Met Office
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Executive Summary: The impact of Climate change on the Department for Work and Pensions

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Executive Summary

This project analyses the components of climate change that were deemed high priority for DWP in the previous scoping study carried out with the Met Office and forms the beginning of the Department for Work and Pensions (DWP) strategy to prepare and adapt to the challenges from climate change. In this report the following weather parameters are analysed:

- Ø cold spells with respect to their impact on cold weather payments and vulnerable sectors of society
- Ø heat waves of different severity; e.g. from levels where temperatures will affect general population well being and DWP staff will be unable to carry out their work, to temperatures which will be dangerous for vulnerable members of the public.
- Ø precipitation; how this may lead to increased risk of flooding and periods of drought. Either eventuality may lead to hardship with regard to basics, such as energy and food prices. It should be noted however, that these factors are also affected by global climate change which is outside the scope of this project.

The analysis uses the distribution of probable outcomes from the latest UK climate projections (UKCP09) for the high and medium emissions scenarios. Each possible outcome has been assigned a level of probability based on observations of the current climate, latest understanding of the science and expert judgement. The area of climate science is a rapidly progressing field and these projections could change in the future as understanding of the climate system develops and more processes are included in climate models or if actual emissions are significantly different from the scenarios used in the projections. There are two stages to the analysis. The first takes into consideration the whole of the UK and the second involves a study of nine specified areas of the UK selected to provide a more focussed analysis and a good spread of densely populated regions across the UK. Each analysis has been completed for the 30-year means centred on the 2020s and 2050s.

A further vulnerability analysis combines climate information with DWP information on populations and estates.

Cold temperatures

Mean minimum temperatures in winter for the 2020s are likely to increase across England and Wales. It is very likely this change will be less than 2˚C following a medium or high emissions scenario. Parts of central and southern Scotland are less likely to experience an increase in temperatures whilst Scotland in general is the main region where mean minimum temperatures most likely to be less than 0˚C.

Following a medium or high emissions scenario, the mean minimum temperatures in winter in the 2050s are likely to increase across England, Wales and southern Scotland. It is very likely this change will be less than 3˚C. Parts of central and northern Scotland are less likely to experience as much of an increase in temperatures as other regions of the UK. In the 2050s Scotland is the only part of the UK likely to still have a mean minimum temperature in winter of less than 0˚C.

High temperatures

The analyses of high temperatures were separated into 3 categories:

- 23 to 26˚C: potential implications for general public, DWP staff and operations.
- 27 to 31˚C: increasing potential for health implications to general public DWP staff and operations.
- Above 32˚C: greater potential for health risks to vulnerable members of society.

Mean maximum temperatures in summer in the 2020s are likely to be less than 20˚C across Scotland and parts of Wales. England is more likely to experience temperatures above 20˚C. The climate change signal on this timescale is smaller than the natural variability so there could be spells where the temperatures both daily maximum and night time temperatures exceed these values.

Mean maximum temperatures in summer in the 2050s are very likely to be less than 23˚C across Scotland and parts of Wales. England is more likely to experience temperatures above 23˚C but mean maximum summer temperatures are unlikely to be as high as 26˚C.

Mean minimum summer temperatures are mean summer night time temperatures. Night time temperatures are important in understanding heatstress because cool night time temperatures provide respite from high daytime temperatures. Minimum summer temperatures are unlikely to be above 14˚C for most of the UK.

These predictions may underestimate the changes in these regions as the UKCP09 assumes the patterns of Urban Heat Island effect are the same as the present day and changes in energy consumption in urban areas that could have an impact and are not accounted for in UKCP09.

The main locations that could see a significant increase in the maximum summer temperatures by the 2020s in all three categories of heat wave as described here are London and Bristol. These areas are heavily urbanised and as a result further work would be recommended to look at these regions more closely.

The analysis suggests that there could be a strong geographical north south split in the number of heat waves experienced in the 2020s. This becomes less well defined by the 2050s particularly for the category 1 and 2 heat waves; category 3 heat waves in Scotland and northern England are still rare.

Precipitation

The analysis of future rainfall included consideration of both heavy winter rainfall and low summer rainfall.

The mean winter rainfall is likely to increase throughout England and Wales for both the 2020s and 2050s. Scotland is the main region with a low probability of an increase in winter rainfall even in the 2050s.

