Country Level Impacts of Climate Change (CLICC) Project

Proposed CLICC Template – UK Pilot DRAFT 03/12/2015

The CLICC templates are the result of a pilot study designed to test the feasibility of presenting country-level climate impacts information in a consistent and transparent manner. These CLICC pilot products are just the start of the CLICC process. The CLICC template is under continuous development and will improve over time.

The UK CLICC template presented here is at a first stage of development and has been populated with a variety of already published government information sources and supporting working papers. It is intended that this template is developed over time with updates in scientific approaches and knowledge and to meet the evolving needs of stakeholders. There are assumptions and limitations on the translation of this information into the CLICC Technical Approach being tested during the pilot phase. For further information on these assumptions and limitations, please see the relevant sections of the metadata in the template.

Table 1: Proposed template for recording and presenting Observed climate impacts

Observed climate impacts							
Sector	**Observed climate impacts**	**Global impact rating** (High / Medium / Low) *(Please see Technical Guidelines Section 4.2 for rating method)*	**National impact rating** (High / Medium / Low) *(Please see Technical Guidelines Section 4.2 for rating method)*	**Confidence rating** (Very low / Low / Medium / High) *(Please see Technical Guidelines Section 5.1.1 for rating method)*	**Data quality rating** (Low / Medium / High) *(Please see Technical Guidelines Section 5.1.2 for rating method)*	**Time period**	**Metadata identifier(s)** *(Please see Annex 1 below and Technical Guidelines Section 6 for further details)*
		(In order to embrace variation and uncertainties, ratings can include a range, e.g. Low-Medium, Medium-High, or Low-High)					
Flooding	- There has been an increase in the frequency and magnitude of flooding over the last 30 years, particularly in the west and north. These changes cannot be attributed to climate change.	**High**	**High**	**Low**	**Medium**	**1960-2013**	**Otherwise: 1.1** **Global/National Impact rating: 2.2**
Water resources: Water Supply & Dryness	- There is little evidence of changes in very low flows and no clear pattern of droughts over the last 50 years.	**Current impact unknown**	**Current impact unknown**	**Low**	**Medium**	**1960 - 2013**	**1.1**
Water resources: Water quality & ecology	- Over the last 30 years there has been an overall improvement in river water quality. These changes have not been linked to climate change. - There is some evidence that freshwater ecosystems may be responding to changes in water temperature, for example with reductions in some fish species in some catchments	**Current impact unknown**	**Current impact unknown**	**Low**	**Medium**	**1980-2013**	**1.1**

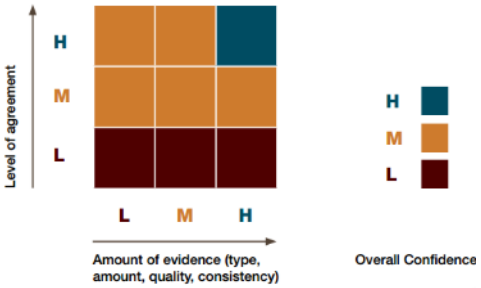
Table 2: Proposed template for recording and presenting Projected climate impacts

Projected climate impacts						
Sector	**Projected climate impacts**	**Impact rating** (High / Medium / Low) *(Please see Technical Guidelines Section 4.3 for rating method)*	**Confidence rating** (Very low / Low / Medium / High) *(Please see Technical Guidelines Section 5.1.1 for rating method)*	**Data quality rating** (Low / Medium / High) *(Please see Technical Guidelines Section 5.1.2 for rating method)*	**Time period**	**Metadata identifier(s)** *(Please see Annex 1 below and Technical Guidelines Section 6 for further details)*
		(In order to embrace variation and uncertainties, ratings can include a range, e.g. Low-Medium, Medium-High, or Low-High)				
Flooding	• Increase in the number of people exposed to significant likelihood of flooding. • Increase in the annual damage to properties due to flooding as well as an increase in average annual insurance claims for flood-related damage. • Increase in average annual cost to businesses due to disruption by flooding. • Increase in infrastructure exposed to significant likelihood of flooding.	**By 2050's: High** **By 2080's: High**	**Medium-High**	**High**	**Until 2020's** **Until 2050's** **Until 2080's**	**2.2**
Water resources: Water Supply & Dryness	• Reduction in average summer river flows • Decrease in water available for public water supply • The current water supply surplus is projected to turn into a water supply deficit • Increasing number of people living in areas affected by water supply-demand deficits • Reduction in number of sites with sustainable abstraction (based on water availability in the local catchment only)	**By 2050's: High** **By 2080's: High**	**Medium**	**High**	**Until 2020's** **Until 2050's** **Until 2080's**	**2.1**

