

Workshop to examine the impacts of Climate Change on the implementation of the Water Framework Directive

**Canal Court Hotel, Market Quay, Newry
Tuesday 23 June 2009**

Introduction

The need for this workshop was identified at a SNIFFER facilitated meeting between the NIEA and EPA. It was one of a number of areas identified where joint working on environmental issues could be beneficial. The workshop provided the first opportunity for climate change scientists and river basin planners to come together on the island of Ireland to consider the impacts of climate change on the setting and delivery of Water Framework Directive (WFD) objectives via the River Basin Plans.

Objectives

- **To identify what we need to achieve in the first River Basin Plans (end 2009) in relation to climate change adaptation**
- **To identify what are we need to do to adapt to our changing climate for the 2nd river basin plan (end of 2015)**
- **An opportunity for climate change and WFD scientists to get together to discuss the issues and identify any actions.**

Programme for the day

The morning programme was chaired by Dave Foster, Acting Director of Environmental Protection, NIEA. There were a number of presentations covering policy and implementation updates on both WFD and Climate Change. The newly launched UK climate projections (UKCP09) were also presented as well as the latest on Republic of Ireland climate projections. This enabled all delegates to be up to date on both the requirements of the WFD River Basin Plans and with the latest information on climate change predictions before going into the interactive afternoon sessions.

The afternoon session was chaired by Pat Canney, River Basin District Co-ordinator, Western River Basin District. The majority of the time was dedicated to interactive breakout sessions looking at specific pressures on the water environment, discussing the likely impact of the climate change projection on these and identifying action required either to lessen uncertainty or to manage the potential impact. Appendix 2 provides a full report of the breakout sessions.

Details of the day's programme are listed below:

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| 10:00 | Welcome by Diane Foster, SNIFFER |
| 10:05 | Session 1. WFD and Climate Change Policy Background |
| 10:05 | <u>Gabriel Nelson, NIEA & Tommy Bree, ESBI</u>
Background to WFD and progress to date with adapting the RBPs to climate change |
| 10:30 | <u>Pat Macken, DEHLG & Brendan Forde, DOE</u>
Background to Climate Change Policy in ROI & NI |
| 10:55 | Plenary Discussion |
| 11.10 | Tea/coffee |
| 11.30 | Session 2. Climate Projections |
| 11:30 | <u>Roger Street UKCIP - UK Climate Projections</u>
Update on Climate Change Projections in the UK |
| 12:05 | <u>Eoin Whelan, Met Éireann</u>
Update on Climate Change Predictions in Republic of Ireland |
| 12:40 | Plenary Discussion |
| 13:00 | LUNCH |
| 14:00 | Introduction to Breakout Sessions |
| 14:05 | Workshop sessions: What do we need to do to address the implications of climate change on the River Basin Plans |
| 15:40 | Feedback from breakout groups |
| 16:00 | Concluding remarks and next steps |

Summary of Breakout Groups

The attendees were split into 3 breakout groups made up of a mixture of NI and ROI WFD and CC staff. They were each given tables of two key pressures and pre-identified, likely impacts of climate change that may affect each pressure. These were taken from a sample of the 2009 draft River Basin Plans:

Group 1 = biodiversity and non native species and protected areas

Group 2 = abstraction and morphology

Group 3 = diffuse & point source pollution and abstraction

The attendees first considered whether there were any key impacts missing from the table that they would like to add, based on what they have heard in the morning sessions. Only group 1 added any new impacts to the table. These are recorded in Appendix 2.

The delegates were then asked to prioritise each of the impacts in the table and then discuss each in priority order. The following questions were considered:

1. What else can we do in cycle 1 to address the implications for CC?
2. What do we need to do in cycle 2 to address these implications?
3. Where do we not have a mechanism to address these?
4. Are these mechanisms available in both NI and ROI?

