

Severn Estuary Climate Change Research Advisory Group: Update on the science and recent project work

SECCRAG meeting, Wednesday 8th December, 2010

Main Building, Cardiff University

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Attendance:

Rhoda Ballinger (RB), Cardiff University
Hance Smith (HS), Cardiff University (Chair)
Nick Rodgers (NR), Cardiff University
Ciara Hovey (CH), Cardiff University
Piers Stanger (PS), Cardiff University
Gethin While (GW), Cardiff University
Tara Thrupp (TT), Cardiff University
Jeanette Reis (JR), Cardiff University
Paul Parker (PP), Cardiff University
Merryn Thomas (MT), Cardiff University
Paul Jones (PJ), Somerset County Council
Peter Henderson (PH), PISCES Conservation
Simon Jones (SJ), University of Wales
Guy Schumann (GS), Bristol University
Ken Tatem (KT), Environment Agency Wales
Rhys Morgan (RM), Environment Agency Wales
Emerald McLoughlin (EM), Plymouth Coastal Observatory

Apologies:

Mike Phillips, Swansea Metropolitan University
Chris Spencer (CS), University of the West of England
Christine Marsh (CM), Severn Estuary Partnership
Steve Hall (SH), National Oceanography Centre
Allan Williams (AW), Swansea Metropolitan University
Louise Pennington (LP), Wales Coastal Monitoring Centre (Gwynedd County Council)
Richard Cowell (RC), Cardiff University
Ian Hall (IH), Cardiff University
Rupert Perkins (RP), Cardiff University
Andrew Flynn (AF), Cardiff University
Richard Brunning (RBr), Somerset County Heritage Service
Simon Haslett (SH), University of Wales
George Ashworth (GA), Monmouthshire County Council

Acronyms

BGS	British Geological Survey
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
COMPASS	Coastal Marine Perception Application for Scientific Scholarship
COREPOINT	Coastal Research and Policy Integration
DECC	Department for Energy and Climate Change
DEFRA	Department for Environment, Fisheries and Rural Affairs
EA	Environment Agency
EDINA	Edinburgh University, National Academic Data Centre
EH	English Heritage
EIA	Environmental Impact Assessment
ESRC	Economic and Social Research Council
EU	European Union
GOSW	Government Office South West
IMCORE	Innovative Management of Europe's Changing Coast
INTERREG	EU Interregional Funding
IPCC	Intergovernmental Panel on Climate Change
LIDAR	Light Detection and Ranging, Remote Sensing Tool
NAO	North Atlantic Oscillation
NERC	Natural Environment Research Council
RCZA	Rapid Coastal Zone Assessment
RSPB	Royal Society for the Protection of Birds
RTPI	Royal Town Planning Institute
SEA	Strategic Environmental Assessment
SECCRAG	Severn Estuary Climate Change Research Advisory Group
SELRG	Severn Estuary Levels Research Group
SEP	Severn Estuary Partnership
SMP2	Shoreline Management Plan (Round 2)
TAN	Technical Advisory Note (Planning)
UKCIP	UK Climate Change Impacts Programme
UKCP	UK Climate Projections
UWE	University of the West of England
WAG	Welsh Assembly Government

INTRODUCTION TO THE IMCORE PROJECT

Promoting a transnational, innovative & sustainable approach to climate change adaptation along the coasts of North West Europe, this project will run until 31/10/2011. Project partners include Cardiff University, Glamorgan University, Severn Estuary Partnership, University of Aberdeen, Sefton Borough Council, University College Cork, Cork County Council and Donegal County Council. It has five major work strands including: identifying drivers for climate change, developing adaptive management strategies and future scenarios building. More detailed information is available at: <http://www.imcore.eu/>

On the Severn Estuary, the IMCORE project is aiming to facilitate better informed climate change adaptation. Specific work areas on the Severn concern the following five areas:

1. Improving the science/evidence base
 - Through the Severn Estuary Climate Change Research Advisory Group (SECCRAG)
2. Planning review & stocktake
 - Climate change considerations / synergies in the planning system
3. Futures research
 - Investigating 'coastal futures' for the Estuary
4. Education and awareness on coastal climate change
 - Education schools pack
5. Climate change adaptation assessment
 - Based on 1, 2 and 3

SEVERN ESTUARY CLIMATE CHANGE RESEARCH ADVISORY GROUP

Welcome and matters arising from the last meeting

HS (Chair) welcomed participants to the meeting and briefly went through the agenda for the day. No matters arising were presented.