There is likely to be an increase in the amount of rain on the wettest day in winter in the 2050s compared with the baseline. This could be important in areas prone to flash flooding. In general the 2020s shows a uniform pattern of increased precipitation on the wettest day. In the 2050s the increases in precipitation on the wettest day are much more likely across England and Wales.

A heavy rainfall episode was classified using the average rainfall for each region for a period of 5 days as the threshold. This was chosen because even the average

rainfall for this period could present a flood risk but this would depend on other factors at the time. Each of the 9 regions had a similar number of minimum events in the baseline and future but the mean and maximum events show a small increase.

The mean precipitation in summer is expected to reduce in most areas of the UK although there is a lower probability of a reduction of more than 20 percent in rainfall in Scotland than in England and Wales.

In general the local analysis of both scenarios indicates a potential increase in the number of 15-day periods with below average precipitation for both time periods. This increase is visible in the mean and maximum of the distributions. The minimum are less certain showing either little change or in some cases a potential decrease in the number of 15 day periods with below average rainfall for some of the locations.

Vulnerability Analysis

The vulnerability analysis considered weather parameters; cold winter temperatures; high summer temperatures; and precipitation in summer and winter, for the current and future climate, in conjunction with data provided on the number of qualifiers for the cold weather payment in a given postcode. The high and medium emissions scenarios from UKCP09 were used to represent the range of possible outcomes for the 2020s and 2050s in the vulnerability analysis.

The cold weather payment qualifiers for each postcode were used for the purpose of this study as an indicator of the general vulnerability of a population. This assumes that the number of vulnerable people in a given area will remain the same into the future. The most populated areas of the UK tend to have the larger numbers of vulnerable people e.g. London, Birmingham, Nottingham. Displaying socio-economic information together with climate information enabled those regions with significant changes in climate that were coincident with large numbers of vulnerable people to be identified. Figure 6.5 is an example plot from the report showing a range of mean maximum summer temperatures from the projections alongside the 1971-2000 baseline for the 2050s. Similar plots are included in the report for the other weather parameters considered.

The winter minimum temperatures are generally expected to increase but because of natural variability this may not represent a change in the number of cold weather

payment triggers. By the 2050s, the spread in possibilities is such that there may be no region with mean minimum daily temperatures that are below 0˚C. This analysis does not mean that temperatures of less than 0˚C will never occur by the 2050s but the changes in mean minimum temperature could mean that the 0˚C threshold is no longer appropriate for the definition of the cold weather payment.

The summer mean maximum temperatures are projected to increase the most in regions where the population of vulnerable people (as indicated by the number of cold weather payment qualifiers) is largest e.g. the south of England. There were no regions with a mean maximum summer temperature that exceeded 32˚C but this does not mean that individual events with temperatures much greater than this will never occur.

The projections of precipitation for both summer and winter have a large range of possibilities. In general the projections suggest a reduction of summer rainfall particularly in the regions with large vulnerable populations; however a moderate increase in rainfall cannot be completely ruled out. The analysis of the wettest day in winter suggests that there could be significant increases in rainfall on the wettest day; this increase could be as much as 44 percent greater than the baseline. This could be significant in regions with more vulnerable people that are inadequately protected against flooding.

