

Climate Change Projections West Yorkshire

August 2026



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Introduction

- This slide deck outlines the findings of a climate hazard analysis for the West Yorkshire region.
- This work forms part of research being conducted by CAG Consultants on behalf of WYCA.



Method

This climate hazard assessment is the **first step** in developing a climate adaptation plan



Climate Hazard Assessment

These are large scale and long-term changes to temperature, rain and sea level driven by climate change.

(This slide deck)



Risk Prioritisation and Mitigation

Once the local risks and opportunities are understood, they are short-listed based on impact and likelihood, and mitigating actions are identified.



Adaptation Plan Development

In this step interventions to address the priority risks and opportunities are defined and integrated into management systems.

(Not in the scope of this current commission.)

Method



The three main climate variables for a climate hazard assessment are temperature, precipitation, and sea level rise. For West Yorkshire, we do not need to assess direct impacts from sea level rise.



Within each of the main variables, there are sub-sets of variables that need to be considered. These include maximum temperature variation, monthly precipitation projections, annual heating degree days, etc.



The data presented below is for a sub-set of variables of changing temperature and rainfall patterns.

- All data has been sourced directly from [The UK Met Office climate data portal](#).
- Data is provided for 'median', 'upper', and 'lower' values. The "median" represents the central value among an ensemble of model projections, while the "lower" and "upper" values correspond to the second lowest and second highest projections, respectively, offering a range of plausible future conditions.
- The results are calculated by averaging the four 12km² grids that cover the site.



Global Warming Levels

- The data in this presentation uses global warming levels (GWLs).
 - GWLs are a way to categorise average global temperature increase relative to pre-industrial (1850-1900) levels.
 - GWLs are used as benchmarks for understanding how different levels of warming (such as 1.5°C, 2°C, and beyond) can affect weather patterns, ecosystems, sea levels, and human livelihoods worldwide.
- The GWLs used below are 1.5°C, 2.0°C, 2.5°C, 3.0°C and 4.0°C above the pre-industrial period.
 - The approximate timeframes for each GWL are as follows:
 - Baseline (1981-2000)
 - Recent Past (2001-2020)
 - 1.5°C change (2021 – 2040)
 - 2°C change (2037 – 2056)
 - 3°C change (2066 – 2085)
 - 2.5°C change (2052 – 2071)
 - 4°C change (2100 and beyond)

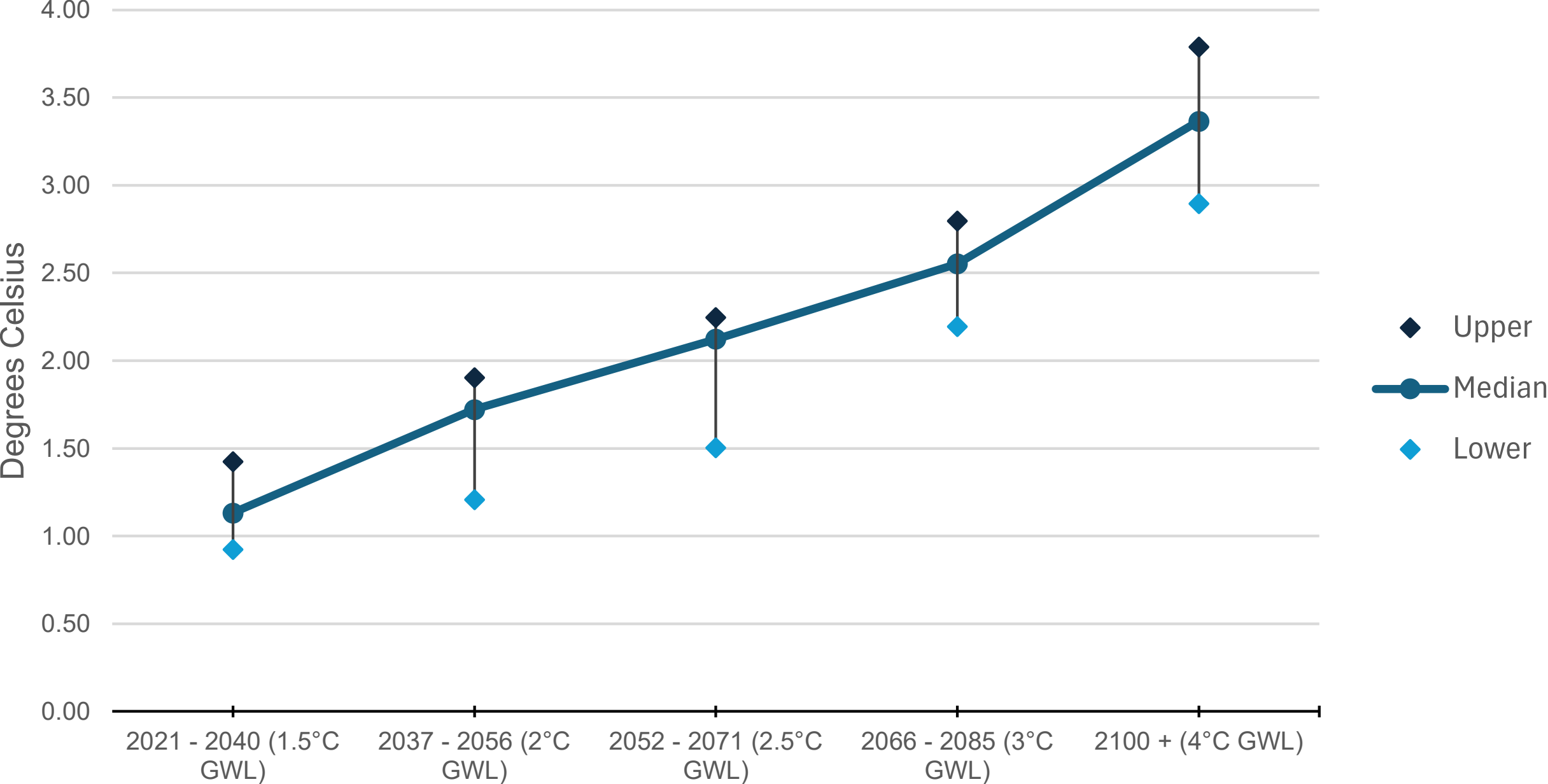
Climate Hazard Data

Annual Average Temperature Change

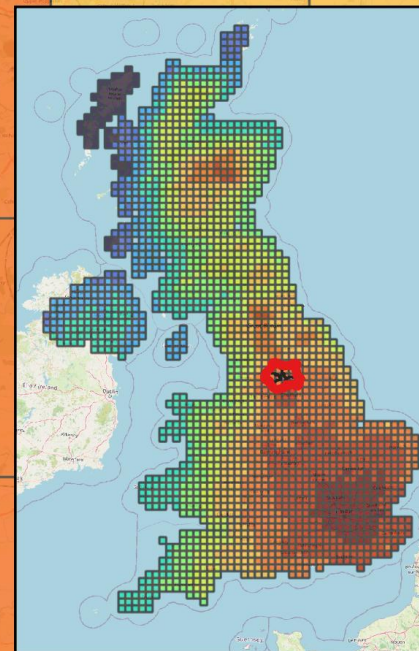
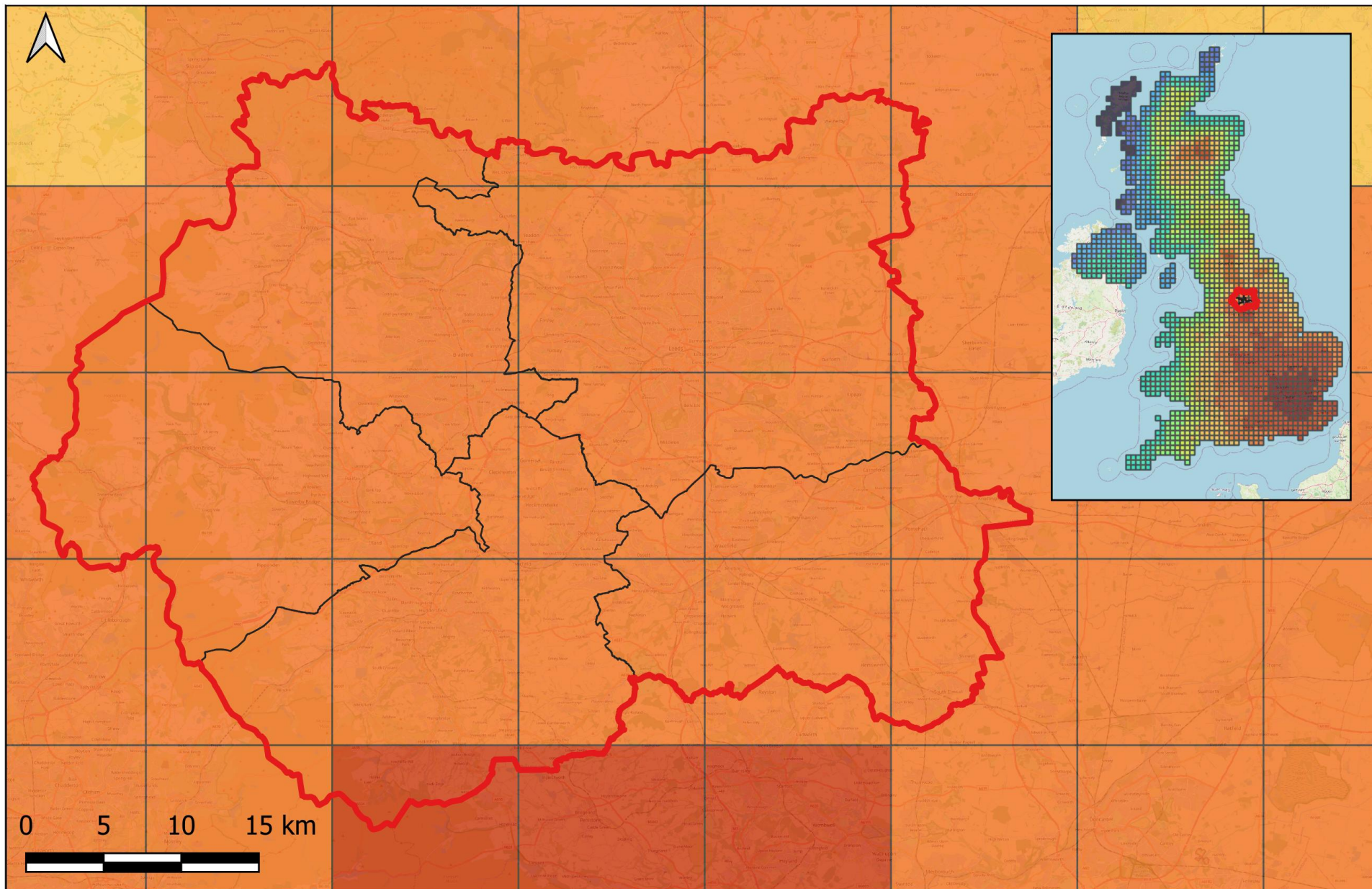
- This dataset shows projected changes in annual average temperature across West Yorkshire. It helps the region anticipate changing heating and cooling demand, overheating risks, impacts on health and productivity, and the need for climate-resilient buildings and infrastructure. As annual averages, the projections show long-term trends rather than extreme daily temperatures.

Range	Upper	Median	Lower
2021 - 2040 (1.5°C GWL)	1.42	1.13	0.92
2037 - 2056 (2°C GWL)	1.90	1.72	1.21
2052 - 2071 (2.5°C GWL)	2.25	2.12	1.50
2066 - 2085 (3°C GWL)	2.80	2.55	2.20
2100 + (4°C GWL)	3.79	3.37	2.90

West Yorkshire Annual Average Temperature Change - Projections (12km)



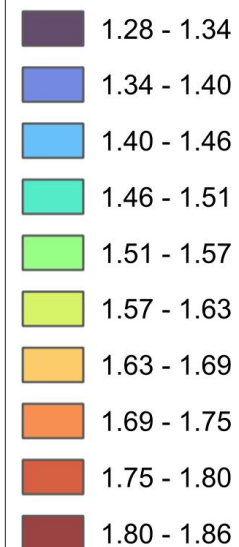
Annual Average Temperature Change (°C)



Legend

Met Data Projections

Annual Average Temperature Change (°C)



OpenStreetMap

Global Warming Level 2°C Median

Scale 1:400000

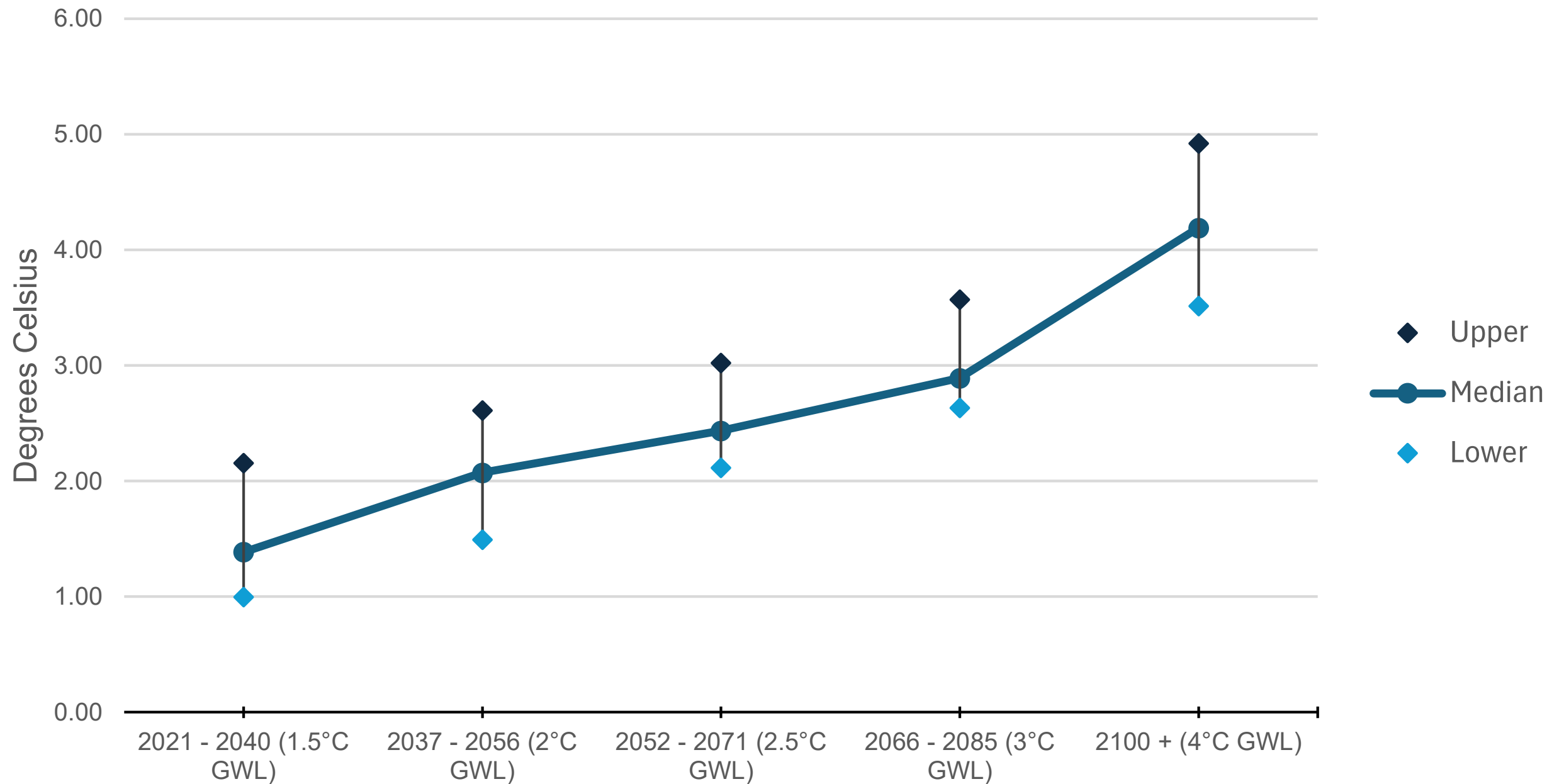
Date: 2026-07-30

Summer Average Temperature Change

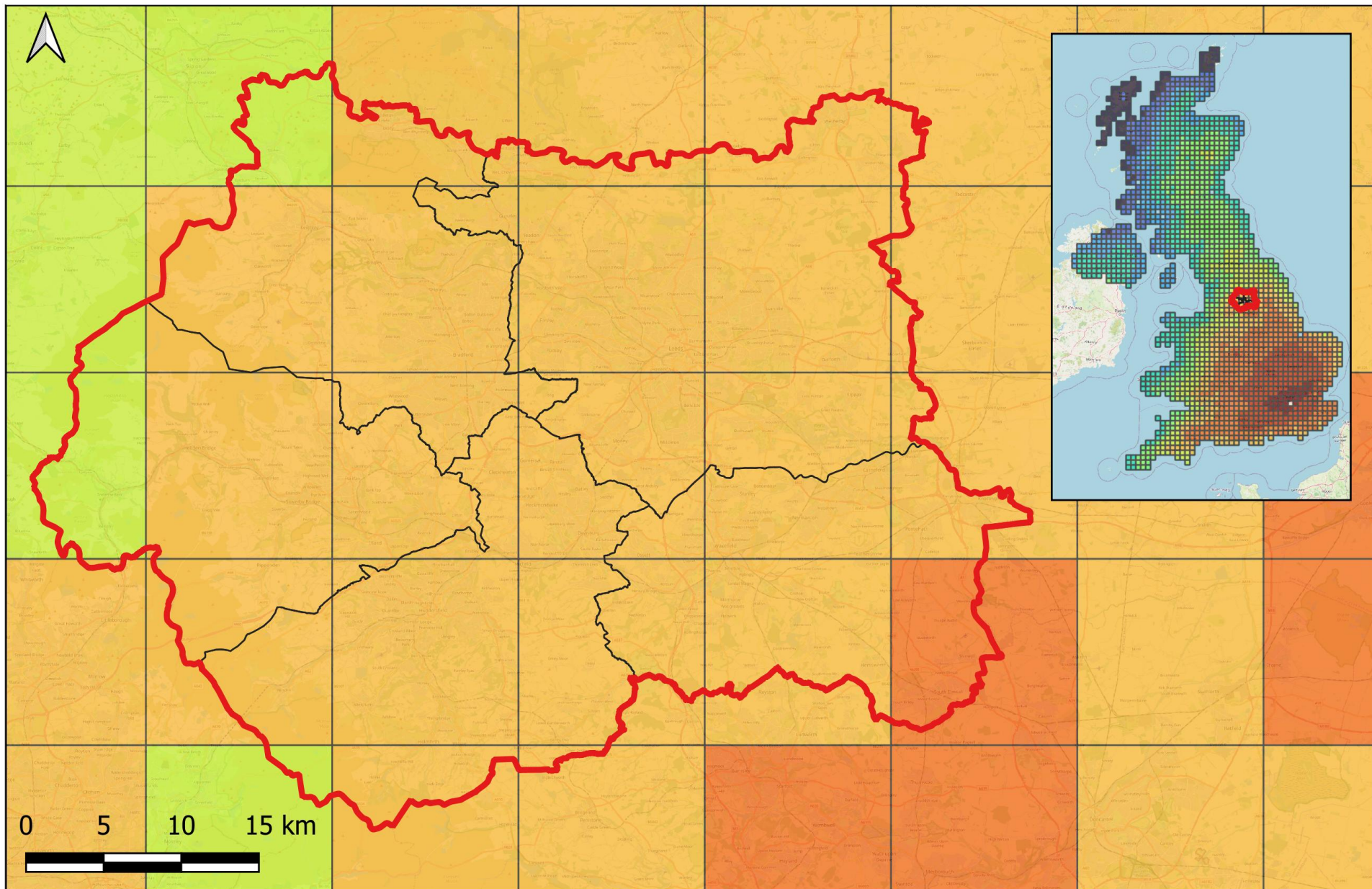
- This dataset shows projected changes in average summer temperature across West Yorkshire. It helps the region plan for greater overheating and heat-related health risks, increased cooling demand, pressure on energy and transport infrastructure, and the need for climate-resilient buildings and public spaces. As seasonal averages for June to August, the projections show long-term summer trends rather than extreme daily temperatures.

