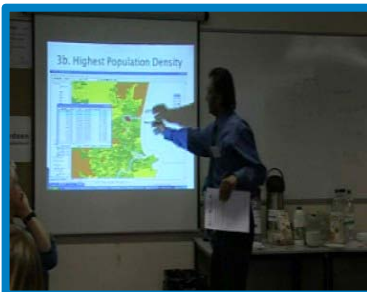
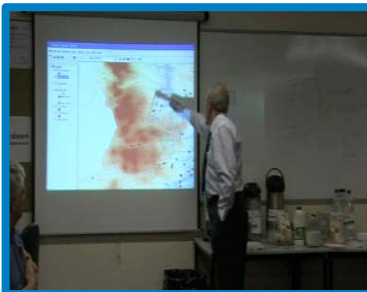
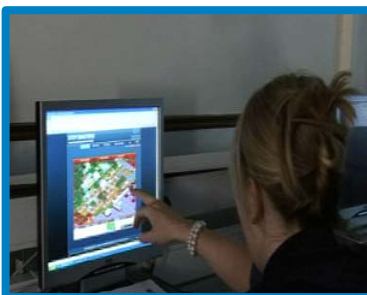


## Scenarios Workshop

# The Impact of Climate Change on Flooding in Coastal Communities in Aberdeen and Aberdeenshire

31st of May 2010



## Delegates

Name	Organisation	Title	Email
Alan Garvie	East Grampian Coastal Partnership	Chair	agggarvie34car@aol.com
Emily Hastings	Macaulay Institute	Coastal Coordinator	e.hastings@macaulay.ac.uk
Ian Hay	East Grampian Coastal Partnership	Project Officer	i.hay@macaulay.ac.uk
Scott Leith	Scottish Water	Waste Water Asset Planner	scott.leith@scottishwater.co.uk
Stephen MacFarland	Aberdeenshire Council	Flooding and Coast Protection	Stephen.McFarland@aberdeenshire.gov.uk
Aftab Majeed	ACC	Environmental Planner	amajeed@aberdeencity.gov.uk
Paul Rankine	ACC	Senior Authorised Officer	prankine@aberdeencity.gov.uk
Alan Robertson	ACC	EPI	alanr@aberdeencity.gov.uk
Rachel Sharp	ACC	Senior Planner	rsharp@aberdeencity.gov.uk

## Organisers

Name	Organisation	Title	Email
David R. Green	University of Aberdeen	Senior lecturer / IMCORE	d.r.green@abdn.ac.uk
Guillaume De La Fons	University of Aberdeen	IMCORE	g.delafons@abdn.ac.uk
Thomas Bedford	University of Aberdeen	IMCORE	t.bedford.09@aberdeen.ac.uk
Thomas A. Danks	University of Aberdeen	IMCORE	t.a.danks.09@aberdeen.ac.uk
Alissa J. Johnson	University of Aberdeen	IMCORE	alissa.j.johnson.09@aberdeen.ac.uk
Peter Inglis	ACC	IMCORE	pinglis@rya-online.net
David Fryer	ACC	IMCORE	DFRYER@aberdeencity.gov.uk
Dr Joseph Somevi	ACC	Sustainability Officer (SEA)	JSomevi@aberdeencity.gov.uk

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## Workshop Introduction

In the context of the IMCORE (Innovative Management for Europe's Changing Coastal Resource) Interreg IVB project, the University of Aberdeen and the Aberdeen City Council organised a workshop on the Impact of Climate Change on Flooding in Coastal Communities in Aberdeen City and Aberdeenshire on the 31<sup>st</sup> of May 2010. The aims of the workshop were for delegates to:

- Learn about the impact of Climate Change on flooding events in Aberdeen and Aberdeenshire
- Examine the potential of gaming technology to explore various flooding scenarios
- Use flood data, visualisation technology, and GIS tools to analyse the effects of Climate Change on flooding in Aberdeen and Aberdeenshire

The workshop had four main activities; welcome and presentation, quiz, flood simulators/serious games and teamwork using GIS for flooding issues.

