to the method. One way of overcoming this is to involve local decision makers in the assessment.
- This approach could be used to ground-truth or locally test the sensitivity classification of habitats in the vulnerability model e.g. blanket bog areas are showing as moderately vulnerable on the maps but this could be assessed in more local detail using the NCA method.
- It is useful to start from a positive position – what is in the landscape and what it delivers in terms of services, before thinking about vulnerability, rather than starting with impacts.
- For both methodologies to be useful, they need to be regularly updated as more information becomes available. The NCA model can be updated at any time as it is qualitative whereas the vulnerability model is only updated when underlying data sets are updated.

Barriers to adaptation and additional support required

- Resources – time and capacity to run GIS, not just this model but more generally. The NIA is aware of various models and GIS tools which could be useful.
- Funding for delivery – can adaptation be delivered through agri-environment? HLS measures should include adaptation. Could updated HLS measures be screened to identify how they can contribute to adaptation? There is some uncertainty regarding the update to the CAP.
- Influencing politicians and policy makers e.g. elected members. Getting politicians to look beyond economic impacts and benefits to recognise wider benefits of natural environment and biodiversity. Do we need to speak in the same terms as politicians and planners, i.e. economics? It seems to be the best way of capturing their attention.
- Legislation – adaptation and mitigation needs to be mainstreamed throughout policies at all scales. It should become business as usual to think about adaptation and mitigation in a similar way to H&S. Adaptation should be embedded and become a pillar of policy making.

E.3. Dearne Valley Green Heart

Project:	NIA Climate Change Adaptation workshop		
Subject:	Dearne Valley NIA workshop		
Date and time:	11th Dec, 11.30am – 3.30pm		
Meeting place:	Old Moor Reserve	**Minutes by:**	Nikki van Dijk

Introduction

- England Biodiversity Strategy Principles for Adapting to Climate Change - http://www.defra.gov.uk/publications/2011/05/24/pb13168-england-biodiversity-strategy/
- Natural England publications library – search 'climate change' to find climate change related reports, including NCA vulnerability assessment reports. http://www.naturalengland.org.uk/publications/publications/default.aspx

NIA presentation – key points

- The area has a history of coal mining – provides opportunities for habitat creation and restoration on former industrial land.
- There are urban areas throughout and bordering the NIA. Wildlife is found in close proximity to urban areas.
- Flooding is a major issue in the NIA. Severe flooding in 2007 – effects on biodiversity (breeding lapwings and avocets, water voles). Significant numbers of properties flooded. Considerable effort is going into alleviating flooding through use of soft-engineering approaches e.g. wetland habitat creation, upstream flood storage etc.
- The NIA is looking to create multi-functional land uses.
- The area is socio-economically deprived – there are opportunities for NIA work to have socio-economic benefits as well as benefits for biodiversity and flood alleviation. The economic case for action has brought local authorities into the partnership.
- The business plan focuses on restoring integrated ecological networks – focus on buffering core areas. Working with farmers to buffer core areas by getting land into HLS and WGS.
- The England Biodiversity Strategy adaptation principles underlie the business plan e.g. restoring ecological networks, making space for the natural development of rivers, reducing sources of harm not linked to climate change.
- The NIA business plan is being embedded into local planning and there are close links with local authorities.
- One of the strands of the business plan is communication with local people – community wardens.

Vulnerability model – questions and feedback

- The model doesn't include underlying data on hydrology.
- In this NIA, there are small areas of non-priority habitats which are of great importance but don't show up on the maps. This could be a major limitation to use of the model in this area. It would be useful to include HLS grassland and amenity grassland. For example, the site at Old Moor isn't showing up but it is very valuable. It could be difficult to persuade policy makers of the value of these sites and small habitat patches if they are not showing up on the maps.
- How does the water quality indicator in the condition metric treat Heavily Modified Water Bodies? Under the WFD these water bodies cannot achieve Good Ecological Status so are they always classified as low condition in the model?
- *(Nikki to check with Sarah Taylor and Michael Knight).*
- This area is characterised by very small areas of habitat – a mosaic. Some areas are not showing up on the maps because they are small. It might be more useful in this area to use a 100m x 100m grid. Habitats associated with water courses don't seem to be showing up – possibly because they are narrow and linear.
- There are significant differences between different river types, particularly in terms of their sensitivity to climate change. This doesn't show up in this model as there is only one priority habitat covering rivers – this is too crude.
- Good local data on habitats exists – phase 1 data. This could be used locally instead of the national priority habitat information. The NIA would be happy to act as a pilot to trial the use of the model with local data sets and a smaller grid size.

- The model focuses on the vulnerability of what's there now rather than how climate change might affect habitats – it is not predictive.

Potential uses for the biodiversity vulnerability model

- Initial reaction is that the model could be useful at a strategic level for directing spending and developing plans but that it won't be helpful for local delivery as the underlying data is too crude and doesn't represent well a landscape with lots of small areas of non-priority habitat. Local knowledge and understanding of opportunities is likely to be more useful when working at the local scale.
- However, the maps can be used to prompt high level discussions about targeting effort and conservation strategy.
- The model could act as a framework for inputting local data which might make it more applicable in this area.
- Maps could reinforce messages about where not to build houses.
- Could be used to test options e.g. for buffering if changes can be seen at a fine enough resolution.
- Concern that underlying data is not updated frequently enough for the model to be useful in monitoring and evaluation.

NCA vulnerability assessment - feedback

- This method could be useful as it looks at relative vulnerability within a defined area rather than at a national scale.
- It would be useful for LNPs and LEPs to be introduced to this methodology. Also health and wellbeing board might be interested in looking at the access and recreation aspect of the method.
- The methodology is subjective but this can be seen as strength – based on local knowledge and consensus building.
- This could be a useful tool for local authorities, particularly for thinking about ecosystem services. Could use the method to look at ecosystem services without running the biodiversity aspect.

Barriers to adaptation and additional support required

- It would be useful to have information on planting regimes for forestry – what should we do differently due to climate change?
- It is difficult to express the effectiveness of catchment management as there is little baseline monitoring prior to catchment works taking place.
- Quantifying the benefits associated with soft engineering flood defence schemes – it is difficult to communicate reduction in risk as a result of soft engineering works. How do we express the benefit of soft defences so they can be compared with hard defences in terms of numbers of houses protected?
- Public understanding of risk – people don't understand that a 1 in 1000 year event could happen tomorrow. Also there is a need to communicate to people that flood defences are designed to protect against a certain magnitude flood but there is still residual risk from higher magnitude events. Also, there is an expectation that we should be able to control natural systems completely and that organisational failure is responsible for flooding (e.g. Environment Agency, local authority).
- Public perception of soft engineering – people often want to see hard defences. There is also disagreement within the Environment Agency over hard and soft defences.
- Planning policy that still allows construction in the flood plain – whilst accommodation might be on the first floor, properties can still be flooded and damaged.
- Uncertainty over future rainfall patterns is a major challenge in terms of adapting to flood risk – how will rainfall change? Will we see more intense events or increases in seasonal rainfall? Or both? How will this affect flooding?
- Existing sources of harm e.g. weirs and canalised channels which are a barrier to fish movement.
- How to know when to give up on certain highly vulnerable species? It would be useful to have national level guidance on thresholds and how/when to take difficult decisions about prioritising effort and shifting away from previously protected species.

E.4. Greater Thames Marshes

Notes taken by Sheils Flynn

NIA FUNDING BIDS – options to consider

Overview of stakeholder priorities (from round-up), favourites first:

1. TTI habitats and brownfield sites (development and landfill)
2. Access and connecting people to the marshes – but with a strong emphasis on heath/mental health
3. Intellectual access – websites/schools & community engagement plus key hubs/ visitor centres
4. Re-wetting the marshes via managed realignment and/or strategic water level management
5. Building the evidence base – e.g. NE climate change adaptation model; bird disturbance study
6. Securing and improving existing public access sites (as a priority)
7. Sustainable energy (but not a focus of the workshop)

TTI habitats and brownfield sites

Open mosaic habitat creation and management - Focus on the Open Mosaic Habitats (OMH) of the Thames Terrace grasslands/cliffs and brownfield sites. This an opportunity to scale up the existing TTI work and incorporate lessons learned. OMH is now a priority Habitat and a UK OMH inventory is being promoted but so far only two areas of the UK are mapped and there is currently no research to inform best practice for OMH management and creation. Building on the NIA TTI and Biodiversity offsetting trial, the NIA offers an ideal foundation on which to build a national research programme investigating best practice for OMH management and mitigation. Links to pressures for redevelopment of brownfield sites on the Thames Terrace grassland habitats and conflicting demands for sustainable development of the T Gateway. Outputs could include Thames Gateway OMH inventory, guidance and advice – on the ground/published and input to ES schemes.

- Thames Gateway is an important exemplar. Inventory essential to highlight aspects that are most important
- Consider on a holistic landscape scale for the whole of the estuary, incorporating opportunities for habitat/species mapping, conservation, mitigation on the semi-natural OMH on the Thames 'cliffs' that back the marshes and the **sea walls** on the edge of the estuary, which offer potential opportunities for connecting ecological networks.
- Recognise that some work already, but UEL/Buglife claim that this is inadequate
- Scope for links to private sector and also for promotion/education re 'messy' brownfield
- How to compensate for loss of important brownfield sites to development?
- TTI is an iconic statement for the Greater Thames NIA
- Note may need to avoid use of term 'brownfield'.

Brownfield land strategy for NIA – designing for the future - link with landfill and mineral operators to plan suitable after use and management; plus industrial heritage dimension. Also link with developers. This is related to 1.1, but a different angle.

- Good potential for links to the private sector.

On the ground TTI habitat improvements – suggest we would need to balance any 'national research study' with 'on the ground' habitat improvements – linking with existing delivery mechanisms (incl. volunteers) to ensure ongoing habitat management. Essential links to training and promotion/interpretation/engagement.

There could be several inter-connected bids on the theme of TTI habitats and brownfield sites, covering:

- Evidence – inventory; mapping seawalls, ditches, natural 'cliffs', identifying priority sites (links to biodiversity offsetting)
- Biodiversity – need to demonstrate that we are securing the ecological network in a holistic way
- Advice to developers/landfill operators

- Communication and engagement with the public

Re-wetting the marshes

Bear in mind the obvious relevance of this strand for the GTM NIA because of links to SPA and waders. Possible links for Interreg (maybe in Baltic states, as this is where many of our over wintering waders come from).

Strategic water level management across the NIA – aiming to make the Thames Estuary Marshes wetter, counteracting the ongoing process of drying out/overgrazing etc.

- Extension of Higham Marshes approach
- Recognise importance of historic character of grazing marshes (promotion of historic land-use - summer/winter grazing), including biodiversity value of ditches.
- Underpinned by climate change adaptation model.

Managed realignment studies – scope for a comparative study (across France/Germany/Holland) looking at the costs, benefits and methods, leading to future projects with a range of partners.

- Create inter-tidal habitat (inland and on slightly elevated land) to replace habitats lost as a result of sea level rise. Focus on grazing marsh and on delivering 'more-bigger-better-joined' habitat. Possible scope in some cases to manage for tree/scrub habitats along the edge of higher land, defining the inland margins of the marshes
- Underpinned by climate change adaptation model – used to identify opportunities for habitat creation/management to reduce fragmentation and increase resilience
- Constraint of timing – EA unable to engage in the dialogue for next few months; but may be longer. Need to clarify as delivery would rely on close involvement of EA
- Have been some calls for purchase of key sites.

Wetland Agriculture – paradigm shift promoted by UEL. Manage the NIA as a 'big wetland'.

- UEL study would be part of a much wider research project, ties in with key themes of ecosystem services derived from wetland land use
- Constraint of relatively little arable land in the NIA, but could be wider range of uses
- Links to work in other NIAs?
- Links to communication, advice to farmers
- Partners (e.g. Canterbury CC) highlight the serious problems of fragmentation as a constraint to delivery of projects under this general theme – underpinned by NE climate change adaptation model research

NIA land management fund – to provide ongoing training, advice etc for landowners and farmer, plugging the anticipated funding gap when environmental stewardship funding is reduced (from 2016?).

- Possibly a toolkit approach.
- North Devon e.g. – possibly one where a co-ordinated response across NIAs would be relevant

Access and connecting people to the marshes

Gateways to the marshes and the river – connecting people, with a particular focus on areas which suffer from socio-economic deprivation. There are many stakeholder green infrastructure projects with an emphasis on access. Some are rural (e.g. Hoo Stepping Stones); others urban (e.g. Rainham to River, Erith Marshes, Benfleet Marsh); and some new e.g. (Rushenden to Iwade).

- Need to consider sites that are just outside the boundary of the NIA (check that this is acceptable) but that link it to centre of population
- *Links to the 'Nature Watch Points' ideas*
- Links to interpretation and community engagement
- Don't over emphasise the TEP – not used much for long journeys, but as part of circular walks. Links to public transport nodes
- *Securing the landscape* – a big issue. Make sure what we have is in good condition and welcoming, before investing in more. Received strong support from stakeholders
- Port of London Authority highlighted potential promotion of historic piers, which have recently been refurbished but are underused.

Pressures for change and impacts of disturbance – building on the evidence contained in the Pressures and Opportunities Atlas - enable targeted investment in recreation and/or development projects on more resilient sites. But is this underway already to some extent via the forthcoming Recreation and Access Strategy for North Kent

- *Planning ahead of the forthcoming coastal path* (arrives 2015) to anticipate pinch-points (many other e.g. from elsewhere to consider)
- *Focus on interpretation and sympathetic design* (veering away from core NIA concept here).

Health and well-being – several stakeholders made the connection between health and access to the estuarine landscapes, both in terms of physical exercise and mental health.

- Scope for links to health sector funding.

