

# Climate Change

Report of Workshop held on  
8<sup>th</sup> February 2010



Association of  
Inland  
Navigation  
Authorities

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February 2010

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## 1. Introduction

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- 1.1 Following the publication of the IWAC report entitled Climate Change Mitigation and Adaption – Implications for Inland Waterways in England and Wales, the Association of Inland Navigation Authorities (AINA) commissioned a workshop on the same topic.

The main objective of this workshop was to allow AINA members to consider the report and, particularly, to focus on practical measures which navigation authorities should take during the next 10 years in order to adapt their operations and infrastructure to the anticipated effects of climate change.

## 2. Background and process

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- 2.1 Ian White Associates and Jan Brooke Environmental Consultant Limited; the authors of the IWAC report, were commissioned by AINA to facilitate the workshop.

The workshop was held on the 8th February 2010 at Broadway House, Tothill Street, London SW1.

Invitations were issued and eighteen AINA members attended. John Edmonds; the Chair of IWAC, and Martyn Webb of the Defra inland waterways team also participated.

- 2.2 The facilitators organised the afternoon as per the timetable below.

- 2.3 A record of the PowerPoint slides used for the various presentations (1 to 4) is contained in Appendix 1. A list of the participants in each of the break-out group discussion sessions on adaptation is presented in Appendix 2.

These groups were assembled on the basis of bringing together individuals from broadly similar sized organisations. The various discussions and the outputs of the break-out sessions were all recorded on flipcharts or using 'post-it' notes and these records were used to inform the writing of this workshop report.

1245	Welcome and introductions Ian White (Presentation 1)
1255	IWAC climate change report: background and key findings Jan Brooke (Presentation 2)
1310	Overview of climate change mitigation options Ian White (Presentation 3)
1325	Discussion on mitigation
1340	Introduction to climate change adaptation options Jan Brooke (Presentation 4)
1355	Group brainstorming session on adaptation options
1420	Summary of discussion
1450	Facilitated break-out group discussions on key adaptation issues, priorities, potential synergies and delivery mechanisms
1600	Overview of outcomes and key findings
1615	Workshop close

### 3. Workshop discussions on climate change mitigation

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3.1 Following the presentation and discussion on mitigation, a number of additional ideas and issues raised by the group were captured.

These included:

- *Opportunities for hydro on river navigations.*
- *Simple measures, good housekeeping, carbon audits.*
- *Future proofing new projects to minimise emissions.*
- *Renewable energies.*
- *Behaviour and local carrying capacity.*
- *Broads Authority question re. whether it is better for navigation authority to reduce their emissions by a small percentage of 2% or to spend the same amount of effort convincing others to change their behaviour with a greater overall reduction and hence benefit.*
- *Differences between canals, rivers and lakes? 'Significant' but not specified.*
- *Priorities:*
  - o *be seen to do something vs. persuade others: where is greatest benefit?*
  - o *look for real savings*
  - o *save energy in their own operations*
- *On carbon foot-printing/auditing – show of hands suggests 50% of participating authorities 'have already done something'.*
- *Discussion on funding options. Carbon Trust can provide loans for smaller private and voluntary sector organisations and Salix can provide either loans or grants for all parts of the public sector. Carbon Trust are also able to provide advice, undertake energy audits and recommend the most effective carbon saving measures in all sectors.*
- *Encourage development of waterborne freight in conjunction with existing recreational use.*

3.2 Participants were then asked to identify two climate change mitigation options which they feel are most relevant or important to their own organisation. In doing so they were also asked to indicate whether such initiatives were already underway and/or whether they were likely to need external support to be able to take forward such initiatives. The outcomes of this exercise are listed in full in Appendix 3, however some of the key observations from this list are as follows:

- ***What is already being done***
  - Reduce transport energy consumption, greater use of public transport*
  - Better energy management and monitoring at installations eg sub metering*
  - Green procurement strategies*
  - Improved office and site practice to reduce energy consumption*
- ***What is seen as needing to be done***
  - Insulation and improvement of buildings*
  - Alternative power sources for structures*
  - Water storage to help both in winter and summer*
- ***Any main areas where help will be needed***
  - Energy audit and whole life carbon costing*
  - Green cooling and heating in adjacent and own buildings*
  - User education*
  - Creation and exchange of data*

### 4. Workshop discussions on climate change adaptation

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4.1 Following the presentations, there was a general group discussion to give workshop participants the opportunity to highlight additional opportunities or issues of concern.