### Welcome and presentation - *David R. Green, Dr Joseph Somevi*

David R. Green welcomed the delegates at the University of Aberdeen and presented the IMCORE project and the workshop.

Dr Joseph Somevi made a presentation on "The Impact of Climate Change on Flooding in Coastal Communities" and answered the questions of the delegates on this subject.

### Quiz - *Thomas Andrew Danks*

The aim of the Quiz was to raise awareness and interest about climate change. The Quiz had 23 questions divided into 4 sections, each lasting 3-4 minutes: 1. Climate change (CC) background, 2. Coastal CC, 3. UK coastal CC and 4. Aberdeen CC.

### Flood simulators/Serious games - *Alissa Johnson*

The purpose of these games was to demonstrate the complexities of protecting against flooding and the impacts it can have on a community using simplified scenarios. The first game Stop Disasters!-Flood (<http://www.stopdisastersgame.org>) helped the delegates to understand how managers can defend their community in case of a flood, and will allow you to explore many different defence strategies. The second game FloodSim (<http://www.floodsim.com>) illustrated the difficulties of integrating local and regional policies in the UK.

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**Teamwork using GIS for flooding issues - *David R. Green, Guillaume De La Fons, Thomas Bedford, Thomas Andrew Danks, Alissa Johnson.***

The main activity during the workshop was a task involving the use of GIS software to answer a series of questions on different aspects of the impact of climate change on flooding in Aberdeen, with delegates split into teams which were divided between sets of questions on human and physical aspects of flooding and its impacts. Delegates with an obvious interest and expertise in a particular aspect of the task (such as delegates from Scottish Water and coastal engineers who would have a clear bias towards the physical issues) were allocated to the appropriate teams in order to capitalise on their professional perspectives. After answering their questions, the teams gave presentations of their findings to the rest of the group so that teams could share each others' expertise and see different perspectives on the data used. For questions requiring the use of more technical functions in the GIS software, GIS technicians were available to all teams. This section will summarise the teams' findings.

### **Human Aspects teams**

The two human aspects teams worked on issues such as population density, development in areas vulnerable to flooding, likely sources of flooding for Aberdeen and patterns in recorded flooding incidents in the city.

Both teams identified King's Links, parts of Seaton and parts of the harbour as being vulnerable to flooding due to low altitude from a preliminary inspection of the Digital Terrain Model (DTM), with Ordnance Survey maps to identify locations. One of the teams also identified areas of Deeside as being at risk due to low elevations.

One team identified 'rain and storms' as the main general causes of flooding in Aberdeen. The other team gave more specific answers, citing 'too much water' as the general problem, and highlighting 'river discharge' and 'sea level rise' as two specific examples. This team also noted that 'poor maintenance' of watercourses and drainage systems is a problem, which was also apparent from an examination of the extract from Aberdeen City Council's flooding incidents database.

Seaton was identified by both teams as a location with a high population density which is vulnerable to flooding due to proximity to watercourses, with one team also identifying the University Campus, Woolmanhill and the Den Burn valley as potentially vulnerable areas. The other team additionally identified Footdee, although the population density choropleth map provided did not show a high population density here; the team's answer could have been informed by personal knowledge and perceptions, particularly in relation to vulnerability, as Footdee is situated between the river and the sea, both of which have the potential to cause problems in the context of climate change.