The key outcomes from the discussions follow:

Group 1 Biodiversity and non native species and protected areas

1.	<p><u>Invasive species</u> (N & S) It was felt that we are already proposing adequate measures to control invasive species and there is work ongoing to improve the deportation of non-native species. However do need to:</p> <ul style="list-style-type: none"> • Evaluate the effectiveness of Invasive Species Ireland in Cycle 1 • Tighten up trade legislation • Develop eradication programmes where appropriate
2.	<p><u>Changes in seasonal cycles on species and habitats</u> – there are mechanisms in place e.g. data on smolt migration and data on aquatic flora and fauna on existing species plus reference conditions. Further measures needed are:</p> <p>In Cycle 2 we need to</p> <ul style="list-style-type: none"> • consider climate change projections for climate proofing • consider the effects of land use in the wider context to help achieve good status <p>Groundwater dependent terrestrial ecosystems are not considered adequately in Cycle 1.</p>

3.	<p><u>Change in land use</u></p> <p>It was noted that the Strategic Environmental Assessment Directive may not be adequate for considering changes to land use on water bodies.</p> <ul style="list-style-type: none"> • We need to consider impacts of renewable energy systems on river systems • Need to develop a protocol for land use. This was identified as an area for international cooperation and possibly something that SNIFFER could coordinate • Need to develop control mechanisms for crop growth, including possibly the development of permits for crop growth. • Need research forecasting the potential impact of new crops on the aquatic environment
5.	<p><u>Increased Riparian and Coastal erosion</u></p> <p>We need to consider what happens when habitats move due to climate change (e.g sand dunes). Do we replace habitats or manage transition?</p>

Group 2 abstraction and flow regulation and morphology

1.	<p>Both the UK and Rol Met Offices recommend using the 1961-1990 record as baseline data in hydrological models. This may now be becoming less representative and result in a need for a more recent dataset to be used i.e. 1971 - 2000. Discussions are needed with both Met Offices to consider this issue and also the need to collect more field data for rainfall, evapotranspiration and temperature rather than relying on modelled inputs.</p>
2.	<p>There is uncertainty as to whether the hydrological conceptual models include catchment storage (subsoil and groundwater) and the contribution this gives to river flows. NIEA should liaise with UKCIP and the EPA consult with the two modelling groups in Rol to explore the modelling issues further and ensure models are fit for purpose.</p>
3.	<p>It will be necessary to consider more winter storage (for water supply and environmental releases) to capture high flows through soft storage in upper catchments. This measure would also support the flood risk management agenda. A more holistic approach to the management of catchments including planning and flooding teams would be required.</p>
4.	<p>Abstraction licensing regimes should incorporate mechanisms to take the likely effects of climate change (higher winter flows and lower summer flows) into account. In NI the planned review of licences in 2009 should take into account the new climate change scenarios. In ROI, the forthcoming licensing regime needs to include mechanisms to deal with climate change.</p>
5.	<p>There needs to be a more sustainable use of water to manage water demand. New policies and measures should be designed to include metering, water efficiency etc. Perhaps start with pilot studies to show the effectiveness of these measures to get buy in from the public.</p>

Group 3 Diffuse and point source pollution

1.	It was agreed that the implications of climate change on the WFD will be assessed and actioned in detail during the 2 nd and 3 rd cycle. However, the 1 st RBP should flag the activity needed from 2009 to 2015 to prepare for this work. This will include capacity building and raising awareness for all those involved in implementing RBPs. Also development of key guidance e.g guidance for consent scientists on how to include climate change scenarios when setting discharge consent limits and costing of supplementary measures taking into account the impacts on energy usage and the impacts on the environment will need to be undertaken.
2.	Land use and the impacts of rural pollution is a high risk area. The establishment of a high level policy group to include key stakeholders from different agencies was viewed as essential in getting the agreement and ownership of the measures needed to address this
3.	The integration of existing models with the probabilistic climate change models was seen as critical in determining which waterbodies may be particularly sensitive to the impact of lower summer flows. The validity of existing models will need to be undertaken first and there may be the need for the development of new WQ models.
4.	A better understanding of sewerage networks is needed to determine where blockages may develop and where the receiving watercourse may be particularly sensitive. This will require closer working relationships with engineers.
5.	There needs to be better integration of plans and programmes e.g planning policy and flood risk management. Closer working relationships with key stakeholders in these areas and a better understanding of each others issues is required.