Projected climate impacts						
Sector	**Projected climate impacts**	**Impact rating** (High / Medium / Low) *(Please see Technical Guidelines Section 4.3 for rating method)*	**Confidence rating** (Very low / Low / Medium / High) *(Please see Technical Guidelines Section 5.1.1 for rating method)*	**Data quality rating** (Low / Medium / High) *(Please see Technical Guidelines Section 5.1.2 for rating method)*	**Time period**	**Metadata identifier(s)** *(Please see Annex 1 below and Technical Guidelines Section 6 for further details)*
		(In order to embrace variation and uncertainties, ratings can include a range, e.g. Low-Medium, Medium-High, or Low-High)				
Water resources: Water quality & ecology	• An increase in the proportion of rivers in England and Wales potentially affected by a decline in water quality during summer months due to concentration of pollutants • Possible decrease in number of water bodies meeting their current Environmental Flow Indicator thresholds in south-west England	**By 2020's: Low** **By 2050's: Magnitude unknown** **By 2080's: Magnitude unknown**	**Low**	**High**	**Until 2020's** **Until 2050's** **Until 2080's**	**2.1**

Annex 1: Metadata table

The Metadata table supports Tables 1 and 2 and can be repeated for each row in the impact tables. The Data Quality Assessment scoring will need to be repeated for each **dataset** used only.

Metadata	
Metadata identifier	1.1
Explanation for *Impact* rating (Explanation of the impact rating given and how it relates to the specific information in question)	Source does not really provide information on Impact rating
Explanation for *Confidence* rating (Explanation of the confidence rating given and how it relates to the specific information in question)	The LWEC report cards using the following definition for confidence: Confidence level of high, medium, low defined in the information source. The level was assigned by scientific experts and reflects both the degree of agreement of scientific studies and the amount of information available (type, amount, quality, consistency).  The confidence ratings for observed impacts from the LWEC report cards are low, which in the case of flooding seems surprising in contrast to the high confidence ratings for projected flooding in the CCRA report. The working paper Wilby (2013) which focuses on flooding provides further information on why the certainty is low for observed flooding. For example, "Observed records show variability in flooding from one decade to the next but convincing long-term trends are harder to discern. Most studies are based on relatively short periods of data (often beginning in the 1960s) and predisposed to an upward trend by the extreme flooding outliers in year 2000 (and now 2012) associated with anomalously warm conditions in the North Atlantic."
Climate projections, emissions scenarios, or models used (if relevant)	**Synthesis report overall:** The 2009 UK climate projections (UKCP09) are the latest, most detailed projections for the UK. The projections are probabilistic and include 3 emissions scenarios, high, medium, low which correspond to the A1F1, A1B and B1 SRES scenarios. The range of available model outputs (10th to 90th percentile Range and across scenarios) were generally assessed in order to produce the reported information; this is not always clearly stated in the synthesis report, though further details are provided in the working papers. For example, the report card states "The latest UK climate projections, UKCP09, suggest that annual average rainfall may not change much over the twenty-first century" but this is a general statement summarizing information across a number of sources included in the working paper.
Source(s) (e.g., document, study, report, etc.)	**Synthesis source:** Living With Environmental Change, Water Climate Change Impacts Report Card 2012 -13

Metadata	
Metadata identifier	1.1
	This is supported by a technical synthesis document: Watts G, Battarbee R, Bloomfield J, Crossman J, Daccache A, Durance I, Elliot J, Garner G, Hannaford J, Hannah DM, Hess T, Jackson CR, Kay AL, Kernan M, Knox J, Mackay JD, Monteith DT, Ormerod SJ, Rance J, Stuart ME, Wade A, Wade SD, Weatherhead EK, Whitehead PG and Wilby RL (2013) Climate change **Working papers** are used to compile the Report Card. For example: Wilby, R.L. (2013), Working Technical Paper 10. Future flood – magnitude and frequency.
Datasets (if applicable)	N/A
Additional assumptions (if applicable and not covered by common ratings approach)	N/A
Additional limitations (if applicable and not covered by common ratings approach)	Although this source provided information on observed impacts, it did not provide information on the magnitude of those impacts. Metadata 2.1 and 2.2 have been used to fill this gap.