Range	Upper	Median	Lower
2021 - 2040 (1.5°C GWL)	2.16	1.39	1.00
2037 - 2056 (2°C GWL)	2.61	2.07	1.49
2052 - 2071 (2.5°C GWL)	3.02	2.43	2.12
2066 - 2085 (3°C GWL)	3.57	2.89	2.63
2100 + (4°C GWL)	4.92	4.19	3.51

West Yorkshire Summer Average Temperature Change - Projections (12km)



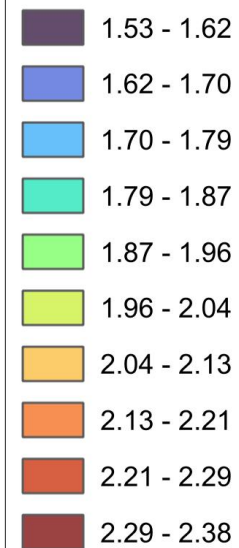
Summer Average Temperature Change (°C)



Legend

Met Data Projections

Summer Average Temperature Change (°C)



OpenStreetMap

Global Warming Level 2°C Median

Scale 1:400000

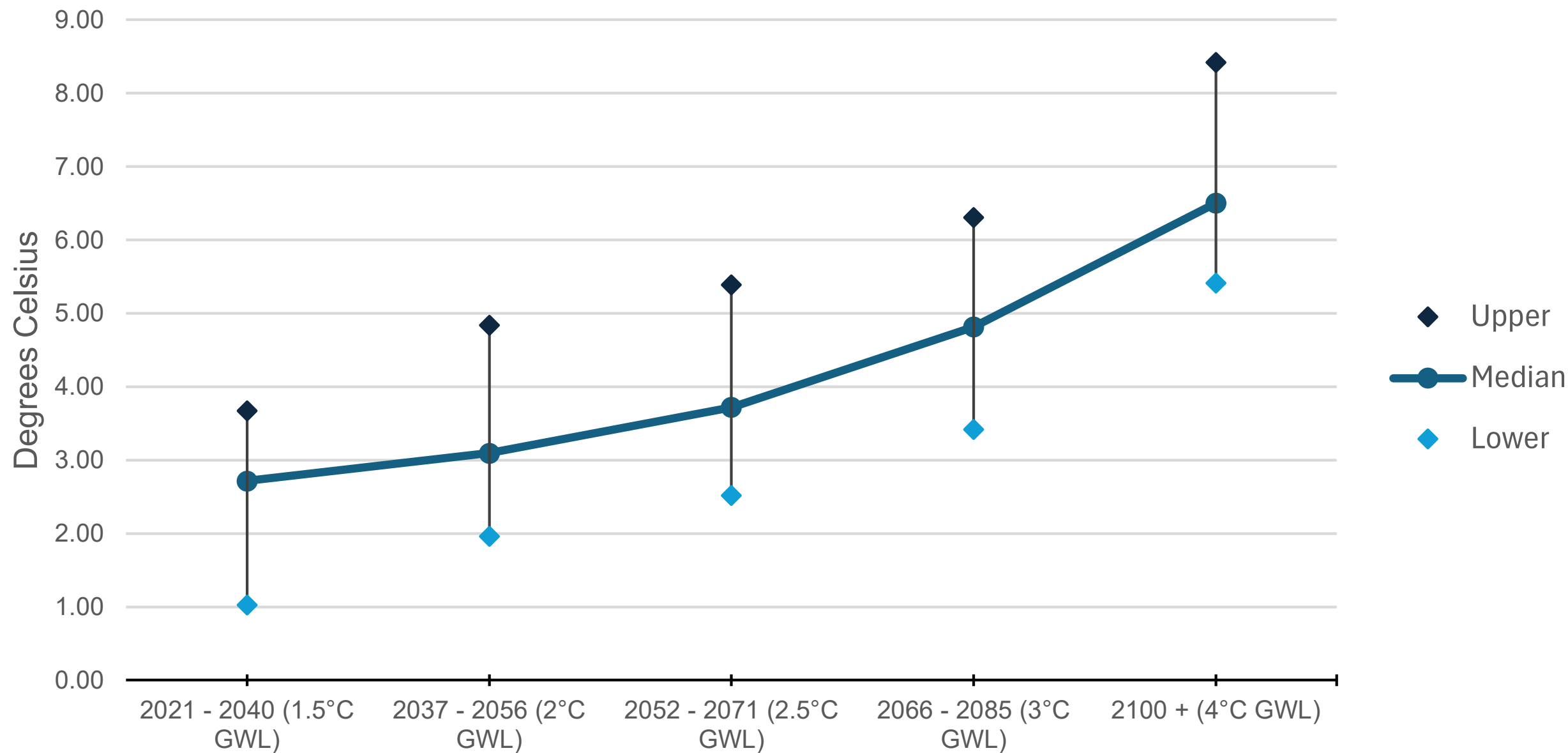
Date: 2026-07-30

Summer Maximum Temperature Change

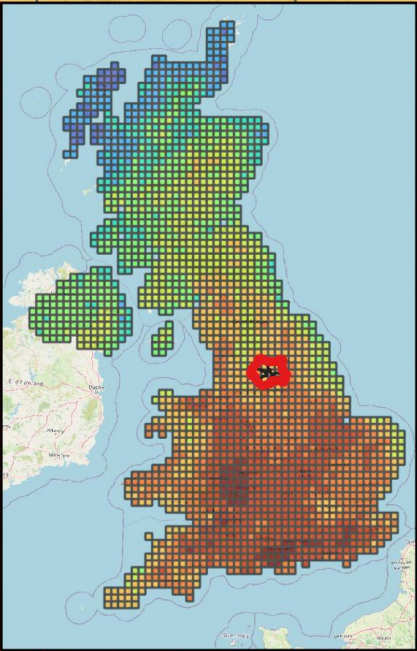
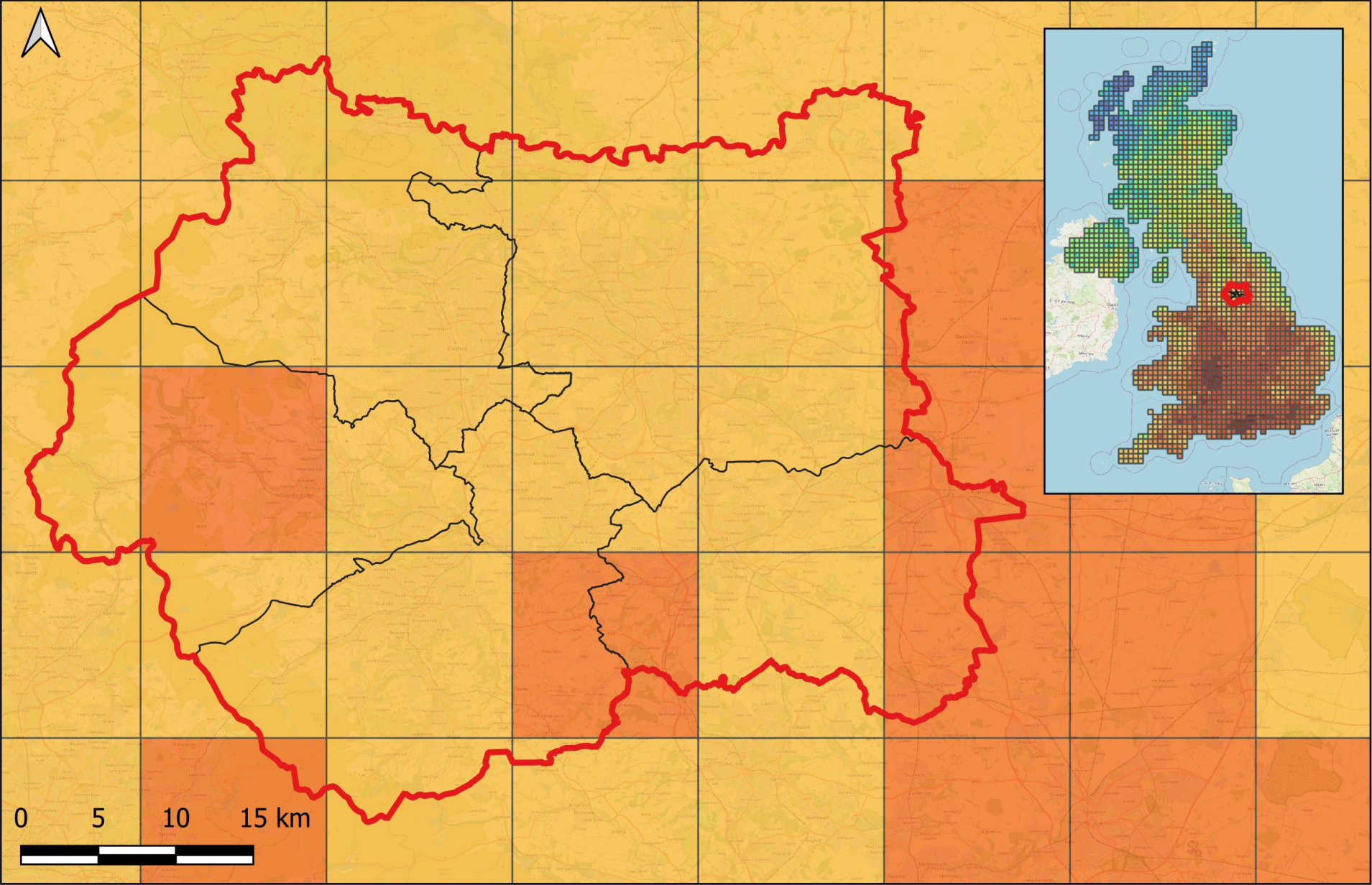
- This dataset shows projected changes in maximum summer temperatures across West Yorkshire. It highlights how hotter summer peaks could increase heat-related illness, workplace and transport disruption, building overheating, cooling demand, and pressure on energy and other essential infrastructure. The projections support targeted heat-resilience planning for communities, buildings and public services.

Range	Upper	Median	Lower
2021 - 2040 (1.5°C GWL)	3.68	2.72	1.02
2037 - 2056 (2°C GWL)	4.84	3.09	1.97
2052 - 2071 (2.5°C GWL)	5.39	3.72	2.52
2066 - 2085 (3°C GWL)	6.31	4.81	3.42
2100 + (4°C GWL)	8.42	6.50	5.41

West Yorkshire Summer Maximum Temperature Change - Projections (12km)



Summer Maximum Temperature Change (°C)



Legend

Met Data Projections

Summer Maximum Temperature Change (°C)

- 1.63 - 1.88
- 1.88 - 2.13
- 2.13 - 2.39
- 2.39 - 2.64
- 2.64 - 2.89
- 2.89 - 3.14
- 3.14 - 3.40
- 3.40 - 3.65
- 3.65 - 3.90

OpenStreetMap

Global Warming Level 2°C Median

Scale 1:400000

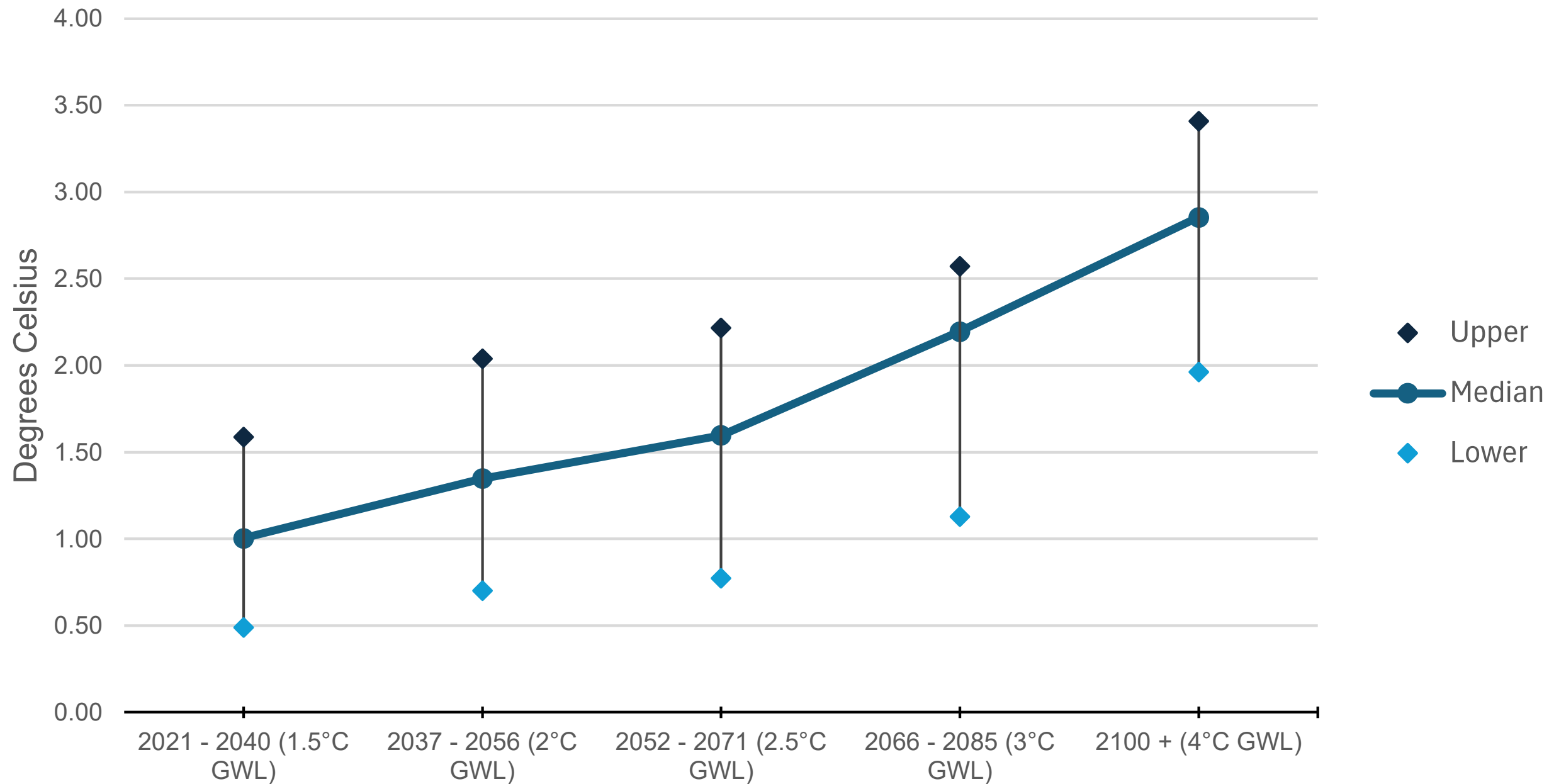
Date: 2026-07-30

Winter Average Temperature Change

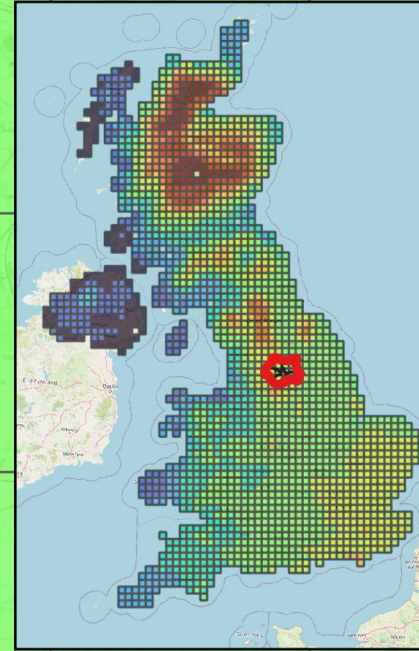
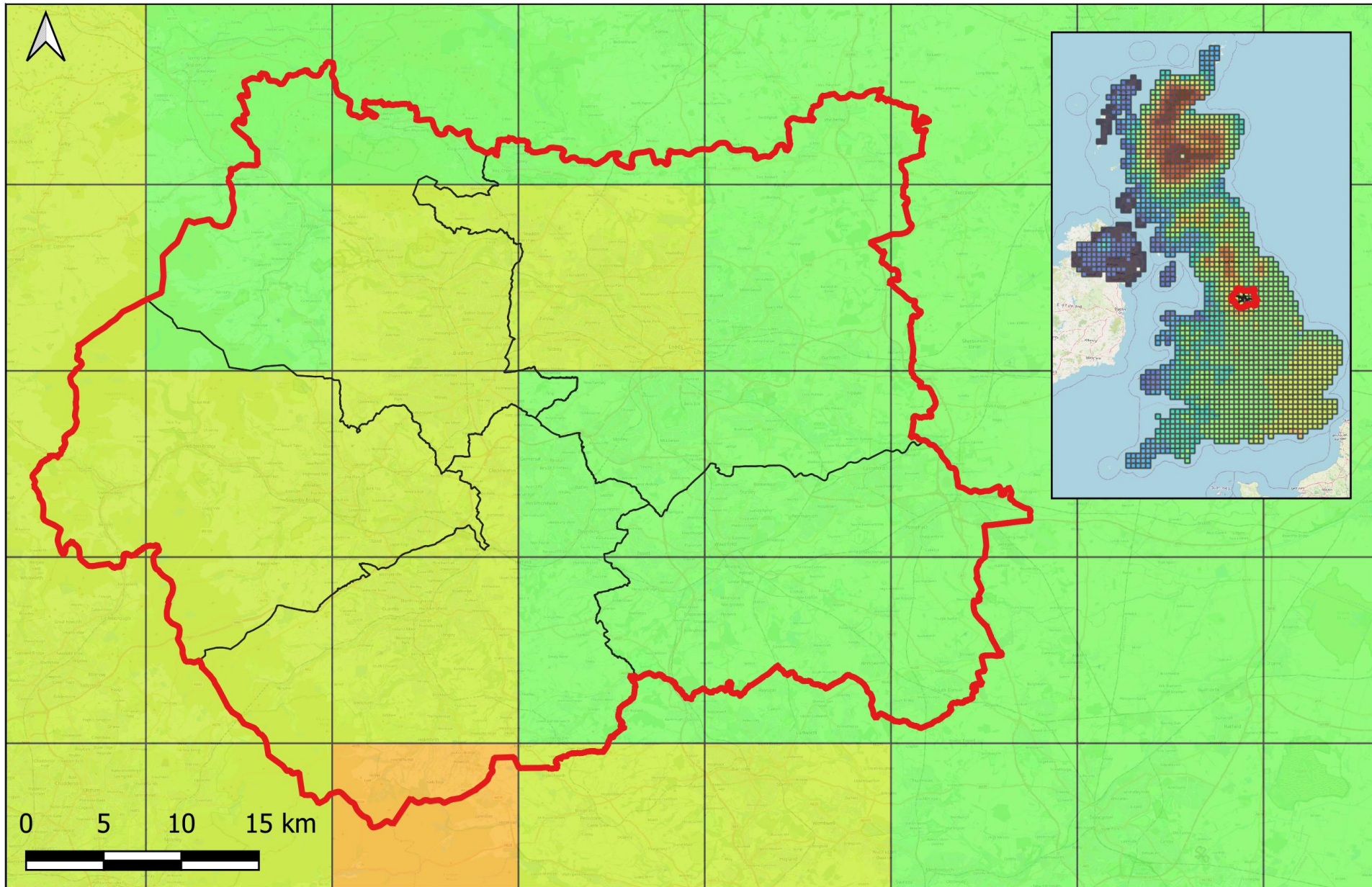
- This dataset shows projected changes in average winter temperature across West Yorkshire. It helps the region understand how milder winters could reduce heating demand while changing frost, snow and ice patterns, affecting transport, site safety, ecosystems and infrastructure maintenance. As seasonal averages for December to February, the projections show long-term winter trends rather than individual cold events.