Key Recommendations & Next Steps

Key agency actions identified

- During the River Basin Planning Cycle 1, data will need collected and collated to ensure that the knowledge base is available for implementing climate change scenarios in RBP Cycle 2. Some of the detailed actions above will support this.
- Existing water quality and hydrological models need to be re-visited and verified to ensure they are fit for purpose for re- running with data from the new probalistic climate change scenarios.
- An holistic catchment approach will be required to ensure that agriculture and land use planning, flooding and WFD all take an integrated approach in dealing with impacts of climate change. This may require the establishment of a high level policy group to take joint ownership of issues and to ensure joined up working between policy makers in each department. There may be a role for SNIFFER in facilitating initial conversations in this area.
- Forthcoming regulations and guidance documents need to be climate proofed. This will include abstraction, consenting and land use policy and guidance.

SNIFFER next steps:

- Investigate with NIEA and EPA contacts whether a series of small scale meetings pulling together land use planning, WFD and flooding staff would be useful to review the outcomes of the workshop and agree a way forward.
- Investigate whether the identified need to develop a protocol for land use is something that SNIFFER could coordinate.
- Investigate with NIEA and EPA contacts whether SNIFFER could support on the development of guidance to consent staff on how to incorporate climate change uncertainty within decision making.

Appendix 1

Delegate List

Ken Macken	EPA
Pat Macken	DEHLG
Brendan Forde	DOE PEPG
David Dodd	EPA
Donal Daly	EPA
Tommy Bree	ESBI
Paddy Boylan	Loughs Agency
Eoin Whelan	Met Éireann
Alvin Wilson	NIEA
Clifford Henry	NIEA
Dave Foster	NIEA
Gabriel Nelson	NIEA
Glen McCleary	NIEA
Enda Thompson	RBD Coordinator, Shannon RBD
Pat Canney	RBD Coordinator, Western RBD
Grace Glasgow	RPS
Diane Foster	SNIFFER
Kirsty Irving	SNIFFER
Vanessa Kind	SNIFFER
Roger Street	UKCIP
Fiona Mulholland	NIEA
Jim Bowman	EPA
Rebecca Quinn	EPA
Margaret Desmond	EPA
Philip McMurray	DOE PEPG
Paul McKendry	NIEA
Bob Davidson	NIEA
Neil McCulloch	NIEA
Murray Martin	RBD Co-ordinator, Monaghan County Council

Appendix 2

The following provides a detailed record of the discussions of the breakout groups.

Group 1: Biodiversity and non-native species and protected areas

Facilitator: Vanessa Kind

Rapporteur: Jim Bowman

Potential consequence of climate change	Expected impact on water environment	Existing Mechanisms	Action required in future cycles
Higher temperatures, changing hydrological conditions and water quality	More favourable conditions for non-native species, spread of non-native diseases	<ul style="list-style-type: none"> • Invasive Species Ireland (covers N and S) – 3 year project • Legislation is being improved to prevent deportation (e.g. in the South there is legislation to prevent movement of fish) • Risk assessment – list of most concern and WFD looks at top 15-20 species 	<ul style="list-style-type: none"> • Need for stricter more traditional style legislation to control invasive species • Tighten up trade legislation • Eradication programmes • Evaluate cycle 1 effectiveness of prevention mechanisms
Changes in seasonal cycles	Interactions between species, habitats and ecosystems (e.g. migration and change in fish spawning)	<ul style="list-style-type: none"> • Data on smolt migration is used • Data on flora/fauna on existing species and reference conditions 	<ul style="list-style-type: none"> • Ensure latest projections are brought into next cycles for climate proofing • Links to EU • Need to understand effects of land use in wider context to help achieve good status – need better relationships with farmers, forestry, agricultural policy • Issue of groundwater dependent terrestrial ecosystems