From the buildings dataset derived from Ordnance Survey Mastermap, the railway station, bus station, Union Square shopping centre and government offices (identified as Health

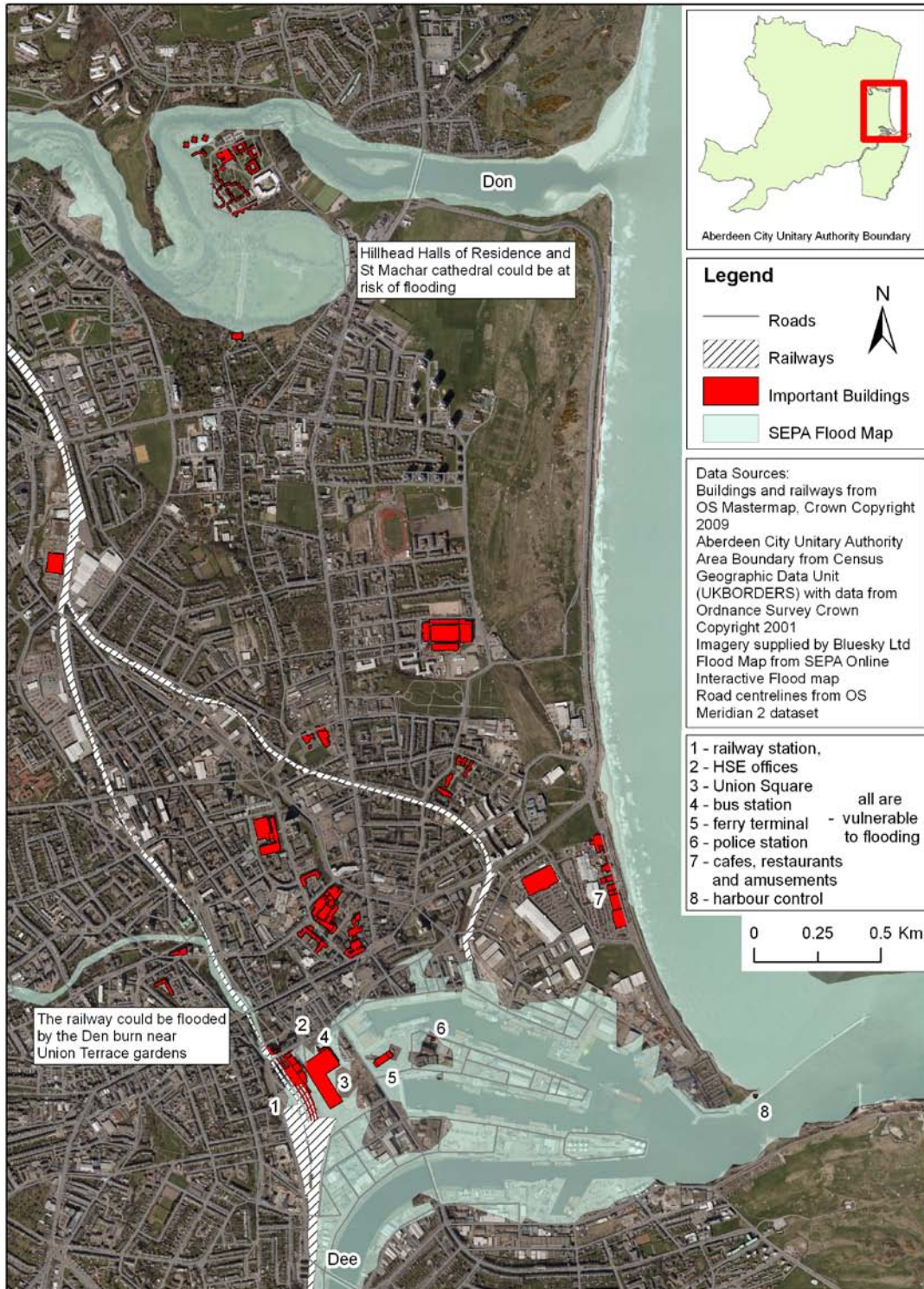
and Safety Executive offices by one of the team members) were shown to be at risk of flooding according to the SEPA flood maps. It was also noted that many of the point locations of flooding incidents in the City Council's database were not in areas where flooding would be expected to be a significant problem as a result of elevation and proximity to waterways, as many of the incidents were caused by failure, or lack, of infrastructure which shows that provision and maintenance of water management facilities are crucial to minimising harmful effects of flooding in inhabited areas.