Digital access and interpretation

- *Web-based material to promote aspects of estuary interpretation* – as per SaLT concept – which is ready and waiting for funding/development to become an estuary-wide tool
- *Visitor hubs* – focus on the existing visitor centres and their immediate environment. Thurrock is already developing an HLF bid for Coalhouse Fort. Scope to widen to strengthen connections between these key hubs and their wider environment – e.g. Coalhouse to Thurrock Thameside Nature Park, Shoeburyness and an equivalent centre in Kent – e.g. at Gravesend, linked to Kent-Medway Canal and Higham Marshes?
- *App based interpretation* – Thurrock is already working on a model (European project for heritage interpretation); SaLT also, so plenty of expertise to draw on
- *Art related projects/interpretation*, perhaps as part of physical design of access projects. Again lots of local experience of this via SET and Artlands

Community engagement

Helping local people to understand and enjoy the natural environment of the estuary

- *Community engagement* – very wide experience around the NIA. Scope to invest in the process, with training and materials. Develop voluntary sector links
- *Education* – use the Southend Education Trust e.g. as a model to develop curriculum based interpretation. Plenty of money from this sector via school partnerships, Teaching school Alliances
- *Health* – we don't have any specific examples, but could pursue a similar strategy with health related community projects, focus would be links to the river and circular walks, interpretation etc. Note EU priority for projects that focus on tackling issues facing the elderly, and new demands due to demographic change.

Climate change adaptation

NE model development – so that it provides a tailored evidence base for future NIA work. The model could be adapted to look at how different scenarios/patterns of habitat creation and management might influence vulnerability to climate change, or to explore the potential costs of different approaches to tackling fragmentation e.g. buffering and/or extending existing core habitats or introducing stepping stones.

- Could underpin a range of possible bids, providing evidence of need and justification for specific intervention.

Climate change adaptation action plan – develop, evaluate and implement an adaptation action plan for the GTM NIA. EU policies emphasise need for research on water-based ecosystems (water retention capacity), allowing natural dynamics of habitats and connectivity between fragmented sites.

- Consider the patterns of response to climate change by key indicator species in the NIA
- Leads in to range of possible technical, but relevant ecological network modelling issues e.g. habitat permeability, size of gaps for different species etc – all related to overarching NIA goal of increasing resilience.

Sustainable energy

Combined Heat and Power Plants on the River Thames - A sustainable energy study carried out for Dartford and Gravesham identified combined heat and power plants, potentially fed by biomass, as one of the most effective forms of renewable energy to meet some of the energy requirement arising from the large-

scale proposed development in the area. There are a number of sites on the River Thames in Dartford which are available for redevelopment. These are the Littlebrook Power Station, the former Thames Europort ferry terminal on Crossways Business Park and the Swanscombe Peninsula. These sites also have wharfage facilities, with their use for sustainable river transport being encouraged. They are ideally placed to receive the feed for the energy plant by water. A feasibility study is proposed examining the potential for this and how it could be incorporated into development proposals for the sites. *This would fit with themes relating to links with business partners, ways for businesses to reduce environmental impacts, climate change adaptation etc.*

Tidal energy - PLA also looking at tidal energy opportunities on the Thames. Have requested further info but not yet received.

E.5. Humberhead Levels

Project:	NIA climate change adaptation		
Subject:	Humberhead Levels NIA workshop		
Date and time:	29th Nov 10.30am - 3.30pm		
Meeting place:	Natural England, York	**Minutes by:**	Nikki van Dijk

Introduction – questions and comments

- Please send link to UKCP09 website, EEA 2008 climate change impacts report and EBS principles:
  - UKCP09 climate change projections http://ukclimateprojections.defra.gov.uk/
  - European Environment Agency report on climate change indicators (2008) http://www.eea.europa.eu/publications/eea_report_2008_4 and update (2012) http://www.eea.europa.eu/publications/climate-impacts-and-vulnerability-2012
  - England Biodiversity Strategy Climate Change Adaptation Principles http://www.defra.gov.uk/publications/2011/05/24/pb13168-england-biodiversity-strategy/
- There is a need to get information on climate change and the natural environment out to planners – this is not just a job for Natural England but for all partners. There is a potential link with planners through LNPs.
- The audience for climate change reports (and others) needs to be considered when they are being written. There is a risk that reports sit on a shelf unused because they are too long or technical for practitioners to use.
- It is important that messages in Natural England's reports are consistent – new reports should be checked against previous reports to check consistency and highlight where guidance is being updated. It would also would be useful to check consistency between Defra agencies (Environment Agency, Natural England, Forestry Commission) to make sure conclusions and guidance is aligned – otherwise there is a risk that the messages going out to landowners are confused.
- There is a general lack of awareness of Natural England's climate change work and reports on the website.
- Some sort of user interface to help navigate climate change information would be useful – the Adaptation Manual could help on this front. It must be relevant to Natural England advisors and people delivering conservation on the ground.
- Good to hear about training modules on climate change for Natural England staff (including advisors).
- The RSPB reserve vulnerability assessment method has been developed into a method applicable at a landscape scale. This has been trialled in Poole Harbour and the East Midlands. This will be applied to all Futurescapes areas by 2015.

NIA presentation - key points

- The NIA business plan has five themes:
  - Create additional sites in the inner Humber estuary
  - Sustainable water management
  - Increase hydrological integrity of the area
  - Improve biodiversity assets
  - Green economy.
- Water is an overarching theme for the NIA.
- Climate change adaptation is not a theme in its own right but underpins all objectives.
- The adaptation actions and conclusions of the Humberhead Levels NCA report were used to inform the development of the NIA objectives.
- Areas of prime agricultural land are not included in the NIA boundary.
- Delivery of the NIA objectives will contribute to adaptation and mitigation:
  - Peat soils and increasing carbon sequestration
  - Increase use of sustainable agricultural practices
  - Raising awareness of local communities and connecting them to the environment.
- There is a monitoring and evaluation sub-group for the NIA. Some indicators have been given to the NIA by Defra (including habitat connectivity) and others have been chosen (from a list) by the M&E sub-group.

Vulnerability model – questions and feedback

- Does the model include effects of latitude and species moving northwards?
  No, the model is based on habitats rather than species. The outputs can be layered with information from species envelope modelling to look at change in species and habitat.
- The habitat sensitivity classifications are taken from the England Biodiversity Strategy document (Mitchell, R.J., Morecroft, M.D., Acreman, M., Crick, H.Q.P., Frost, M., Harley, M., Maclean, I.M.D., Mountford, O., Piper, J., Parr, T.W., Pontier, H., Rehfisch, M.M., Ross, L.C., Smithers, R.J., Stott, A., Walmsley, C.A., Watt, A.D., Watts, O. and Wilson E. (2007) '*England Biodiversity Strategy - towards adaptation to climate change*'. Final report to Defra for contract CRO327).
- The fragmentation metric looks at structural connectivity (i.e. the model looks at the proximity of habitat and permeable land) rather than functional connectivity. Other models look at this – least cost path models.
- There is a planned change to the permeability measure – at the moment it considers all priority habitats permeable whereas some priority habitats may not be permeable for other habitats. There is an update planned which will look at groups of habitats which are permeable.
- How does the model deal with squares where SSSI condition is 50% favourable and 50% unfavourable?
  A threshold is applied to decide if a square's condition is positive or negative.
- In some cases, management is carried out at a very small scale (sub-field scale) – will this be picked up by the condition metric in the model?
  It depends on how you set the threshold for deciding if a square is positive or not in terms of management. At the moment, the majority of the square has to be managed to score positively.
- Are Local Wildlife Sites included in value metric?
  Yes, if they are priority habitats outside other designations (if they are not priority habitats, then no). There is no consistent data set on LWSs at a national level so they are not included in the model, however this could be added in a local run of the model if local data is available. If good local data is available, it makes sense to include it (subject to GIS capability).
- Does the WFD indicator in the condition metric look at current or projected status?
  Current. This dataset is due to be updated in December 2012 so the model would need updating.
- Not all national priority inventories are of good quality – wet grassland is known to be bad which affects the output of the model in this area. It looks like estuarine habitats are not being picked up by the model e.g. saltmarsh. Also, the national inventories are out of date: small areas (single squares) of habitat shown on the model are no longer there, they have been lost in many cases. The outputs of the model may not be very useful as the underlying data is poor – a model is only as good as the data that goes in and in this case, some of the underlying habitat data is very poor.
- Local workshops have already been held with stakeholders to ground truth habitat inventory data however there is uncertainty over whether this information was digitised or was accepted by Natural England for use in the national habitat inventory. The partnership would not want to go through the same exercise with stakeholders based on the output of this model.
- It would be useful to set metrics up based on local conditions – e.g. topography is irrelevant here as the whole NIA is flat. Everything is vulnerable due to being low lying and flat in this area but prioritisation of action is still required. Opportunities for 'bigger' and 'better' are only showing higher areas but work must be done in low lying areas too. It makes sense to take topography out of these cuts of the data in low lying areas.
- Water is the key feature in this landscape and the model doesn't include hydrology as part of the condition or connectivity metrics. The model needs to include data on waterways (main river and other watercourses, including drains) to be useful in this area. Opportunities for habitat creation and restoration are dependent on water – it would be useful to use a similar approach to the fragmentation metric to assess proximity of habitat in squares to water i.e. score positively if there is water in the neighbouring squares. Data on main rivers should be available from the Environment Agency and IDBs may have some data on drains.
- The water quality/quantity indicator largely determines the condition metric in this NIA.

Transport corridors project – comments

- This is an example of potential use of climate change vulnerability model information – overlay with transport infrastructure to identify network opportunities (and risks form invasive species).
- The scope of the project needs to be better defined to identify how it might align with NIA objectives. It is unclear if infrastructure soft estate can contribute to NIA habitat creation targets. There might be bigger opportunities elsewhere e.g. south Yorkshire.
- There is a need to map the current soft estate around transport infrastructure and understand current management. The partnership needs to know what the Highways Agency / National Rail could do in terms of habitat management before potential benefits for NIA can be identified.
- It would be useful to include canals within the scope of the project.

- This project could be a way of demonstrating multiple benefits (biodiversity, flood alleviation, drainage, adaptation on grey infrastructure etc).
- The NIA might be more interested in priority outfalls work as it affects the water environment (which is central to the NIA).
- Initial reaction is that it could be a distraction for the NIA and will not contribute significantly to delivering objectives. Resources are limited.

Potential uses for the vulnerability model

- There is a feeling that the model doesn't show the partners anything they don't already know. However, the output could be used as **further justification for the NIA**. In terms of determining what else needs doing on the ground, it is not useful as plans will be based on local practitioner knowledge.
- The model is not predictive but assesses the vulnerability of what's there at the moment. The model is essentially behind the planning in this NIA and will not able to lead it.
- Whilst the model is too late to be used for developing NIA plans but it could be useful as a piece of **evidence to use in funding requests** to Defra to pay for future work or to expand the NIA.
- It would be useful if Natural England advisors could use the model as part of the **evidence base for HLS** targeting.
- The wider HHL Partnership has to **review its 10 year delivery plan** – it might be possible to use the model to inform this.
- Single habitat runs might be more useful for **prioritising areas for action on a habitat-by-habitat basis** – demonstrate relative vulnerability between habitat areas.
- It might be useful to **combine the outputs of this model with GIS work being done by a PhD student** at the University of Sheffield on evaluating the NIA.
- The group would be interested in seeing output from the Climate Change and Agricultural Land Classification model. This would be useful for planning future work and targeting areas where we think land use will change and there are opportunities for biodiversity.
- It may be possible to use the model for monitoring and evaluation of the NIA but only if the data is available, updated and correct. The concern is that the baseline data is flawed so the model will not be useful for M&E.

Further maps / model runs identified as useful for Morecambe Bay NIA

There is no dedicated GIS resource in the NIA partnership so making changes to the model locally will be difficult.

However, the following maps and changes to the model were identified during the meeting:

- Single habitat runs, particularly for wetland habitats.
- Maps of the wider Humberhead Levels Partnership boundary – please send a GIS file of the boundary required to Sarah Taylor.
- Include baseline information on water in this NIA – location of main rivers and drainage infrastructure.
- Change the proximity score for water habitats in this NIA to show proximity to water sources.

Barriers to adaptation and additional support required

- How to answer the question 'how much adaptation is enough?' This is a major challenge.
- Monitoring change in the NIA and attributing change to actions taken to adapt to climate change.
- Using GIS models – there is no dedicated GIS resource in the NIA. A non-expert user interface would be useful for all models (climate change or other topics).
- Awareness of information – the group was not aware of all the reports and guidance Natural England has produced. The one they were aware of (the Humberhead Levels NCA report) has not been published or draft version shared with stakeholders. This is a barrier for taking things forward with stakeholders.
- Quality of habitat data (national and local) - there doesn't seem to be an easy way of overcoming this without re-surveying which is resource intensive.
- Support for decision making – not just information about potential impacts and actions but guidance on how to take difficult decisions about prioritising and delivering action.
- Translating information in models into economic impacts – we need to talk about climate change impacts and adaptation in terms of costs and benefits for policy makers and landowners to change behaviour. We need to identify incentives.