Data quality assessment		
Dataset: *(List the dataset assessed)*	Living With Environmental Change, Water Climate Change Impacts Report Card 2012 -13	
Data Quality Criteria	**Levels**	**Score**
1. Transparency and auditability	1. Data unavailable to public	
	2. Limited summary data available	2
	3. Full raw/primary data set and metadata available	
2. Verification	1. Unverified data	
	2. Limited verification checks in place	
	3. Detailed verification in place and documented	3
3. Frequency of updates	1. Sporadic	
	2. Every 3-5 years	2
	3. Annual or biennial	
4. Security	1. Future data collection discontinued	
	2. Future data collection uncertain	
	3. Future data collection secure	3
5. Spatial coverage	1. Partial national coverage	
	2. National coverage, some bias	2
	3. Full national coverage, including adjacent marine areas, if and where appropriate	
	TOTAL	12
Total scores should be rated as follows: 5 to 8 (Low); 9 to 12 (Medium); 13 to 15 (High)	**RATING**	Medium

Metadata

Metadata identifier	2.1
Explanation for *Impact* rating (Explanation of the impact rating given and how it relates to the specific information in question)	

Impact	Information used to determine impact rating (from Rance et al. 2012)
Projected impacts: Water Supply & Dryness	Water Sector Summary Report: Number of people living in areas affected by water supply-demand deficits: between 27 million and 59 million by the 2050s. Page xi: WA6 – Population affected by a supply-demand deficit: The estimate of the number of people potentially affected by a supply-demand deficit (when water resource zones fall into deficit and require demand or supply-side measures) is calculated from the information for each water company for the security of supply. The scenarios suggest that nationally (UK) the number of people affected could be as high as 83 million (81 to 85 million) by the 2080s (this includes population growth). This means that the majority (roughly 97%) of the UK population could be affected by rising costs of supply and potentially limitations on non-essential uses if the gap between supply and demand is not closed. *This does not equate to a projection of genuine regular water shortages but highlights that most people could be affected in some way by the increasing challenge of meeting public water supply needs.* Appendix 2 (Selection of Tier 2 consequences) in Rance et al. (2012) rates Water supply-demand deficit as having the highest magnitude rating in terms of economic impact; major drought has the highest magnitude rating in terms of environmental impact.
Projected impacts: Water quality & ecology	Page 121: As well as abstraction pressures, rivers and lakes could be affected by changes in water quality as lower summer flows have less capacity to dilute pollutants from point and diffuse sources. The assessment, based on expert elicitation, estimates that there could be 'very low' to 'low' consequences for the 2020s with a decline in status of up to 10% of rivers in England and Wales. Although changes in flow are important, water quality outcomes may be more affected by population pressures and land use change in the longer term.

Explanation for *Confidence* rating (Explanation of the confidence rating given and how it relates to the specific information in question)	Confidence is reported for each of the impacts included in the water summary report. Five impacts relating to water supplies are rated as "Medium"; Two impacts relating to water quality are rated as "low".
Climate projections, emissions scenarios, or models used (if relevant)	An important step within the UK CCRA process is to assess how risks will vary with changes in climate variables. The UK Climate Projections (UKCP09) were used to make this assessment. The UKCP09 website allow users to access information on plausible changes in 21st century climate for the United Kingdom. UKCP09 provides future climate projections for land and marine regions as well as observed (past) climate data for the UK. For the UK CCRA, the full UKCP09 data set was downloaded from the User Interface (available from: http://ukclimateprojections-ui.defra.gov.uk), for the 2020s, 2050s and

Metadata	
Metadata identifier	2.1
	2080s, for three emissions scenarios (high carbon emissions, A1FI; medium emissions, A1B; low emissions, B1; see http://ukclimateprojections.defra.gov.uk/content/view/1367/687/ for further details). Full details on how the probabilistic projections were produced can be found in the Climate change projections report (Murphy *et al*. (2009), *UK Climate Projections Science Report: Climate change projections*. Met Office Hadley Centre, Exeter). The following variables were used: • Change in mean annual temperature (degrees Celsius) (change in future 30-year average of annual average air temperature measured at 1.5 metres above ground level, from the baseline climate (1961-90) long-term average); • Change in annual average precipitation (%) (change in future annual average precipitation from the baseline climate (1961-90) long-term average).
Source(s) (e.g., document, study, report, etc.)	Summary Report: Climate Change Risk Assessment Summary: Water Rance et al. 2012, Climate Change Risk Assessment for the Water Sector, part of the UK Climate Change Risk Assessment (CCRA),
Datasets (if applicable)	
Additional assumptions (if applicable and not covered by common ratings approach)	The CCRA analysis is conducted on the basis of certain assumptions about demographics and adaptation, as stated below: "The results presented here do not take account of changes in society (e.g. population growth, economic growth and developments in new technologies); nor do they take account of responses to climate risks (e.g. future or planned Government policies or private adaptation investment plans). All results presented are based on current population figures and, unless indicated, apply to the whole UK."
Additional limitations (if applicable and not covered by common ratings approach)	There are a number of additional impacts included in the CCRA – we have just presented the most important impacts, namely, those included in the Water Sector Summary of the CCRA. It is also important to note that some of the projected impacts presented in the tables above are only true in a no-adaptation scenario. Due to adaptation measures, the magnitude of some of the impacts are likely to not be as severe. The UK's second CCRA will provide a fuller picture of risk including current adaptation plans.

