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: Human Health							
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)					
Human health and Winter temperatures	• In recent decades, there have been reductions in cold-related morbidity and mortality reported in UK populations. There is little information on the contribution that observed climate changes may have provided to such reductions.	**High**	**High**	**Medium - High**	**Medium**	**1970 - 2013**	**1.1** **Impact rating: 3.1**
Human health and Summer temperatures	• Days with warm or hot weather and heatwaves (i.e. sustained episodes of very hot weather) increase the risk of deaths and morbidity in some groups among the UK population. • Across Europe in recent decades, the pollen season for some species has started earlier, consistent with the climate warming that has been observed and the earlier onset of spring. • Higher temperatures increase the number of cases of Salmonella infection H but overall the incidence is declining in the UK due to improvements in food hygiene. • Heatwaves impact the functionality of buildings used to deliver health care and have adverse effects on staff, patients and	**High**	**High**	**Medium-High**	**Medium**	**1970 - 2013**	**1.1** **Impact rating: 2.1**

Observed climate impacts: Human Health							
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)					
	equipment.						
Human health and Ozone levels	• Air pollution, particularly particulate matter (PM) and ground-level ozone, has adverse impacts on health. • Extreme air pollution episodes are associated with stagnation events and sometimes heatwaves.	**High**	**High**	**Medium-High**	**Medium**	**1970 - 2013**	**1.1** **Impact rating: 2.1**
Human health and Flooding and storms	• Flooding has a range of effects on human health including deaths from drowning, injuries and mental health impacts. • People who have been flooded report a range of health concerns, often made worse by difficulties occurring after the floods, such as being displaced from home or problems with insurance. • Flood events can interrupt health services and may also disrupt other essential infrastructure on which health services depend.	**Medium**	**Medium**	**Medium**	**Medium**	**1970 - 2013**	**1.1** **Impact rating: 2.1**

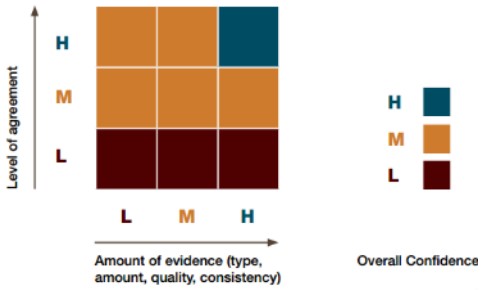
Table 2: Proposed template for recording and presenting Projected climate impacts

Projected climate impacts: Human Health						
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)				
Human Health and Winter temperatures	• Decrease in cold-related deaths each year as winter temperatures become milder	**Positive impact:** **By 2020's: Low** **By 2050's: Low** **By 2080's: Low**	**Medium**	**High**	**Until 2020's** **Until 2050's** **Until 2080's**	**2.1** **Impact rating: 3.1**
Human Health and Summer temperatures	• Increase in heat-related deaths each year as a result of rising temperatures, mainly during the summer. The highest levels of excess mortality are typically observed in the southern regions, with the South-East and London accounting for approximately one third of the total UK estimates given.	**By 2020's: High** **By 2050's: High** **By 2080's: High**	**High**	**High**	**Until 2020's** **Until 2050's** **Until 2080's**	**2.1**
Human Health and Ozone levels	• Increase in frequency and intensity of summer air pollution (ozone) as a result of increased average temperatures. • Increase in deaths each year caused by ground-level ozone. • Increase in hospital admissions each year caused by ground-level ozone	**By 2020's: Magnitude unknown** **By 2050's: Magnitude unknown** **By 2080's: High**	**Medium**	**High**	**Until 2020's** **Until 2050's** **Until 2080's**	**2.1**
Human	• Increase in deaths each year due to	**By 2020's: High**	**Medium**	**High**	**Until 2020's**	**2.1**

Projected climate impacts: Human Health						
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)				
Health and Flooding and Storms	flooding and storms • Increase in injuries each year due to flooding and storms • Increase in people affected by flood-related mental health effects each year	**By 2050's: High** **By 2080's: High**			**Until 2050's** **Until 2080's**	
Human Health and Sunlight	• Change in ground levels of UV: potentially greater risk of skin cancer in south, reducing further north.	**By 2020's: Magnitude unknown** **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 It does include adaptation measures which should reduce the risk to public health from certain climate events. For example: - Low-energy and relatively low-cost options are available to adapt existing hospitals and design new buildings for improved thermal comfort and operational resilience during heatwaves. - The health system has updated surveillance and monitoring systems to improve responses to extreme weather.
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). 
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.
Source(s) (e.g., document, study, report, etc.)	**Synthesis source:** Living With Environmental Change, Health Climate Change Impacts Report Card 2015. **Working papers** are used to compile the Report Card and have been used to provide further information in the CLICC template. For example: Hajat, Shakoor (2015), Health Climate Change impacts report card technical paper: Health effects of milder winters.
Datasets (if applicable)	N/A
Additional assumptions (if applicable	N/A