<p>Habitats may be affected by changes in land use</p>	<p>Introduction of new crops to suit new climates (e.g. increased maize growth and impacts on water), increased production of biofuels</p>	<ul style="list-style-type: none"> • This has not been identified as a pressure in cycle 1 • SEA exists, but is potentially superficial as a mechanism to adequately deal with this issue 	<ul style="list-style-type: none"> • Need to ensure 2020 targets for renewable energy takes account of impacts to river systems. Also are there sufficient protocols for offshore windfarms? • Need to establish protocols for land use policy. This is currently a new area of development and needs to link into water framework directive. There is no one managing this at field level currently • Spatial planning needs to consider land use change and development change associated with new crops • Crop change is not part of the decision making process – need to instigate • May need new measures, such as permitting/controls for crop growth • Need research into forecasting the potential impacts of crops • This is an area that would benefit from cross-regional cooperation (N,S plus Scotland and potentially the rest of the UK. This could be an area that SNIFFER could co-ordinate knowledge and research on). Pooling of resources and knowledge in order
<p>Increased riparian and coastal erosion</p>	<p>Key native species may be adversely affected</p>		<ul style="list-style-type: none"> • For cycle 2, will need to consider how habitats move

<ul style="list-style-type: none"> • Marine conditions may change • Changes in phenology • Changes in hydrology and precipitation 	<ul style="list-style-type: none"> • This may affect migration of species 	<ul style="list-style-type: none"> • Flooding National policy to guide actions 	
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Group 2: Abstraction and flow regulation

Facilitator: Kirsty Irving
Rapporteur: Donal Daly

Potential consequence of climate change	Expected impact on water environment	Uncertainties wrt this impact	Action required to increase certainty of impact
Increases in autumn and winter rainfall & Lower summer rainfall	Higher winter flows and lower summer flows	UK and RoI Met Offices recommend using as baseline data the 1961-1990 record in models. This will become less representative as getting old. There is a need for a more representative dataset	Met Offices asked to consider this issue and the need for more stations and to collect field data for rainfall, evapo-transpiration, & temperature.
		Check that the hydrological conceptual models include catchment storage (subsoil and groundwater) and the contribution this gives to river flows.	NIEA to liaise with UKCIP EPA to consult with the two modelling groups in RoI.
Increased likelihood of summer droughts & hotter summers	Increase in temperature in rivers and lakes, combined with lower flows.		

Action to begin to take this into account in River Basin Plans:

Potential consequence of climate change	Expected impact on water environment	Possible measures required	Action required	Who	When
Increases in autumn and winter rainfall & Lower summer rainfall	Higher winter flows and lower summer flows	More winter storage required to capture the high flows for use in the dry summers (water supply, compensation flows)	Investigate options for increased soft storage in upper catchments and link with flooding teams and land use planning teams to look this. Possible need for demonstration projects.	NIEA in collaboration with NI Rivers Agency and NIW	<i>Will have long lead in time. RBP Cycle 2 may be too early for implementing as measure but may be useful to be working towards proving the effectiveness of this measure during RBP 1 & 2 though pilot studies.</i>
		Abstraction licensing regimes must incorporate mechanisms to take this future change into account.	NIEA – undertaking a review of public water supply licences in late 2009. Should take account of UKCC09 predictions in this.	NIEA (water management)	2010

			EPA – When proposed licensing regime comes into play then mechanisms to take CC effects on available water resources should be incorporated; perhaps learning from the EA (E&W) experience.	EPA (water management)	??
		<p>In some situations greater use of groundwater may be a measure (where high storage holds the winter rains through into the summer.)</p> <p>However, in some areas the groundwater will also suffer from similar effects to the surface waters (ie low summer levels) and will not provide any mitigation to the effects of CC.</p>	To note.		