4.2 As anticipated, a wide variety of different perceptions exist between authorities as to what comprise the key issues for adaptation. Some participants mentioned the integrity of earth structures or an increased frequency of winter flooding. Others were concerned about reducing wastage or improving water storage or were interested in the use of sustainable urban drainage schemes (SUDS) or the role of reservoirs. Sea level rise and saline intrusion were highlighted as particular concerns for some navigation authorities. There was also discussion about energy security.

4.3 Overall, however, there was general agreement amongst workshop participants that targeted monitoring, effective data management, data-sharing and building capacity are important irrespective of the organisation type. However, in terms of the climate change issues which are expected to require an adaptation response, the workshop concluded that:

- there are no clear or obvious differences between the key issues identified by small, medium sized or large authorities; and
- there are only relatively few issues specifically linked to the differences between rivers, canals and lakes.

Rather, the key issues identified by each navigation authority appear to be a function of the particular geographic and natural characteristics - and hence the likely response of each waterway system to climate change; also the statutory responsibilities of the authority, and the type and intensity of use.

4.4 There was some agreement to the suggestion that the WFD categories of natural, heavily modified, or artificial water bodies may provide a useful method of classifying potential adaptation issues or responses. However, overall, workshop participants agreed that in the first instance it is probably better simply to acknowledge that adaptation priorities will be site- and authority-specific.

## 5. Break-out session on key climate change adaptation issues

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5.1 The first break-out discussion session required participants to consider which are most likely to be the key climate change adaptation issues faced by their own authority or organisation. Following this brain-storming session, each participant was then asked to identify a smaller number of 'priority' issues and to indicate which, if any, of these may require the authority to seek some kind of external support (e.g. research, funding, etc.).

5.2 'Post-it' notes were used to record key adaptation issues, with each 'post-it' note representing an issue of concern to one authority. Thus there were often several notes highlighting the same issue. The full record of issues identified during this break-out group discussion is presented as Appendix 4: this record identifies the specific issues posted under each of the general headings.

5.3 Taking an overview of this record, it is clear that the most commonly mentioned adaptation issues (in order of the number of references made thereto) were as follows:

- low flows/too little water\*
- high flows/too much water
- flood risk management
- safety issues/warnings
- sediment management
- invasive or alien species\*
- other ecological issues (e.g. cutting, clearance, tree management)\*
- structural integrity
- tourism opportunities
- sea level rise and saline intrusion and
- pollution/run-off

5.4 No clear relationships between the size of the navigation authority and the key issues can be identified.

5.5 Those issues marked with an **asterisk\*** in the list above were highlighted by participants as being amongst the 'priorities' for attention. The full range of priorities highlighted by participants is illustrated in Appendix 4.

5.6 When asked to identify issues which they felt would be likely to result in a need for additional external support (whether research and/or funding), some participants identified issues which corresponded to the above priorities (notably dealing with invasive or alien species). However, other issues with which assistance is likely to be required appear to be more a function of specific local characteristics. Therefore, whilst fewer numbers of participants highlighted these as key issues, a high proportion of those who did so also indicated that they were also of high priority to their organisation. Examples of issues where external support may be required at an authority-specific level include: dealing with anticipated structural problems; accommodating sea level rise/saline intrusion; or responding to increased tourism/demand.

5.7 Again, there are no obvious relationships between the size of the authority and their priorities or anticipated support requirements.

## 6. Break-out session on synergies, common objectives and delivery mechanisms

6.1 Having identified and discussed key climate change adaptation issues, workshop participants were then asked to consider whether they could identify (i) potential synergies (or common objectives) with other organisations, initiatives, etc. and (ii) possible delivery mechanisms (i.e. how adaptation might be delivered).