Session 1 – SCIENCE PROGRESS UPDATE

Aim/Content of Session:

This session provided updates on understanding of climate change on the estuary. To achieve this, presentations were given by representatives from key topic areas delivering perspectives on the current state of science on the estuary within their respective fields.

The following presentations were given during this session:

The science of the Severn Sea, Hance Smith, Cardiff University
IMCORE climate change research: report cards, Ciara Hovey, Cardiff University
Coastal monitoring and remote sensing, Guy Schumann, Bristol University
Recent changes to fish and crustaceans in the Severn Estuary/Bristol Channel, Peter Henderson, PISCES Conservation

A brief discussion session was held at the end of the presentations.

SCIENCE OF THE SEVERN SEA, Hance Smith, Cardiff University

HS gave an overview of the natural, social, economic and cultural environment of the Severn Estuary and Bristol Channel.

The natural environment of the Severn Estuary encompasses the geology, geomorphology (flooding and erosion issues are very relevant), oceanography, meteorology and climate of the local region. There is a constant need for monitoring the natural environment in order to establish rates of change of bigger scale issues (such as climate change). It is also important to look at how the social, economic (especially the development of urban coastal environments) and cultural issues link in with climate change impacts in order to address adaptation issues. Applications of the science knowledge need to be considered by a wide variety of sectors across the estuary, including public, private industry and community organisations. The effects of climate change are very likely to have impacts on the monitoring and surveillance of the estuary coast line and also on landuse planning in the future. A key question is how far ahead can realistic decisions on the impacts of climate change currently be based upon?

HS concluded with an outlook on the meeting agenda and how the key themes presented in this overview could assist in shaping the discussion sessions to be held later in the day.

IMCORE CLIMATE CHANGE RESEARCH: REPORT CARDS, Ciara Hovey, Cardiff University

The IMCORE research report cards were developed to inform non-specialists of the key climate change science and impacts issues relevant to the Severn Estuary region. These were developed as summaries of the current research findings for sea level, wave climate, storminess, storm surges and rainfall. The key information sources for the report cards were UKCP09, the Marine Climate Change Impacts Partnership (MCCIP), the Severn Estuary citations database for independent research and current research projects (such as through Bristol University and Swansea Metropolitan University).

The presentation clarified the term 'uncertainty' within the context of climate projections and gave a brief overview of these key issues, highlighting climate modelling capabilities and the problems associated with downscaling of global information to regional and local scales as major concerns. A summary of the key findings for future climate change across the Severn Estuary was also presented.

A brief overview of the Severn Tidal Power Feasibility Study documents available on the DECC website was also given, highlighting the most relevant to the group as the Strategic Environmental Assessment (SEA) summary report and individual topic reports.

COASTAL MONITORING AND REMOTE SENSING, Guy Schumann, University of Bristol

GS gave a short talk about monitoring the coast using technology such as LiDAR, AVHRR, SAR, aerial photography and GPS. Some of the main event and post-event datasets that are collected using these methods are algal blooms, ocean chlorophyll and temperature (Coastal Zone Colour Scanners (CZCS 1978-86), SeaWiFS, MODIS Aqua, MERIS etc). However, flooding has received less attention in monitoring terms; the majority of flooding recording has been opportunistic. The suitability of differing types of monitoring technology was also commented on. For instance, AVHRR has a long historical archive (from 1981) and can be calibrated well; however it is unable to be used during bad weather (rain or clouds). AVHRR can be used for flood monitoring due to its suitability for large-area post flood event mapping. In the future it is likely new technologies will map the sea, coastal zone and inland with great detail and accuracy.

GS also highlighted that there is a large and free database of coastal monitoring information available on the Channel Coast Observatory and Plymouth Coastal Observatory websites.

Discussion

NR commented that better understanding of the meteorological conditions is required to monitor and produce mapping of storm surge events. This can be looked into by reviewing and analysing historical events, but in attempting to do this as part of the IMCORE report cards project, it was found that there is a relatively large amount of information available for floods on the Somerset levels but much less for the Welsh side of the estuary. The 1981 storm surge event and flooding is still a key recent historical event that is used in current day flooding research for this region.