E.6. Meres and Mosses of the Marches

Project:	NIA Climate Change Adaptation workshop		
Subject:	Meres and Mosses of the Marches NIA workshop		
Date and time:	3rd Dec 2012, 10.30am – 3.30pm		
Meeting place:	Shropshire Wildlife Trust, Shrewsbury	**Minutes by:**	Geoff Darch

Introduction

- England Biodiversity Strategy Principles for Adapting to Climate Change - http://www.defra.gov.uk/publications/2011/05/24/pb13168-england-biodiversity-strategy/

- Natural England publications library – search 'climate change' to find climate change related reports, including NCA vulnerability assessment reports. http://www.naturalengland.org.uk/publications/publications/default.aspx

NIA presentation – key points

- Essentially two projects have been brought together under the NIA partnership:
  - Lottery-funded landscape partnership (5 years from June/July). The boundary is represented by the red line (on the provided map). This is focussed on community engagement, although there are some key sites for action. There is a programme of farm audits and mainly small-sale capital works that aim to reduce pollution and restore habitats.
  - NIA funding (3 years from April). The boundary is represented by the purple line. This is focussed on conservation, and includes County Wildlife Sites and undesignated peatland; actions are likely to include buffering and connectivity.
- 5 staff, in post for 3 months to date.
- The NIA includes key Meres and Mosses sites, quite a few of which are RAMSAR and SAC designated. These sites are important, but few people know they exist!
- The JCA is much bigger and includes 50 SSSIs, of which 33 are RAMSAR sites and 5-6 are SAC sites. There is a diversity of wetlands e.g. very large raised bog, isolated basins, a few riverine peats but drained.
- Meres and Mosses was one of 4 Wetland Vision projects, which set out a 50-year vision and which has helped get things going.
- The area is intensively farmed (dairying and arable). Most farmland is drained and suffers from post-war diffuse pollution problems.
- Some work is underway to restore the natural hydrological system within headwaters.
- Opportunity mapping was undertaken by Penny Anderson Associates; this modelled wetland potential and produced a GIS layer. The map in the booklet provided is a high-level expression of this.
- A field-by-field survey of what habitats exist (focussed on wetland areas) has been undertaken. This informed a 10-year look forward. It is available as a GIS tool.
- The Environment Agency via the Water Framework Directive is tacking diffuse pollution in smaller streams (pollution-led approach).
- In Cheshire there is a high density of ponds, which are home to Great Crested Newts and other pond species.
- There used to be more heath, on sandier soil.
- There is little woodland, although some on the mosses, which presents a conflict.
- Air pollution is a big issue (ammonia and nitrogen).

Vulnerability model – questions and feedback

- GIS contact is Robin in Shropshire WT.
- Some use has been made of the Forestry Commission work further north in the NCA (least-cost pathway approach).
- Confirmed that HLS in the vulnerability model relates to specific scheme/options beneficial to biodiversity and is sub-farm level.

- There is an issue with lack of data for Wales for some habitats e.g. peat. Also an issue with data for floodplain grazing marsh.
- Query over water and how will show with respect to connectivity.
- Are canals included?
  Only assets of priority habitat standard are included.
- Are lakes included?
  Lakes are included (as open water), but ponds are not.
- Value - are local wildlife sites included?
  Local wildlife sites are not included because these are designated differently; also assumed that included in the priority habitat (but they are not in all places).
- SSSIs – does the weighting affect vulnerability?
  Yes, but represents the principle of conserving the best quality sites.
- Could look at finer scoring (e.g. 1-10) to minimise differences.
  Agree, but trying to keep simple.
- Is the split in landscape value contrary to the idea of landscape-scale conservation?
  It is in line with the Lawton Review and does not affect the connectivity score/metric.
- River data skews perception of where focus should be.
- Need to think about the catchment of pools, rather than pools themselves.
- How long is work going on for? Sarah intends to carry it on.

Potential uses for the biodiversity vulnerability model

- Connectivity is seen where you get peat soils but this is not currently represented. Connectivity is also seen along floodplains (Environment Agency flood map). Bringing this together with the Vulnerability Model could provide the **basis of opportunity mapping** and exploring action in the white space (between priority habitats).
- We already have a good idea about what will be done in the NIA; this model might help to **check if any opportunity areas have been missed** and helps **provide evidence**.
- When will this be complete / enough resilience/adaptation? Adaptation is a process, so likely to be ongoing but could **use model to see improvements** – potential for use in monitoring and evaluation of NIA.
- It would be useful to understand the experience of other NIAs where there is more variation in habitat type.
- Could have a narrative to go with the map of example narratives. To cover aspects such as joined vs. isolated habitat patches. To be included in **user documentation**.
- Model for **prioritising environmental stewardship** (help targeting)? This is being piloted in SE England and there is talk about doing this nationally.

A staged approach to taking the outputs of the model forward was discussed:

1. Identify uses of the data and maps presented from the vulnerability model as it is (i.e. using the national scale data with no change to metrics).

2. Identify uses which would require further maps or changes to the model. To progress this:
   i. Identify if there is local GIS capacity to make simple changes such as overlaying local data layers with output from the national model or changing the boundary of the maps.
   ii. Identify if there is local GIS capacity to make changes to the model once the full version and software is available e.g. use local data sets, change the definitions used in the metrics, change the relative weighting of metrics.
   iii. Identify where assistance would be required from Natural England at a national scale and use this to start dialogue to determine what can be provided.

If Partners have GIS capability they should be able to update the model, make changes to the metrics and weightings and produce different runs themselves, if this is the case, Natural England would ask that users feedback experiences of using the model and how the data is being used.

NCA vulnerability assessment - feedback

- Check what happened in the North West including what has been published.
- What happened next in the Shropshire Hills? Uncertain, but one immediate follow-up was landscape visualisation.
- Similar approach to the RSPB model.
- Are local authorities using it? Not aware of this.

- Outputs of MONARCH/BRANCH are used occasionally by one attendee.

Barriers to adaptation and additional support required

- Environment Agency links – it is unclear what they are doing on adaptation at the moment.
- Making decisions on the ground e.g. at the individual site level – it is difficult to include climate change adaptation.
- Processes are often quite fixed e.g. SSSI notification and rigidity of definitions (e.g. priority habitat); instead need to look at ecosystems. Targets and objectives drive decisions.
- Land ownership and financial rewards for managing the land, especially when moving from habitats to ecosystems.
- Time horizons – going after 2-, 5- and maybe 10-year pots of money; need to consider the long-term e.g. 20-year HLS for wetland sites (as is done for inter-tidal creation). What does society want with respect to climate change?
- Naming of CAP. Shift to include environment in title.
- Sometimes landowners extend across hydrological units.
- Biodiversity offsetting. Cheshire WT getting lots of offers but concerned about lack of use of 'avoid etc' hierarchy and lack of strategic planning.
- Ponds and lakes in eutrophic environments. Academic research on carbon sinks: Loughborough PhD on Meres and Mosses; American paper on global carbon sink of ponds etc (huge). Creating ponds might be good for adaptation and mitigation.
- Translocation of species. Guidelines would be useful – rationale of when to move etc; need to incorporate all (non-climate) factors. SNH has recently published a report on this.
- How to measure adaptation? How will we know if the NIA is more resilient in 3 years?
- What are Defra's expectations of NIAs in terms of considering climate change adaptation? The NIA is implicitly thinking along these lines anyway (e.g. using Lawton). It will use the climate change argument to support intended actions.

E.7. Morecambe Bay Limestones

Project:	NIA climate change adaptation		
Subject:	Morecambe Bay NIA workshop		
Date and time:	28th Nov, 10.30am - 3.30pm		
Meeting place:	Natural England, Kendal	**Minutes by:**	Nikki van Dijk

Introduction – questions and comments

- England Biodiversity Strategy Principles for Adapting to Climate Change - http://www.defra.gov.uk/publications/2011/05/24/pb13168-england-biodiversity-strategy/
- Natural England publications library – search 'climate change' to find climate change related reports, including NCA vulnerability assessment reports. http://www.naturalengland.org.uk/publications/publications/default.aspx
- Is the species modelling in BRANCH similar to that done by the England Habitat Networks? Yes, it is based on least cost path modelling. The models used are Small Steps and LARCH. See the BRANCH website for maps and guidance.
- How can we use this information to talk to farmers about climate change vulnerability and what they can do to adapt?
- Information needs to be provided at a scale relevant to farmers which will allow them to take action. Natural England is planning practitioner training on climate change, including and intro to the model, which will raise awareness and help them talk to farmers when developing HLS agreements.
- Similar question as above but related to forestry – it is important to communicate the need to think long term when planting woodland but at the moment it is difficult to persuade farmers and land managers to change long-established practices. The vulnerability model might be too high-level or not fine enough resolution to use on a farm-by-farm scale to provide advice but it certainly can help target strategic actions and planting.
- Food security is an issue – it is difficult to get farmers to take actions to improve biodiversity/adaptation when there is a concern about food security. We need to help people think long term – adaptation can improve food security through soil and water management.
- Is Natural England talking to agricultural scientists and policy makers in Defra about the vulnerability model?
  Yes, Defra is on the project SG. Agriculture is a sector covered in the CCRA separately to natural environment but there is a need to join up to ensure messages are consistent.

NIA presentation key points

- Business plan objectives:
  - Low carbon economy – wildlife tourism and woodfuel.
  - Ecological networks – wetlands, grasslands, woodlands.
  - Influence the planning system – get NIA objectives into Local Plans.
  - Connect people with nature.
- Climate change adaptation has been considered throughout the development of the plan – it is an integrating principle. The objectives of the NIA contribute to developing a well adapted landscape.
- Morecambe Bay NCA Vulnerability Assessment Report was a significant source of information when developing the plan and high-level adaptation actions from the NCA work are reflected in the business plan objectives, which are:
  - Reduce harm not linked to climate change – e.g. diffuse pollution
  - Catchment management e.g. Leighton Moss
  - Multifunctional wetlands e.g. Lythe Valley
  - Enhance the mosaic
  - Restore lowland raised bog as a carbon sink.
- Next step for NIA is to translate this into practical action at a small scale – farm scale.

Vulnerability model - questions and feedback

- Can the model be updated with local data if it is better? E.g. habitat inventory data.
  Yes, local inventory data can be used to replace the national data. This would require someone locally with GIS experience to alter the model using the software interface which is being developed.
- Can local data about the sensitivity of habitats be made?

Yes. The H, M, L habitat sensitivity classifications in the model are taken from a national level document (Mitchell, R.J., Morecroft, M.D., Acreman, M., Crick, H.Q.P., Frost, M., Harley, M., Maclean, I.M.D., Mountford, O., Piper, J., Parr, T.W., Pontier, H., Rehfisch, M.M., Ross, L.C., Smithers, R.J., Stott, A., Walmsley, C.A., Watt, A.D., Watts, O. and Wilson E. (2007) '*England Biodiversity Strategy - towards adaptation to climate change*'. Final report to Defra for contract CRO327). The classification of habitat sensitivity could be altered in the model if local data is available or as a partnership you decide that you want to change it.

- Can the model be used to predict how NVC will change i.e. project how habitats will move?
  No, the model is not at a fine enough level of detail to do this and is not predictive. The model is based on assessing the vulnerability of what's there at the moment. There may be other tools which can help e.g. CEH wetland tool.
- Condition metric – if a habitat is not managed it is not necessarily in bad condition. The way the model is set up could introduce bias. Conversely, just because something is under management doesn't necessarily mean it is in good condition.
  Not all HLS measures address biodiversity – is this a potential source of bias in the condition metric?
  Only HLS measures which address biodiversity are included (there is a list of 'beneficial options' which underpins this part of the metric).
- Local knowledge is required to ground truth maps – saltmarsh does not appear to be picked up in the model. There are white areas around the Morecambe Bay coast which are saltmarsh and are vulnerable to the impacts of climate change. This is not picked up in the model as there is no national inventory of saltmarsh - local data would need to be included to rectify this.
- Can Local Wildlife Sites be included in the value metric?
  Local Wildlife Sites should be included in the 'priority habitat outside designated areas' category. However, the scale could be expanded to four scores with LWSs scoring 2 (above priority habitat, no designation). Theoretically the model software could be changed to do this if it was agreed locally that this was necessary and there was good local data on LWSs.
- Can single habitat runs be done?
  Yes, some have been done (e.g. grassland) and others are planned for early 2013.
- Can the data underpinning the scores be seen? I.e. can you find out what is turning a square red or yellow? Yes, GIS can be used to show the attributes for each square which will show why it is red or yellow and which metrics are contributing to the overall vulnerability score.
- It would be useful to run the model to include the LNP boundary as well as the NIA (this would also align with RSPB Futurescape boundary).
- There is concern over the terminology used in the 'value' metric. 'Low' value for non-designated priority habitat could be misunderstood, particularly by local authorities, as meaning low value whereas actually it is still very valuable. Better wording might be high, higher, highest or Natura 2000, SSSI, priority (i.e. remove 'low'). It might be useful to ask local authority ecologists for advice on the best terminology to use.
- Bart is the main contact for GIS in the NIA partnership – in the first instance the data will be sent to Bart but the data and underlying model (and software) can be made available to all partners if there is GIS capacity and expertise to use it. It would be useful to have data in Arc and MapInfo format – Arc files can be converted into Map Info files.
- How will the data be updated?
  Natural England plan to update data annually (or when the underlying datasets are updated).
- Is there an expectation from Natural England about how the model should be used and what NIAs do with it?
  No, but Natural England would like to hear feedback about how it is being used and how it can be improved.

Transport corridors project – comments

- The transport corridors project is an example of a project which could make use of the vulnerability model output.
- The vulnerability model output has been overlain with transport corridors information – can see the contribution of transport corridors to connectivity (and potential risks in terms of invasive species).

Potential uses for the vulnerability model

- **Prioritising HLS** – the model could help to identify where to target HLS action. It could be used as part of Natural England's Holding Assessment Toolkit to prioritise land management actions. Outputs of the model will be added to Natural England's webmap so advisors can see it and there is potential for training on climate change vulnerability and the model to be rolled out to advisors.
- **Strategic targeting** of woodland planting rather than farm scale actions.

- **Identifying priority areas for action on a habitat by habitat basis** – the model can be run for single habitats and single metrics if required. It would be useful to see wetland runs to prioritise areas for action. The grassland restoration strategy could also be informed by single habitat runs.
- **Monitoring and evaluation** – the NIA has to develop a habitat connectivity indicator. It might be possible to use the model to help develop that indicator: effects of NIA actions on connectivity could be shown using the fragmentation metric. If actions are having an effect on the amount and connectedness of squares, this would show on the model if updated datasets were available. A single metric map would be most useful for developing indicators. The model could also be used to set a baseline (previous runs will be kept and can be compared with updated runs).
- **Inform planning system** – the model could offer additional information to local authorities as part of their evidence base for planning. It could be used to inform local authority climate change adaptation plans. The scenario planning aspect of the model could be used to test development proposals and options in sustainability assessments – see effects of gaining/losing priority habitat.
- **Use alongside other tools** e.g. RSPB reserve vulnerability assessment. Model output can be used as an input or one of the sources of information considered in more qualitative approaches such as the RSPB reserve vulnerability assessment or the NCA vulnerability assessment.