The three break-out groups interpreted these questions slightly differently. Further, as discussions during this second break-out session also confirmed that a delivery mechanism will often be related to the organisation with which the synergy has been identified, the results of these two questions have been combined.

6.2 Appendix 5 presents the full results of this second break-out session. Taking an overview of this table, the most commonly mentioned opportunities or needs arising from the discussion (presented according to the number of 'post-its' posted on the topic) were as follows:

- (identifying) potential partners for delivery based on shared objectives
- (facilitating) engagement of stakeholders/users/local communities\*
- (confirming the) role of strategic planning and guidance
- (delivering) integrated water management\*
- internal capacity building and training (related to delivery only)
- (facilitating) data sharing\*
- (identifying/securing) funding opportunities\*
- alien species monitoring and eradication
- asset management
- (developing) climate change adaptation plans
- (promoting) research and
- energy-related issues

It is accepted that many of these headline topics are, in fact, inter-related.

6.3 Appendix 5 also lists a variety of other areas of synergy and/or possible delivery mechanisms.

6.4 Taking into account both the above list and other topics highlighted in Appendix 5, there are again very few differences between small, medium or large authorities in terms of identifying actions, opportunities or needs. Indeed, there were only two obvious differences:

- the smaller authorities typically see a greater need for internal capacity building; and
- the larger authorities typically identified more potential partners for delivery and more opportunities for data sharing.

Both of these findings could have been anticipated.

6.5 Again, the asterisks on the above lists highlight participants' priorities, and Appendix 5 illustrates that the main areas in which a likely requirement for external support was identified by participants were facilitating data sharing; delivering integrated water management; and identifying and securing funding.

## 7. Plenary discussion

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7.1 During the plenary discussions, some of the above points were elaborated upon further. The main observations made are recorded below:

### (i) No 'one size fits all'

7.2 It was clear throughout the workshop that there is no 'one-size-fits-all' solution to climate change. Indeed, the results of the break-out discussion sessions confirmed that, even amongst authorities of a similar size, or those dealing with similar waterway types (rivers, canals, lakes), there are very few areas of common concern. Rather, the response of an authority to climate change, and the issues that will be important to them, will be a function of their particular geographic/natural and statutory circumstances.

A priority for many authorities will therefore be access to meaningful data to enable them to understand the particular implications and priorities for their own organisation, and the capacity to do this.

### (ii) Data sharing

7.3 Workshop participants recognised on the one hand that effective data sharing arrangements rely upon a process of give-and-take, but on the other that many of the smaller authorities may only have limited data to offer to the process. It was therefore suggested that options for data sharing protocols (or Memoranda of Understanding) should be explored wherever it is cost-effective and mutually beneficial to do so, but that partnerships should also be developed particularly to enable the needs of the smaller authorities to be properly represented.

### (iii) Partnerships

7.4 Workshop participants identified that partnerships – both between navigation authorities and with third parties such as the Environment Agency and Internal Drainage Boards – will be vital in responding to climate change. However, the point was also made that efforts must be made to build real partnerships, in which organisations genuinely interact, share data, take into account others' objectives and collaborate to achieve joint objectives. It was suggested that there are potentially important roles here not only for AINA (for example as a facilitator) but also for some of the larger organisations (EA, BW) in understanding and helping to represent the views of the smaller authorities on climate change issues, for example in regional and national fora which may not be accessible in practical terms to the smaller authorities.

### (iv) Water Framework Directive

7.5 Workshop participants identified a number of synergies with the EU Water Framework Directive. Specifically, it was suggested that there may be opportunities to combine climate change adaptation with WFD implementation.

Participants identified that the delivery process which is now commencing for the river basin management plans – and particularly the development and delivery of the second round plans due for publication in 2015 - potentially provides a useful mechanism for collaboration and coordinated action.

- 7.6 Within this wider framework of integrated water management, some participants felt that it may be useful to organise regular (say twice annually) meetings to bring together a variety of organisations with interests in integrated waterway management (e.g. navigation authorities, Defra, Environment Agency, Local Authorities, Internal Drainage Boards and, where appropriate water companies). Such a process would allow relevant, local actions to be identified, prioritised and implemented by the organisation(s) best placed to do so. It should also ensure that potential win-win opportunities can be exploited.