RECENT CHANGES TO SEVERN ESTUARY FISH AND CRUSTACEANS, Peter Henderson, PISCES Conservation

PH gave a brief update on the dynamics and change of fish and crustaceans in the Severn Estuary and Bristol Channel. PH reported that the 30 year once-monthly sampling at Hinkley Point has now been completed, arising from a late 1970s interest in monitoring. The database is likely to be one of the largest of its kind currently in the world and monitoring was recently increased to once a week (catching everything larger than 1cm). The results of the database show a biological system in continuous flux. There has been evidence of change in the fifteen most abundant species with the three top species (all prawns) showing increasing abundance. Whiting and Sprat are the two most abundant fish species but these are exhibiting trendless variability, whilst there are some considerable trends occurring in 'lesser' species. Crustaceans in general are increasing in numbers. Sea snails are a particular species that are sensitive to water temperature and trends show numbers decreasing as they migrate north to seek cooler waters (thereby indicating that sea water temperatures are increasing in the region). However, some trends can conflict with current views on marine climate change, such as increasing numbers of Cod (a cold water species) despite sea water temperatures rising; there is widespread confusion over why this species is increasing across the southwest of the UK.

PH highlighted some of the climate variables that are likely to be causing some of these trends. It was noted that sea temperature has steadily risen across the estuary since the 1980s. Salinity has also dramatically increased recently. It is likely that the North Atlantic Oscillation (NAO) is having an impact; it has recently shown a recent trend of negativity, bringing stormier conditions to the UK. It is possible that the total number of fish declining is related to species not being attracted to living in a negative NAO environment. It has been shown that when the NAO shows a positive trend, total fish abundance is higher.

GS inquired about how salinity affects species in the estuary and PH responded by saying as salinity increases species move up and down the estuary to cope with this. He also added that there are strong interdependencies between species distribution, salinity, and temperature shifts and species distributions within the estuary.

ASSESSMENT AND FURTHER DEVELOPMENTS, round table discussion

Key themes arising from this discussion were flooding events, monitoring (some long term datasets already exist but there is a need for a coordinated management system) and sources of this information.

The group acknowledged the usefulness of media coverage in compiling information on historical extreme weather and flooding events. A database of this information is currently being compiled at Bristol University as part of a PhD thesis.

KT commented that the EA have found they tend to run out of places to search for more information on flooding including historical events; involving communities to share their knowledge and information (such as photographs) could be very useful.

RB suggested reviewing the work currently being done by Robin McInnes which is a photograph and painting analysis, including critique on reliability of these sources.

JR queried whether the work being done by Bristol University had any links with the military (in terms of gathering historical/present data). GS replied yes, there had been contact with the military regarding some Tewkesbury flooding research but even though the data was there, it had been very difficult to get hold of.

RM observed that there are currently many applications for marine dredging licences coming through to the EA for the Severn Estuary region. In order for these applications to be approved significant monitoring is conducted by dredging companies such as LiDAR and bathymetric surveys (most notably for Newport to Chepstow) to identify benthic habitats amongst other things.

Afternoon Session: CLIMATE CHANGE AND THE SEVERN ESTUARY: Current developments and applications

Aim/content of session:

The aim of the morning's session was to provide an update on the state of the science knowledge base on the Severn Estuary. The first afternoon session was aimed at exploring the developments and applications of the science knowledge and how this can be communicated. on the science-policy interface and the role SECCRAG could play in the dissemination of Severn Estuary information. It was also aimed at updating the group with IMCORE project progress and developing a way forward for SECCRAG and the role it can play in the dissemination of Severn Estuary information.

The following presentations were given during this session:

Monitoring, update from Emerald McLoughlin, Plymouth Coastal Observatory, and strategic overview of the Wales Coastal Monitoring Centre
State of the Severn Report, Paul Parker, Severn Estuary Partnership
Somerset Coastal Pathfinder Project, Paul Jones, Somerset County Council
Science communication on the Severn, Piers Stanger, Cardiff University
Science education project work, Jeanette Reis, Cardiff University
Planning and policy update, Rhoda Ballinger, Cardiff University
IMCORE scenario building and science inputs, Cardiff University

A round-table discussion was also held concerning SECCRAG's role and continuation.

MONITORING, Emerald McLoughlin, Plymouth Coastal Observatory

EM updated the group with recent developments at the Plymouth Coastal Observatory and monitoring of the south west coastline. The funding application for phase two of the 100% Defra funded project is still awaiting a decision, but it is very likely it will be awarded for the 2011-2016 period. The most recent annual survey report to be published is Hartland Point to Sand Point. In

terms of data collection, LiDAR is due to be carried out across the whole estuary in March 2011. The autumn interim profiles of the coastline are in progress and a full beach survey of Porlock is also scheduled for completion. A new WaveRadar Rex wave and tide gauge is now due to be launched by the second Severn crossing in January 2011.