Further maps / model runs identified as useful for Morecambe Bay NIA

A staged approach to taking the outputs of the model forward was discussed:

1. Identify uses of the data and maps presented from the vulnerability model as it is (i.e. using the national scale data with no change to metrics).

2. Identify uses which would require further maps or changes to the model. To progress this:
    i. Identify if there is local GIS capacity to make simple changes such as overlaying local data layers with output from the national model or changing the boundary of the maps.
    ii. Identify if there is local GIS capacity to make changes to the model once the full version and software is available e.g. use local data sets, change the definitions used in the metrics, change the relative weighting of metrics.
    iii. Identify where assistance would be required from Natural England at a national scale and use this to start dialogue to determine what can be provided.

To start this process, the following specific maps and changes were identified during the meeting:

- Single habitat maps (overall vulnerability and Lawton maps). Natural England will be running these maps in early 2013.
- Maps of the NIA and LNP boundary (which coincides with the RSPB Futurescape project). This is a simple change which could be done locally if GIS capability exists. Otherwise, please send the required boundary as a GIS file to Sarah Taylor.

If Partners have GIS capability they should be able to update the model, make changes to the metrics and weightings and produce different runs themselves, if this is the case, Natural England would ask that users feedback experiences of using the model and how the data is being used.

Barriers to adaptation and additional support required

- Communicating climate change vulnerability and adaptation to landowners in a way that makes them take action. Also, communicating difference between weather and climate – the long term direction of travel (i.e. hotter drier summers, warmer wetter winters) is hard for people to understand when they've experienced a series of wet summers and cold winters. Need to get people to think about resilience and wider benefits: adaptation actions can improve resilience to change (whatever the direction of that change). Guidance on how to present climate change messages to land owners would be useful.
- CAP reform – needs to look wider than just biodiversity and include consideration of ecosystem services and climate change adaptation.
- Adaptation manual – it would be useful to have adaptation actions for different habitat types and at a local scale which can be used to help land owners and managers take action on the ground.
- Training modules on climate change, the vulnerability model and adaptation actions would be useful for Natural England staff and other organisations.

E.8. Nene Valley

Project:	NIA climate change adaptation		
Subject:	Nene Valley NIA workshop		
Date and time:	30th Nov 10.30am - 3.30pm		
Meeting place:	Lings House	**Minutes by:**	Nikki van Dijk

Introduction – questions and comments

- Please send the link to the EEA (2008) report - European Environment Agency report on climate change indicators (2008) http://www.eea.europa.eu/publications/eea_report_2008_4 and update (2012) http://www.eea.europa.eu/publications/climate-impacts-and-vulnerability-2012
- England Biodiversity Strategy Principles for Adapting to Climate Change - http://www.defra.gov.uk/publications/2011/05/24/pb13168-england-biodiversity-strategy/
- Natural England publications library – search 'climate change' to find climate change related reports, including NCA vulnerability assessment reports. http://www.naturalengland.org.uk/publications/publications/default.aspx
- Invasive species and pests and diseases are potential risks associated with climate change – in some cases they are included in community risk registers.

NIA presentation - key points

- The Nene Valley NIA business plan has five objectives:
  - Planning – opportunities for improving biodiversity and ecosystem services and links to Local Enterprise Partnership (LEP).
  - Improving SPAs (gravel pits) – particularly addressing disturbance from access and recreation.
  - River environment – opportunities to improve water quality and morphology, contributing to meeting Good Ecological Status under the WFD. There are links to the planning objective e.g. flood attenuation.
  - Land management – opportunities for HLS, buffering of habitat, restoration and habitat creation. Linked to Catchment Sensitive Farming and addressing diffuse pollution.
  - Ecosystem services – identify the value of ecosystem services and research markets and payments for ecosystem services.

Vulnerability model - questions and feedback

- It would be useful to carry out a review of models and provide a summary for users which show what they can be used for, their strengths and weaknesses, data requirements, software requirements etc. It is thought that Natural England is carrying out such a review for ecosystem services tools (Nick Dales). It would be useful to see some examples of how models have been used by conservation organisations and partnerships, as well as the lessons learnt.
- Can Local Wildlife Sites be added to the value metric?
  They should be covered by the 'priority habitat not designated' category. There is no consistent data set on LWSs at a national level so they are not included in the model, however this could be added if local data was available. It would be interesting to overlay County Wildlife Sites with the value map to see how well they are represented. There is a local dataset on LWS condition which could be used as part of the model's 'condition' metric.
- On the sensitivity map, red areas are thought to be standing water but there is a lot more standing water in the NIA which does not show up. This could be because it is not classified as priority habitat or the habitat inventory is imperfect.
- Maps will be provided in GIS so users can zoom in.
- The model is useful for showing relative vulnerability at a national scale. All metrics are equally weighted at this scale but at a local scale it might make sense to alter weightings e.g. topography might not be an important variable in this NIA.
- The red squares on the condition metric map might be red because of their current WFD status. Local condition data might alter the appearance of this metric (although squares containing watery habitats would remain red where water quality or resources are an issue).
- Is the water available indicator in the condition metric based on actual abstraction or licensed abstraction?

It is based on licensed. This shows the worst case scenario as in reality most abstractions do not reach the full licensed amount. The actual water resources situation may not be as bad as shown by the condition metric. It is fine to use the licensed amount but it needs to be made clear that this is a worst case scenario.

- There was some concern over the terminology used in the 'value' metric – saying a priority habitat is of low value is not a message we want to be sending out. All priority habitats are valuable; it is the white areas on the map which could be considered of low value. Suggest that this be re-worded in the next version of the model.
- The group was not sure how useful the value metric is as it really only shows designations – it might be better to show how representative designated habitats are of the ideal for that habitat type. Although data for this does not exist at a national scale so cannot be included in the model as it is. However, local data could potentially be included or overlaid with output from the national model.
- Is the software compatible with Map Info?
  The model runs in ArcGIS although it should be possible to convert files to Map Info. Natural England is thinking about whether open source software could be used. Initially NIAs will not be given the software behind the model, just some of the model output. However, the software can be provided in future, following refinement of the model with feedback from these sessions.
- Tributaries do not show up well – the model does not distinguish between river types as the priority habitat inventory includes rivers as one category. If local data on sensitivity of different types of rivers was available, this could be included in local runs of the model. Or, locally, it could be decided to increase the sensitivity of rivers from medium to high.

Vulnerability model potential uses

- The model could assist with strategic targeting and **inform high-level decisions about conversation priorities** – do we focus resources on designated areas or outside designated areas? There is a risk that funders will look at the maps and choose to invest in habitats which can be sustained in the longer term (the lower vulnerability habitats in this model). This could be detrimental to existing high quality habitats.
- **Spatial prioritisation of effort within the NIA** – single habitat runs would be useful for this. The 'all habitats' output is useful at a strategic scale but single habitat runs would be more useful for planning action on the ground.
- At a national level, areas with high vulnerability could be used to **justify conservation effort**.
- The maps could be very useful to **inform discussions with developers and local councillors** – puts across a powerful message which is based on established principles and nationally verified data.
- Although the maps don't show a lot of new information they are valuable because they are more defensible than the argument '*because we say so*'. This gives more weight to biodiversity arguments in **planning reviews** and for **funding applications** for improving priority habitats. The map could contribute to the argument for funding biodiversity improvements as it will have multiple benefits including improving resilience to climate change.
- Information from the model can be **fed into other vulnerability assessments** such as the RSPBs reserve vulnerability assessment or the NCA method.
- **Test scenarios** e.g. management options for different habitat types, habitat creation plans, HLS options etc.
- Could group habitats which are considered **proxies for ecosystem services** and use the model to look at vulnerability of ecosystem services.
- Use the model to **target** areas which could contribute to **'allowable solutions' to mitigate carbon emissions** e.g. woodland planting, wetland creation.
- The model is a medium term tool which can help increase resilience in current habitats. The model does not make a judgement about what habitats are best in certain locations over certain timescales – other tools are mode suitable for this e.g. Forest Research tool for selecting tree provenance or the CEH wetland tool which is more predictive.

Further maps / model runs identified as useful for Nene Valley NIA

A staged approach to taking the outputs of the model forward was discussed:

1. Identify uses of the data and maps presented from the vulnerability model as it is (i.e. using the national scale data with no change to metrics).

2. Identify uses which would require further maps or changes to the model. To progress this:
   i. Identify if there is local GIS capacity to make simple changes such as overlaying local data layers with output from the national model or changing the boundary of the maps.

ii. Identify if there is local GIS capacity to make changes to the model once the full version and software is available e.g. use local data sets, change the definitions used in the metrics, change the relative weighting of metrics.
iii. Identify where assistance would be required from Natural England at a national scale and use this to start dialogue to determine what can be provided.

To start this process, the following specific maps and changes were identified during the meeting:

- Re-do maps with the Northamptonshire county boundary and catchment boundary – this is a simple change which could be done locally when Natural England shares the software. In the meantime, please send required boundaries as GIS files to Sarah Taylor.
- Single habitat maps. Natural England will be running these maps in early 2013.
- Include local data on County Wildlife Sites and condition. Depending on GIS capability, this change could be made locally once the full version of the model and software has been shared.
- Split 'rivers' into different river habitats and assign sensitivities based on local assessment. Again, depending on GIS capability, this change could be made locally once the full version of the model and software has been shared.

If Partners have GIS capability they should be able to update the model, make changes to the metrics and weightings and produce different runs themselves once the software is shared. If this is the case, Natural England would ask that users feedback experiences of using the model and how the data is being used.

NIA vulnerability assessment - feedback

- The approach is similar to the RSPBs reserve vulnerability assessment. It provides a framework for thinking about vulnerability and bringing together sources of information including model output, GIS, scientific knowledge, local knowledge and practitioner experience.
- The approach complements the GIS model approach – this is more practitioner and local knowledge based. Outputs of the model can be used to inform the NCA method. Alternatively, the NCA method can be used to determine local sensitivity classifications for priority habitat types which can be fed into local runs of the model.
- Don't under estimate how much time it takes to get stakeholders together and agree consensus around vulnerability ratings. It is valuable but time consuming.
- National vulnerability tables have been assembled by Natural England experts – these can be used as a starting point for local discussions about relative vulnerability.
- This approach could be used as part of the Neighbourhood Planning Process - there is probably no lower scale limit at which the steps could be applied. There probably is an upper limit as any bigger and it becomes difficult to consider all information sources and the range of stakeholders becomes unmanageable.
- The approach could be used to inform development of future landscape character assessments which should include consideration of climate change impacts.

Barriers to adaptation and additional support required

- There is an issue around communicating with policy makers, land managers and developers about climate change impacts and the need to adapt. They want to know the costs and benefits associated with impacts and adaptation. We need a way of being able to express costs and benefits of biodiversity and adaptation action. The ecosystem services approach goes some way towards this and the project at the University of Northampton will help. However, guidance on this would be helpful.
- We need to provide meaningful information about climate change impacts and adaptation to developers. Developers are generally only interested in what's in it for them in terms of doing things differently or taking action to adapt to the impacts of climate change.
- Visualisations might be useful for communicating the potential effects of climate change. Could be compared with visualisations done by the Wildlife Trust which show the vision for the area (i.e. what we want it to look like in future).
- Failure of national planning legislation to adequately consider adaptation is a barrier e.g. continuing to allow building to occur in floodplain areas. The NPPF is unlikely to be an improvement.
- The value of land and competition for land use is a significant barrier in this area – most of the area is urban or will be developed therefore land values are very high. There is very little land which is not already used for development or agriculture and any land which is not is use is likely to be expensive. There is very little room to manoeuvre from a biodiversity perspective and little opportunity to try new things.
- Recreation pressure is a barrier to action to improve biodiversity in some places in the NIA.

- There is not always the political will to progress adaptation or biodiversity improvements – need to communicate multiple benefits and speak in terms of economics more. However, green infrastructure provides an opportunity to deliver multiple benefits for biodiversity, climate change adaptation, recreation and other services.
- Biodiversity offsetting could be an opportunity for biodiversity but should be very much seen as a last resort – it is not an excuse for destroying priority habitat. It may not offer a solution in this areas as land for habitat creation is very scarce.

E.9. Northern Devon

Project:	NIA climate change adaptation		
Subject:	Northern Devon NIA workshop		
Date and time:	29 Jan, 10.30am - 3.30pm		
Meeting place:	Natural England, Renslade House, Exeter	**Notes by:**	Geoff Darch

Presentations (morning)

The following presentations were made:

- Context – Sarah Taylor
- NIA Overview – Lisa Schneidau
- Natural England Climate Change Vulnerability Model – Sarah Taylor
- Forest Research tool – Kevin Watts
- SNA and Nature Map – Peter Burgess
- Biodiversity offsetting – Andy Bell

Discussion (afternoon)

Clarification questions

- Have the Wetland Vision outputs been included in the NE model? *No, but they could be.*

Discussion

- It was suggested the discussion should focus on the specific questions or management actions that the NIA was considering.
- The three main objectives of the NIA Phase I (to April 2015) are:
  - More coherence terrestrial ecosystem, with five SNAs done.
  - 75% of all terrestrial habitats in favourable condition.
  - Flagship species populations robust and better able to cope with threats of climate change.
- Also included in the Business Plan is an aspiration to assess the links between land use planning and ecosystem services, and to develop an ecological network map.
- The network map is seen as key advocacy aid. However, it would not be used for targeting in the next two years. The latter will focus on schemes that are relatively straight-forward to implement. Good datasets are already held and these are helping guide implementation.
- However, more than a map, it was decided that a decision support tool was needed.
- What do we want?
  - Decision support tool.
  - Simple approach.
  - Needs to relate to NIA outcomes i.e. guiding achievement and helping to monitor results
  - Audience? Range of different audiences including partners, funders, landowners, public. Advisors identified as a key audience.
  - Practicalities: data access, usability of tool, skill consistency requirements.
- Three stages of delivery of the 'network'
  - Opportunity led delivery (some targeting already used to identify).
  - Advocacy and planning.
  - NIA legacy: longer-term targeting (more difficult sites), supported by 'network map'.
- Spatial expression of Lawton review is welcome and useful.
- Combinations of data are useful i.e. overlaying data. For example current agreements, temporal nature of these, future targeting.
- Spatial scale of maps is critical:
  - Different funding schemes and different models.
  - Fuzzy boundaries can be useful for particular audiences and to avoid over-focus.
  - Broad focus / network areas – local knowledge informs within this e.g. land use within a field (e.g. WFD advisors).