Range	Upper	Median	Lower
2021 - 2040 (1.5°C GWL)	1.59	1.00	0.49
2037 - 2056 (2°C GWL)	2.04	1.35	0.70
2052 - 2071 (2.5°C GWL)	2.22	1.60	0.77
2066 - 2085 (3°C GWL)	2.57	2.20	1.13
2100 + (4°C GWL)	3.41	2.85	1.96

West Yorkshire Winter Average Temperature Change - Projections (12km)



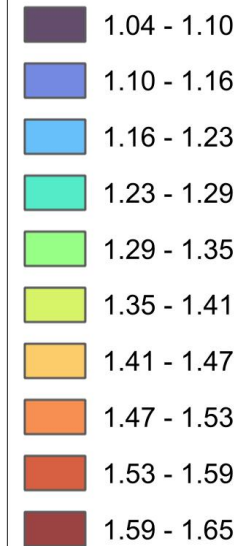
Winter Average Temperature Change (°C)



Legend

Met Data Projections

Winter Average Temperature Change (°C)



OpenStreetMap

Global Warming Level 2°C Median

Scale 1:400000

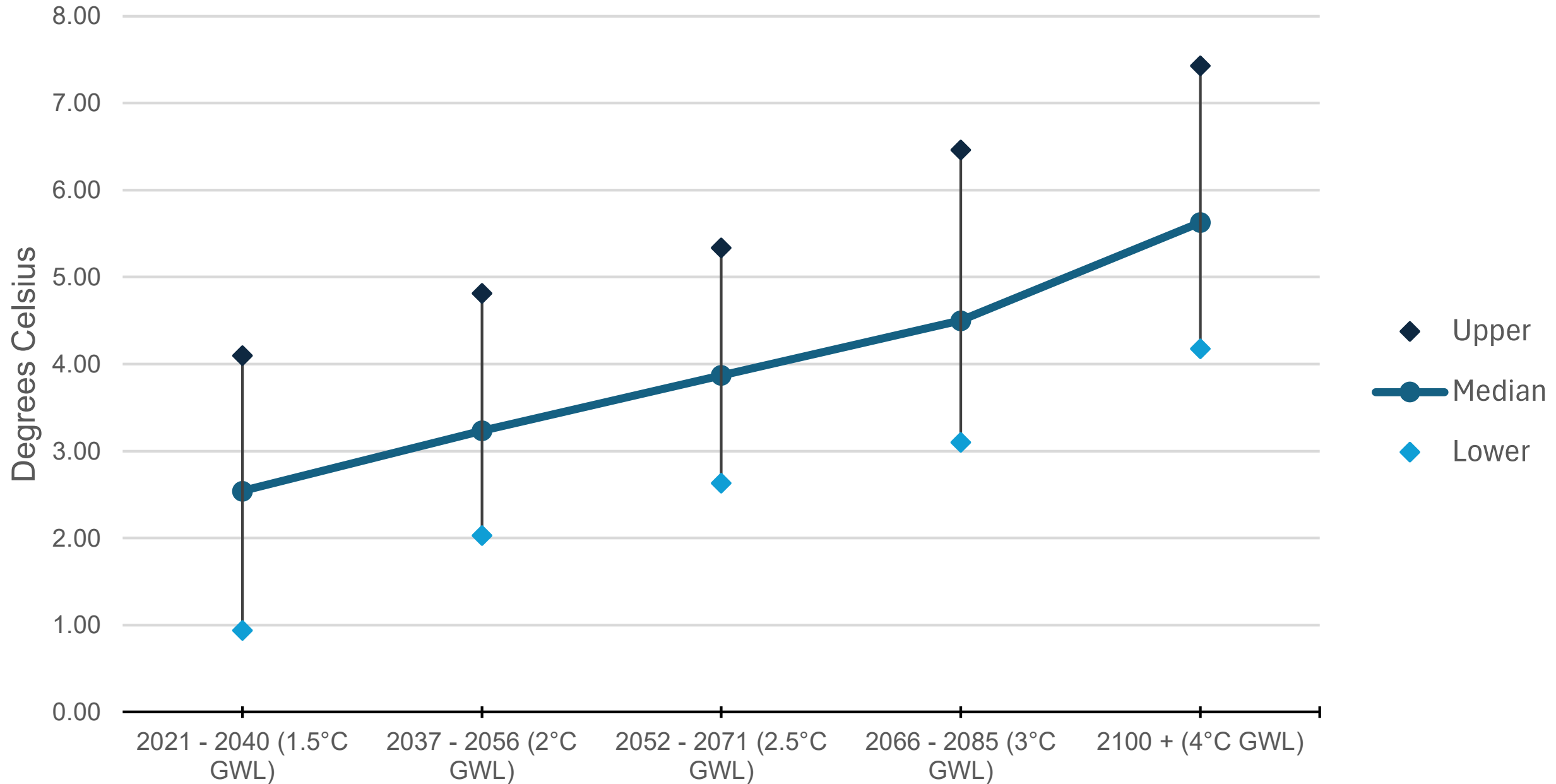
Date: 2026-07-30

Winter Minimum Temperature Change

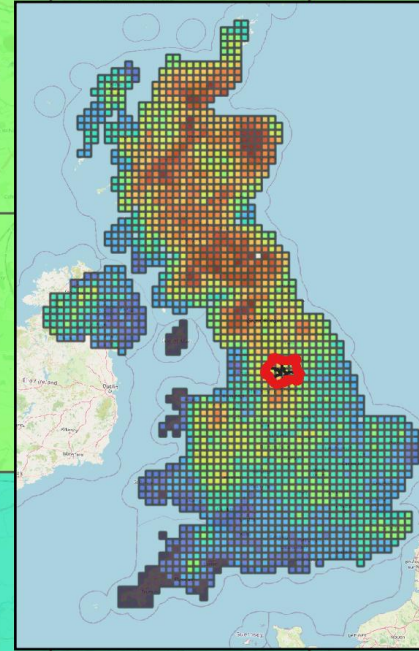
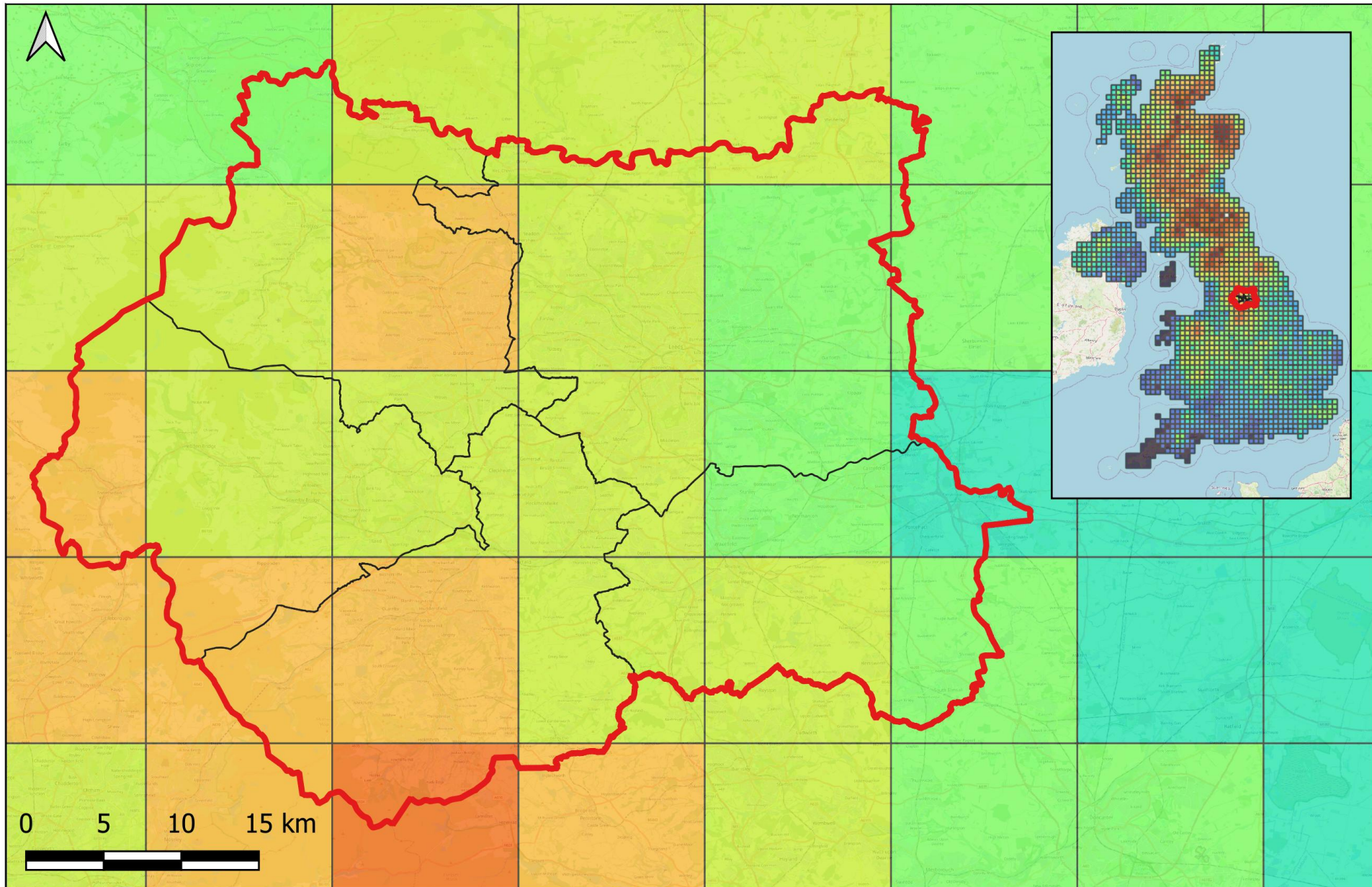
- This dataset shows projected changes in minimum winter temperatures across West Yorkshire. It helps the region assess how fewer or less severe freezing nights could reduce heating, gritting and frost-protection needs while changing road and site safety, building maintenance, ecosystems and pest risks. The projections support long-term planning while recognising that individual cold spells may still occur.

Range	Upper	Median	Lower
2021 - 2040 (1.5°C GWL)	4.10	2.54	0.94
2037 - 2056 (2°C GWL)	4.82	3.23	2.03
2052 - 2071 (2.5°C GWL)	5.34	3.87	2.64
2066 - 2085 (3°C GWL)	6.46	4.50	3.10
2100 + (4°C GWL)	7.43	5.63	4.18

West Yorkshire Winter Minimum Temperature Change - Projections (12km)



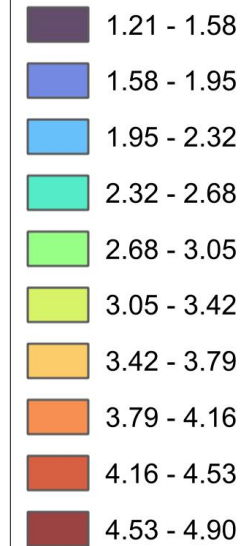
Winter Minimum Temperature Change (°C)



Legend

Met Data Projections

Winter Minimum Temperature Change (°C)



OpenStreetMap

Global Warming Level 2°C Median

Scale 1:400000

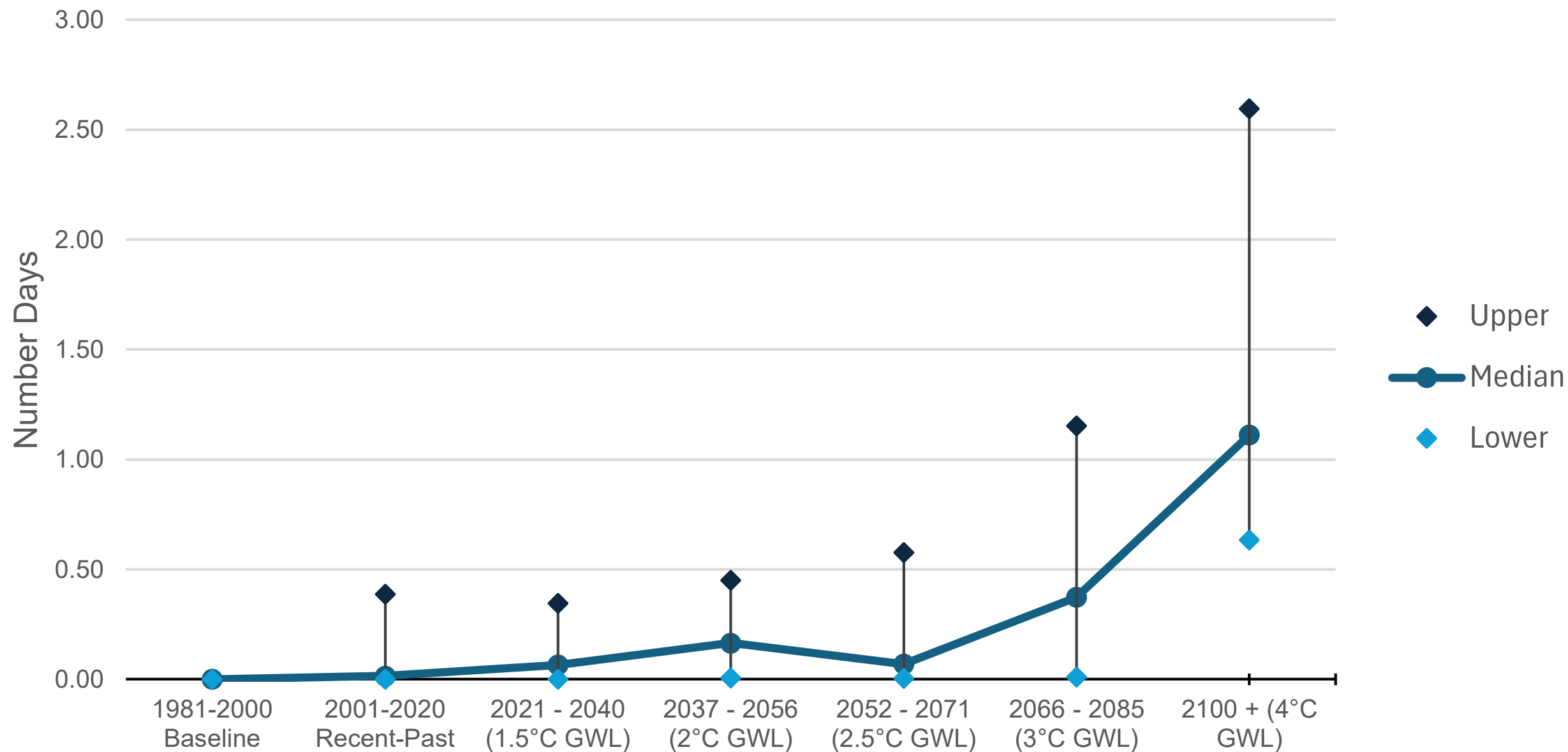
Date: 2026-07-30

Annual Count of Extreme Summer Days

- This dataset shows the projected annual number of extreme summer days across West Yorkshire (days when maximum temperatures exceed 35°C). It shows where more frequent severe heat could increase risks to health, workplaces, transport, buildings and essential services, while raising cooling demand. The projections help target heatwave preparedness and long-term investment in shade, green infrastructure and climate-resilient places.