SOMERSET COASTAL PATHFINDER PROJECT, Paul Jones, Somerset County Council

PJ gave the group an overview of the 100% Defra funded Somerset Coastal Pathfinder Project, a pilot project currently being run in England from December 2009 to June 2011. There has been an emphasis on sea level rise and focusing on three areas, namely Porlock Weir, Steart and Brea and Berrow. The project is heavily involved in community-led initiatives and highlights the importance of community engagement practices to assist with adaptation to sea level rise. The project aims to help communities adapt to coastal change in light of SMP policy designations. It also aims to raise awareness of future scenarios at Porlock Weir. The key outputs are expected to be the development of a future scenario (Porlock Weir), formulation of a specific Adaptation Action Plan for Porlock Weir, the pathfinder website, an e-game for schools and the initiative to gather local knowledge, experiences and observations. Initiatives include a 'community coastal monitoring team' whereby regular photos are collected from a specific location by the public. Work so far has included gathering historical and heritage information, community engagement, drop-in sessions at Porlock Weir and the development of a mock newspaper detailing the worst case scenario at Porlock. Black and Veatch consultants were also drawn in for environmental monitoring and awareness input to Porlock Weir scenario development. Future work will look at potentially storing coastal monitoring data on the pathfinder website, exploring funding options and establish a Flood Action Group for Porlock (rolling out to Brea and Berrow shortly). It was also noted that a public document will be made available at the end of the project (this funding phase) to indicate lessons learnt.

SCIENCE COMMUNICATION ON THE SEVERN, Piers Stanger, Cardiff University

PS gave a presentation about the communication of climate change information across the estuary. Specifically, he showed the use of science in Local Authority climate change strategies and the relationship between science and decision-making for adaptation to climate change. Twelve Local Authorities around the estuary were examined and of the 8 which had a climate change policy document factors such as sources for the information, what parameters were used (e.g. temperature) and whether the issue of uncertainty in data sources was referred to, were examined. Notably, UKCIP02 and UKCIP09 information was preferred for Welsh authorities and SWCCIP for English authorities. A large proportion of the documents examined actually made no reference at all to uncertainty in climate change data and information. Precipitation and temperature were used as climate change variables extensively, followed by storminess, seasonality and extreme events and drought.

PS also discussed his thesis research interests related to coastal management and the communication of climate change information (with particular reference to adaptation policy). As part of this work, the SMP(II) has been reviewed extensively to analyse the collection of scientific data, its use and reporting of this information. This was compared with an SMP(I) review to identify

the key points/areas of science use on the Severn Estuary. Future work will look at the FRMS in a similar way, identify local case studies, consider how the SMP/FRMS transfers to local level planning and action, detail how much and what climate change science filters through and formulate suitable questions and potential candidates for surveys and interviews.

SCIENCE EDUCATION PROJECT WORK, Jeanette Reis, Cardiff University

JR presented the purpose of the Beacons/IMCORE Young People's Climate Change Project to the group. The aim of the project was to 'change the way young people in Wales think about their role and influence in a world with a changing climate'. This is currently being delivered via a series of workshops, an education material pack, website development and a young people's policy document. The Beacons programme is funded by the University of Wales, the BBC, Techniquet, IMCORE and the Countryside Council for Wales. Progress to date includes the development of bi-lingual workshop support material, training of the engagement team, delivery of three workshops so far (Barry, Penglais and Ysgol Tryfan schools), website launch and background research for the education pack. Research themes include critical infrastructure, food supply and industry. Future work includes the delivery of one more south Wales workshop, source funding for bi-lingual translation of all supporting material, produce the young people's policy document and wrap up the project by May 2011.

IMCORE PLANNING AND POLICY UPDATE, Rhoda Ballinger, Cardiff University

RB gave a brief overview of the two phases comprising the Severn Estuary planning review. Phase one reviewed corporate responses to climate change and how this is incorporated into planning practice whilst phase two focused on interviews with planners and identified what their key issues and concerns for the Severn Estuary were in relation to climate change adaptation. Findings were that although there is a strong emergence of explicit climate change policies within plans the focus still remains on mitigation. Further to this, the 'coastal zone' appears to be dropping out of emerging policy and there are few references to the SMPs. From the planner's interviews, a selection of key ideals was created. There were as follows:

- 1) Best practice examples of climate change adaptation
- 2) Greater clarity relating to aspects of Planning Framework
- 3) Maintaining nature conservation (i.e. Natura2000 sites)
- 4) More prescriptive planning guidance on climate change
- 5) Greater scientific certainty about climate change and coastal change
- 6) Evidence Base:
 - a) Improved knowledge of socio-economic impacts of climate change
 - b) Greater frequency of updates of WAG Development Advice Maps (Wales)
 - c) Improved knowledge of local renewable energy generation potential