<table>
<tr><th colspan="2">Metadata</th></tr>
<tr><td>Metadata identifier</td><td>2.2</td></tr>
<tr><td>Explanation for Impact rating
(Explanation of the impact rating given and how it relates to the specific information in question)</td><td>
<table>
<tr><th>Impact</th><th>Information used to determine impact rating (from Ramsbottom et al. 2012)</th></tr>
<tr><td>Observed increase in the frequency and magnitude of flooding over the last 30 years</td><td>From page xi: The number of people at risk of flooding (with an annual probability of 1.3% or greater) from rivers or the sea in England and Wales is projected to increase from the baseline of about 900,000.

From page xii: The Expected Annual Damage (EAD) to properties from river and tidal flooding in England and Wales is projected to increase from the baseline of about £1.2 billion (£640 million residential and £560 million non-residential).</td></tr>
<tr><td>Projected increase in the number of people exposed to significant likelihood of flooding and increase in the annual damage to properties due to flooding</td><td>From page xi: The number of people at risk of flooding (with an annual probability of 1.3% or greater) from rivers or the sea in England and Wales is projected to increase from the baseline of about 900,000 to:
• Between 1.3 million and 3.6 million by the 2050s
• Between 1.7 million and 5 million by the 2080s.

From page xii: The Expected Annual Damage (EAD) to properties from river and tidal flooding in England and Wales is projected to increase from the baseline of about £1.2 billion (£640 million residential and £560 million non-residential) to:
• Between £1.6 billion and £6.8 billion by the 2050s of which between £1.0 billion and £3.8 billion is for residential properties
• Between £2.1 billion and £12 billion by the 2080s of which between £1.2 billion and £6.5 billion is for residential properties.</td></tr>
</table>
</td></tr>
<tr><td>Explanation for Confidence rating
(Explanation of the confidence rating given and how it relates to the specific information in question)</td><td>Confidence is reported for each of the impacts included in the flooding and coastal erosion summary report. Five of the 13 impacts related to flooding are rated as “High”; the remaining three are rated as “Medium”, thus the overall rating is medium-high.</td></tr>
<tr><td>Climate projections, emissions scenarios, or models used (if relevant)</td><td>In the Floods and Coastal Erosion chapter of the CCRA, three epochs are used for the analysis in addition to present day (2020s, 2050s and 2080s). These three epochs are those used for the climate projections in UKCP09.
Future UKCP09 projections are available for three emissions scenarios: Low, Medium and High (which correspond to the IPCC B1, A1B and A1FI emission scenarios). In the 2020s only the Medium scenario is used since the projections are relatively insensitive to the choice of emissions scenario (due to the inertia of the climate system), but in the 2050s and 2080s projections from all three scenarios are analysed.
As the projections are probabilistic it is important to explore the full range of probability; to do this the 10%, 50% and 90% probability levels of the projections are used (labelled
p10, p50 and p90) to provide a range of possible future projections. Taking into consideration all of these possible choices of projections, the following thirteen selected climate scenarios are applied:
• 2020s : p10 Medium, p50 Medium, p90 Medium
• 2050s: p10 Low, p50 Low, p50 Medium, p50 High, p90 High</td></tr>
</table>