Range	Upper	Median	Lower
1981-2000 Baseline	0.00	0.00	0.00
2001-2020 Recent-Past	0.39	0.02	0.00
2021 - 2040 (1.5°C GWL)	0.35	0.07	0.00
2037 - 2056 (2°C GWL)	0.45	0.17	0.01
2052 - 2071 (2.5°C GWL)	0.58	0.07	0.00
2066 - 2085 (3°C GWL)	1.15	0.37	0.01
2100 + (4°C GWL)	2.60	1.11	0.63

West Yorkshire Annual Count of Extreme Summer Days - Projections (12km)



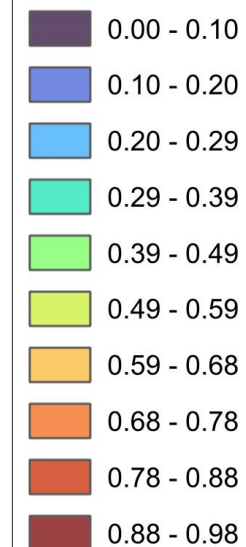
Annual Count of Extreme Summer Days (Days)



Legend

Met Data Projections

Annual Count of Extreme Summer Days (Days)

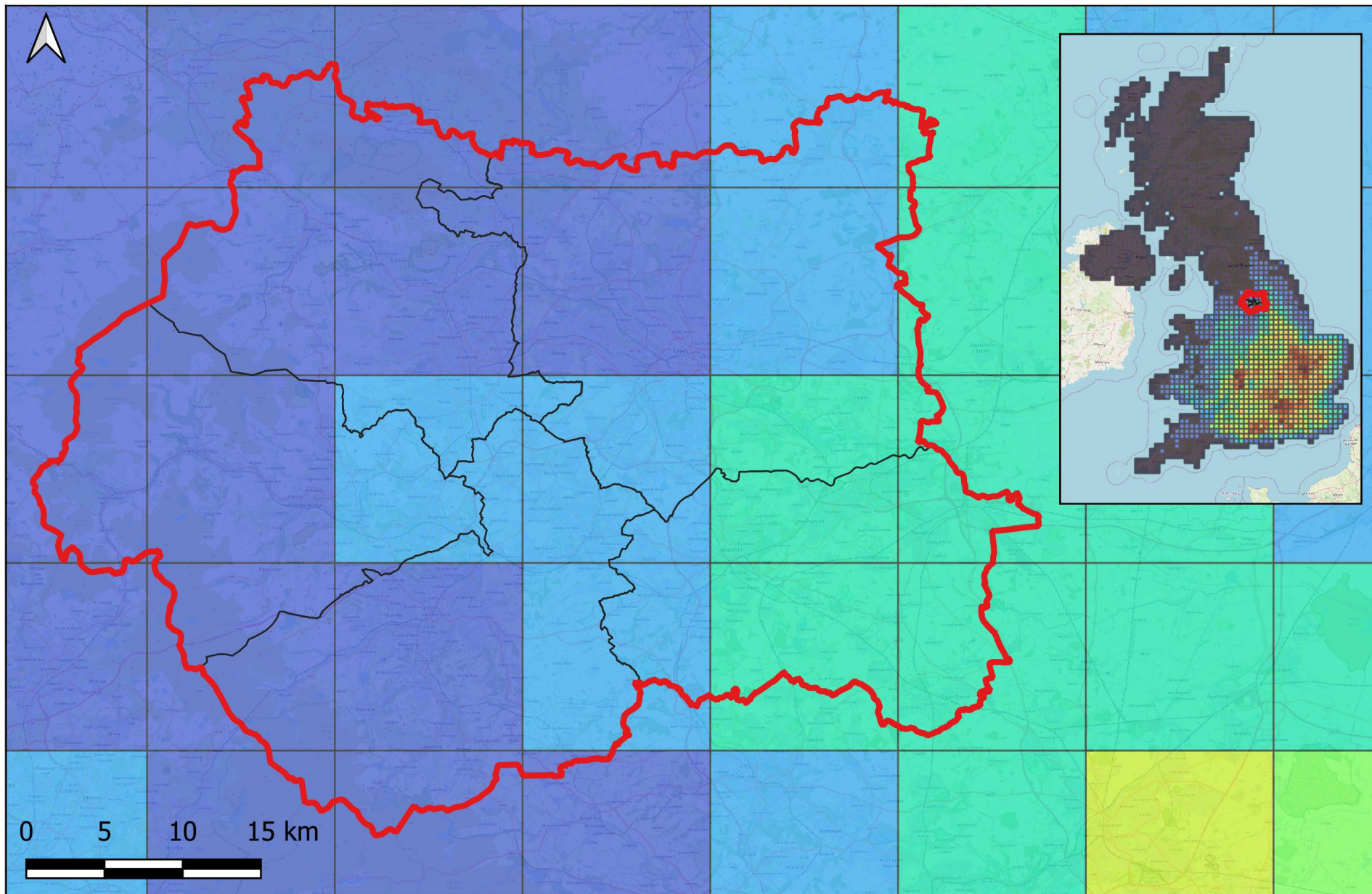


OpenStreetMap

Global Warming Level 2°C Median

Scale 1:400000

Date: 2026-07-30

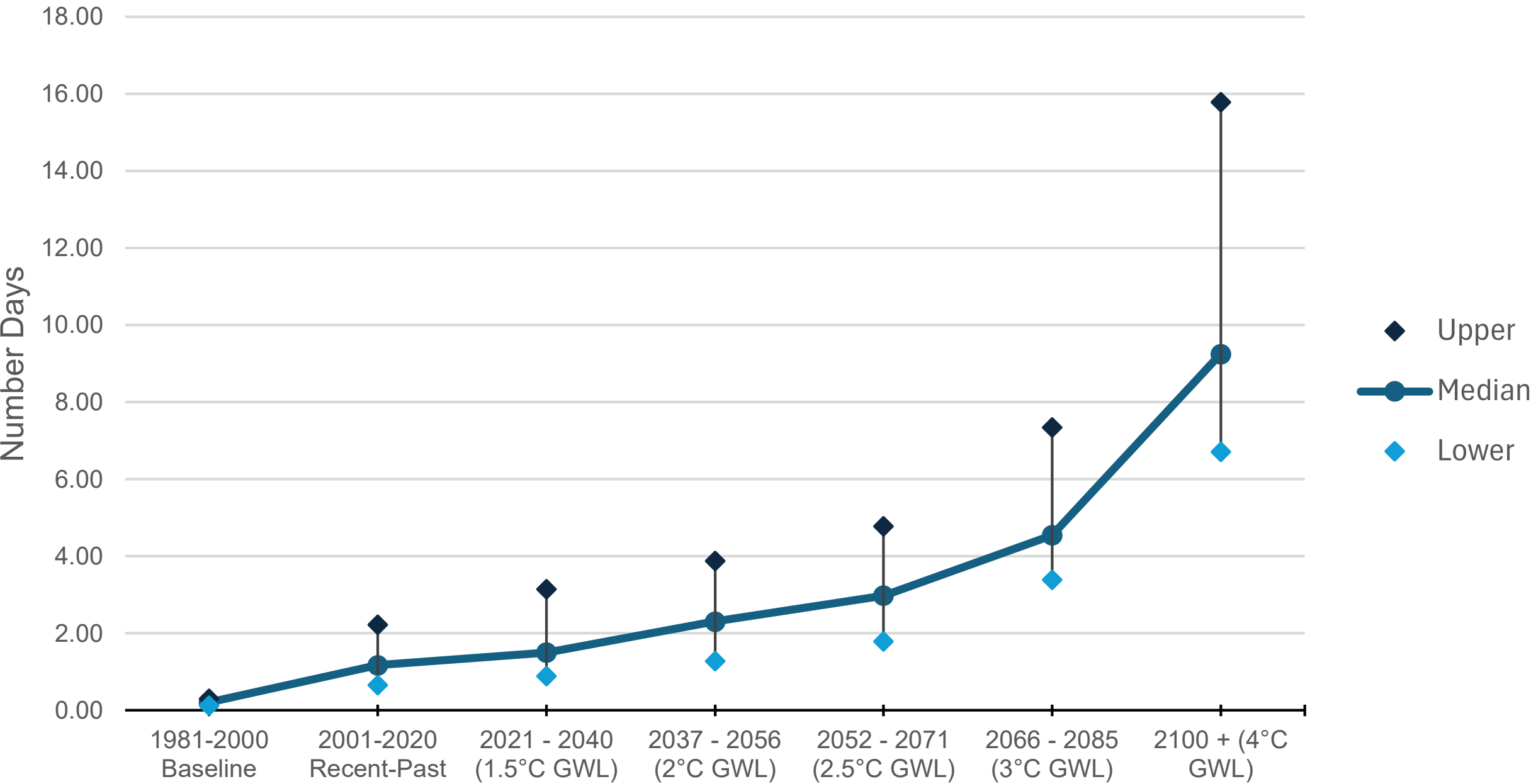


Annual Count of Hot Summer Days

- This dataset shows the projected annual number of hot summer days across West Yorkshire (days when maximum temperatures exceed 30°C). It shows where more frequent hot weather could increase heat-related health risks, building overheating, cooling demand and disruption to transport, workplaces and public services. The projections help target heat preparedness and investment in shade, green infrastructure and climate-resilient buildings and places.

Range	Upper	Median	Lower
1981-2000 Baseline	0.30	0.21	0.13
2001-2020 Recent-Past	2.23	1.17	0.67
2021 - 2040 (1.5°C GWL)	3.15	1.50	0.90
2037 - 2056 (2°C GWL)	3.88	2.30	1.28
2052 - 2071 (2.5°C GWL)	4.78	2.98	1.79
2066 - 2085 (3°C GWL)	7.35	4.55	3.39
2100 + (4°C GWL)	15.78	9.25	6.71

West Yorkshire Annual Count of Hot Summer Days - Projections (12km)



Annual Count of Hot Summer Days (Days)



Legend

Met Data Projections

Annual Count of Hot Summer Days (Days)