Increased likelihood of summer droughts & hotter summers	Increase in temperature in rivers and lakes, combined with lower flows.	Manage water demand.	Develop policies and measures around sustainable water use (metering, water efficiency etc) Pilot studies to show effectiveness	NIEA/Department for Regional Development/NIW EPA	<i>For implementation in RBP cycle 2.</i>
		Investigate thresholds at which the combined increase T and reduced Q affects biology.	NIEA and EPA to encourage and initiate studies to investigate this for key species.	?? Academics, agencies	<i>During RBP1 and 2 to bring as evidence for classification in RBP3</i>
Sea level rise	Increased risk of salination in some aquifers	<i>Not discussed</i>			

Group 3

Key Pressure 3: Diffuse and point source pollution

Facilitator: Diane Foster
 Rapporteur: Clifford Henry

The group were firstly asked if they wanted to add any further impacts to the table with impacts of climate change. They were happy with the impacts listed. The group were then asked to vote for the 3 impacts they thought were most important.

The group decided that the top two impacts were in fact very similar:

1. During periods of lower summer flow, some point source discharges may no longer be adequately diluted.
2. Lower summer river flows, along with higher temperatures reducing the dissolved oxygen in water bodies, will provide less dilution for discharges, leading to increased sewage treatment costs and energy usage.
3. higher river flows will reduce the impact of pollution in rivers, but may increase loading of pollutants to the sea. This could increase the risk of the failure of microbiological standards in bathing waters and shellfish waters.

The group then discussed the potential impacts in priority order. The following key issues were taken from the discussion.

Potential consequence of climate change	Action required	Who	When
higher river flows will reduce the impact of pollution in rivers, but may increase loading of pollutants to the sea. This could increase the risk of the failure of microbiological standards in bathing waters and shellfish waters	Examine sources of contamination and work out the sensitivities under different climate scenarios. Prioritise monitoring programme. This is a big public health issue. For diffuse pollution inputs develop some sort of warning system. Need a model for diffuse pollution with climate scenarios built in. Need to upgrade rainfall predictions and understand the key thresholds.	Issue for NI & ROI	RPB Cycle 2

	Overall need more work on the economics of different solutions.		
higher rainfall with more intense episodes may increase loads of diffuse pollutants from both urban and rural areas	Need a link with FRM plans and also better integration with planning policy. More use of SUDS though these are not compulsory	Issue for NI & ROI	
during periods of lower summer flow, some point source discharges may no longer be adequately diluted COMBINED WITH lower summer river flows, along with higher temperatures reducing the dissolved oxygen in water bodies, will provide less dilution for discharges, leading to increased sewage treatment costs and energy usage	<ul style="list-style-type: none"> • Work out what the current dilution is for current low flows and compare to predicted CC scenarios • Need to consider mixing zones and develop for other parameters such as priority substances • Sensitivity testing using a range of CC scenarios. Consider other factors such as economics. Need to develop guidance on how to choose the appropriate sensitivity and include CC in consent setting. • Need to consider how to balance water quality v's energy costs/production of GHG. Also statutory and voluntary requirements. • PPP STW's in ROI – how do they meet increased costs – there could be a penalty to tax payers for improvements. • Whole issue of being unable to review consent limits within a certain time period may be an issue 	Issue for ROI & NI Issue for ROI & NI	RBP Cycle 1 RBP Cycle 2

<p>lower summer flows can also cause reduction in sewer base flows , leading to blockages and potential flooding risks</p>	<p>Need to link in more with engineers and carry out a network evaluation to determine which systems are at greatest risk. Can then carry out a sensitivity analysis for the most sensitive sites backed up with technological solutions. eg. aeration in river</p>	<p>ROI & NI</p>	<p>RB Cycle 2</p>
<p>enhanced algal and plant growth due to increased temperature and increased nutrient run-off will exacerbate the effects of eutrophication. Increased temperature may also cause problems through dissolved oxygen depletion</p>	<p>We need a better understanding of eutrophication process – for e.g how long will it take systems to recover?</p> <ul style="list-style-type: none"> • Could consider actions such as linking slurry spreading in with appropriate weather conditions rather than calendar months as this doesn't work. Also need to prioritise the high risk areas. • There is real absence of a high level policy setting land use group to take ownership of these types of issues and provide a more holistic approach across agencies and departments. 	<p>ROI & NI</p>	<p>RBP Cycle 2</p>