The delegates' work showed that both important roads and railways in the city could be affected by flooding, in particular around the harbour, one of the lowest-lying areas of the city.

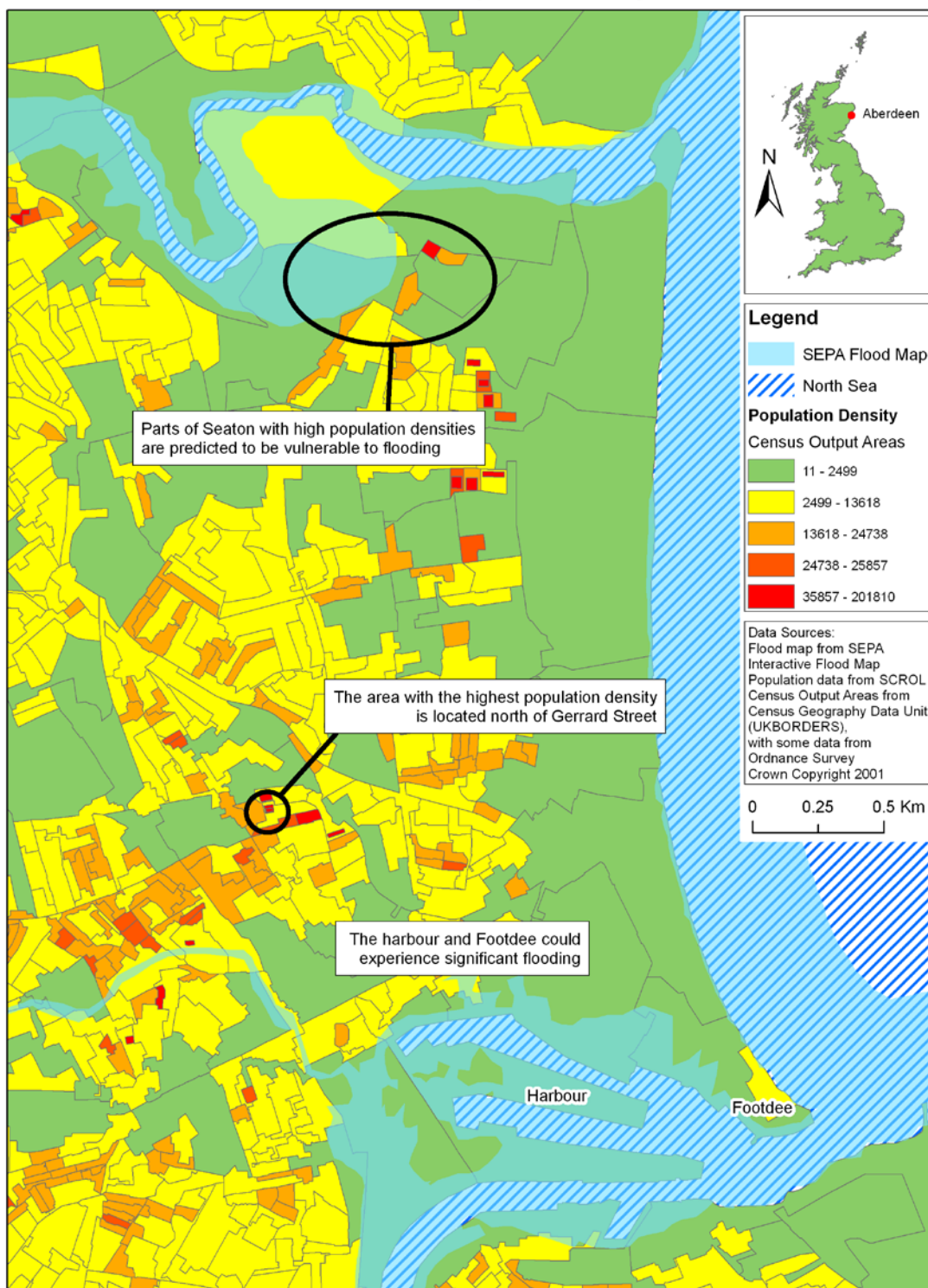
Conclusions drawn by the human aspects teams on impacts of climate change and flooding on Aberdeen city and possible solutions they suggested were;