Metadata	
Metadata identifier	1.1
and not covered by common ratings approach)	
Additional limitations (if applicable and not covered by common ratings approach)	It should be noted that although the observed impacts discussed in the LWEC report card are attributable to a particular climate hazard (e.g. higher temperatures), they are not necessarily attributed to climate change. Also, this source does not provide information on the magnitude of the observed impacts. Metadata 2.1 and 3.1 were 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)	

Observed impact category	Source information from Hames & Vardoulakis (2012)
Human health and Winter temperatures	Impact rating taken from Hajat et al. (2013) – Metadata identifier 3.1.
Human health and Summer temperatures	CCRA Health Sector Summary: The effects of heat currently account for an average of around 1100 deaths and many thousand patient days in hospital every year, with much larger figures in exceptionally hot years. Around 2000 excess deaths were recorded in England and Wales during the heatwave of August 2003.
Human health and Ozone levels	Page xi: At present, ground-level ozone is estimated to cause around 10,000 premature deaths and 33,000 respiratory hospital admissions per year in the UK. These estimates, based on a linear non-threshold exposure-response relationship, are in good agreement with ozone-related mortality rates reported by Stedman and Kent (2008) but larger in the case of hospitalisations, probably due to the regional baseline morbidity rates used in the present study. Future concentrations of ozone depend on a complex relationship between future emissions of nitrogen oxides and volatile organic compounds (the main ozone precursor gases), synoptic weather circulation, local weather conditions, and land use patterns.
Human health and Flooding and storms	CCRA Health Sector Summary: Flooding (all types) and coastal wave activity result in an average of 18 deaths each year. Sea level rises and more intense downpours may lead to an increase in this figure. Moreover, evidence is emerging that flooding can have a substantial impact on mental health, causing anxiety and depression, which can be long-lasting in some cases. As 7% of hospitals and 9% of surgeries and health centres in England, for example, are built in flood risk areas, floods may also increasingly disrupt healthcare services.

Projected impact category	Source information from Hames & Vardoulakis (2012)
Human Health and Winter temperatures	Impact rating taken from Hajat et al. (2013) – Metadata identifier 3.1.
Human Health and Summer temperatures	Page 145: For the available population projections, it is estimated that there could be in the region of 130 to 1670 additional premature deaths per year as a result of increasing temperatures by the 2020s, increasing to between 580 to 5,900 by the 2050s and

Metadata		
Metadata identifier	2.1	
		1,040 to 14,400 by the 2080s.
	Human Health and Ozone levels	Page 146: From an assessment of the results, the number of premature deaths on an annual basis is projected to increase on a UK basis by between 650-2,900 by the 2080s. For additional (or brought forward) respiratory hospital admissions, these are anticipated to increase by between 2,300-10,000 by the 2080s. For the low, principal and high population growths, these figures are anticipated to increase by approximately 2%, 40% and 84% respectively. On a regional basis, these ratios relative to the populations are approximately 30-40% lower in the North East and Wales regions and approximately 60% larger in the South East.
	Human Health and Flooding and Storms	Page 146: The overall number of deaths due to extreme event flooding and storms in the UK currently are noted to be small. Although a significant and "newsworthy" event, the primary effects of flooding on people are disruption, displacement, mental stress, etc. Based on the analysis carried out in this report, 4-17, 6-34 and 13-69 additional deaths are estimated to occur on an annual basis by the 2020s, 2050s and 2080s respectively due to floods and storms potentially associated with climate change based on the current population. These rates rise to 5-21, 8-49 and 14-98 when the various population growth estimates are taken into account. These deaths are likely to be clustered to a small number of events for coastal flooding, perhaps 2 or 3 large events every 100-1,000 years. Page 146: Assessing the number of people who go from a GHQ-12 score of below 4 to 4 or above, in the region of 3,000 to 4,000 additional people per year are anticipated to be affected by psychological distress due to flooding in the 2020s. This may rise to between 4,000 to 7,000 by the 2050s and 5,000 to 8,000 by the 2080s. These figures, which have been given for England and Wales only, are anticipated to increase in direct proportion to the number of properties flooded under the different socio-economic futures considered. Page 147: Based on the analysis carried out in this report, it is estimated that approximately 80- 340, 120-680 and 270-1,380 additional injuries may occur due to flooding on an annual basis by the 2020s, 2050s and 2080s respectively. These rates rise to approximately 100-420, 160-980 and 290-1,960 when the various population growth estimates are taken into account.
	Human Health and Sunlight	Magnitude is unknown
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 health summary report.	