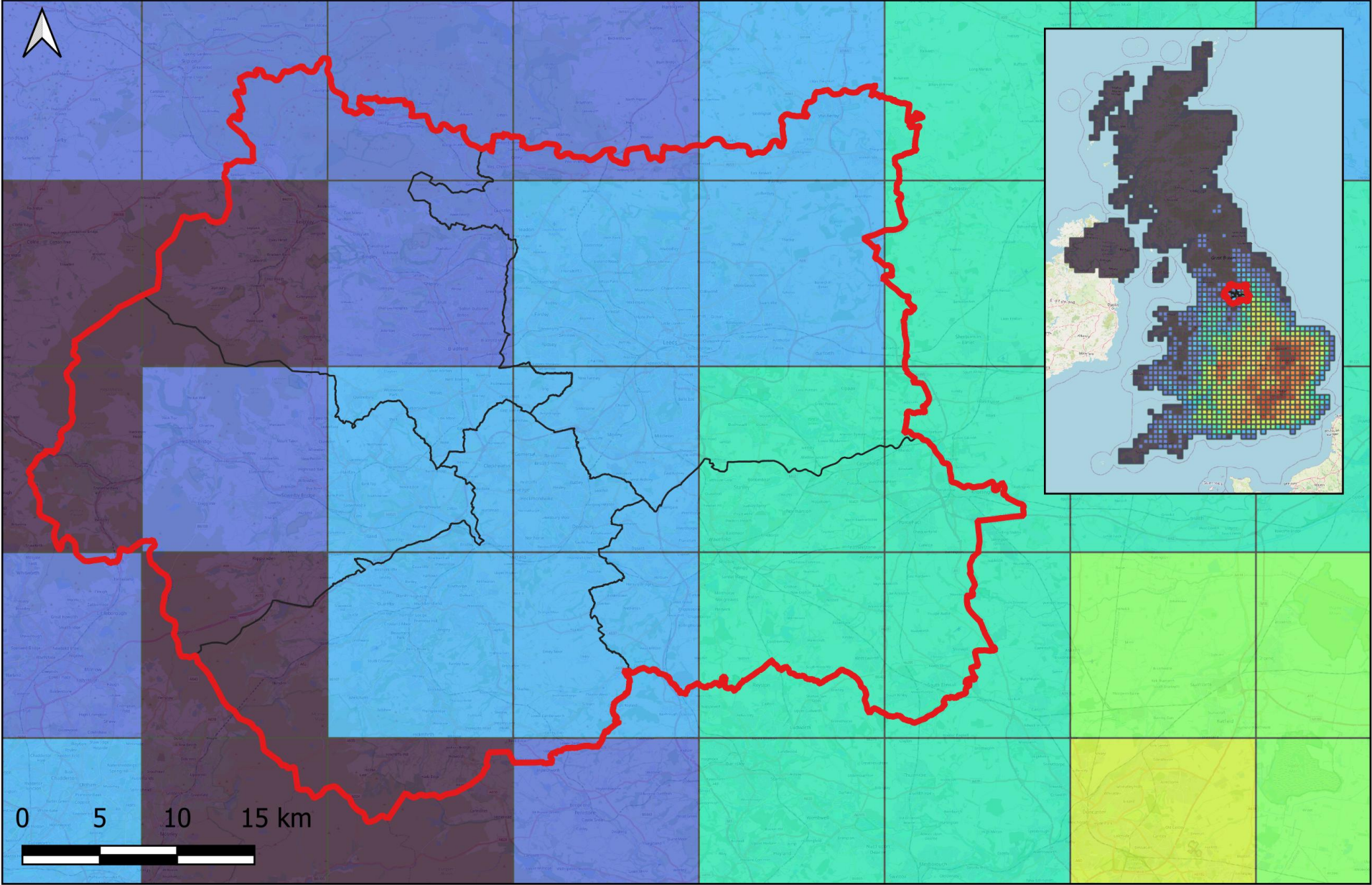


OpenStreetMap

Global Warming Level 2°C Median

Scale 1:400000

Date: 2026-07-30

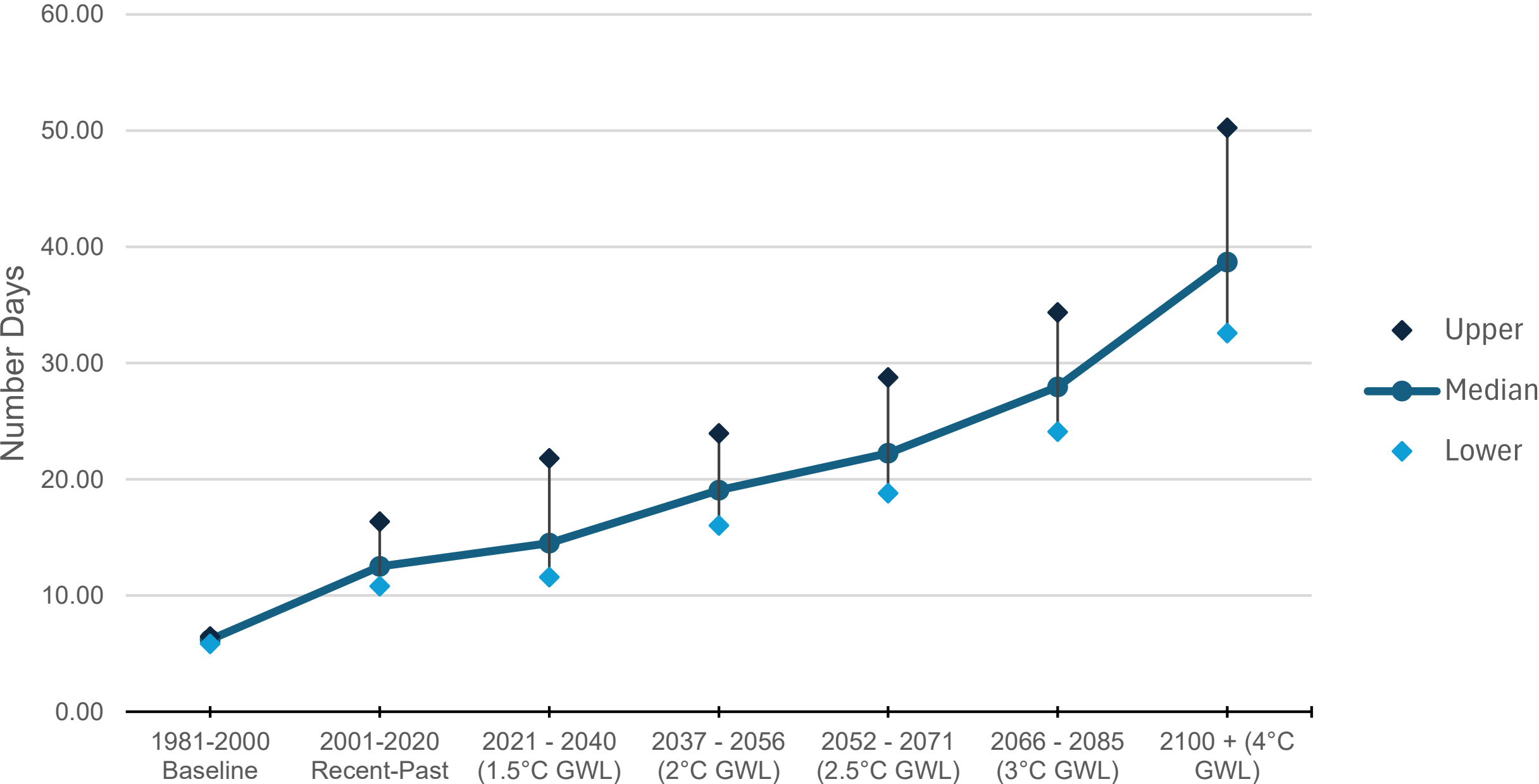


Annual Count of Summer Days

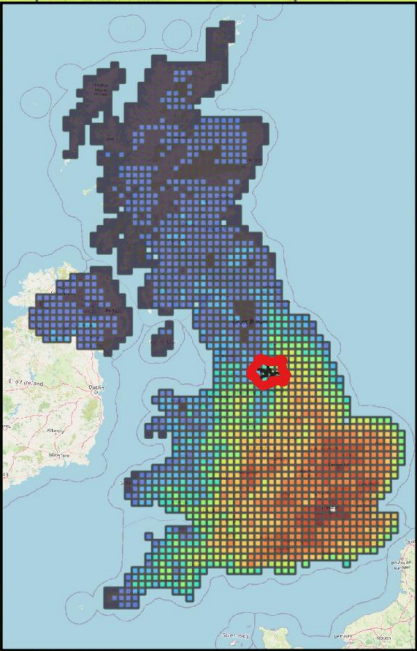
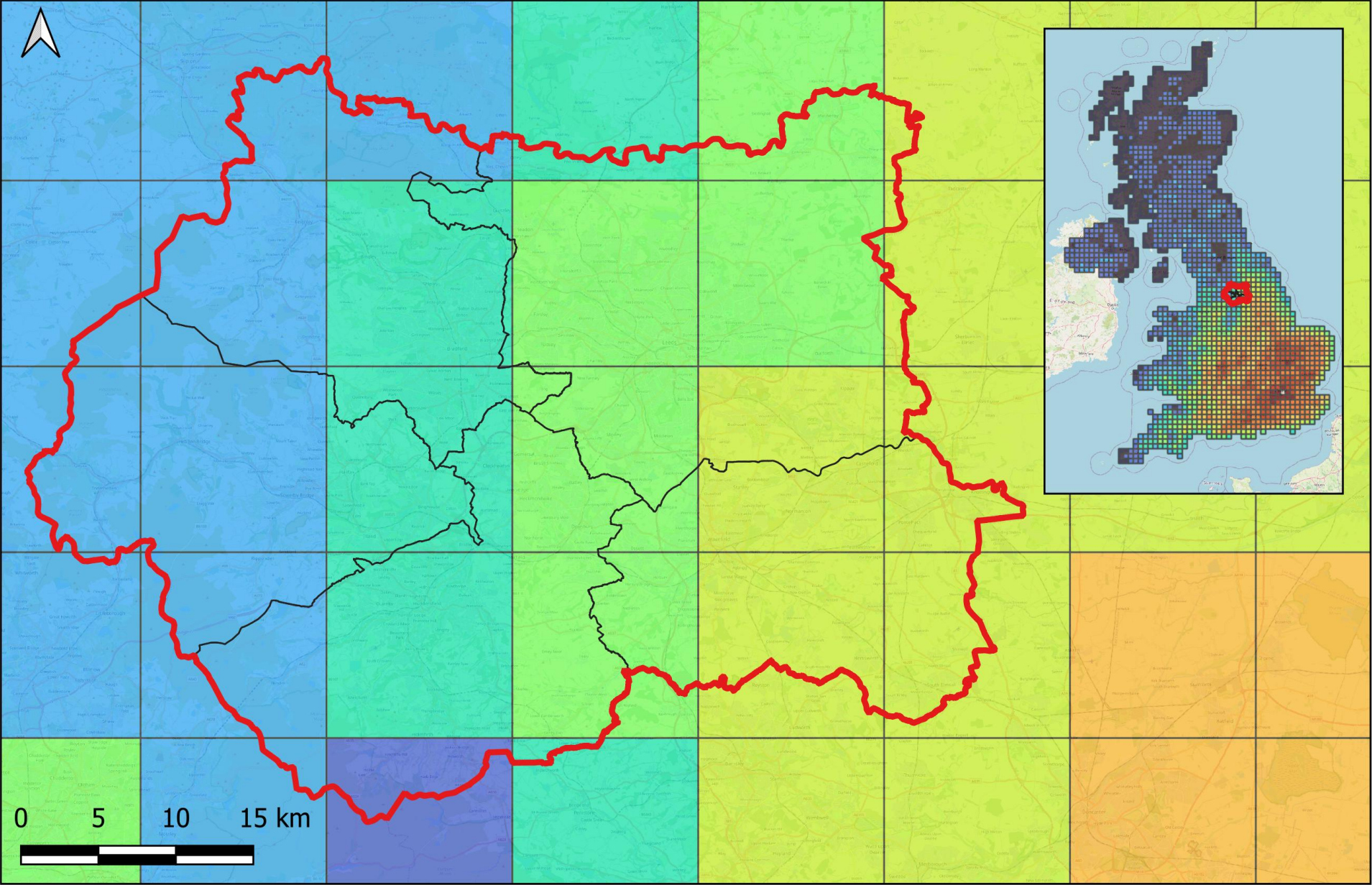
- This dataset shows the projected annual number of summer days across West Yorkshire (days when maximum temperatures exceed 25°C). It indicates how warmer conditions may lengthen the period of heat exposure, increasing building overheating, cooling demand and health risks while affecting water use, ecosystems, outdoor work and transport. The projections support planning for heat-resilient communities, infrastructure and public services.

Range	Upper	Median	Lower
1981-2000 Baseline	6.50	6.22	5.88
2001-2020 Recent-Past	16.38	12.52	10.83
2021 - 2040 (1.5°C GWL)	21.82	14.52	11.62
2037 - 2056 (2°C GWL)	23.98	19.07	16.03
2052 - 2071 (2.5°C GWL)	28.76	22.26	18.82
2066 - 2085 (3°C GWL)	34.38	27.96	24.13
2100 + (4°C GWL)	50.24	38.71	32.60

West Yorkshire Annual Count of Summer Days - Projections (12km)



Annual Count of Summer Days (Days)



Legend

Met Data Projections

Annual Count of Summer Days (Days)

- 0.00 - 5.13
- 5.13 - 10.25
- 10.25 - 15.38
- 15.38 - 20.50
- 20.50 - 25.63
- 25.63 - 30.76
- 30.76 - 35.88
- 35.88 - 41.01
- 41.01 - 46.14
- 46.14 - 51.26

OpenStreetMap

Global Warming Level 2°C Median

Scale 1:400000

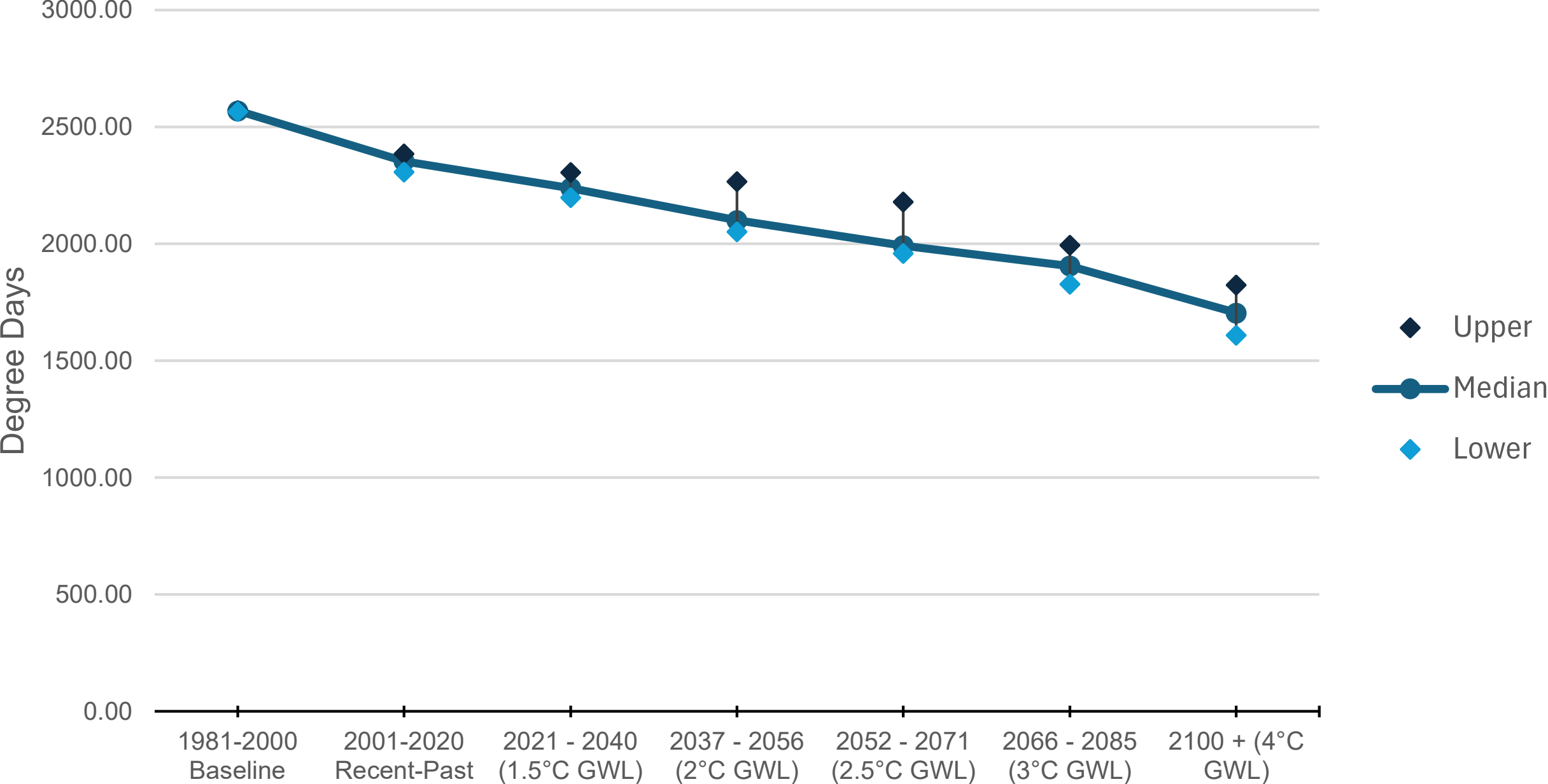
Date: 2026-07-30

Annual Heating Degree Days

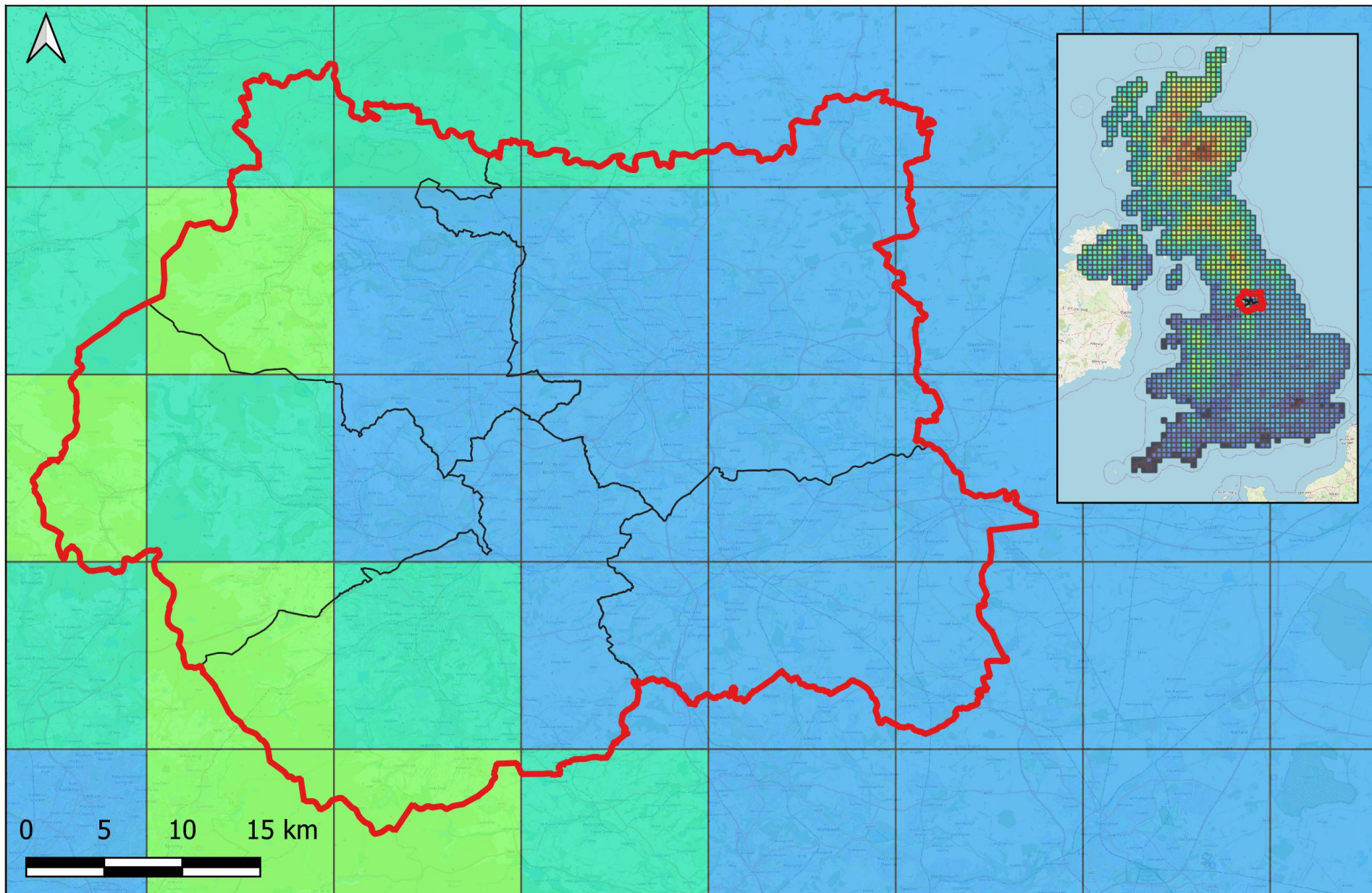
- This dataset shows projected annual heating degree days across West Yorkshire. Heating degree days measure how far daily average temperatures fall below 15.5°C and indicate the energy buildings may need for space heating; lower values generally mean lower demand. The projections help the region plan energy networks, building upgrades, fuel-poverty responses and lower-carbon, climate-resilient homes and workplaces.

Range	Upper	Median	Lower
1981-2000 Baseline	2569.85	2568.15	2565.88
2001-2020 Recent-Past	2384.46	2353.35	2307.27
2021 - 2040 (1.5°C GWL)	2304.58	2237.81	2198.19
2037 - 2056 (2°C GWL)	2266.96	2100.35	2051.92
2052 - 2071 (2.5°C GWL)	2179.27	1991.65	1958.50
2066 - 2085 (3°C GWL)	1995.00	1904.81	1828.42
2100 + (4°C GWL)	1824.46	1704.00	1609.92

West Yorkshire Annual Heating Degree Days - Projections (12km)



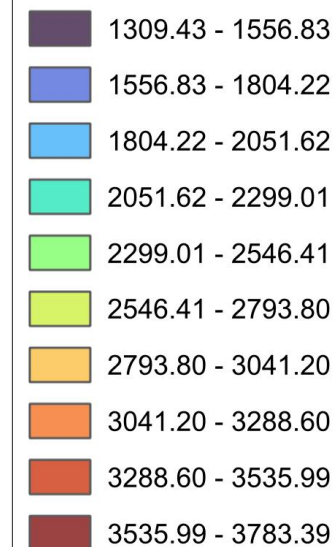
Annual Heating Degree Days (Degree Days)



Legend

Met Data Projections

Annual Heating Degree Days (Degree Days)



OpenStreetMap

Global Warming Level 2°C Median

Scale 1:400000

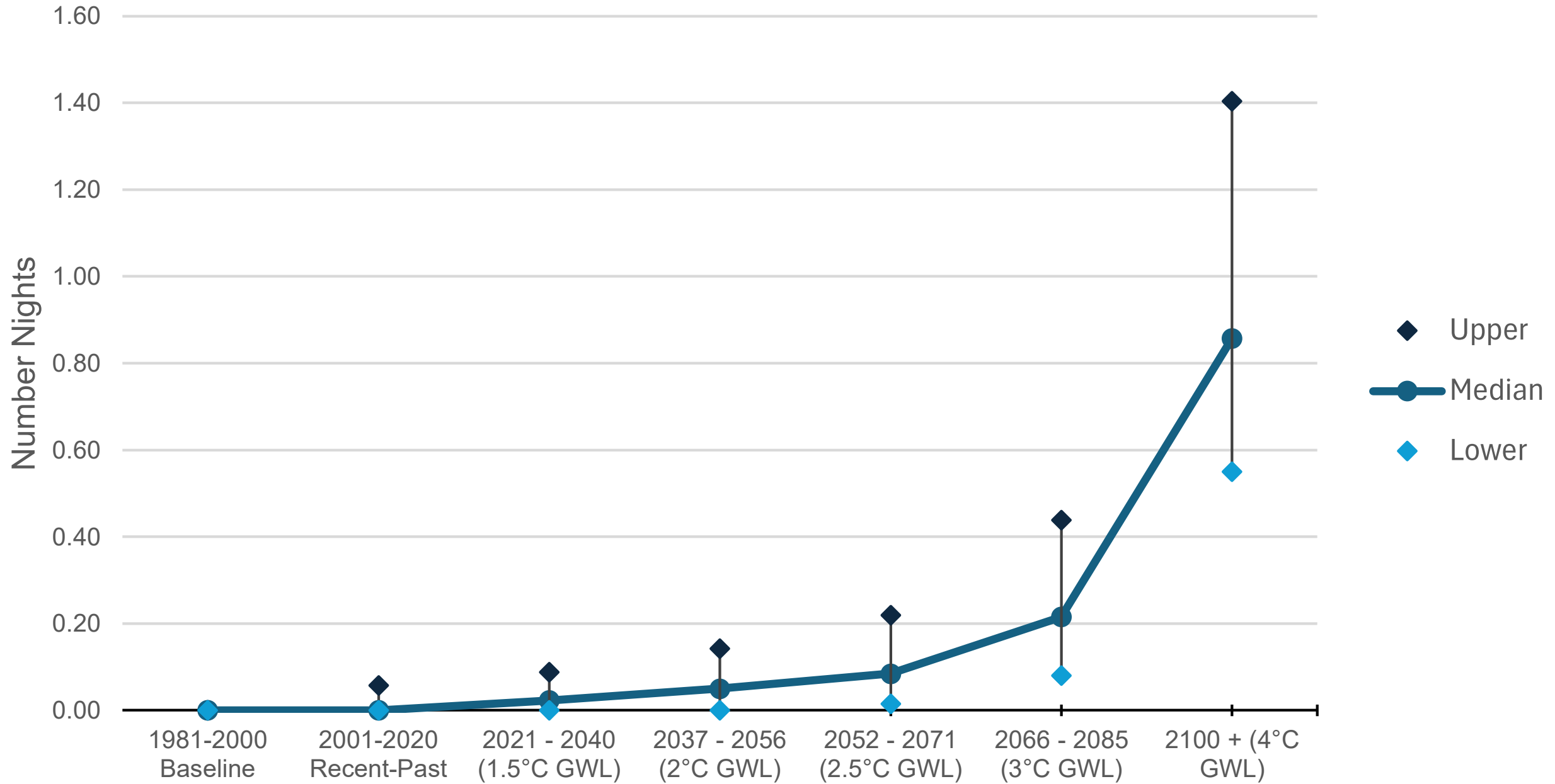
Date: 2026-07-30

Annual Count of Tropical Nights

- This dataset shows the projected annual number of tropical nights across West Yorkshire (nights when minimum temperatures remain above 20°C). Warmer nights limit recovery from daytime heat, increasing risks to health, sleep and productivity, particularly for vulnerable residents and occupants of buildings prone to overheating. The projections help target heat-health planning, building adaptation, cooling provision and resilient care and housing services.