(v) [Climate change checklists](#)

- 7.7 Another suggestion arising from discussions at the workshop was the possible development of checklists, templates or similar to help guide climate change decision making. Such guidance could potentially be particularly useful for the smaller authorities in helping them to understand and prioritise issues; develop useful and relevant working relationships; identify and apply for funding, etc.

## 8. Workshop conclusions

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- 8.1 It is acknowledged that the workshop outcomes represent only a small snapshot based on participants' contributions on the day.

Nonetheless, they may also provide some potentially useful insights into how climate change mitigation and adaptation might be taken forward for the inland navigation sector.

- 8.2 In dealing with mitigation it was apparent that the navigation industry was not aware of its total energy consumption and steps should be taken to collect and interpret this data to help meet future target setting. The need also to share common experience and practices regarding mitigation measures should be further developed. The future proofing of structures and installation to protect against flooding should become a matter of routine when undertaking repair or replacement or improvement.

- 8.3 With regard to climate change adaptation, all participants appeared to agree on the fundamental importance of monitoring; recording, reviewing and managing data; and capacity building as key elements informing any response to climate change. Steps could therefore be taken by all authorities to better define exactly what is required, and implementation of these 'no regrets' actions could commence in the short term. The workshops highlighted, however, that some authorities may require a level of assistance and support, and that developing 'real' partnerships will be important.

- 8.4 Four high level themes are clear from the exercise to identify key climate change adaptation issues. These potentially identify 'work streams' for future investigation in the first instance (whether at national, local or authority level) followed by preparatory planning (at navigation authority level):

- safety issues associated with high and/or low flows
- changes in engineering maintenance or asset management requirements associated with high or low flows including sea level rise
- changes in ecology/vegetation management requirements including saline intrusion), and
- changes in human use of the waterways and towpaths (including opportunities).

8.5 Four main themes can similarly be anticipated as potentially useful routes for eventual delivery of climate change adaptation solutions. Many if not all of these have an underlying requirement for effective communication and engagement with of a wide range of potential partners – not only other types of organisation but also users and local stakeholders:

- monitoring and data sharing
- capacity building (particularly within the smaller authorities)
- integrating climate change adaptation into integrated water planning and management, and
- practical/physical management actions.

8.6 These conclusions should enable AINA (working with Defra, IWAC and the various navigation authorities as appropriate) to begin to understand the challenges likely to be faced by inland navigation authorities, and some of their identified requirements and priorities. There are also some early indications of where support is likely to be required – whether in terms of research or funding.

## 9. Way forward

### a. Mitigation

9.1 It is essential that the inland navigation sector collects data to show that it has a full understanding of its limited impact in terms of energy consumption within the UK and that it can also show how much it has reduced its energy consumption over time to meet corporate and government targets. The collection, sharing and long term retention of water levels and data must become a priority to allow navigation authorities to measure and monitor the impact of climate change on a local basis.

### b. Adaptation

9.2 In the light of the conclusions set out above, the main areas of activity/support required by navigation authorities appear to be methodological and procedural rather than technical, at least in the first instance.

Whereas cost-effective technical adaptation solutions may well be needed in due course to enable authorities to deal with the specific effects of more frequent high or low flows, or changes in dredging or vegetation management, it appears from the workshop that the more immediate needs (say in the next 1-5 years) are:

- (i) Capacity building (at least for the smaller authorities); ensuring effective sharing of relevant information; and building partnerships, and
- (ii) Guidance and methodological tools: to enable authorities to understand the issues they are likely to face and to be in a position to respond in an effective and timely manner, for example:

- how to understand what data will be needed
- how to access those data (data sharing, data collection)
- how to identify others with similar interests and how to form meaningful partnerships
- how to engage and communicate with stakeholders, users and local communities most effectively in responding to climate change (initially education and awareness raising, leading to changed behaviour and/or guided participation (e.g. volunteering) as appropriate)

- (iii) Integrated water management: steps are required to help ensure that navigation requirements are properly integrated into various strategic planning initiatives, notably those dealing with integrated water management. In this respect, in addition to local authority and water company plans, the new river basin management plans (RBMP) prepared under the Water Framework appear to be of particular potential relevance.