Metadata	
Metadata identifier	2.2
	• 2080s: p10 Low, p50 Low, p50 Medium, p50 High, p90 High.
Source(s) (e.g., document, study, report, etc.)	Summary Report: Climate Change Risk Assessment Summary: Flooding and Coastal Erosion Ramsbottom et al. 2012, Climate Change Risk Assessment for Floods and Coastal Erosion Sector, part of the UK Climate Change Risk Assessment (CCRA).
Datasets (if applicable)	n/a
Additional assumptions (if applicable and not covered by common ratings approach)	The CCRA analysis is conducted on the basis of certain assumptions about demographics and adaptation, as stated below: "The results presented here do not take account of changes in society (e.g. population growth, economic growth and developments in new technologies); nor do they take account of responses to climate risks (e.g. future or planned Government policies or private adaptation investment plans). All results presented are based on current population figures and, unless indicated, apply to the whole UK."
Additional limitations (if applicable and not covered by common ratings approach)	There are a number of additional impacts included in the CCRA – we have just presented the most important impacts, namely, those included in the Flooding and Coastal Erosion Summary of the CCRA. It is also important to note that some of the projected impacts presented in the tables above are only true in a no-adaptation scenario. Due to adaptation measures, the magnitude of some of the impacts are likely to not be as severe. The UK's second CCRA will provide a fuller picture of risk including current adaptation plans.

Data quality assessment		
Dataset: *(List the dataset assessed)*	Dataset 2: UK Climate Change Risk Assessment (CCRA) 2012	
Data Quality Criteria	**Levels**	**Score**
1. Transparency and auditability	1. Data unavailable to public	
	2. Limited summary data available	
	3. Full raw/primary data set and metadata available	3
2. Verification	1. Unverified data	
	2. Limited verification checks in place	
	3. Detailed verification in place and documented	3
3. Frequency of updates	1. Sporadic	
	2. Every 3-5 years	2
	3. Annual or biennial	
4. Security	1. Future data collection discontinued	
	2. Future data collection uncertain	
	3. Future data collection secure	3
5. Spatial coverage	1. Partial national coverage	
	2. National coverage, some bias	2
	3. Full national coverage, including adjacent marine areas, if and where appropriate	
	TOTAL	13
Total scores should be rated as follows: 5 to 8 (Low); 9 to 12 (Medium); 13 to 15 (High)	**RATING**	High

Annex 2: National classes of observed impacts

Note: The UK thresholds set below match those used in the UK CCRA. For example, Table A2.1 in Rance et al. (2012).

For the impact ratings in the template above, the impacts have been scored according to the highest scoring category below. For example, if an impact has a "high" social impact rating, the overall impact rating is "High" even if the economic and environmental rating is "low". For this reason, the overall impact ratings in the templates in the previous sections sometimes differ from the magnitude ratings in the UK CCRA which use a composite score across all three categories.

Future CLICC work should consider which approach is best and whether a composite impact rating across all three categories would be more accurate.

National class of observed impacts	Economic	Social	Environmental
High	**Major damage and disruption** • Major consequence on regional and national economy • Major cross-sector consequences • Major disruption or loss of national or international transport links • Major loss/gain of employment opportunities (~£100 million for a single event or per year)	**Potential for many fatalities or serious harm or major disruption** • Loss or major disruption to utilities • Major consequences on vulnerable groups • Increase in national health burden • Large reduction in community services • Major role for emergency services (~ millions affected, thousands harmed, hundreds of fatalities)	**Major or widespread loss or decline in long-term quality of valued habitats** • Major loss or decline in long-term quality of valued species/habitat/landscape • Major or long-term decline in status/ condition of sites of international/national significance • Widespread decline in land/water/air quality (~5,000 hectares lost/gained, ~10,000km river water quality affected)
Medium	**Moderate damage and disruption** • Widespread damage to property and infrastructure • Influence on regional economy • Consequences on operations and service provision initiating contingency plans • Minor disruption of national transport links • Moderate cross-sector consequences (~£10 million per event or year)	**Significant numbers affected** • Minor disruption to utilities • Increased inequality (e.g. through rising costs of service provision) • Consequences on health burden • Moderate reduction in community services • Moderate increased role for emergency services • Minor impacts on personal security (~hundreds of thousands affected,	**Medium term or moderate loss** • Important/medium-term consequences on species/habitat/landscape • Medium-term or moderate loss of quality/status of sites of national importance • Regional decline in land/water/air quality • Medium-term or Regional loss/decline in ecosystem services • Moderate cross-sector consequences (~500 hectares lost/gained, ~1,000km river water quality affected)

National **class of observed impacts**	**Economic**	**Social**	**Environmental**
		hundreds harmed, tens of fatalities)	
Low	**Minor damage and disruption** • Minor or very local consequences • Localised transport disruption (~£1 million per event or year)	**Small numbers affected/within coping range** • Small numbers affected • Small reduction in community services • Within 'coping range' (tens of thousands affected)	**Short-term / reversible / local effects** • Short-term/reversible effects on species/habitat/landscape or ecosystem services • Localised decline in land/water/air quality • Short-term loss/minor decline in quality/status of designated sites (~50 hectares lost/gained, ~100km river water quality affected)