Range	Upper	Median	Lower
1981-2000 Baseline	0.00	0.00	0.00
2001-2020 Recent-Past	0.06	0.00	0.00
2021 - 2040 (1.5°C GWL)	0.09	0.02	0.00
2037 - 2056 (2°C GWL)	0.14	0.05	0.00
2052 - 2071 (2.5°C GWL)	0.22	0.08	0.02
2066 - 2085 (3°C GWL)	0.44	0.22	0.08
2100 + (4°C GWL)	1.40	0.86	0.55

West Yorkshire Annual Count of Tropical Nights - Projections (12km)



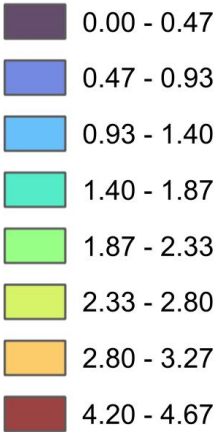
Annual Count of Tropical Nights (Nights)



Legend

Met Data Projections

Annual Count of Tropical Nights (Nights)

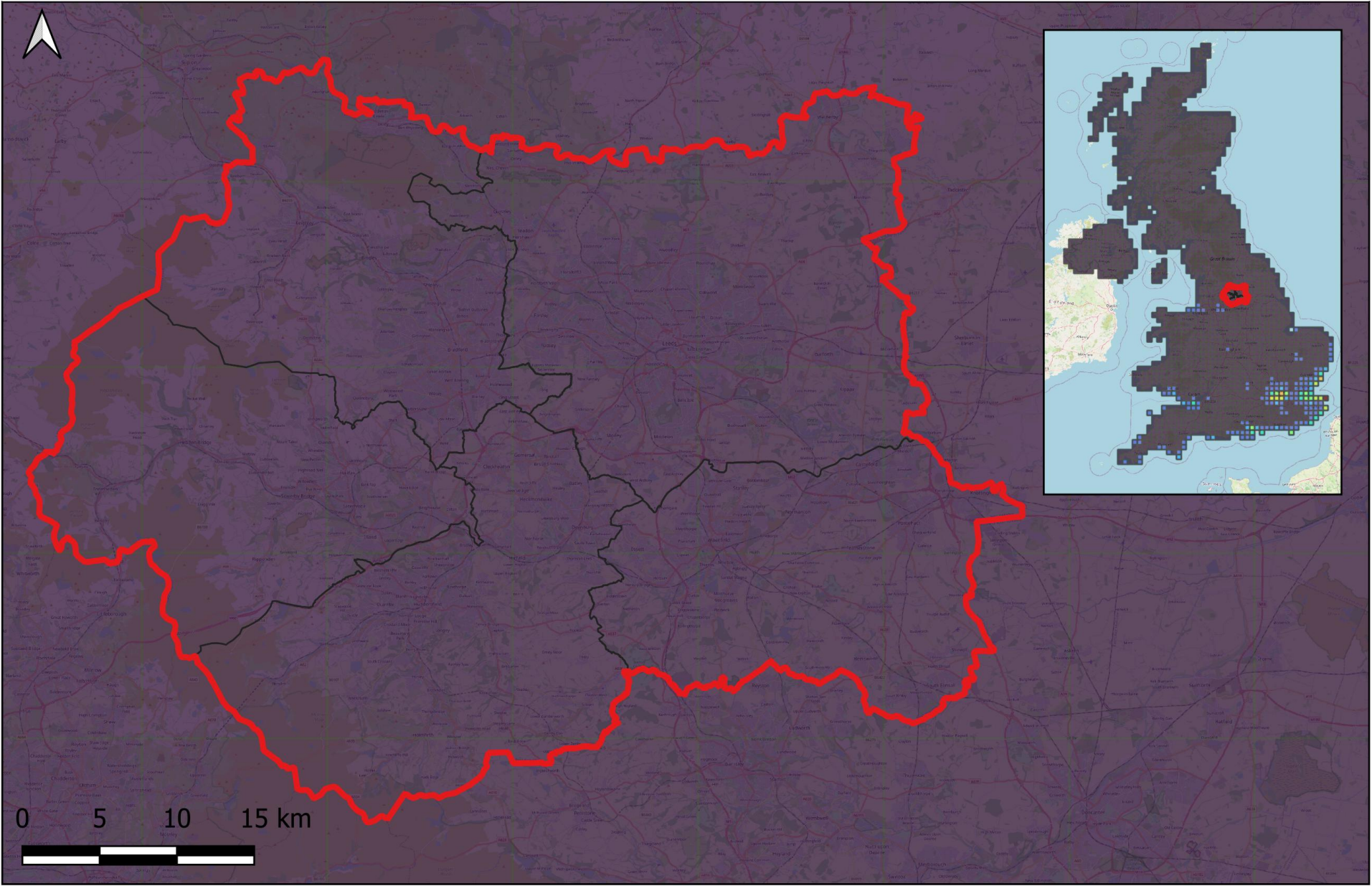


OpenStreetMap

Global Warming Level 2°C Median

Scale 1:400000

Date: 2026-07-30

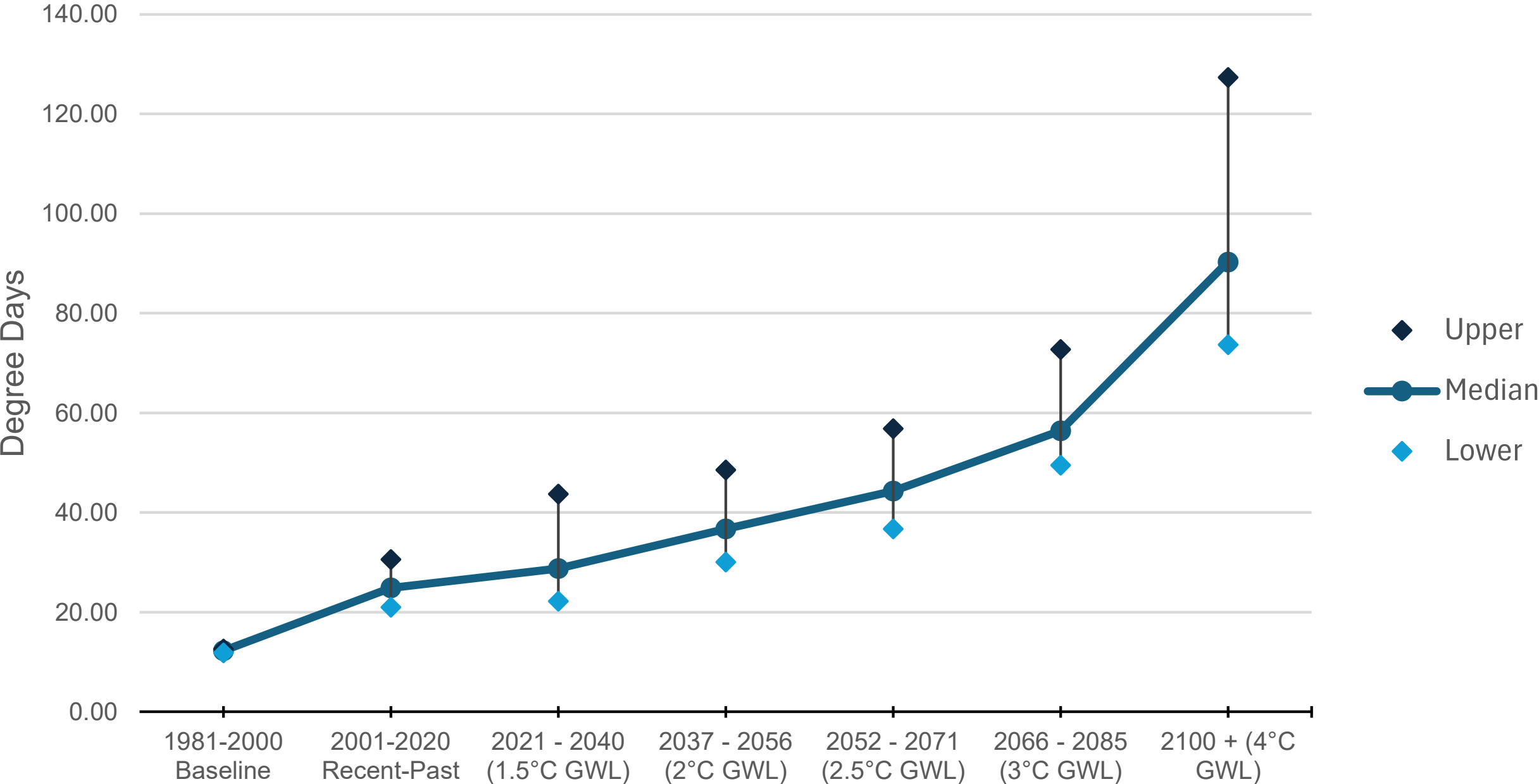


Annual Cooling Degree Days

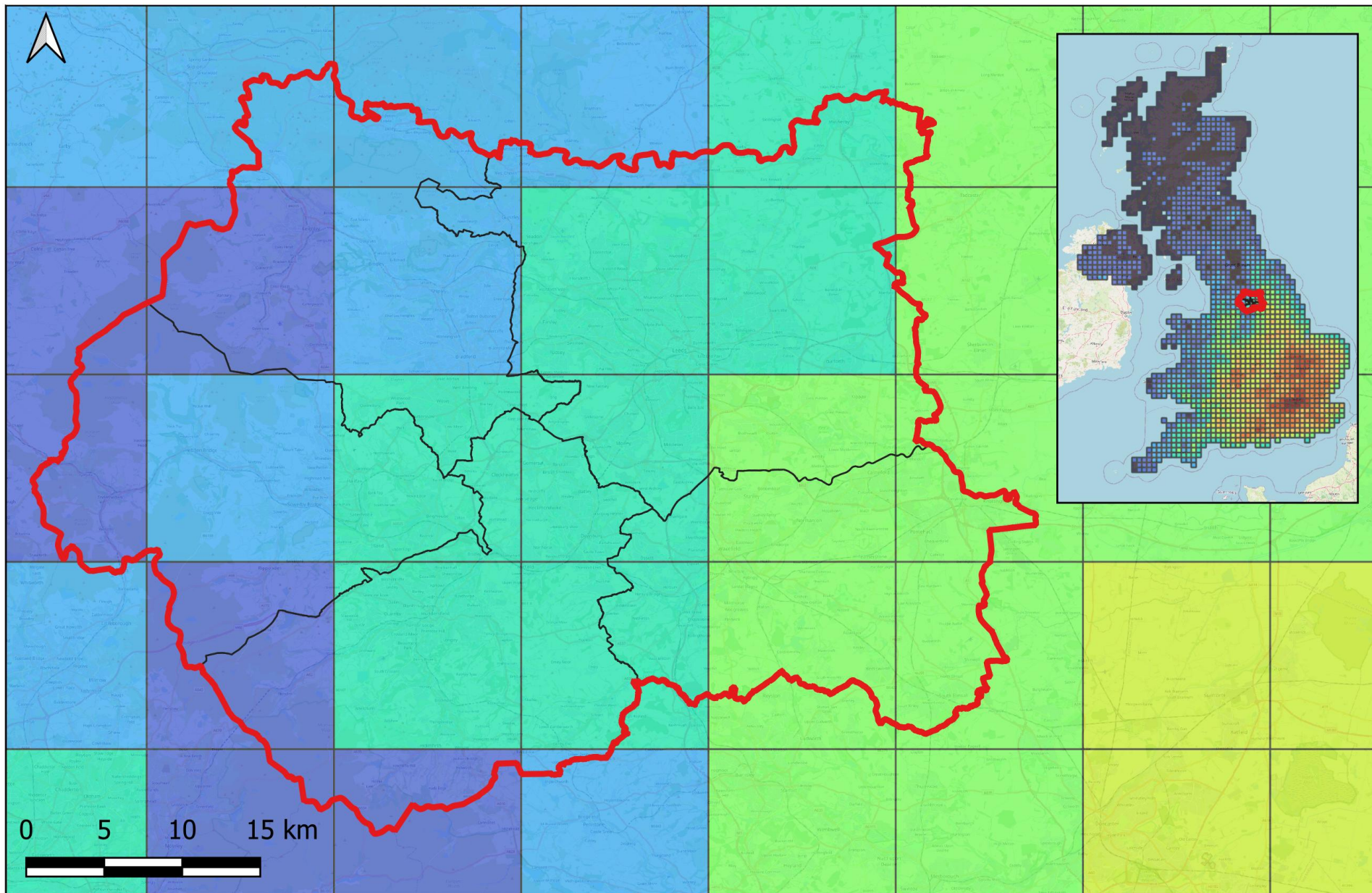
- This dataset shows projected annual cooling degree days across West Yorkshire. Cooling degree days measure how far daily average temperatures rise above 22°C and indicate potential demand for building cooling; higher values generally mean greater energy use and overheating risk. The projections help the region plan energy networks, adapt homes and workplaces, protect vulnerable people and deliver low-carbon, climate-resilient buildings.

Range	Upper	Median	Lower
1981-2000 Baseline	12.68	12.28	11.87
2001-2020 Recent-Past	30.62	24.88	21.07
2021 - 2040 (1.5°C GWL)	43.73	28.76	22.24
2037 - 2056 (2°C GWL)	48.55	36.75	30.12
2052 - 2071 (2.5°C GWL)	56.83	44.33	36.75
2066 - 2085 (3°C GWL)	72.75	56.42	49.52
2100 + (4°C GWL)	127.35	90.34	73.73

West Yorkshire Annual Cooling Degree Days - Projections (12km)



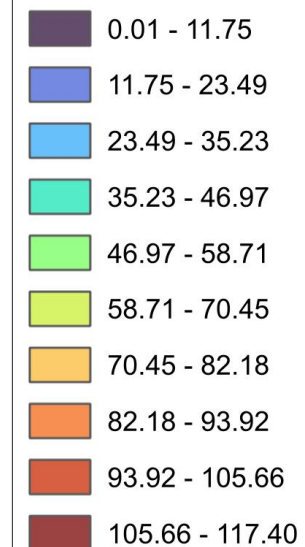
Annual Cooling Degree Days (Degree Days)



Legend

Met Data Projections

Annual Cooling Degree Days (Degree Days)



OpenStreetMap

Global Warming Level 2°C Median

Scale 1:400000

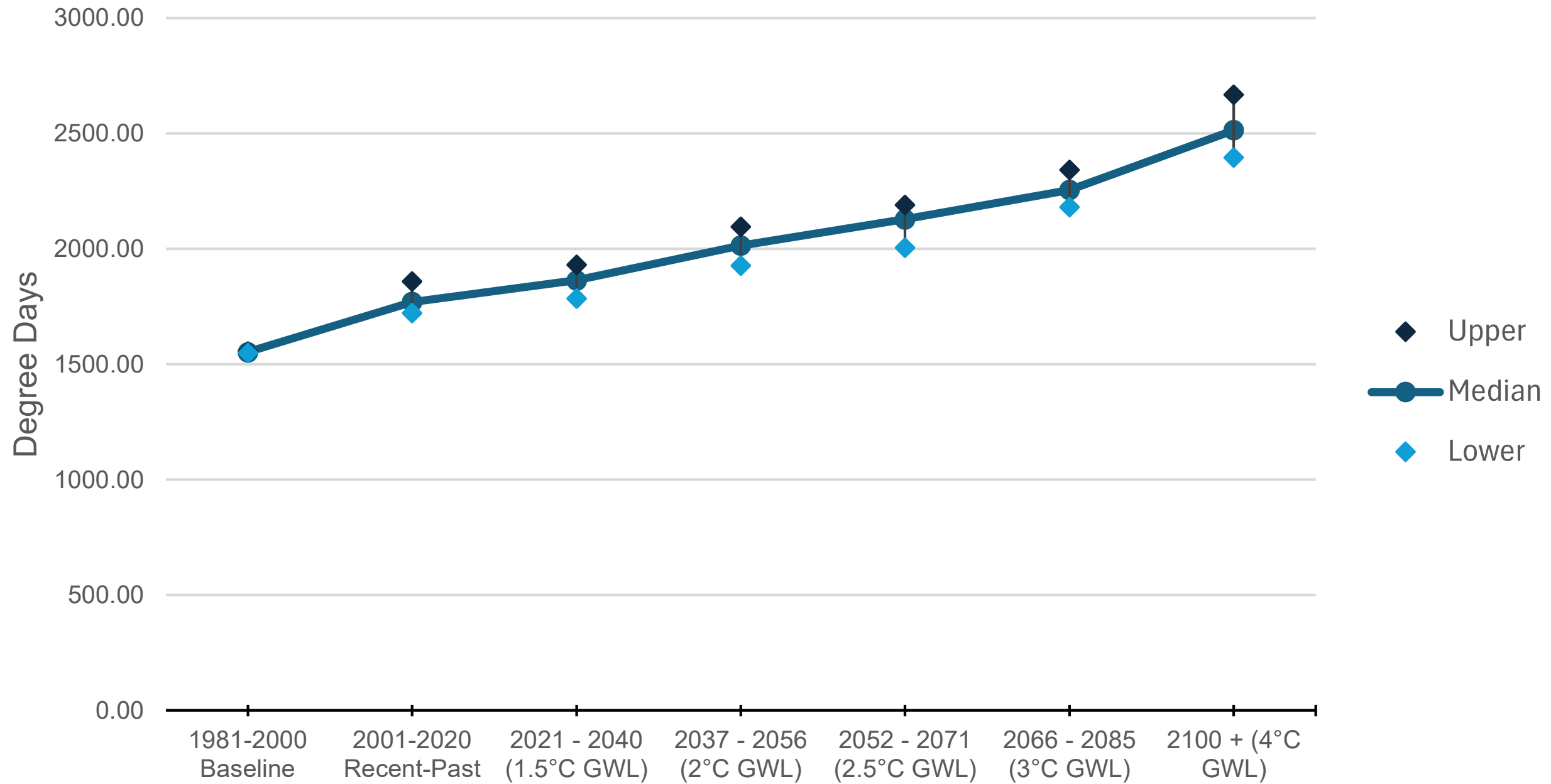
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Annual Growing Degree Days