Building on the development of partnerships and drawing on any data collected/collated under heading 2 above, it would therefore be useful to arrange a series of meetings with the Environment Agency and other key stakeholders to discuss how navigation climate change adaptation requirements can most effectively be integrated into the second round of RBMPs at an appropriate geographic scale.

- 9.3 In the short-medium term (say 1-10 years), as navigation authorities' understanding of likely climate change adaptation requirements improves, two further likely requirements at both sector and individual authority level might be:
- (iv) Additional research. Whilst there is already a great deal of relevant research underway both in the UK and internationally, if potentially significant gaps exist (or if site specific needs are identified) further research may need to be identified, funded and commissioned
  - (v) Future-proofing. Authorities will need to begin to take appropriate steps to 'future-proof' both their maintenance and asset management programmes and to ensure that any new infrastructure or assets are designed with likely climate change impacts in mind.
- 9.4 Finally in the longer term (say, 5-10 years plus), navigation authorities will need to begin to adapt their activities and potentially modify their infrastructure to cope with often site-specific impacts. It was agreed that planning for such actions will usefully be informed by the data collected and the partnerships built during the short to medium term.

# Appendix 1: Record of PowerPoint presentation

## Presentation 1: Workshop programme

Introductions

Overview of IWAC climate change report

Climate change mitigation options

Discussion

Climate change adaptation

Adaptation options

Priorities, delivery mechanisms and research or support requirements

## Presentation 2 IWAC climate change report

About IWAC

- Statutory public body providing independent advice on matters relevant to inland waterways
- Role to ensure that inland waterways are developed sustainably to meet the needs of those who use and enjoy them

2009 IWAC grant from Defra to research and publish report on mitigating and adapting to climate change

Resulting 'Scoping report'

- highlights 'most likely' impacts of climate change; potential consequences for inland waterways in England and Wales
- presents information collated from UK and international publications and organisations
- identifies and assesses range of mitigation and adaptation options; highlights research needs

Informed Chapter 4 of 'Waterways for Everyone'

'Low emissions' projections cited in report

- up to 15% increase in (mainly winter) precipitation
- up to 30% decrease in summer precipitation
- 2° - 3°C increase in average annual temperature

Likely accompanied by

- increase in water temperatures
- changes in sedimentation patterns
- sea level rise
- greater frequency of extreme events

UKCP 09: typical figures from 'low emissions' scenario

	By 2020	By 2050	By 2080
Increase mean winter precipitation up to:	+15%	+23%	+32%
Reduction in summer precipitation could be:	-20%	-33%	-35%
Typical average temperature increase:	+2.5°	+3.8°	+4.5°

# Appendix 1: Record of PowerPoint presentation

## Presentation 2/continued

### Mitigation measures

- help reduce the scale of the problem

### Adaptation measures

- help society prepare for and adapt to the anticipated effects of climate change by reducing vulnerability and increasing long-term resilience

### Measures can include

- 'no regrets' or 'win-win' solutions
- longer term options
- 'regrets' solutions

### Mitigation recommendations include

- review range of measures and opportunities
- determine most appropriate; commence implementation
- working with IWAC, AINA, Government, industry

### Adaptation recommendations include

- improve data collection and management
- build capacity within organisation
- undertake risk assessments
- communicate outcomes
- modify or replace assets or activities as necessary

### Research and development recommendations

Measures to understand and reduce the contribution of the inland navigation sector to the climate change problem

UK plc 630 million tonnes per annum

Inland recreation 82,000 tonnes?

What about operations and the infrastructure?