- The harbour appears to be vulnerable to flooding but cannot be moved, and is economically very important to the city. As such, its' operation must be safeguarded.
- Despite some predicted vulnerabilities, many areas of the city actually appear quite resilient against flooding due to good planning decisions (such as the avoidance of building on flood plains).
- It is important to raise awareness of flooding and climate change issues.
- Green engineering techniques (such as SUDS – Sustainable Urban Drainage Systems) should be used where possible.

**Impact of Climate Change on Flooding in Coastal Communities Workshop 31st May 2010  
GIS Task Human Aspects Team Output**



**Impact of Climate Change on Flooding in Coastal Communities Workshop 31st May 2010  
GIS Task Human Aspects Team Output**



## Physical Aspects teams

The two physical aspects teams worked on issues such as effects of altitude on flooding, calculations of area of land vulnerable to flooding, and underlying causes of the distribution of points in the city council's flooding incidents database. Despite technical problems with the GIS software limiting the teams' abilities to complete some of the questions in as much detail as originally intended the teams nevertheless identified a range of important factors of the physical environment which affect Aberdeen's vulnerability to flooding and the effects of flooding when it does occur.

As with the human aspects teams, the physical aspects teams identified Seaton and the harbour as potentially vulnerable to flooding as a result of their low elevations. The physical aspects teams also identified lower reaches of the Dee and the Don, as well as Garthdee and Grandholme, and the coast in general as being at risk of flooding due climate change induced to sea level rise.

The team that successfully overcame technical problems used the GIS software to interrogate the DTM and find the highest point within the city boundary to be at 266m in the area of Northfield/Newhills (the actual point is Brimmond Hill, NJ 856092).

The physical aspects teams showed their scientific backgrounds in the answers they gave on the causes of flooding, differentiating in one case between flooding with a fluvial source and that caused by tidal surges on the coastline, and in the other case between fluvial and pluvial causes. Inadequate drainage and lack of maintenance were highlighted by both teams as possible causes of flooding, with one team also mentioning the possibility that high densities of burns in residential areas could cause problems if all of these were to simultaneously overflow. The fact that impermeable surfaces associated with development increase runoff, potentially contributing to overcharged watercourses was also noted.