- Decision framework (Oliver *et al.,* 2013)
  - Non-spatial.
  - Climate envelope modelling (BRANCH, MONARCH) – available for priority species in NIA?
- Challenges within offsetting pilots. At the moment using what data is available, including own mapping because we have to make decisions now.
- NE Tool, with local data - could be used to develop Marsh Fritillary network
- What species? Marsh Fritillary (but don't map Pearl Mussels).
- What habitats? Culm grassland, woodland.
- Where / situation now – NE and UKMO models (with local data / products).
- What next?
  - Functional network modelling / mapping.
  - Opportunity mapping (SNAs) e.g. Culm potential mapping.
  - FR Woodland / PAWS scenarios.
  - Re-running models to monitor change.
- Who will use what products? Intelligent PDFs used by land management advisers; production of an app?
- Technical capabilities:
  - GIS capabilities, to run, update, and query model.
  - PDF use, simple layer queries
  - Fuzzy maps?
- Targeting framework versus local opportunities:
  - Targeting needs to add value (to work of advisors) on top of local opportunities.
  - How big do you make a site before you decide it is viable and move on?
  - This is where data / models can help.

Immediate actions

Action	**Responsible**
NE Model updates: Specific habitat maps Software provisions Webinar on technical detail	Sarah Taylor, Peter Burgess
Start to write a network design method for the NIA (with NIA partners)	Lisa Schneidau
Species network maps	Peter Burgess
Climate space data	Sarah Taylor (BRANCH), Kevin Watts (FR)
Incorporate FC ESC model within offsetting modelling	Andy Bell
Come up with a definition of coherence: when are we successful?	Emma Richardson

Also:

- Need to engage with advisors soon (April?), to brief them.
- Need to look beyond 2015. Use maps to help identify longer-term opportunities (including for funding).

E.10. Wild Purbeck

Project:	NIA climate change adaptation		
Subject:	Wild Purbeck NIA workshop		
Date and time:	05 Dec, 11am – 3.30pm		
Meeting place:	Slepe Farm, Lytchett Matravers	**Minutes by:**	Nikki van Dijk

Introduction

- Link to the EEA (2008) report - European Environment Agency report on climate change indicators (2008) http://www.eea.europa.eu/publications/eea_report_2008_4 and update (2012) http://www.eea.europa.eu/publications/climate-impacts-and-vulnerability-2012
- England Biodiversity Strategy Principles for Adapting to Climate Change - http://www.defra.gov.uk/publications/2011/05/24/pb13168-england-biodiversity-strategy/
- Natural England publications library – search 'climate change' to find climate change related reports, including NCA vulnerability assessment reports. http://www.naturalengland.org.uk/publications/publications/default.aspx

NIA presentation - key points

- Climate change adaptation has been considered throughout the development of the NIA business plan.
- Impacts of climate change on the NIA:
  - Sea level rise in Poole Harbour
  - Increase in flooding and drought
  - Ecological effects of changing temperature and rainfall
  - Possible species gains and losses
  - Heathland fires
- Human responses to the impacts of climate change are likely to be s significant as the direct impacts.
- NIA projects with benefits for adaptation:
  - Land management projects – heathland restoration and woodland creation will improve resilience and contribute to climate change mitigation.
  - Community projects – improving awareness of climate change.
  - Green economy – get landowners involved.
- The NIA is linked to other projects – LiCCO (focused on adapting to sea level rise), Frome and Piddle Catchment Initiative (focusing on habitat creation and catchment management) and Poole Harbour strategy.
- Need to consider monitoring and evaluation of adaptation actions – shouldn't be a separate process to other M&E in the NIA.
- Landscape permeability project (led by Ian Rees, Dorset AONB). GIS based methodology for analysing land use between areas of habitat and identifying where action could be prioritised to improve habitat networks in the area. Whilst the model looks for potential permeability (rather than theoretical permeability) there will still be constraints e.g. landowner buy-in, economic viability.
- Wessex Water is taking a similar approach to identifying areas for habitat creation/restoration in the Frome and Piddle catchment.

Vulnerability model - questions and feedback

- How much priority habitat does there have to be in a square for it to show up in the model?
  There is a threshold under which a square does not show as having priority habitat in it. Thresholds are different for different habitat types because some habitats only exist in small patches.
- The 'value' metric shouldn't classify priority habitat outside designated areas as 'low value'. All priority habitat is by definition valuable – need to change terminology used in this metric. Low value areas would be the white squares.
- Are County Wildlife Sites included in the value metric?
  If they are priority habitats they will be picked up under the classification priority habitats outside of designated areas.
- Can weighting of metrics be changed? Some metrics are more important than others e.g. topography might not be as important as sensitivity.
  At a national scale there is no evidence to weight metrics differently; hence they are equally weighted in the model. However, at a local scale these changes could be made if agreed by partners. The model is

flexible and there will be software which will allow it to be altered, assuming GIS capability in the partnership.
- This seems to link to a Natural England R+D project looking at landscape attributes which contribute to resilience. The model could be updated once the findings of this work are available.
- It would be useful to know what the sources of harm identified for each habitat were.
- There appears to be an issue with SSSI condition data – there are areas in favourable or unfavourable recovering status which are not picked up by the maps – particularly sea cliffs and grassland.
- GIS layers from the landscape permeability work could be layered with the vulnerability model output. Other local datasets which could be overlaid include HLS and Strategic Nature Area data.
- The model output could be improved locally by using better local habitat inventory data – possibly available from Dorset Records centre (although would need resourcing).
- How is the data available?
  The model runs in ArcGIS. Shapefiles will be sent to Alison Turnock and Alex Martin (Wessex Water).

Vulnerability model potential uses
- Potential to add climate change information from the model to Wessex Water's GIS for the Frome and Piddle Catchment to provide further evidence of multiple benefits of habitat creation to land owners. The model shows the benefit in terms of reducing vulnerability to climate change, which alongside other evidence, contributes to the evidence of multiple benefits. Could also be used to help target areas for land use change and habitat creation.
- Forest design planning – this is carried out over a 50 year timescale so the model could help show where to prioritise effort in terms of reducing vulnerability to climate change. It would be useful for forest planners to see the outputs of the model. Links to Forest Research work on forest opportunity modelling for the south west.
- There was a feeling that the local authority would use it if it could contribute to development of local plans. Could have particular relevance to Green Infrastructure plans.
- Use the model to prioritise future areas for work – beyond the 3 year horizon of the NIA.
- Monitoring and evaluation – although concern that the model is not a fine enough resolution to be used for M&E. Although the statistics which accompany maps might be helpful.
- It would be useful to run a handover training session with local GIS users once the final model and software is available. This could be a webinar.

Further maps / model runs identified as useful for Wild Purbeck NIA

A staged approach to taking the outputs of the model forward was discussed:

1. Identify uses of the data and maps presented from the vulnerability model as it is (i.e. using the national scale data with no change to metrics).

2. Identify uses which would require further maps or changes to the model. To progress this:
   i. Identify if there is local GIS capacity to make simple changes such as overlaying local data layers with output from the national model or changing the boundary of the maps.
   ii. Identify if there is local GIS capacity to make changes to the model once the full version and software is available e.g. use local data sets, change the definitions used in the metrics, change the relative weighting of metrics.
   iii. Identify where assistance would be required from Natural England at a national scale and use this to start dialogue to determine what can be provided.

To start this process, the following specific maps and changes were identified during the meeting:

- GIS layers from the landscape permeability work could be layered with the vulnerability model output. Other local datasets which could be overlaid include HLS and Strategic Nature Area data. This should be possible with local GIS expertise.
- The model output could be improved locally by using better local habitat inventory data. This could be done locally once the final model and software is shared, depending on GIS capability and resource.

If Partners have GIS capability they should be able to update the model, make changes to the metrics and weightings and produce different runs themselves once the software is shared. If this is the case, Natural England would ask that users feedback experiences of using the model and how the data is being used.

It was felt that the partnership needed to evaluate the model and hold a meeting to discuss specific uses, including local GIS resources to input local data and layer with existing data sets. This could be done as part of the upcoming M&E meeting.

Adaptation planning in Wild Purbeck

- Tasks and questions for the adaptation planning project in Wild Purbeck;
  - Produce an adaptation plan for the NIA – what might this include? Who is the audience?
  - Monitoring – how to monitor adaptation? Link to the wider M&E group.
  - Training and engagement - who to involve?
- The RSPB have already produced a vulnerability and adaptation report for the area. This was based on the reserve vulnerability assessment method (which is similar to the Natural England NCA vulnerability assessment method) but scaled up to landscape scale.
- The method involves the following steps:
  - Identify impacts of climate change on habitats and species
  - Identify potential human responses
  - Identify adaptation actions (screen existing objectives)
  - Develop an adaptation plan
  - Communicate and monitor the plan.
- This work now needs to be translated into a plan for the NIA. There are different ways the adaptation plan could be presented in Purbeck:
  - Adaptation actions presented by habitat type.
  - Adaptation actions presented under the EBS principles headings.
  - Adaptation actions presented by audience type (e.g. farmers and land owners, advisors, conservation bodies, local authority).
  - Adaptation actions presented at different timescales – what needs to be done in the short, medium and long term.
- This could be an exercise in communicating the findings of the RSPB work rather than a theoretical assessment of vulnerability and adaptation actions (this work has largely been done, although the NIA objectives could be screened to identify how they might be affected by climate change). A communications plan would be useful.
- All output should be concise e.g. factsheets or FAQs. It would be useful to summarise the findings of the RSPB work into simple messages which can be used with stakeholders.
- Adaptation actions should focus on being 'no regrets' i.e. good to do under any scenario of climate change e.g. river restoration, fire management. Adaptation actions should reinforce good conservation and achieve multiple benefits.
- It could be possible to produce the adaptation plan as a map – although caution is advised as this might be of concern to landowners.
- This might be something to take forward through the Wild Purbeck community strand. It would also be important to get landowners involved (possibly through contact with FWAG).
- A separate workshop on a Wild Purbeck adaptation plan may be required: decide messages, audience, products, communications and monitoring.

Barriers to adaptation and additional support required

- Communications with stakeholders – it can be difficult for people to accept the need for adaptation. Training on climate change for advisors and practitioners would be useful – particularly how to get messages across clearly, in terms that people understand.
- Monitoring and evaluating adaptation – how can adaptation be measured? How do you know if it's working? How can you measure damage avoided? M&E needs to complement existing NIA M&E rather than being a new process for adaptation.
- HLS doesn't address adaptation very well at the moment – it is based on conventional habitat management. Natural England should be considering what changes are required to HLS to support adaptation and enable HLS to be a better mechanism for delivering adaptation action. Agreements need to be longer term than 10 years for adaptation benefits to be realised. There might be an opportunity for NIAs to feed into the process of HLS review – the NIA would be interested in doing so. The successor to HLS needs to accommodate flexibility that is required to adapt to climate change.
- Incentives for landowners to change – linked to HLS above. Adaptation has to be economically viable for farmers. If farmers have to abandon land for adaptation purposes, they need to be compensated for this (currently through Single Farm Payment) – farmers need to make the same amount of money from an area of land before and after they take adaptation action. From a farmer's perspective, making changes at the edge of fields is more viable than making changes over large areas.
- Political cycles (5 years) are too short for adaptation.
- It would be useful to have guidance on how to improve biodiversity during development as there is a need for development in this area.
- It would be useful to have more information about what to do in areas of existing habitat that will be affected by climate change impacts (not just about habitat creation and joining up patches). E.g. how should we manage areas of existing ancient woodland in the face of climate change?

Appendix F. Survey results

Question 1

Which event did you attend?		
Answer Options	**Response Percent**	**Response Count**
Birmingham and Black Country	20.8%	5
Dark Peak	16.7%	4
Dearne Valley	16.7%	4
Greater Thames Marshes	0.0%	0
Humberhead Levels	12.5%	3
Nene Valley	8.3%	2
Northern Devon	4.2%	1
Meres and Mosses of the Marches	4.2%	1
Morecambe Bay Limestones	0.0%	0
South Downs	0.0%	0
Wild Purbeck	16.7%	4
answered question		**24**
skipped question		**0**

Question 2

What sort of organisation do you represent?		
Answer Options	**Response Percent**	**Response Count**
Conservation NGO	33.3%	8
Defra family	20.8%	5
Local authority	25.0%	6
Academic institution	0.0%	0
Access and recreation group	0.0%	0
Private sector organisation	8.3%	2
Other	12.5%	3
answered question		**24**
skipped question		**0**

Number	**Other (please specify)**
1	Land owners/farmers
2	The secretariat of the NIA - hosted by RSPB
3	Water company

Question 3

Please rate the usefulness of the different elements of the workshop in assisting with planning for adaptation						
Answer Options	**Not at all useful**	**Not very useful**	**Neutral**	**Useful**	**Extremely useful**	**Response Count**
Introductory presentation	0	1	2	17	1	21
NBCCV model presentation and discussion	0	2	1	15	4	22
NCA method presentation and discussion	0	1	4	15	1	21
Discussion of adaptation barriers	0	2	4	14	1	21
answered question						**22**
skipped question						**2**

Question 4

Were there any other aspects of the workshop that you found particularly useful? Please give details.	
Answer Options	**Response Count**
	11
answered question	**11**
skipped question	**13**

Number	**Response Text**
1	Specific detailed methodology discussions
2	Getting NIA partners around table to actually discuss this stuff in a structured way.
3	New ideas contributed from the partners about using other types of data i.e. watercourses data from EA and engagement with Internal Drainage Boards and farmers to provide other types of info and develop practical solutions
4	Useful to understand the different approaches/work and tools being developed by other organisation
5	All were useful
6	The methodology and its application.
7	Very useful catalyst to get a good range of partners thinking about these issues and how to address them from a strategic perspective.
8	I think that this workshop gave me a better understanding as to the thought process that went into the production of a plan to tackle the effects of global warming.
9	The most useful part was to gain a knowledge of the criteria that NE were using for the model. These are limited in use due to the scale in which the Riparian and wider floodplain habitats are mapped - making them appear somewhat insignificant in spatial terms. They are by their nature transient and small and therefore not easily expressed at this scale if at all.
10	Discussion as to how to use the maps to promote "bigger, better, more, joined"
11	I really enjoyed looking into how the two methods could be used. Also being given the opportunity to think about as an NIA we might use it.