## Presentation 3      Climate change mitigation

### Why mitigate?

- Government policy
- Corporate policy
- Public relations/public expectations
- Financial benefit
- Improve resilience

### How to mitigate?

- Reduce vessel emissions
- Reduce infrastructure emissions
- Help others reduce their emissions
- Types of measures
  - Win Win
  - No regrets
  - Regrets
  - Longer term

# Appendix 1: Record of PowerPoint presentation

## Presentation 3/continued

### Vessels

- Education: encourage reduced speed, switch off engines in locks - Green Blue
- Make freight grants conditional on meeting emissions targets
- Discount licences for meeting emission standards, eco hulls and electric boats
- Provide hook up points for electricity
- Research alternative energy sources
- New standards/monitoring for marine engines

### Infrastructure

- Reduce energy demand
- Good housekeeping
- Green energy, micro renewables

### Assist others

- Heat pumps, wind turbines, low head hydro, W4E
- Freight by water W4E
- Green Commuter Routes W4E
- Tourism/Staycations W4E

Summary - see IWAC Report Table 5.2

### W4E - Waterways for Everyone

#### Funding opportunities

- Grants or loans
- Carbon Trust (private sector, voluntary bodies)
- Salix (public sector)
- DfT Mode Shift Revenue Support Scheme
- Eco-Innovation Fund
- RDAs
- [www.grantfinder.co.uk](http://www.grantfinder.co.uk)
- NERC and ESRC
- EU – Marco Polo? Interreg?

#### Advice

- Partnership for Renewables
- Energy Savings Trust
- Building Research Establishment

## Presentation 4      Climate change adaptation

Identify the problems, issues and opportunities relevant to the organisation; to the activities taking place; and to the local environment

### Decide

- what to monitor and why?
- opportunities for sharing data/how to collect data?
- how to manage (and retain) data?
- how to use data?

How and when to respond?

What to do?

**NOT** 'one-size-fits-all'

# Appendix 1: Record of PowerPoint presentation

## Presentation 4/continued

### Issues may include:

Too much water	Too little water	Strong stream	Refuges
Limited headroom	Closures	Structural stability	Low flow
Water supply	Dredging	Safety	Ecology
Towpaths	Tourism	Flood defence	Agriculture

### Potential adaptation measures: IWAC report recommendations include

- improve data collection, management and retention
- Build capacity within organisation
- Undertake risk assessments
- Communicate outcomes
- Modify or replace assets or activities as necessary (resilience, future-proofing)
- Awareness raising; warnings
- Education, codes of practice
- Temporary moorings; safe havens
- Maintenance activities
- Bank raising; strengthening; retro-fitting
- Dredging; cutting; vegetation clearance
- Water storage opportunities
- Water conservation measures
- Restrictions (lock sharing; closures)
- Constraints on dredging or vessel movement
- Buffer strips; wetland creation
- Soft/green engineering solutions
- Eco-hulls
- Tourism development opportunities
- Zoning
- Strategic planning
- Future-proofing new developments

### Research and development

- Resilience of assets and infrastructure
- Vegetation in engineering
- Vessel design, eco-hulls
- Alternatives or improvements to dredging
- Water conservation, water storage
- Reducing sediment in run-off
- Carrying capacity of natural systems
- Alien species management/eradication
- Habitat creation/restoration
- Increased towpath use

*Remember that much research is already ongoing*

## Appendix 2: Adaptation Discussion Groups

### Group 1

Nick Birch	Avon Navigation Trust
Dave Meigh	City of York Council
Geraint Coles	Chesterfield Canal Partnership
Pip Noon	Conservators of the River Cam
Mark Baker	Devon County Council
Martyn Webb	Defra
Roy Chandler	Essex Waterways Ltd

### Group 2

Richard Smith	Bristol City Council
Charlotte Ghaye	Loch Lomond National Park Authority
Roger Thorney	Cardiff Harbour Authority
John Pomfrett	Essex Waterways Ltd
John Edmunds	IWAC
Bill Ransom	Middle Level Commissioners
Ian Brown	Basingstoke Canal Authority

### Group 3

Grahame Newman	British Waterways
Trudi Wakelin	Broads Authority
Stuart Taylor	Environment Agency
Iain Smith	Middle Level Commissioners