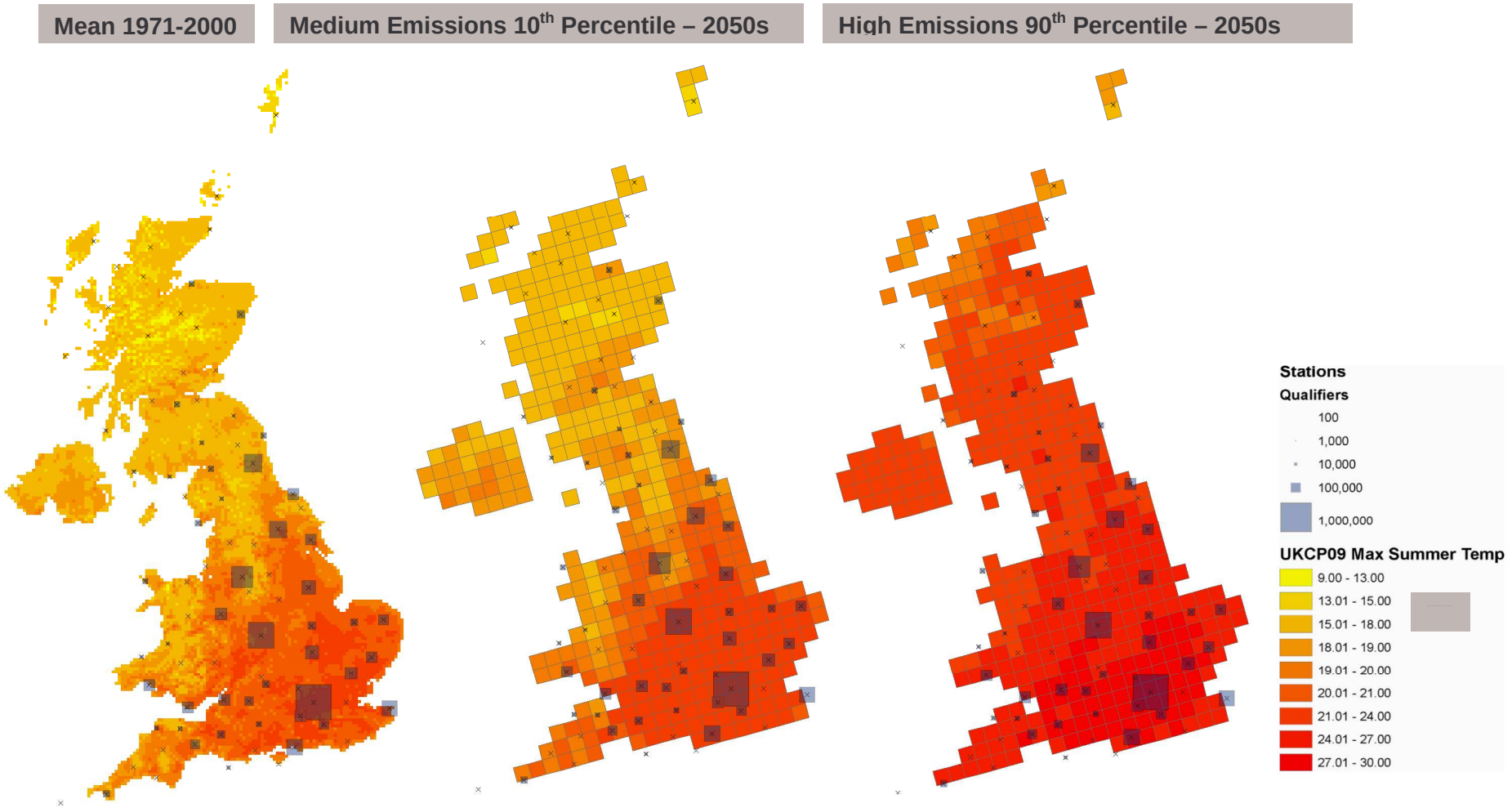

Figure 0.1 Mean maximum summer temperatures (˚C) with the cold weather payment stations (crosses) and the population of cold weather payment qualifiers (blue squares of different sizes).

DWP Estate analysis

The analysis of the impact of climate change on DWP buildings considered weather parameters; cold winter temperatures, high summer temperatures and precipitation in summer and winter, for the current and future climate, in conjunction with information on DWP business critical buildings and their associated floodrisk. Displaying this information together enabled the risk of the current business critical buildings to be viewed and evaluated alongside the projected changes in climate. The high and medium emissions scenarios from UKCP09 were used to represent the range of possible outcomes for the 2020s and 2050s in the analysis of DWP buildings. Figure 7.6 is an example plot from the report showing mean percentage change in the wettest day in winter compared with the 1961 -1990 baseline for the 2020s. Similar plots are included in the report for the other weather parameters considered.

Many of the northern buildings are currently located in, or in close proximity to, regions with mean minimum temperatures at 0˚C. This is still possible into the 2050s. However, given a high emissions scenario the projections suggest that all the business critical DWP buildings could be in regions with a mean minimum winter temperature of above 0˚C, even by the 2020s. By the 2050s this could also apply to remote regions of Scotland. This analysis does not mean that temperatures of less than 0˚C will not affect DWP buildings by the 2050s. Natural variability could mean daily fluctuations in temperatures giving minimum winter temperatures that are much less than or much greater than 0˚C. This means that buildings will still need to be resilient to potential cold spells even though the trend may indicate increasing mean minimum winter temperatures.

The projections of precipitation for both summer and winter have a large range of possibilities. In general the projections suggest a reduction of summer rainfall but there is a possibility of an increase in summer rainfall. The analysis of the wettest day in winter suggests that there could be an increase in the precipitation on the wettest day in winter compared with the baseline but some areas could experience a moderate reduction in precipitation on the wettest day.