Question 5

Were there any aspects of the workshop which you did not find useful? Please give details.	
Answer Options	**Response Count**
	10
answered question	**10**
skipped question	**14**

Number	Response Text
1	none
2	The model gave poor results due to poor habitat distribution data. Local knowledge gave better results
3	The data used is old and needs to be updated or new types of data added. Mature partnerships can be used to advise on what works best.
4	No. Some parts of the discussion were not relevant to my work, but were valid points of discussion for other parties
5	No - all aspects were useful
6	Not really.
7	I was the only representative for farmers and land owners, and I do worry that any guide line coming from such a forum will not be balanced as to the financial consequences to land owners or farmers when they try to develop their businesses (planning restrictions) or engage in future environmental programmes(money for schemes)
8	I found the workshop useful but the tool less so for reasons outlined above
9	Some issues relating to the fact that some of the best areas in Purbeck (heathlands) were in the category of needing to be "better" which did not accord with people's views. This was going to be looked at.
10	The timing of the workshop, felt to me as to late. These would have been of benefit to have these workshops in the NIA application stage.

Question 6

To what extent did the workshop meet your expectations in terms of helping to plan adaptation in the NIA?		
Answer Options	**Response Percent**	**Response Count**
Not at all	8.7%	2
Slightly	8.7%	2
Partly	39.1%	9
Mostly	34.8%	8
Completely	8.7%	2
answered question		**23**
skipped question		**1**

Question 7

How useful do you think the NBCCVM will be for understanding vulnerability to climate change and planning adaptation at:						
Answer Options	**Not at all useful**	**Not very useful**	**Neutral**	**Useful**	**Extremely useful**	**Response Count**
National scale	0	1	3	12	3	19
NIA scale	0	5	4	9	1	19
answered question						**19**
skipped question						**5**

Question 8

What ideas do you have for using the data and maps you have seen so far? If you have already used the data, please describe what you have used it for.	
Answer Options	**Response Count**
	15
answered question	**15**
skipped question	**9**

Number	**Response Text**
1	we are using the data and following the approach taken but using locally specific datasets to add greater resolution
2	Still working through how to adapt policies
3	Tweaking it to become an index of vulnerability which can be re-run and assessed to see if work has decreased vulnerability...?
4	Can only assume the model will be more valuable elsewhere
5	the other partners will be able to tell you about this when they complete the survey
6	Green Infrastructure delivery plans and identifying areas and projects that are multi beneficial
7	I intend to use the data in the Frome and Piddle Catchment Initiative risk model to assist in the decision making process for habitat adjustment
8	-
9	We have used the data, but in the context of much wider information on habitat and species distributions
10	If there is a plan to link vulnerable areas then these maps form the basis discussions with land owners/farmers but any environmental scheme must be funded properly and on a long term basis, ten years might not be enough if one believes that climate change had its origins in the post war increase in power use.
11	None at the moment
12	As expressed. It would be useful to update the info used in the model as this is way out of date and that in itself erodes confidence in its efficacy. I would like to see the model trialled in reality in the Dearne, Using up to date data and a scale/resolution that can capture the important but not expansive habitats
13	helping map the at risk habitats
14	Unlikely to use them
15	Am discussing using maps with local plans team. Forestry Commission and Wessex Water are interested in including the maps in their planning GIS maps.

Question 9

Do you have any suggestions for changing the model at a national scale? If yes, please give details.	
Answer Options	**Response Count**
	8
answered question	**8**
skipped question	**16**

Number	**Response Text**
1	No
2	No
3	-
4	It has to incorporate at least an approximation to phase 1 habitat data across the entire landscape to achieve any degree of credibility.
5	It seems that there are some general principles that could be promoted on a national scale, however vulnerable areas have to be tackled locally, what is good for heathland might be less appropriate for chalk downs.
6	As above. the scale nationally cannot take into account important but small habitats due to the 2 ha (?) resolution
7	None at present
8	We need to be careful of how data is interpreted. For example using national data, it showed that the blanket bog in the Peak was not vulnerable.

Question 10

Would you be interested in running the model locally (e.g. with local data sets or amendments to the metrics)?		
Answer Options	**Response Percent**	**Response Count**
Yes	55.6%	10
No	44.4%	8
answered question		**18**
skipped question		**6**

Question 11

If yes, what would you like to use the model for locally?	
Answer Options	**Response Count**
	9
answered question	**9**
skipped question	**15**

Number	**Response Text**
1	Habitat resilience mapping
2	See 8.
3	This is yes if the partners are interested. It could be used to plan for future delivery in the Humberhead Levels NCA and inform the NIA monitoring framework
4	more specific local scale info with local data used in the GIS
5	See Q8
6	If the model could be extended to incorporate other datasets and revised to address the way the methodology treats identified/designated habitats as existing in a uniform wildlife-hostile landscape and instead
7	As I have described above. It would be useful to home in on the river habitats - map them at a smaller scale/ higher resolution to assess the vulnerability. We know they are vulnerable but could assess/refine the tool rather than the NIA plan at the moment.
8	Incorporating into climate change adaptation which is one of Wild Purbecks 20 projects. Also keen to use it for influencing HLS schemes -more work needs to be done at a national policy level on this so that appropriate prescriptions are available
9	Planning for the next three years of NIA work post 2015.

Question 12

Do you envisage any of the following being a barrier to use of the model in the NIA?			
Answer Options	**Yes**	**No**	**Response Count**
Quality of national datasets	13	4	17
Availability and quality of local datasets	8	9	17
Model structure and assumptions	8	9	17
Local GIS expertise / resource	8	9	17
Other (please give details)			2
answered question			**18**
skipped question			**6**

Number	**Other (please give details)**
1	Local GIS is ok when there is someone in post.... otherwise not ok!
2	The model doesn't drill down far enough as NIAs are about much more than identified areas of priority habitat

Question 13

Based on what you have seen so far, what do you consider to be the strengths and weaknesses of the model?		
Answer Options	**Response Percent**	**Response Count**
Strengths?	85.7%	12
Weaknesses?	92.9%	13
answered question		**14**
skipped question		**10**

Number	**Strengths?**	**Weaknesses?**
1	great decision support tool - additional evidence	National datasets! hence our local approach
2	A good starting point	To vague on local detail
3	Good nationally consistent method	Maybe not high enough resolution for local areas where levels of knowledge of habitat etc already high.
4	National scale - could give useful overview	Rather crude model - poor data availability to drive it
5		Quality of data sets and incomplete habitat inventory. Weighting of importance for habitats seemed strange, particularly with example of rivers.
6	The model is fairly easy to understand and can be built upon with different datasets added	Out of date data and some key ones missing like watercourses
7	bringing together a wide range of data sets and using assumptions to then model specific results	not being able to put local data in, but having to do this separately - cause for confusion?
8	coverage	You can't assess vulnerability and connectedness of designated habitat by assuming that only other designated habitat affects connectedness and vulnerability
9	It is a good start	There is no differentiation between different types of vulnerable areas, and what is vulnerable is not discussed
10		inadequate data in relation to river habits
11	Good national indicators.	Less useful at a local scale due to resolution.
12	a general indication of potential change	implementing the models outputs over local knowledge/practice
13	Useful tool for climate change planning	Some issues need resolving prior to widening use- it is particular importance that the information is accurate at a detailed level if it is to be used in planning with landowners e.g. for influencing HLS agreements
14	Good Visuals	

Question 14

How useful do you think the NCA method is / will be for understanding vulnerability to climate change and planning adaptation in the NIA?		
Answer Options	**Response Percent**	**Response Count**
Not at all useful	0.0%	0
Not very useful	20.0%	3
Neutral	20.0%	3
Useful	53.3%	8
Extremely Useful	6.7%	1
answered question		**15**
skipped question		**9**

Question 15

How could the NCA vulnerability assessment method be used in the NIA or beyond?	
Answer Options	**Response Count**
	9
answered question	**9**
skipped question	**15**

Number	**Response Text**
1	Don’t think I understand the question
2	The NCA assessment told us little about the NIA that we do not already know. It is unlikely to change our choice of core areas for work. It may be more interesting in NIAs which have more varied habitats.
3	For informing future landscape-scale work beyond the life of the NIA. For e.g. Humberhead Levels Partnership has a long term delivery plan covering the whole NCA.
4	highlight specific areas for focus
5	It provides a straightforward approach to making subjective assessments of vulnerability that can guide actions and help with prioritisation
6	It should be used to work out a programme and viable financial package to promote ecological and environmental
7	To highlight the local importance of national trends and assess the value.
8	As summarised earlier, for future planning at a variety of scales from the local plan level to individual land holdings
9	Thinks it works well with partnerships

Question 16

What do you consider to be the strengths and weaknesses of the method?		
Answer Options	**Response Percent**	**Response Count**
Strengths?	75.0%	6
Weaknesses?	75.0%	6
answered question		**8**
skipped question		**16**

Number	Strengths?	Weaknesses?
1		Data sets. Not enough distinction between wetland habitats. Overstated importance of rivers
2	Covers the NCA boundary	works at a broad level
3		local differences
4	Allows local knowledge to compensate for gaps in formal datasets	Subjectivity means assessments in different areas/by different people are not directly comparable
5	It is good tool for people who understand	It is a bit complicated
6	simple method of estimating vulnerability	
7	Useful for strategic planning at national /regional scale. The detail	
8	Data across the whole area on a number of subjects	Need to ensure data is entirely reliable - only needs one or two errors to be found and people will lose confidence in it

Question 17

Of the tools, methodologies and reports mentioned at the workshop (or in the briefing note) which: • were you already aware of? • might be useful to you and the NIA? • would you like more information about?				
Answer Options	**Aware of**	**Might be useful**	**More information**	**Response Count**
EBS Adaptation Principles	10	3	2	15
Towards Adaptation to Climate Change	9	4	2	15
BRANCH	2	7	6	15
Green Infrastructure Guidance	7	7	2	16
Guidance on dealing with changing distribution of tree species	2	8	5	15
NCA Vulnerability Assessment method	5	7	2	14
NBCCV model	6	7	2	15
UKCP09	8	5	2	15
UK CCRA	5	7	3	15
Climate Ready Support Service	1	7	8	16
RSPB Reserve Vulnerability Assessment	6	4	4	14
Ecological Site Classification Decision Support System	1	7	6	14
CEH wetland management toolkit	2	7	7	16
answered question				**16**
skipped question				**8**

Question 18

Which of the following (if any) do you consider to be barriers to adaptation in the NIA?			
Answer Options	**Yes**	**No**	**Response Count**
Understanding impacts	10	6	16
Understanding adaptation actions required	12	4	16
Communicating the need to adapt to politicians	12	4	16
Communicating the need to adapt to land owners/managers	14	2	16
Demonstrating the economic value of ecosystem services	15	1	16
Accessing funding for delivery of adaptation	15	1	16
Current conservation policy and designations	8	7	15
Current planning policy	12	3	15
Public understanding of climate change and adaptation	15	1	16
Land values	13	2	15
Current land use	13	3	16
Monitoring and evaluating adaptation	11	4	15
Other (please specify)			1
answered question			**16**
skipped question			**8**

Number	**Other (please specify)**
1	providing a sufficiently robust financial package to effect changes

Question 19

Which of the following (if any) would you find useful for Natural England and its partners to provide to address these barriers?			
Answer Options	**Yes**	**No**	**Response Count**
Info - species impacts	13	3	16
Info - habitats impacts	13	3	16
Info - ecosystem service impacts	13	1	14
Guidance - species adaptation	11	5	16
Guidance - habitat adaptation	11	4	15
Guidance - ecosystem services adaptation	11	3	14
Adaptation case studies	14	1	15
Methods - assess local impacts	13	2	15
Methods - identify local adaptation actions	13	1	14
Info - adaptation benefits of HLS	12	3	15
Guidance - transformational change	11	3	14
Decision support tool - assessing trade-offs	11	3	14
Method - valuing ecosystem services	11	3	14
Training - NE staff	12	2	14
Training - politicians	14	0	14
answered question			**16**
skipped question			**8**

Question 20

What else would you like to see from Natural England and its partners in terms of adaptation advice and support?	
Answer Options	**Response Count**
	6
answered question	**6**
skipped question	**18**

Number	**Response Text**
1	Greater levels of support to build ecosystem resilience - adaptation is a product of this.
2	Profile of this issue needs to be raised across whole of society and in a continuous way, not just the odd press release....engagement in schools, Possible via curricula activities...?
3	Funding for pilots in established partnerships to resource this further work. To include posts (jobs) as well as funding for delivery
4	sympathy towards humankind and their need to live somewhere and run businesses
5	Clear joined up guidance, policies and support across the Defra family (EA/NE/FC/RPA)
6	Reverse the Defra cuts and provide the resources for NE and EA to do their job

Question 21

What other organisations or initiatives should be involved in adaptation? What support do they require?	
Answer Options	**Response Count**
	8
answered question	**8**
skipped question	**16**

Number	Response Text
1	Communities - a better understanding of ecosystem service benefits - through public pressure will come greater resource....
2	Education, Health. Poss insurers to show them investment in services and adaptive measures may save the lots of money in pay outs...?
3	Local communities but would need to be managed as individual projects.
4	Everyone :-)
5	Land agent's organisations Land managers local business They need simple focussed seminars with a method of changing the direction of the environmental travel if necessary.
6	Local Authority Planning which is how we are attempting to engage in the Dearne
7	Wildlife Trusts, National Trust, Woodland Trust, CPRE
8	All large land owning organisations and major decision makers

Question 22

How would you like to see Natural England and its partners communicate with NIA partnerships (and other landscape scale conservation initiatives) regarding climate change adaptation?			
Answer Options	**Yes**	**No**	**Response Count**
Reports	12	3	15
Web-portal	9	4	13
Fact sheets and FAQs	13	2	15
Local workshops	16	0	16
Webinars	9	4	13
Other (please specify)			3
answered question			**16**
skipped question			**8**

Number	Other (please specify)
1	Films, video presentations etc....
2	Supporting the production of local information
3	Draft reports that can be challenged.