## Appendix 3: Mitigation Discussion Outputs

### Actions which are already being undertaken by some navigation authorities

Reduce business travel-set targets	in hand
Discourage business flying	in hand
Reduce private transport	in hand
Facilitate green commuting	in hand
Promote towpaths for green transport	in hand
Increased use of public transport	in hand
Engineering design for predicted changes	in hand
Green procurement standard	in hand
Procurement Strategy	in hand
Utility/water/waste monitoring and reduction	in hand
Electricity hook ups for boaters	in hand
Sub-meter and monitor energy supplies	in hand
Energy Management Audit System accreditation	in hand
Energy efficient service provision	in hand
Site working methods, back office, support activities	in hand
Energy saving in buildings X2	in hand
Flood storage in winter	in hand

### Actions that navigation authorities could undertake

Building insulation X2 lack of staff resources  
Reduce fresh water wastage  
Alternative power sources for structures  
Low energy bulbs as a quick-fix  
Micro hydro power schemes  
Water storage X2, reduce pumping costs and help summer levels

### Actions that navigation authorities require support for

Carbon audit and whole life carbon costing X2	
Energy consumption exercise	
Water based heat pumps for cooling and heating	
Heat pumps in canal to heat adjacent primary schools	
Shared vehicles	
Low emission vehicles	
Facilitate green commuting	in hand
Promote towpaths for green transport	in hand
Switch off engines in locks - signage byelaws education	
Speed limits for boats	in hand
Green Blue codes for boaters	in hand
Maintain boat engines to good standard	
Encourage move to electric boats	in hand
Communication of impact of climate change	
Create flood event data set	

## Appendix 4: Results of Break-out Discussion Session on Key Adaptation Issues

<b>Headline issue</b> - related issues	<b>Number of 'post-its' by authority size:</b> small/medium/large	<b>Priority/help needed by authority size:</b> Small/medium/large
Monitoring <sup>1</sup>	-	-
- evaluation	2	1/1
- data management	-	-
Low flows	6	4/1
- too little water summer/autumn	6	-
- low flow – water supply	4	4/1
- water supply change		
- water budget		
- water conservation requirements		
- lock closures		
- water storage opportunities		
- maintaining public water supply		
- water resources/storage		
High flows	8	-
- too much water	1	-
- strong stream disruption	2	1
- risk of overtopping		
- clearance at bridges		
- closures		
- moorings under water		
Safety	7	2
- warning to users	2	1/1
- refuge points	-	-
- communication		
Structural issues	2	2/2
- structural stability	1	-
- bank protection	4	1/1
- erosion of towpath		
- cancellation of events/ disappointment		
Maintenance	3	-
- investment in plant and machinery	-	-
- debris removal (at control structure)	1	1
Sediment management	4	-
- increased dredging requirement	2	-
- emergency shoal removal	3	1

<sup>1</sup> Prior to beginning the break-out discussion session, workshop participants had agreed that monitoring, data management, data sharing and capacity building will be key elements informing any response to climate change; some participants may not therefore have felt it necessary to repeat these as priorities in the break out groups.

## Appendix 4: Results of Break-out Discussion Session on Key Adaptation Issues

<b>Headline issue</b> - related issues	<b>Number of 'post-its' by authority size:</b> small/medium/large	<b>Priority/help needed by authority size:</b> Small/medium/large
Flood defence - flood damage - sustainable flood risk management - flooding impact on canals/ capacity modelling - protecting property - bank raising	1 4 5	- 1 1
Vegetation - alien species - invasive species/weed management - eradication/management	2 3 4	1/1 - 3/1
Other ecological issues - tree management/pollarding - nutrient input-related growth/ cutting - ecological vs. navigation conflicts	5 2 2	2 1/1 3
Green solutions - sustainability - soft engineering solutions - green construction	- 2 1	- - 1
Sea level rise - tidal water levels - saline intrusion	- 3 2	1 - 1/1
Pollution/run-off - diffuse urban pollution - storm water overflows - thermal pollution	1 1 3	- - -
Recreational use - poor fishing at low flows	1 - -	- - -
Towpaths - towpath erosion - over use on rural paths	1 2 -	0/1 2 -
Tourism opportunities - benefits of climate change	- 3 3	- 0/1 2/1
Development of waterside sites and property	1 - -	1/1 - -