A significant proportion of the business critical buildings supplied for the purpose of this project, are at a medium risk of flooding. An increase in mean precipitation in summer or the amount of precipitation on the wettest day of winter could represent a change in the distribution of rainfall which could put these buildings in the high flood risk category.

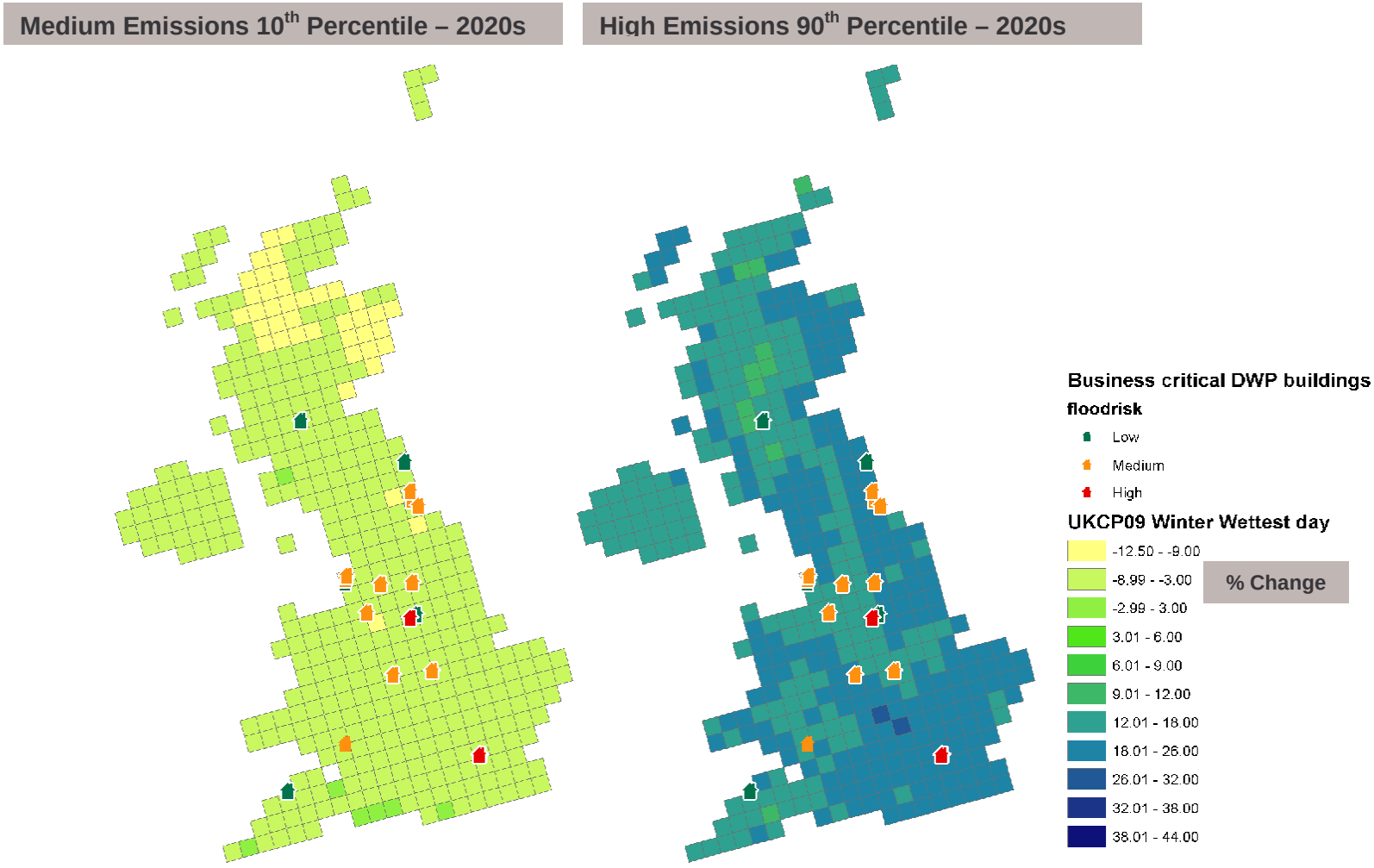

Figure 0.1 Mean percentage change in the wettest day in winter compared with baseline from 1961 – 1990 with the business critical DWP buildings coloured according to their associated flood risk (red is high, amber is medium and green is low).