RB also updated on other Severn Estuary planning events including the RTPPI Planners Conference which was held in June 2010 in Bristol. Future work for the planning side of the IMCORE project will be to develop the adaptation guidelines for the Severn Estuary. These guidelines will be related to the use of planning tools for forward planning (e.g. community engagement), development control (e.g. time limited consents) and examples of best practice. These guidelines will be informed through the IMCORE project work such as the science evidence base (report cards), scenarios workshops, the Delphi survey (informing an adaptable and sustainable planning response for the Severn Estuary in the context of coastal climate change over the next 30 years) and the review of existing climate change policy documents.

IMCORE SCENARIO BUILDING, Gethin While, Cardiff University

GW gave an overview of the IMCORE project scenario work. Scenarios are defined as a tool for ordering one's perceptions about alternative future environments in which one's decisions might be played out. Two days of workshops have already been held in Cardiff and Bristol with relevant stakeholders (planners, Local Authority representation, consultancy agencies). The issues derived from the planning and policy aspect stem directly from the IMCORE planning work stream (see

Rhoda Ballinger's summary above). Impacts from the science work stream include effects on settlement relocation (habitat impacts), flooding and sea level rise restricting future development options (metrics and evidence base), retrofitting (materials science), coastal defence options and maintenance of nature conservation sites. There are five exploratory scenario workshop stages:

1. Collecting and examining drivers of change in the Estuary
2. Scoring Uncertainty and Significance/Impact
3. Driver clustering - Derivation of key determining drivers to be used to inform axial polarities
4. Refining Driver Logic
5. Defining features of the scenarios

At these workshops, stakeholders were asked to consider the critical question "What are the drivers affecting the planning response to climate change in the Severn Estuary in 2040"? Using the PESTLE (Political, Economic, Social, Technological, Legal and Environmental) guide stakeholders considered this question for each sector and then prioritised the outputs.

Future work with the scenario building will take the findings from these workshops forward into selecting scenario axes, developing scenario narratives and using validated scenarios in future planning (guidelines).

SECCRAG role and continuation, round-table discussion

A round-table discussion was held led by the Chair exploring the way forward for SECCRAG. HS reviewed the briefing note document circulated with the meeting agenda, highlighting the proposed options for the group as follows:

- Winding SECCRAG up at the conclusion of the IMCORE project in October 2011.
- Continuation as a specialist science group organised by members of the network. Such an arrangement could be initiated by Cardiff University, for example, which would provide the secretariat, with organisation thereby continued at the behest of the members e.g. a rotating secretariat. Financial commitment would be minimal and mainly carried by the members acting in their professional capacities.
- Continuation as a specialist science group under the aegis of the SEP, who would provide the secretariat. Financial commitment would be similarly minimal. SEP would provide a ready-made link with all the stakeholders, including the universities, major industries, local authorities and government agencies.
- Continuation as a more formally organised and funded group along the lines of e.g. the Sullom Voe Environmental Advisory Group.

GS supported the option for the continuation of the group under a different name and under the organisation of the SEP. It was suggested that the group be renamed as the Severn Estuary Science Group, creating a broader scope than just climate change science research.

RB observed that although possible, previous observations from similar groups re-branding have shown a wider scope is not always effective as the group can lack focus on an overall objective. The group agreed that it was important to first develop a strategic objective of the group and have this as a clear focus for all future meetings and production of documents.

PP observed that there are lessons that can be learnt from other such forums, and the advantage of having a broader science spectrum is that sub-groups can be formed to look at specialised topics.

JR and RB also discussed the possibility of having a regular/annual review meeting to discuss scientific evidence to support management and best practice, and to identify the science needs of policy development. It was observed that if the group is to be linked in with the SEP then it needs to be fairly policy driven to coincide with SEP strategic aims and objectives. In terms of SEP as the secretariat, this can be delivered but consultants and professional expertise still need to be drawn in to meet the aims of the SEP as a whole.

PS also noted that the words 'climate change' can actually put some people off wanting to take part and many are more likely to attend a broader science group.

JR commented that the group needs to be careful to not repeat work already being done by the C3W contingent at Cardiff University.

An overall conclusion was not reached but it is likely these comments will be taken into account when deciding the future of SECCRAG at the end of the IMCORE project in 2011.