Metadata	
Metadata identifier	2.1
Climate projections, emissions scenarios, or models used (if relevant)	The CCRA was done by developing 'response functions' that linked changes in climate with specific consequences based on analysis of historic data, the use of models or expert elicitation. The UKCP09 climate projections and other climate models were then applied to assess future risks. The response functions were used to assess the magnitude of consequences the UK could face due to climate change by making use of the UKCP09 climate projections. This step used the response functions to provide estimates of future risk under three different 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) and three future 30-year time periods (centred on the 2020s, 2050s and 2080s) for three probability levels (10, 50 and 90 percent, see http://ukclimateprojections.defra.gov.uk/content/view/1277/500/ for further details), associated with single or combined climate variables. The probability levels are cumulative and denote the degree of confidence in the change given; for example 90% suggests that it is thought very unlikely that the change will be higher than this; 50% suggests that it is thought equally likely that the change will be higher or lower than this; and 10% suggests that it is thought very unlikely that the change will be lower than this. 90% does not mean that the change is 90% likely to occur, for example. All of the changes given in the UKCP09 projections are from a 1961-1990 baseline. For the health sector, these were adjusted to give a current day baseline.
Source(s) (e.g., document, study, report, etc.)	Summary Report: Climate Change Risk Assessment Summary: Health Full Health Sector report: Hames, D., and Vardoulakis, S., 2012, Climate Change Risk Assessment for the Health Sector, part of the UK Climate Change Risk Assessment (CCRA). Available from: https://www.gov.uk/government/publications/uk-climate-change-risk-assessment-government-report
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)	The health chapter of the CCRA emphasizes that the health sector in the UK will potentially be affected by a wide variety of social and economic factors. Some of these (e.g. the health needs of an expanding and ageing population) may be more challenging than climate change. Adaptation options are also particularly important in the health sector. Risks for the health sector may be modified by adaptation actions within other sectors (e.g. adaptations in the build environment). There are a number of additional impacts included in the CCRA – we have just presented the most important impacts, namely, those included in the Health Sector Summary of the CCRA.

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

Metadata

Metadata identifier	3.1
Explanation for *Impact* rating (Explanation of the impact rating given and how it relates to the specific information in question)	See tables below
Explanation for *Confidence* rating (Explanation of the confidence rating given and how it relates to the specific information in question)	N/A
Climate projections, emissions scenarios, or models used (if relevant)	Projected daily mean temperatures for the periods 2000–2009, 2020–2029, 2050–2059 and 2080–2089 were obtained from the British Atmospheric Data Centre. This contains output from an ensemble of 10 available variants of the Met Office Hadley Centre Regional Climate Model (HadRM3-PPE-UK) designed to simulate regional climate in the UK for historical

Observed impact category	Source information from Hajat et al.(2013)
Human health and Winter temperatures	Page 1: In the absence of any adaptation of the population, heat-related deaths would be expected to rise by around 257% by the 2050s from a current annual baseline of around 2000 deaths, and cold-related mortality would decline by 2% from a baseline of around 41,000 deaths.

Projected impact category	Source information from Hajat et al.(2013)
Human Health and Winter temperatures	Page 5: The estimated reduction in cold risk is similar to that in a previous study which modelled a 2–3% reduction in wintertime deaths in England and Wales by 2050. … However, the same work, which did not consider future demographic changes, observed a 25% reduction in cold-related deaths. Our work suggests that reductions in cold-related mortality are unlikely to be this large, partly due to future population ageing. Indeed, when demographic changes are not factored into our estimates, a 26% reduction in cold deaths was observed by the 2050s.

Metadata	
Metadata identifier	3.1
	emissions and for the medium emissions scenario (SRES A1B) for the period from 1950 to 2100. This was then used to dynamically downscale global climate model results to a horizontal resolution of 25 km for use in the UKCP09 climate projections as part of the UK Climate Impacts programme. A subset of nine regional climate model variants corresponding to climate sensitivity in the range of 2.6–4.9°C was used. Temperature was calculated separately for each variant by taking the mean of the daily temperature for each grid square which fell within a particular regional boundary. This produced nine daily temperature time-series per region.
Source(s) (e.g., document, study, report, etc.)	Hajat, S., Vardoulakis, S., Heaviside, C., Eggen, B. (2013). Research Report: Climate change effects on human health: projections of temperature-related mortality for the UK during the 2020s, 2050s and 2080s.
Datasets (if applicable)	n/a
Additional assumptions (if applicable and not covered by common ratings approach)	Population data were extracted from the 2010-based principal projections for the UK. They consist of annual projections from 2010 to 2036, and then to 2081 in five-yearly increments. Projections were aggregated by age group and for four decades (2000s, 2020s, 2050s and 2080s). If the relevant year was not available, population estimates were obtained through quadratic interpolation. Although the total projections for most regions are relatively smooth and show growth until the end of this century (total UK population is projected to increase from 60 million in mid-2000s to 89 million by mid-2080s), individual age groups can show non-linearity. Future mortality trends among the oldest age groups are estimated by calculating mortality improvements (by age and gender) in recent years and then extrapolated for the very oldest age groups due to sparseness of data and edge effects; in future, mortality rates among the oldest age groups will continue to fall. The expansion of the 85+ age group from around 2% of the total population in mid-2000s to 9% by the mid-2080s demonstrates the ageing of the UK population expected this century.
Additional limitations (if applicable and not covered by common ratings approach)	

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)