Question 23

How would you describe your understanding of climate change adaptation and the natural environment:					
Answer Options	**No understanding**	**Little understanding**	**Some understanding**	**Good understanding**	**Response Count**
Before taking part in this project	0	2	8	6	16
After taking part	0	0	7	8	15
answered question					**16**
skipped question					**8**

Appendix G. Interview notes

G.1. Interview 1 – Humberhead Levels

Prior understanding of climate change adaptation

- There was a high level understanding already e.g. NCA vulnerability study. Practical work in the Humberhead Levels has already been based on this.
- Partnership has been in existence since 2000 – long history and good local knowledge.
- Climate change impacts research already done in this area – NCA study.

Workshop feedback

- But it was good to get stakeholders round the table to talk about it in relation to the NIA – the workshop provided space for thinking.
- More notice of workshops would probably mean that more people could attend.

Strengths and weaknesses of the NBCCV model

- The spatial understanding of vulnerability (using GIS) is useful and better than just reports.
- Open Government Licence is good as there have been problems sharing data in the past.
- It may be possible to adapt it and use more local data.
- For Humberhead Levels, the lack of watercourse data is a big gap in model.
- The priority habitat data looks out of date in this area – inventories are not good for all habitats, particularly water habitats.
- Manmade water features need to be included in the model – ditches and canals.
- Topographic variety – need to remove topography in flat areas – not useful to see high areas.
- Environment Agency data – how much involvement have they had and has any of their data on watercourses been incorporated? Could the model link to tools on flood risk?

Uses of the model

- Can't think of any uses in the NIA at the moment. It may be possible to use it once it can be tailored to more local uses but this would require further development.
- The NFU is keen to explore how it could be used with farmers and IDBs. It would be worth showing to other partners.

What changes are required to use the model?

- User friendly guidance.
- Ideas/examples of how to use.
- Pilot of the model in use in an NIA using local data – happy to be involved in developing local uses.
- There need to be resources available within Natural England to adapt the model – Natural England needs to be able to make changes because partnerships don't always have the GIS expertise or resource.

NCA method

- Need to know when the Humberhead Levels report will be published.
- There is a risk that the NCA report will be out of date by the time it is published and that knowledge and partnership has moved on.
- The NCA report needs to go back to the partners – they have received little feedback since a climate change workshop which was held when the report was being developed. The report will need to be checked for accuracy before publication.
- The approach was useful – but the NCA was the boundary, it needs to be updated for the NIA.
- A lot of partners were interested in the method – it was felt to be a good idea and the format of the method was good.

Barriers to planning and delivering adaptation

- Area might be under water in 50 years time – we need long term funding for adaptation but at the moment Government funding is short term.
- Uncertainty over what to do to manage for the long term.
- Most of the land in the area is Grade 1+2 agricultural land so there is pressure to sue it for food production.
- Planning - the role of NIA in planning is not well explained. How does climate change adaptation link to planning and what is the NIA role.

Further support required

- We need to build links with landowners, NFU etc. It may be possible to use land for flood storage where it's not viable to grow crops.
- We need to join up HLS – at the moment, the points system means that we can't get small areas of land into HLS, e.g. small areas of land around rivers and linear features. Needs partnership working between farmers to link up small areas of land.
- Messages about conservation and adaptation need to be very simple.
- It is time to promote the NIA work – we need very simple messages about what it is and what it is doing (there is a perception that an NIA is the same as a SSSI, farmers worry about restrictions
- Communications to the public on adaptation – how to get them on board?
- Research documents need to have quick, easy to read summaries.
- There are wider strategic link to LNP's and LEPs but the relationship to NIAs is not clear– we need to explain the economic value of the environment. There are five LNPs in the Humberhead Levels area.

The wider HHL Partnership has a 10 year plan. Prior to NIA, the area was a wetland vision area and NIAs projects are old wetland vision projects. This is an advantage – we shouldn't start from scratch each time a new initiative comes along. The Partnership is key to delivering adaptation but it needs to be supported in the long term.

G.2. Interview 2 – Dearne Valley

Prior understanding of climate change adaptation

- The partnership pre-dates the NIA – has been in existence for more than five years.
- There was already a good level of understanding of climate change – partners include RSPB, Environment Agency and Natural England.
- The partnership is already dealing with climate change and adaptation and there is good knowledge which is driving the project.
- Climate change adaptation is well understood even if it's not necessarily explicit in the plan.
- Impacts that the project is considering are mainly flooding related - high population at risk, impacts of flooding on houses and business. Arguments for projects in the NIA have to be people led.

Workshop feedback

- The workshop was interesting and it was good to an update from Natural England.

Strengths and weaknesses of the NBCCV model

- The model data is not good for the Dearne Valley as there is little priority habitat in the area and few designated sites.
- The model outputs could be better if local habitat data (Phase 1 survey data) was included.
- Vulnerability doesn't come out strongly with national level data – we need to look at the EBS principles locally. This is always a problem for this area.
- The model is probably more useful in areas with lots of priority habitat – can use it to prioritise action.
- Priorities for action are already set in the Dearne Valley and we know where habitat is.
- Objectives in the Dearne Valley are more about linking and permeability – not necessary creating priority level habitat.

Uses of the model

- In terms of practical uses of the model in the NIA it's probably not very useful as a practical tool – because of the type of area Dearne Valley is.
- There are probably better tools/methods for planning work in the Deame Valley – we collate local knowledge and data and draw on that more.

NCA method

- Could be a useful exercise to run through.
- Could be a tool for LAs to use – have conversations with other organisations, not necessarily NIA partners.
- It might help have clear structured conversation with non-experts.
- This method doesn't put a "line on map" – it is more about local vulnerability which is a good approach here.
- The partnership is already at stage where it has priorities agreed – we don't need to identify priorities. This method might be useful when reviewing the NIA in 3 years time.

Barriers to planning and delivering adaptation

- Short term funding applications and competition for funding.
- The NIA only lasts 3 years – we can overcome this barrier as the Partnership has a long term vision, looking at a 20 year horizon. We need to have a long term vision but will deliver chunks of action with short term funding. This means that projects are not necessarily done in the right order.
- Pressure on land use – local authorities are looking for regeneration jobs, development which can conflict with conservation interests. Challenge for the partnership is to overcome these conflicts and deliver multiple benefits. All three local authorities are members of partnership.
- Everything comes back to economics. In the Dearne Valley we struggle because of low land values. Developers don't do much for conservation as they already get low returns on the land and they argue that additional actions are not economically viable.

Further support required

- To create new habitats takes a long time – long term management is required. Long term funding for management and adaptation is required.
- How do you quantify future value? Possibility of payment for ecosystem services.

G.3. Interview 3 – Dark Peak

Prior understanding

- Already good understanding of climate change impacts and adaptation because of the way the NIA was put together.
- We were already aware but it was good to bring back focus to adaptation.
- People doing projects in the NIA are thinking about adaptation e.g. woodland planting is thinking about what species and where they come from.

Workshop feedback

- This workshop re-affirmed what we are doing and got everyone in the partnership talking.
- It was good to see what Natural England is doing and it was good to be involved whilst the model is still in developed.
- It might be useful to have another session when the model and software is finalised - more user friendly session with demonstration of the model and opportunity for people to play with it.

Strengths and weaknesses of the NBCCV model

- The model needs local data – the national level data in it is wrong in places.
- Blanket bog is not showing up as highly vulnerable – whilst conservation people understand that it is vulnerable, there is a risk that using this model, funders won't prioritise the area. Need to be careful where the maps are shown.
- National data is a big concern for the partnership. We need to play with the model using local data.
- The model needs user testing.

Uses of the model

- Sheffield City Council could put local data in the model. Concern that the model can't be used as a planning tool at the moment.
- It might be too late for the NIA now – a tool was required 2-3 years ago when developing plans. However, it might be useful in 2015 for future plans, although we are likely to use local knowledge.
- In the next round of NIAs it could be a condition of funding bids to use the Natural England vulnerability tool.
- Possible to use the tool to see if things can be done in non-HLS land.
- The model looks relatively easy to use, thought behind the structure is good.
- Lots of organisations have developed their own tools – RSPB tool, National Trust also doing one. It would have been useful if Natural England had said a few years ago that they were doing one too. Hoping to expand the reserve vulnerability assessment to use local data – the Eastern Moors are very important. The Reserves tool will be used as part of the management plan update.
- We know that species will arrive in the southern bogs – from using the RSPB tool.

NCA method

- Could see this working in NIA context.
- We are looking for private landowners to join NIA – this could be used as conversation tool.
- Good for talking to non-conversation experts. Chance to talk about concerns.
- This is more about listening to people to find out how things are – uses local knowledge.
- We need to get ready for arriving species.

Barriers to planning and delivering adaptation

- Lines on maps.
- Thinking beyond the 3 year management plan. We need to think in 10 – 20 years timescales
- Communications around climate change adaptation.
- Public consciousness – Natural England are the right people to raise public awareness. . People think that the Peak District is over managed but without management it will become trees. People don't understand this.
- It can be hard to persuade funders to spend money on the Peak District as it is not a deprived area.

Further support required

- It would be good to have an idea of what would you do for an area for adaptation in an ideal world (no constraints) – then we could work out what to do given constraints that exist. We could make unconstrained plans then decide what is feasible.
- Could do similar workshop sessions with Natural England local advisors.

- Tree provenance - where to get trees from? We should look at South England provenance. We need advice from Natural England.
- Climate change messages need to be translated from national information into local level information.
- We need habitat level advice.

G.4. Interview 4 – Nene Valley

Prior understanding of climate change adaptation

- General good understanding of impacts.
- The NIA has already considered adaptation.

Workshop feedback

- There were different organisations at the workshop, not just the usual conservation organisations, e.g. the Joint Planning Unit.
- The workshop was a good prompt to think about adaptation measures.
- It was useful to have a workshop focused on adaptation and it encouraged discussion.

Strengths and weaknesses of NBCCV model

Strengths:

- Range of metrics and overall vulnerability.
- Ability to break down the metrics. For Nene Valley, the fragmentation metric could be particularly useful.
- Good to include habitat condition.
- Lawton principles maps – possibly useful but not sure how to do them locally at the moment.

Weaknesses:

- Local Wildlife Sites are not included (although probably covered through priority habitat). We have information on the condition of LWSs which we could incorporate.
- Open water sensitivity – seems to show up as vulnerable because it is flat and is designated as SPA but it is not necessarily that vulnerable. The topographic metric might skew vulnerability of this habitat – topography is possibly more significant in other habitats.
- Don't understand the reasons for the sensitivity of lakes.
- It would be interesting to try the model with and without river habitats. Rivers are always going to be connected because they are linear features. Connectivity might be overstated in this NIA as it is a river valley.
- Not all habitats are permeable for rivers – sometimes they can be a barrier.

Uses of the model

- Lawton maps could inform prioritisation work – current gap analysis looking at habitats and HLS and habitats without HLS.
- Could be used to identify areas for HLS.
- Planning and development – identify where green infrastructure is needed and where it is more suitable.
- Fragmentation metric – could it be used for monitoring and evaluation of the NIA? We need an indicator of connectivity for the whole NIA. Can the scores be aggregated as benchmark then re-do the analysis in 12 months? The analysis needs to be repeatable and an annual data update would be required.
- Local data is required – the Nene Valley has good local data and GIS resource.

Changes to the model

- We need to be able to change the model and input data – should be possible when the software is available. We do have capacity to do GIS.
- We use Map Info rather than Arc. It would be good if the model was available online or freely available software was used.
- Would like to include LWS and condition data when we run it locally.
- We probably wouldn't put the vulnerability maps with habitat opportunity layers at this point (might do at least later stage) because the concept of opportunity mapping is not well understood.
- We might have a go at removing rivers to see what effect this would have.
- Reduce sensitivity of lakes.
- Annual updates to underlying data.
- Guidance on how to produce the Lawton maps.

NCA method

- This is generally less exciting than the GIS model.
- It could be useful for informing Local Authority projects e.g. green infrastructure and development.
- Will be time consuming to do the work.
- It is competing with other work that's already out there.
- Local Authorities might be more interested
- We could use this approach when updating plans and strategies.

Other tools and methods

- There is uncertainty over the carbon sequestration ability of habitats but the Natural England document is not very helpful as the figures are too uncertain.
- The adaptation manual sounds very useful. We need to see guidance translated to site managers.
- Report cards would be useful to see.
- The CEH tool has already been used in developing habitat opportunity maps. It was quite hard to interpret but was useful in the end.
- Regular updates are required.

Barriers to planning and delivering adaptation

- We have been talking about this for a long time and have been speaking to other organisations (non-conservation organisations).
- Need more understanding amongst the general public.
- It is difficult to advocate adaptation as it is not well funded.
- Adaptation is mentioned on funding requirements but it is not always well understood (usually refers more to mitigation). Adaptation is harder to understand and people don't know what they can do.
- There is still some scepticism of climate change.
- Organisations all have their own views on adaptation and what needs to be done.
- There are too many reports. Many are high level and very technical. The model looks more useful as it can be made locally relevant.