## Appendix 4: Results of Break-out Discussion Session on Key Adaptation Issues

Headline issue - related issues	Number of 'post-its' by authority size: small/medium/large	Priority/help needed by authority size: Small/medium/large
Local authority/Environment Agency - lack of coherent policy - RBMPs - funding	1 1 1	1/1 - -
Energy - energy security - carbon footprint	- 1 1	- - -
Other - 'mixed catchments'	- - 1	- - -

## Appendix 5:

# Results of Break-out Discussion Session on Synergies, Common Objectives and Potential Delivery Mechanisms

<b>Headline issue</b> - related issues	<b>Number of 'post-its' by                      authority size:</b> small/medium/large	<b>Priority/help needed by                      authority size:</b> Small/medium/large
Shared objectives with and/or partners in delivery - RBMPs - Catchment flood risk management - Local authorities - Regeneration bodies - Regulators (EA, NE, SNH, SEPA) - Other navigation authorities - Water Companies - IDBs - Highways Agencies; Network Rail - Minerals Planning bodies - Emergency services - Wildlife trusts; rivers trusts - Stakeholder/user groups - ADA - AINA - IWAC - Supporting umbrella of organisations - Real partnerships - Service level agreements	2 4 16	- 1 3/3
Data sharing - EA flow levels - Forecasting - Strong stream best practice - Get real data	1 1 5	1/1 - 2/4
Risk assessments and modelling - hydrological research - modelling - risk assessment	2 2 -	1/1 1 -
Capacity building - existing capacity - training and retraining - staff retention - graduate programme - transfer partnerships - public perception of green Authority – in house marketing	6 2 -	1 1 -
Delivery partners - for engineering works - for emergency response	- 2 -	- 1 -

## Appendix 5:

# Results of Break-out Discussion Session on Synergies, Common Objectives and Potential Delivery Mechanisms

Headline issue - related issues	Number of 'post-its' by authority size: small/medium/large	Priority/help needed by authority size: Small/medium/large
Integrated water management - improved water management - integrated flood management/ dredging and navigation - catchment flood management plans - BW water resources/flood strategy	4 1 3	2/1 - 3/2
Water resources - water budget - risk management	- 1 -	- - -
Funding/opportunities - from EA - from Local Authorities (e.g. for Section 106) - Government/Defra - grant funding for green technology - invasive species - data exchange/management	1 4 2	1 2/1 2/1
Strategic planning and guidance - greater input into planning and development; LDFs - PPGs/PPSs - RBMPs – implementation plans - links to LA and EA strategies - water company periodic review	2 5 3	- 1 2/1
Climate change adaptation plans - strategic corporate policy	- 1 4	- - 2
Asset management - planning - improve resilience - bank raising/funding - future proofing	1 4 - -	- 3/1 - -
Waterways as green infrastructure - joint recreation and freight use	1 - 1	- - -
Soft engineering solutions - bank protection - SUDS	3 1 1	1 - -

## Appendix 5:

# Results of Break-out Discussion Session on Synergies, Common Objectives and Potential Delivery Mechanisms

Headline issue - related issues	Number of 'post-its' by authority size: small/medium/large	Priority/help needed by authority size: Small/medium/large
Works to ensure integrity of infrastructure - bank strengthening - reducing wastage/leakage - funding issues	1 2 1	1 1 -
Land-use - buffer strips/MOPS - SUDS - Section 106 agreements	- 2 1	- - -
Users/local community engagement - use of volunteers - communication of data - influence behaviour - local appreciation - user involvement - public 'buy in' - education providers - Green Blue (boater education)	2 4 6	- 3 3/1
Alien species - eradication - volunteers for clearance works - increased resources - coordinated monitoring	2 4 1	- 0/1 -
Pollution - pressure on companies to deal with storm water runoff	- 1 -	- - -
Tourism opportunities	- - 1	- - 1
Future proofing - new development - sea defences	- 1 -	- 1 -
Energy issues - energy security - carbon footprint - new forms of power (tidal/renewables) - water for heat pumps	- 5 - -	- - -
Research - sustainable flood management - carrying capacity - role of reservoirs - identify and highlight best practice - sustainable transport options	- 4 1	- 1/1 -

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