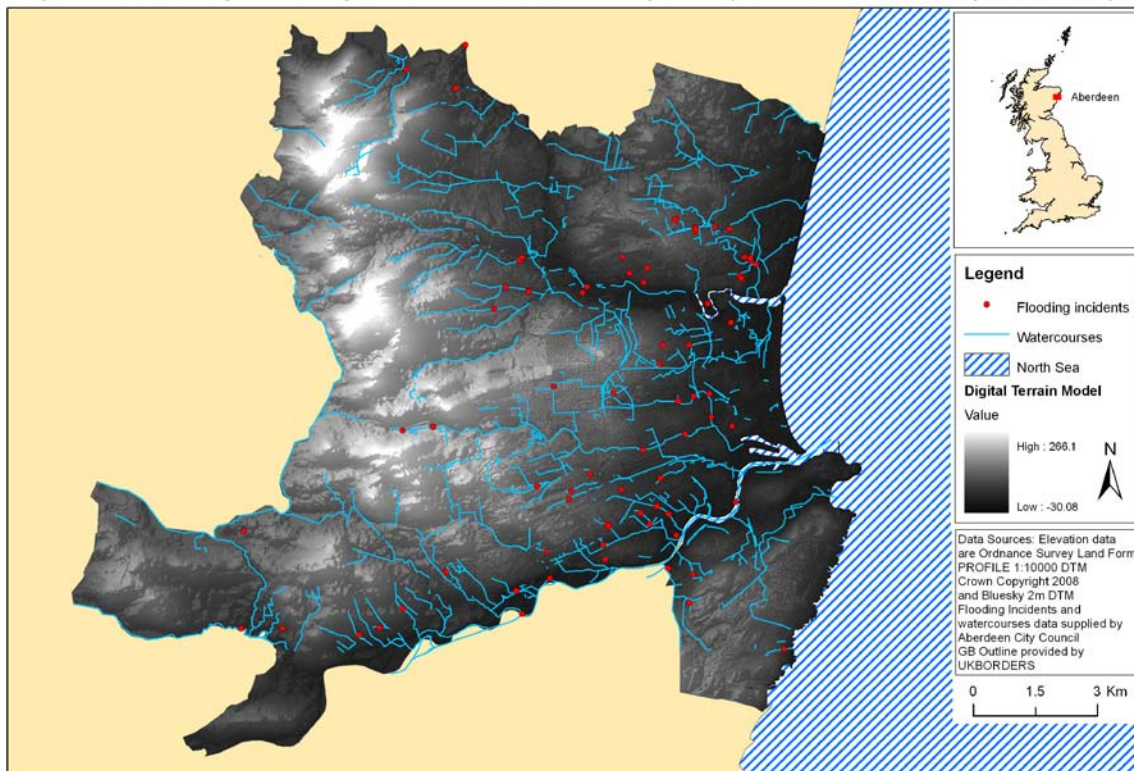
Both teams agreed that rivers appear to pose the greatest flood risk to the city as a result of predicted future increases in intense rainfall, while accepting that these were not the only potential sources of flooding. Other causes of flooding identified were 'obstructions to flow from higher ground deflecting normal flows into other areas' and 'the effect of excessive rainfall on the water table'.

The two teams were also in agreement that of the two large rivers flowing through the city, the Dee was the most likely to cause economically problematic flooding, due to its proximity to the city centre, the railway and the harbour, as well as important commercial areas and infrastructure, and one team noted possible impacts on fresh water supplies. The same team also mentioned that the river Don could pose a greater threat to residential areas, while the other team thought the Don would be more likely to cause problems in Aberdeenshire, in the Kintore and Inverurie areas. Although technically outside the scope of the workshop, this is an important point to make in the context of the relevance of conclusions drawn and the applicability of the work done here to future sessions or outputs.

Conclusions reached by the physical aspects teams on the effects of climate change on flooding in Aberdeen city and possible solutions suggested were as follows;

- The presence of the Rivers Dee and Don and the various burns coupled with inadequate drainage systems will cause future problems for Aberdeen particularly in the light of the massive new housing proposals.
- Rises in sea level and tidal surges will adversely affect low lying areas of the City.
- The city is susceptible to flash flooding.
- Important infrastructure is at risk.
- Good planning, such as the continued avoidance of development in flood prone areas and the protection of open spaces where flood water can be allowed to collect, is essential in order to minimise the impact of potential future increases in flooding on the city.
- SUDS should be implemented to slow the runoff rate.
- Flood resilience in existing buildings should be investigated and, where necessary, improved.
- To help people to plan for and adjust to potential future environmental changes, policies should aim to change their attitudes, which will in turn lead to the necessary changes in behaviour.

Impact of Climate Change on Flooding in Coastal Communities Workshop 31st May 2010 - GIS Task Human Aspects Team Output



Positive comments were received from the delegates on the task, and many of them commented on how interesting they found it in terms of exposing them to datasets they were not aware of and the capabilities of the GIS software to perform analysis and visualise particular situations as a communications tool. Many of the delegates asked questions on a variety of aspects of the task, such as the data sources and access to these, limitations of the datasets, and possibilities for analysis, as well as providing interesting comments on how they already use similar data or how they think it would be useful for future projects. The delegates also had useful ideas on improvements that could be carried forward into future tasks to maximise their utility and their ability to achieve their aims.

Overall, the response to the workshop was very positive. The delegates all said they enjoyed the event and all felt that they had gained benefits from it.