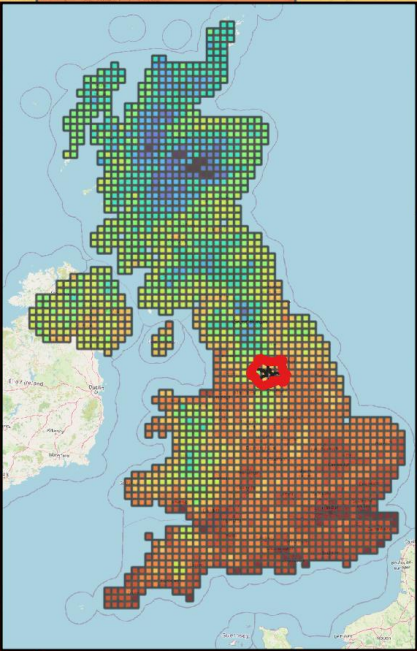
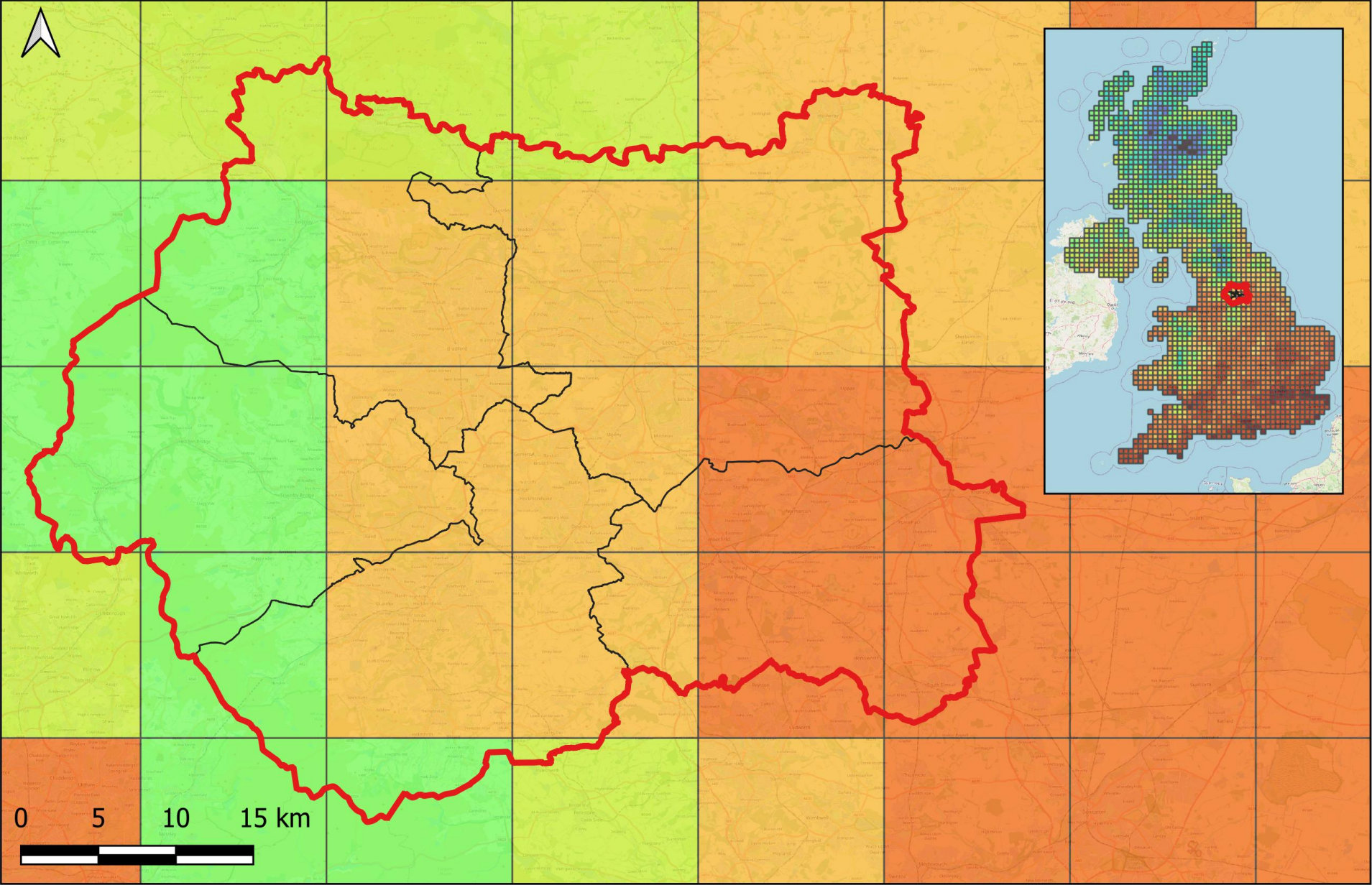
- This dataset shows projected annual growing degree days across West Yorkshire. Growing degree days measure accumulated warmth above 5.5°C, indicating how the growing season and suitability for crops, trees and other vegetation may change. The projections help the region plan agriculture, forestry, biodiversity, green infrastructure and land management while anticipating changing water demand, pests and plant health.

Range	Upper	Median	Lower
1981-2000 Baseline	1556.19	1552.69	1550.38
2001-2020 Recent-Past	1858.92	1769.81	1721.46
2021 - 2040 (1.5°C GWL)	1931.27	1863.31	1785.23
2037 - 2056 (2°C GWL)	2095.19	2014.31	1928.35
2052 - 2071 (2.5°C GWL)	2190.08	2128.12	2005.46
2066 - 2085 (3°C GWL)	2341.77	2255.00	2181.88
2100 + (4°C GWL)	2668.27	2514.23	2395.23

West Yorkshire Annual Growing Degree Days - Projections (12km)



Annual Growing Degree Days (Degree Days)



Legend

Met Data Projections

Annual Growing Degree Days (Degree Days)

- 776.76 - 982.53
- 982.53 - 1188.29
- 1188.29 - 1394.05
- 1394.05 - 1599.82
- 1599.82 - 1805.58
- 1805.58 - 2011.34
- 2011.34 - 2217.10
- 2217.10 - 2422.87
- 2422.87 - 2628.63
- 2628.63 - 2834.39

OpenStreetMap

Global Warming Level 2°C Median

Scale 1:400000

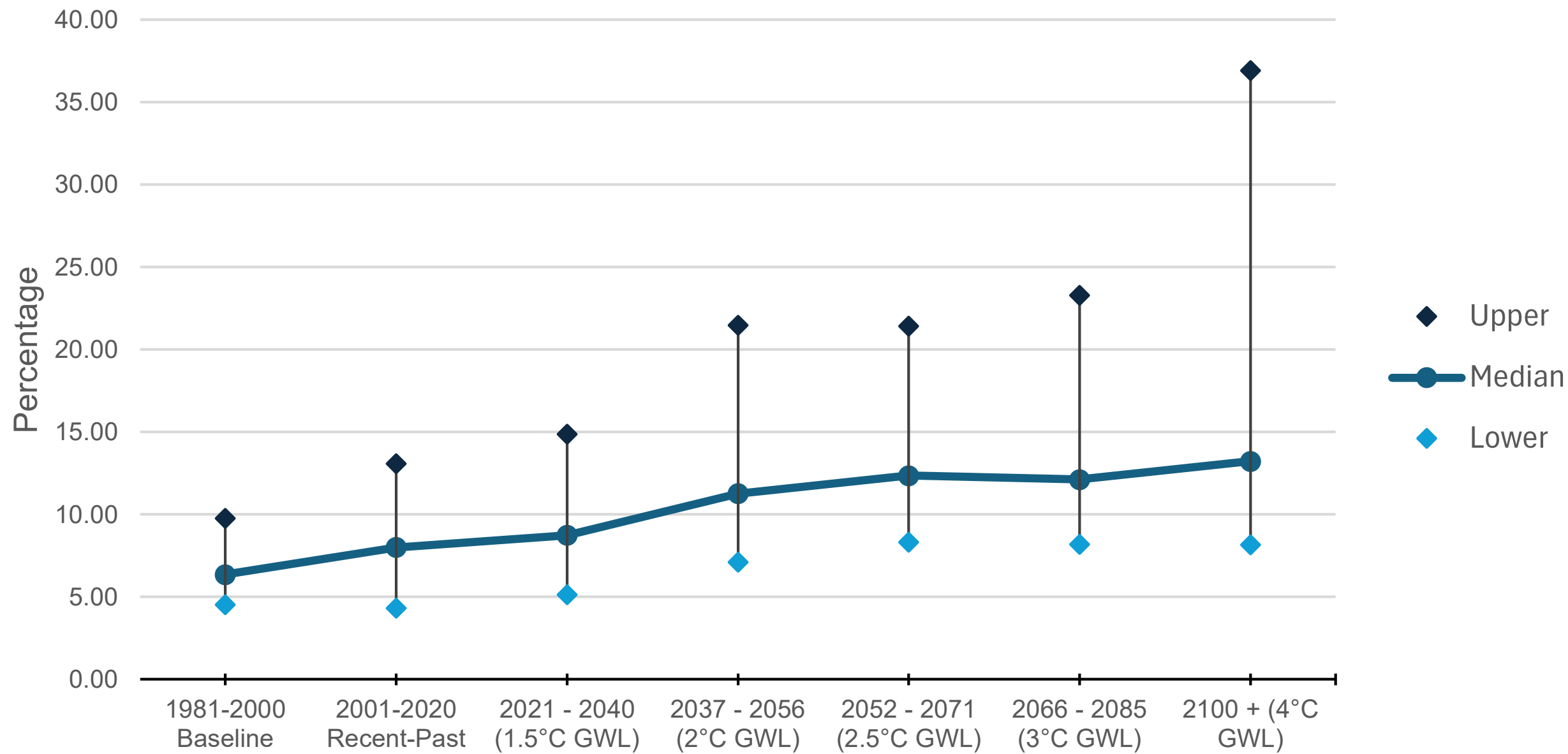
Date: 2026-07-30

Drought Severity Index, 12-Month Accumulations - Projections

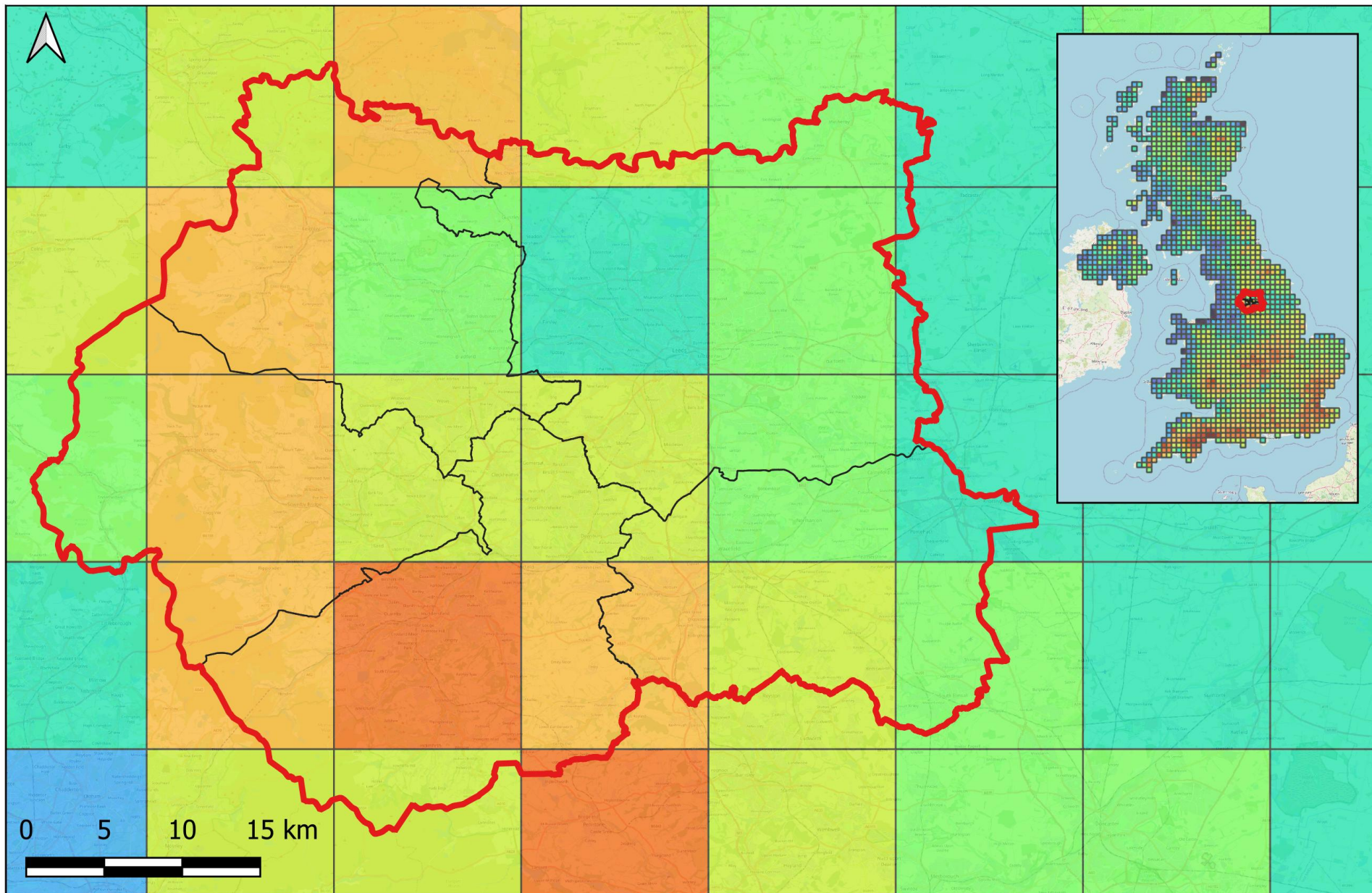
- This dataset maps projected changes in 12-month drought severity across West Yorkshire, showing how prolonged imbalances between rainfall and water demand may develop under future climate conditions. Higher values indicate more severe drought conditions. It helps the region assess risks to water supplies, river flows, agriculture, ecosystems, soils and infrastructure, and supports long-term planning for water efficiency, drought preparedness, land management and resilient public services.

Range	Upper	Median	Lower
1981-2000 Baseline	9.77	6.36	4.54
2001-2020 Recent-Past	13.09	8.01	4.32
2021 - 2040 (1.5°C GWL)	14.88	8.74	5.13
2037 - 2056 (2°C GWL)	21.48	11.26	7.13
2052 - 2071 (2.5°C GWL)	21.44	12.36	8.32
2066 - 2085 (3°C GWL)	23.29	12.12	8.20
2100 + (4°C GWL)	36.93	13.22	8.16

West Yorkshire Drought Severity Index, 12-Month Accumulations - Projections



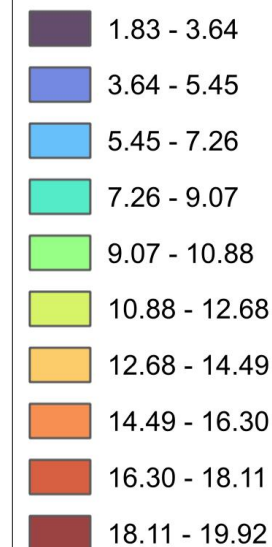
Drought Severity Index (%)



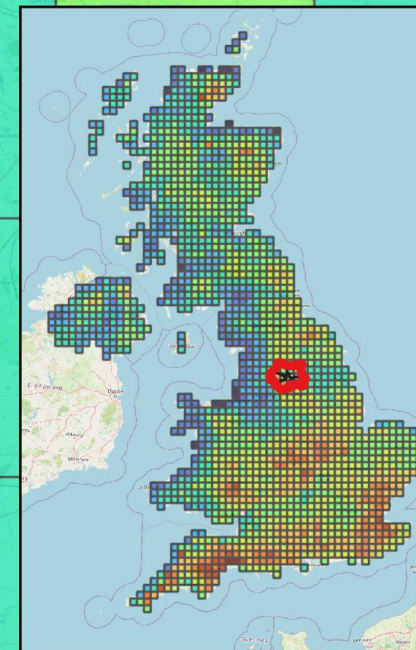
Legend

Met Data Projections

Drought Severity Index (%)