Further support required

- Needs to be local and relevant. Tools should be able to produce local outputs.
- Spreading the message to non-specialists. Natural England should talk to organisations other than conservation organisations.
- Clear integration with existing landscape projects and work – relate to work ongoing, not something new or stand alone.
- Better incorporate adaptation with environmental stewardship. Opportunity through CAP reform to think more about adaptation. This could be a way of influencing land managers and recognising multiple benefits.

G.5. Interview 5 – Wild Purbeck

Prior understanding

- Good awareness – already got RSPB vulnerability assessment for landscape area. Looking to repeat this now for the NIA.

Workshop feedback

- There was some feedback from Natural England local staff that this was yet another Natural England thing to consider.
- However, other organisations at the workshop were more enthusiastic (Forestry Commission and Wessex Water).

Strengths and weaknesses of the NBCCV model

- Not sure that the model could be used at a farm holding level. Management of an area has to happen at this scale and strategic level plans only go so far.
- We have guidance on how to deliver adaptation for nature reserves but we need a version for farm scale action.
- Advisors are not aware of the tool – there could be a role for advisors in prioritising action for adaptation. Climate change is seen as a future issue, therefore not necessarily prioritised at the moment.
- The model is quite difficult to understand. The maps need quite a lot of explaining – it would be difficult to explain them to others.
- In the management metric, SAC/SPAs are showing up where they shouldn't be. The national data doesn't match local knowledge. This puts people off using the results although it may be possible to use the model with local data.
- Getting accurate maps is difficult when using national datasets.
- The topographic variation metric may not be very useful.
- Rivers appear more vulnerable because they are linear.

Uses of the model

- It would be good to incorporate the model output into estate management plans – but not sure how to do this at the moment.
- Useful for strategic purposes but probably won't be used at a local scale, on the ground.
- Maps could be most useful for strategy planning – Wessex Water would find them useful for catchment planning.
- We need to work out who would update the NBCCV model and have ownership locally. Probably the County Council.

NCA model

- Similar to RSPB method. We are more likely to use the RSPB method as a landscape scale adaptation plan has already been prepared in the area based on this approach. We need to replicate this for Purbeck now.
- Looking for input from other organisations, e.g. National Trust, Ministry of Defence, and Forestry Commission.

Other tools

- The briefing note is a useful digest of available tools – will look at before other meetings.

Barriers to planning and delivering adaptation

- RDP – transition period 2014-15.
- How to change ELS/HLS options – what should they be to encourage adaptation. How do we develop options with a climate change adaptation benefit? This is key to getting farmers to do adaptation. We have an opportunity at the moment (CAP reform) to change stewardship to benefit adaptation.
- Keeping up with new information is hard.
- Changing individuals – people leave and join partnership regularly.
- We need long term projects – funding is a barrier.

Further support required

- There is a need for Natural England to update the national model and datasets when updates to data are available.
- Raise awareness of maps and the NBCCV model to other organisations.
- It would be useful to have guidance on what different types of organisations need to do for adaptation.

- Habitats fact sheets – what to do when? E.g. what tress to plant?
- We need to get advisors involved – these are the people that talk to landowners on a day to day basis. We need to know how adaptation stacks up financially. Would be good to have a similar event for advisors – set up an adaptation forum for advisors.

G.6. Interview 6 – Greater Thames Marshes

Prior understanding of adaptation

- Kent was aware of the model and had been involved in development of it in the south east. Essex less aware.

Uses of the NBCCV model

- Keen to develop the model locally.
- Model could be used to help attract funding for other projects – could also be a focus of a funding bid. Get money to make updates to the model and develop it for local uses.
- Adaptation is a theme in funding criteria. Criteria also often require you to demonstrate innovation – using the model could be a way of doing this.
- Adaptation will be an important part of at least one funding bid the NIA is going to put in – model is useful as part of the evidence base.
- The separate information on coastal vulnerability is useful part of the evidence base - it might be useful to incorporate this information into a local version of the model.
- Could look at white squares to focus action.
- Interest in using the model to estimate costs of actions and identify best actions in terms of cost.
- Also interest in using habitats as proxies for ecosystem services – not always possible but could be used to identify where ecosystem services are and how they might be vulnerable to climate change impacts.

Further support required

- Who will make updates? There is good GIS capability within the partnership. Could look to get funding to develop the model Would Natural England be interested in making changes to the model if funding was secured?

Appendix H. LNP workshop report

Introduction

As part of the Climate Ready Support Service, the Environment Agency ran a series of workshops focusing on climate change adaptation and Local Nature Partnerships (LNPs) . Regional events were held in London, Bristol, Warrington and Leeds and were attended by representatives of LNPs and associated colleagues.

The aim of the workshops was to:

- Provide a summary of the latest climate science and projections, and the risks to the natural environment
- Explain the principles of adaptation in biodiversity management
- Help plan simple steps for adaptation to climate change through the Local Nature Partnerships

This report summarises the findings of the workshops, drawing out the common themes and issues identified during the discussion sessions across the four events. It is intended to provide a record of the workshops as well as a resource for you to use when developing plans, delivering actions and speaking to partners about climate change impacts and adaptation.

PowerPoint versions of the slides as well as notes from the other events are available on request – please contact Julian Wright, julian.wright@environmentagency.gov.uk

The report is structured as follows:

- Introduction - including feedback and next steps
- Discussion sessions – common themes
- Climate change presentation slides
- Sources of further information – including web links
- Notes from the London LNP workshop
- Names and contact details of participants

Feedback

Climate Ready and its partners will use the outputs of the workshops to help plan their activities and further engagement. As such we welcome your feedback on the workshop as well as any wider comments or suggestions you have.

We would be very grateful if you would complete a short survey (six questions) about the workshop by following the link below:

http://www.surveymonkey.com/s/H3X97VR

Next steps

We have taken on board some of your comments at the workshop and will be in touch shortly regarding a webinar led by Natural England to introduce the National Climate Change Biodiversity Vulnerability Model.

We will also use the outputs of the workshops and surveys to develop the Climate Ready programme of work for the next two years. If you would like to get in touch with Climate Ready regarding further engagement on adaptation, including requests for presentations or speakers to attend partnership meetings, please email Julian Wright julian.wright@environment-agency.gov.uk

Thank you very much indeed for taking part in the workshop and providing feedback.

Discussion session 1 – challenges facing LNPs

In the first discussion session, we asked participants to identify what they considered to be the biggest challenges facing LNPs. The aim of the session was to understand the context in which LNPs are operating at the moment before considering how climate change might affect LNPs and what needs to be done in terms of adaptation.

We asked participants to think about all types of challenges, not just environmental challenges or those related to climate change.

Physical challenges

- Water availability and flooding
- Water quality – phosphate
- Soil – runoff and degradation
- Biodiversity and habitat connectivity

Organisational / strategic challenges

- Funding - particularly core funding. Funding is short term and generally focused on achieving socio-economic benefits.
- Clarity of LNP role and communicating this to others – we need to understand and demonstrate the added value of LNPs as well as manage expectations of what LNPs can achieve. Defra definition of the LNP role is vague.
- Setting up partnerships – multiple organisations, multiple view points, getting correct people involved, securing time resources. This is made difficult due to constant organisational change.
- Engagement with other groups e.g. LEPs, Health and Wellbeing Boards, private sector.
- Unequal relationship with LEPs – LEPs have a clear remit (jobs and growth now) and funding whereas LNP role is unclear. Role of LNPs is often seen as less important than LEPs.
- Data – we don't always have a robust environmental baseline. Also issues around sharing data between partner organisations.
- Boundaries – different organisational boundaries. Some LEPs have to deal with multiple LNPs which puts them off.
- Maximising benefit for the natural environment through mechanisms such as green infrastructure and biodiversity offsetting.
- Perception of the natural environment – often seen as a brake on development.
- Understanding and communicating the economic benefits of the natural environment – it is difficult to quantify benefits in economic terms and communicating this evidence to non-specialists.

Discussion session 2 – experience of extreme weather events

The second discussion session focused on recent experience of weather events. The aim of the session was to introduce climate change vulnerability and the need for adaptation by exploring vulnerability to current weather events.

Participants were asked to think of examples of recent weather events and to describe their impacts as well as any actions taken in response. We also asked participants to think about what further actions could or should have been taken as well as what actions might be required to respond to future weather events.

Common impacts and actions identified by participants across the four sessions are summarised below and in the following slides. Impacts have been grouped according to broad categories of weather related risks (drought, flooding, increasing temperatures, cold weather and high winds and storms).

Drought – impacts

- Low flows –impact on farmers and public water supply.
- Biodiversity - wetlands and rivers dried out, fish kills. Affected WFD objectives.
- Economic impact on fisheries.
- Vector borne disease.
- Poor water quality downstream of abstraction points.
- Wild fires, forest fires, moorland fires.
- Algal blooms.
- Subsidence in areas of clay soil.

Drought – actions

- Water storage – creating ponds
- Fire management strategy
- Water transfers
- Crayfish moved
- Fish rescues
- Compensation flows

Heavy rainfall and flooding – impacts

- Soil erosion and gullying.
- Agricultural impacts - waterlogged fields meant that farmers couldn't get onto fields, crop damage, gravel deposited on fields.
- Staff roles change – focus on flood response.
- Biodiversity impacts e.g. water vole burrows flooded, fish kills.
- Flood damage to properties and businesses.
- Amenity impacts – sports and leisure events cancelled .
- Water quality issues – run off, nutrients, sediment.
- Spread of invasive species e.g. Japanese Knotweed.
- Impact on recreation - public footpath network flooded, beach failures.
- Transport disruption - road closures, bank erosion and landslips.

Heavy rainfall and flooding – actions

- Catchment Sensitive Farming and whole farm approach
- Environment Agency emergency response
- Upstream habitat creation – water companies
- SUDs e.g. swales in new developments
- Maintenance – gutter and leaf clearance
- Fish rescue
- Community engagement

Increasing temperatures – impacts

- Invasive species e.g. signal crayfish
- Urban heat island effect
- Recreation benefits
- Fish suffer (particularly salmonids) and can result in fish kills.
- Urban heat island effect.

Increasing temperatures – actions

- Tree planting - different tree provenance, street trees
- Green infrastructure
- Heatwave plans (NHS)

Cold weather – impacts

- Traffic disruption
- Office and school closures
- Rapid melt and flooding

Cold weather – actions

- Local Authority response – e.g. Gritting
- Identifying vulnerable people

Storms and high winds – impacts

- Tree loss – biodiversity, reduction in access to sites.
- Combined sewer overflows – bathing water failures.
- Transport disruption

Storms and high winds – actions

- Access restrictions
- Risk assessments

Discussion session 3 – adaptation actions
The third discussion session followed the presentation on climate change projections and impacts. The session focused on actions required to adapt to the impacts of climate change. The aim of the session was to generate ideas of adaptation actions as well as think about the role of LNPs in delivery.

Participants were asked what adaptation actions they felt were necessary in their local areas (and beyond), unconstrained by challenges in funding and delivering actions. We then asked participants to indicate what they thought the role of the LNP should be in terms of influencing others to ensure delivery:

- Influence LNP partners
- Influence LEPs
- Influence other parties
- No role for LNPs

Actions:
- Monitoring – local monitoring of habitat and species to identify climate change impacts on biodiversity and ecosystem services.
- Partnership working - develop policies and priorities to guide partners. Use case studies to influence partners.
- Understand economic benefits of adaptation - make the business case for adaptation:
  - Look for multiple benefits.
  - Develop regional ecosystem services valuation.
  - Set up a 'dating agency' to match funding to projects.
- Raise awareness of issues related to climate change impact
- Promote Lawton principles –prioritise habitat action using existing opportunities mapping.
- Tree planting and woodland management – upstream, street trees, riparian, floodplain.
- Develop and implement green infrastructure strategy.
- Water management - identify opportunities to provide space for water, storage.
- Restore natural processes.
- SUDs.
- Green roofs and walls – case studies, installation, retrofitting.
- Local adaptation risk assessments.
- Influence landowners and farmers – provide advice on land use change and new diseases and pests.
- Connect agri-environment across different holdings.
- For the majority of actions, it was felt that LNPs had a role in influencing multiple stakeholders, including LNP partners but particularly in influencing LEPs.

Discussion session 4 – takeaways
The final discussion session focused on actions and knowledge to take away from the workshop. The session had two aims:

- To encourage participants to feedback on what they found useful about the workshop and what they plan to do as a result of attending.
- To gather ideas and suggestions of what further information and support on adaptation LNPs would like to see from Climate Ready.

This session formed part of the evaluation of the workshops. The outputs of the session, along with the feedback received from the Survey Monkey questionnaire, will be used to help develop the Climate Ready work plan over the next two years.

What will you take away from the event?

- Use tools available to climate change proof all LNP projects and partner initiatives. Consider climate change in plans.
- Undertake a risk assessment of the effects of climate change on the objectives of other initiatives.
- Find out more about:
  - The eleven CCRA sectors
  - Climate projections and adaptation
  - How to integrate climate change vulnerability model into regional nature map work
- Information about what national government is doing about adaptation.
- Feedback to LNP – discuss role in climate change adaptation and the need to work locally to clarify what LNPs can do.

- Speak to others e.g. planning colleagues, LEP Directors about climate change adaptation. Raise as an issue at meetings.

What would you like Climate Ready to take away from the event?

- LNPs need more guidance and information on adaptation and their role.
- A list of resources, toolkits and best practice would be useful. A quarterly Climate Ready briefing to LNPs to convey climate change information would also be useful.
- National datasets from the Natural England vulnerability model cut to LNP boundaries.
- Information on the costs of adaptation and costs of not adapting.
- Develop a national advice paper for LEPs / City Deals on role of the natural environment in social regeneration and economic development.
- Case studies of good practice and examples of where investment has paid off.
- Remember that LNPs need resources to do adaptation. Ideas of funding for LNPs to climate proof their activities would be useful.
- Direction and leadership – make adaptation mandatory for local authorities and champion ecosystem assessments and risk assessments at a local level.

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