OpenStreetMap



Global Warming Level 2°C Median

Scale 1:400000

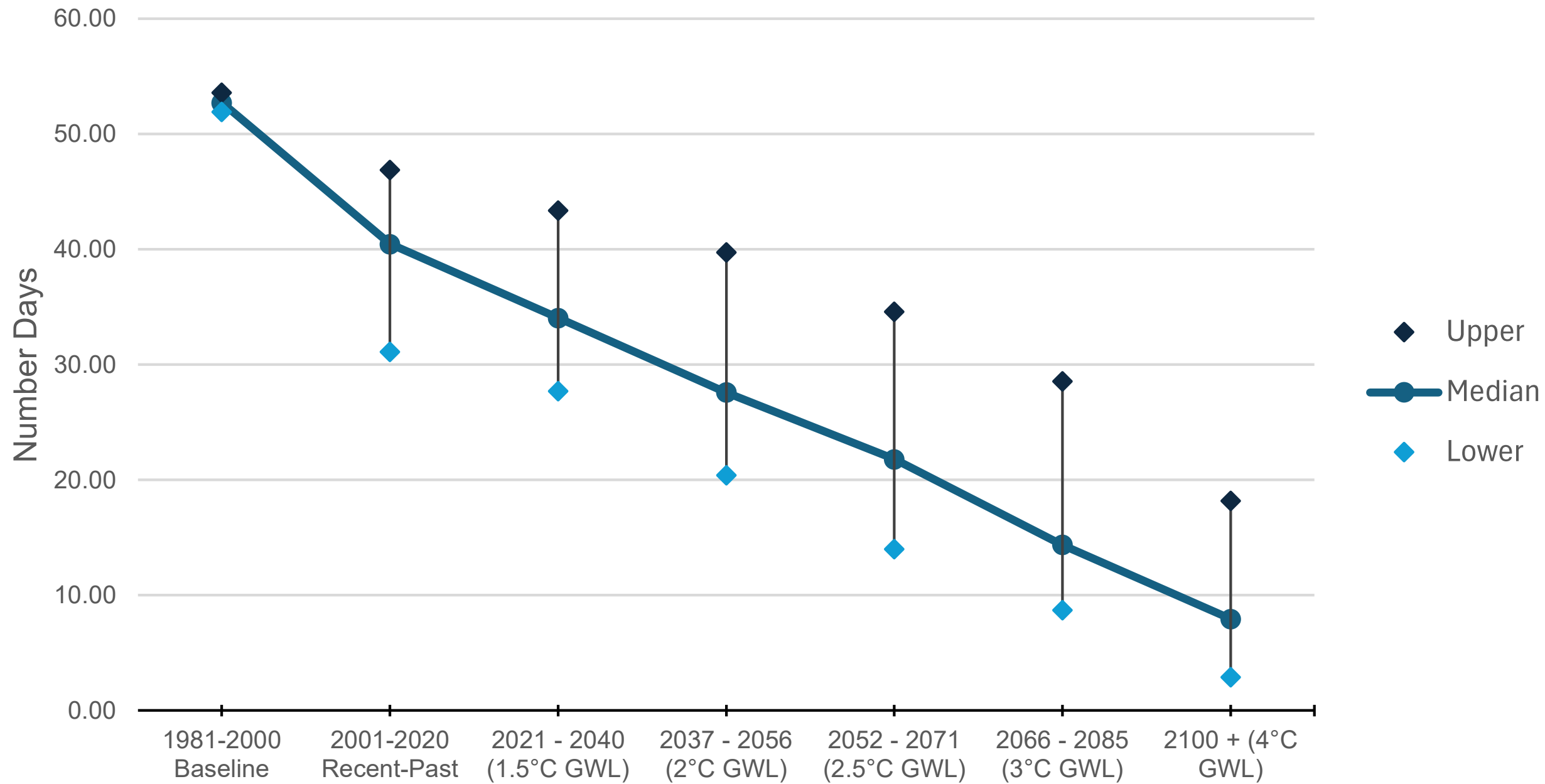
Date: 2026-07-30

Annual Count of Frost Days

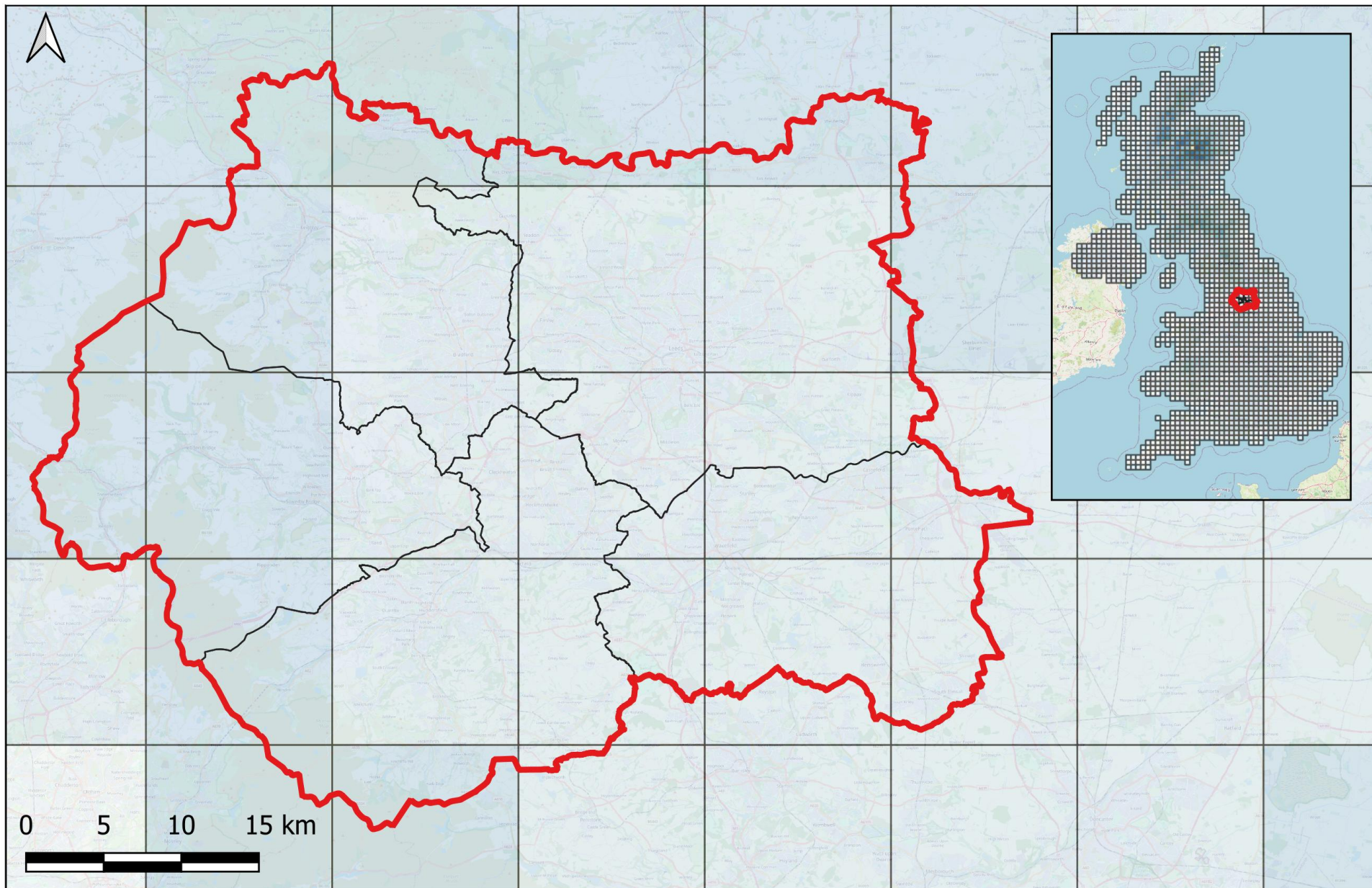
- This dataset shows the projected annual number of frost days across West Yorkshire, days when minimum temperatures fall below 0°C. Changes in frost frequency affect road and site safety, gritting and maintenance needs, agriculture, ecosystems, water systems and building infrastructure. The projections help the region plan winter services and long-term adaptation while recognising that damaging frost events can still occur in a warmer climate.

Range	Upper	Median	Lower
1981-2000 Baseline	53.58	52.71	51.91
2001-2020 Recent-Past	46.88	40.46	31.10
2021 - 2040 (1.5°C GWL)	43.36	34.04	27.70
2037 - 2056 (2°C GWL)	39.74	27.59	20.41
2052 - 2071 (2.5°C GWL)	34.58	21.80	14.03
2066 - 2085 (3°C GWL)	28.57	14.37	8.70
2100 + (4°C GWL)	18.18	7.94	2.92

West Yorkshire Annual Count of Frost Days - Projections (12km)



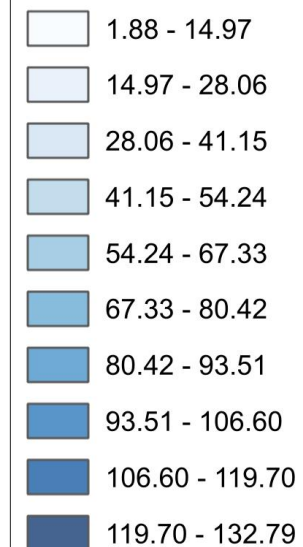
Annual Count of Frost Days (Days)



Legend

Met Data Projections

Annual Count of Frost Days (Days)



OpenStreetMap

Global Warming Level 2°C Median

Scale 1:400000

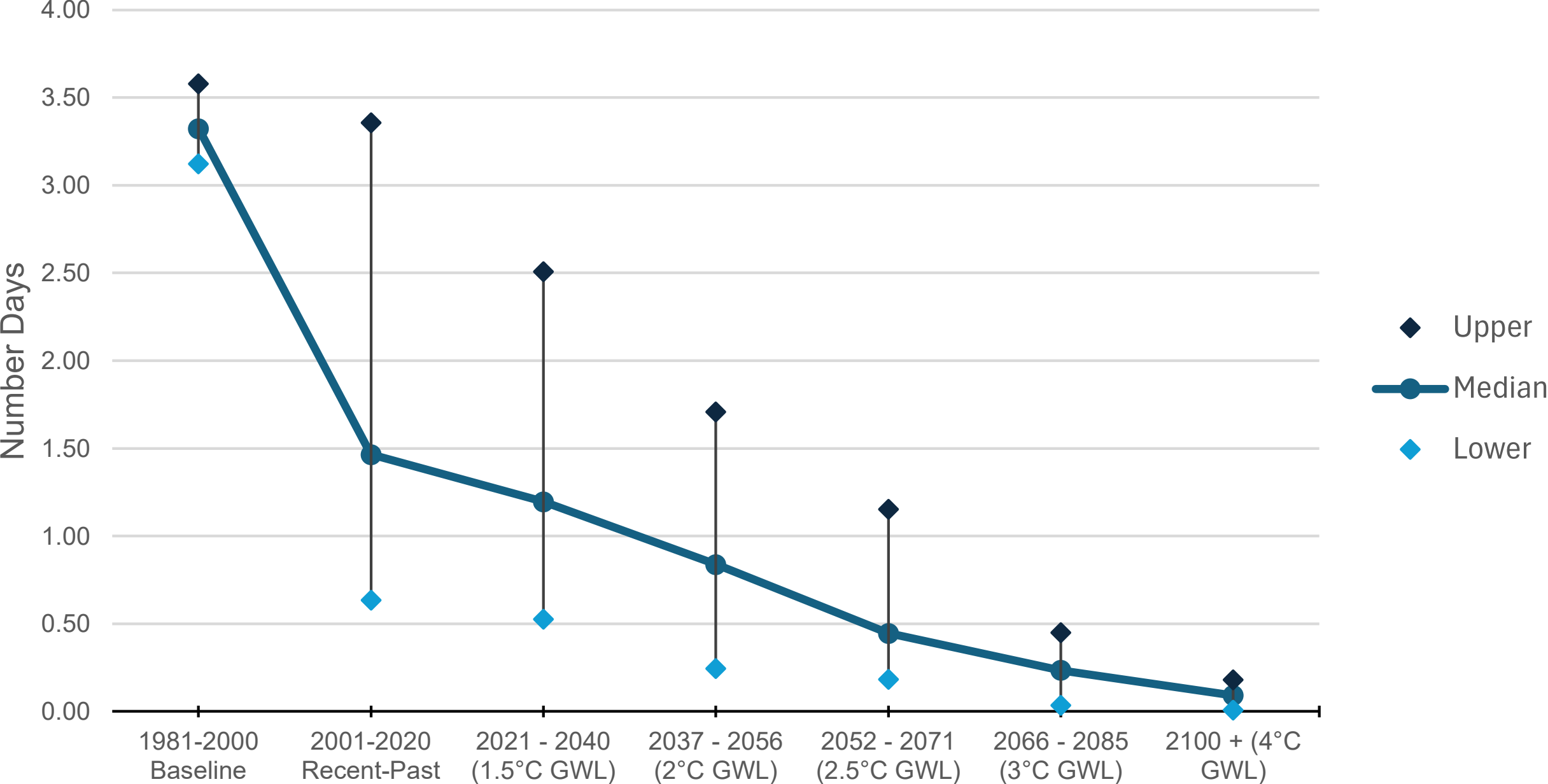
Date: 2026-07-30

Annual Count of Icing Days

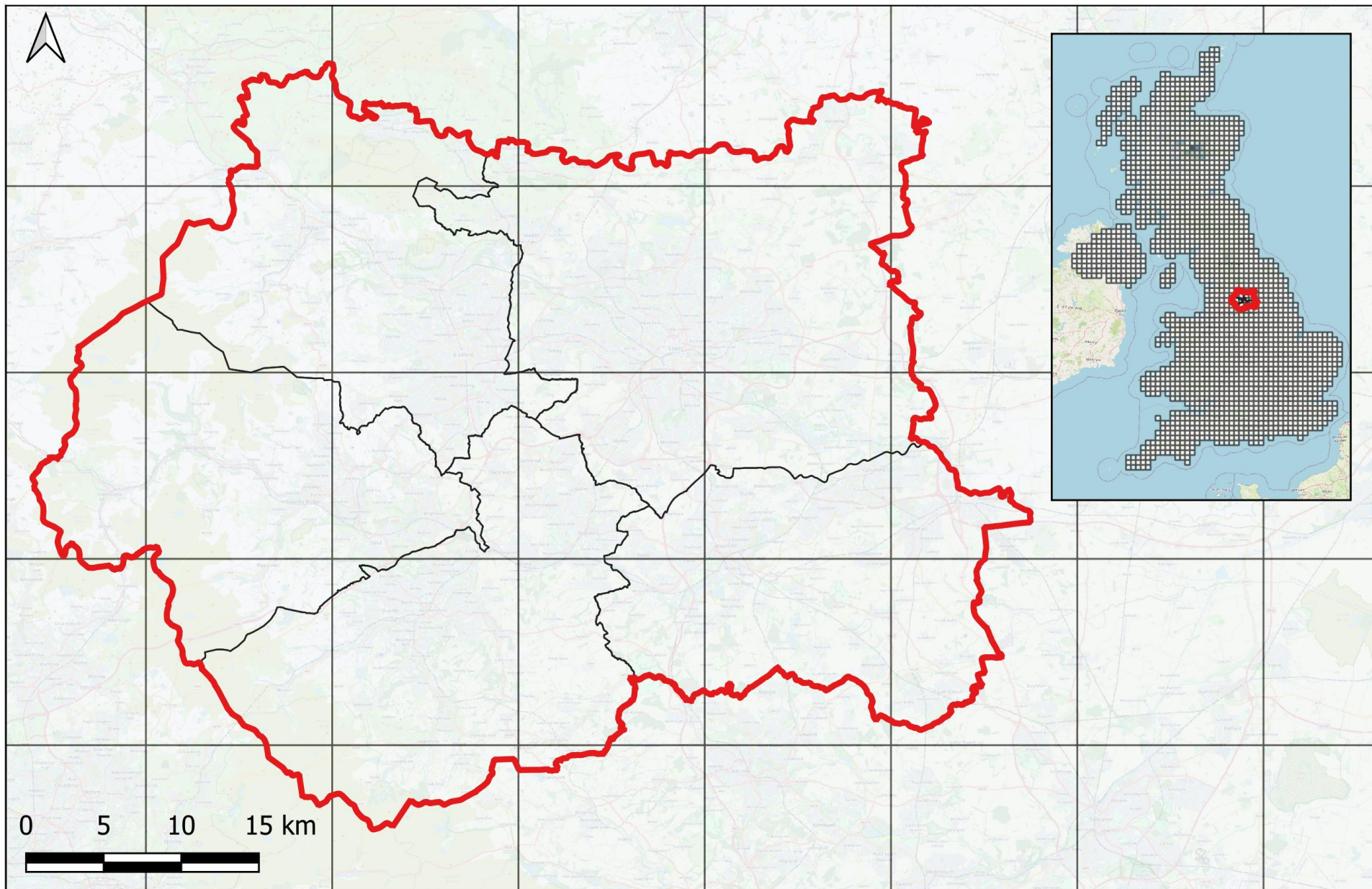
- This dataset shows the projected annual number of icing days across West Yorkshire, days when maximum temperatures remain below 0°C. These prolonged freezing conditions can disrupt roads, rail, workplaces and public services, increase accident risks, and damage buildings, pipes and other infrastructure. The projections help the region plan winter maintenance, emergency response and resilient transport and assets while recognising that severe cold events may still occur.

Range	Upper	Median	Lower
1981-2000 Baseline	3.58	3.32	3.12
2001-2020 Recent-Past	3.36	1.47	0.63
2021 - 2040 (1.5°C GWL)	2.51	1.20	0.53
2037 - 2056 (2°C GWL)	1.71	0.84	0.25
2052 - 2071 (2.5°C GWL)	1.15	0.45	0.18
2066 - 2085 (3°C GWL)	0.45	0.23	0.03
2100 + (4°C GWL)	0.18	0.09	0.01

West Yorkshire Annual Count of Icing Days - Projections (12km)



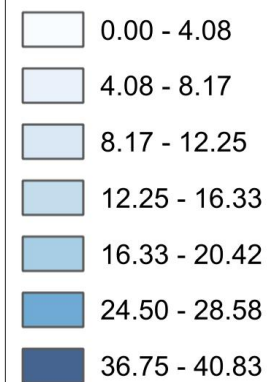
Annual Count of Icing Days (Days)



Legend

Met Data Projections

Annual Count of Icing Days (Days)



OpenStreetMap

Global Warming Level 2°C Median

Scale 1:400000

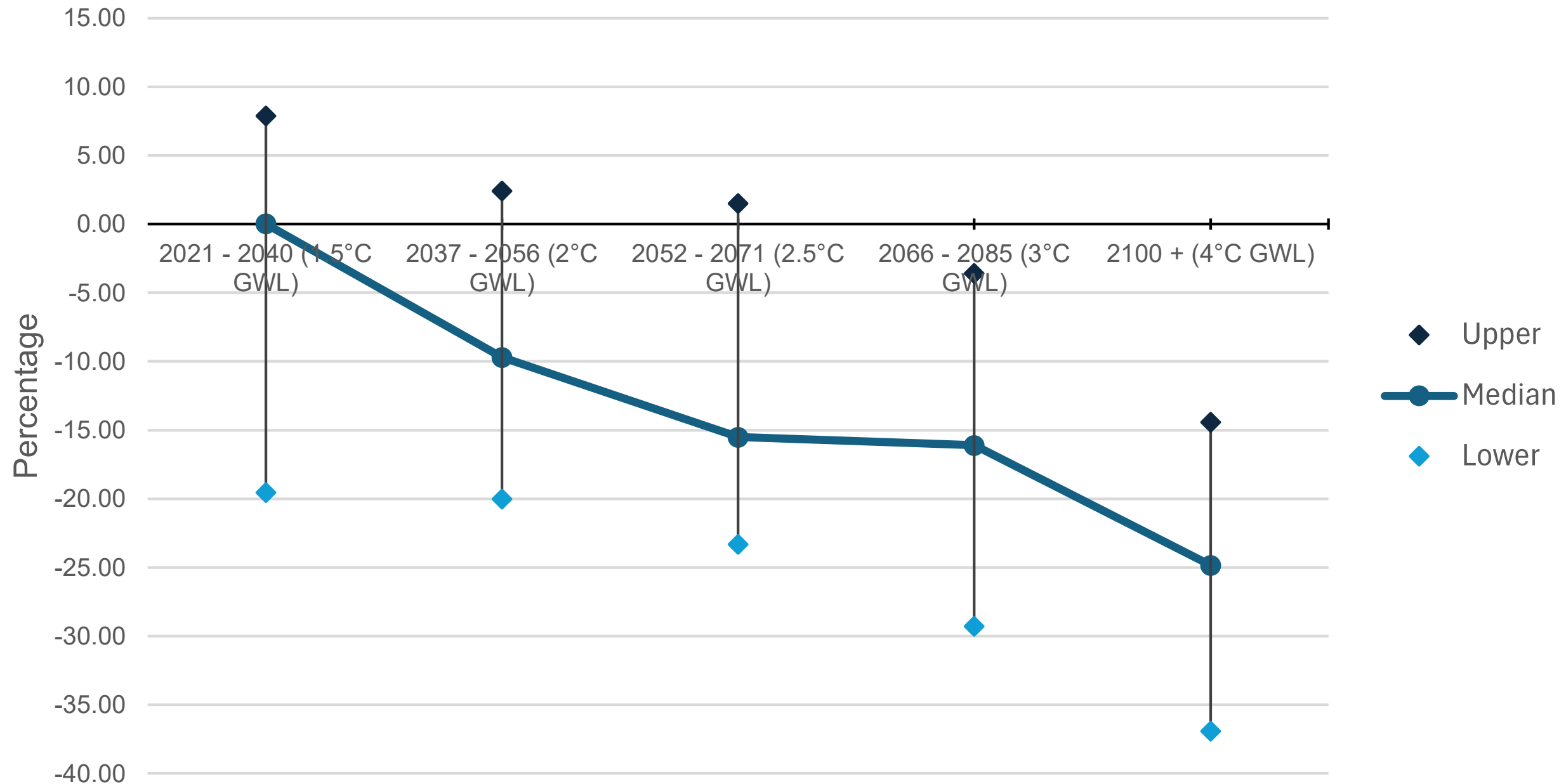
Date: 2026-07-30

Summer Precipitation Change

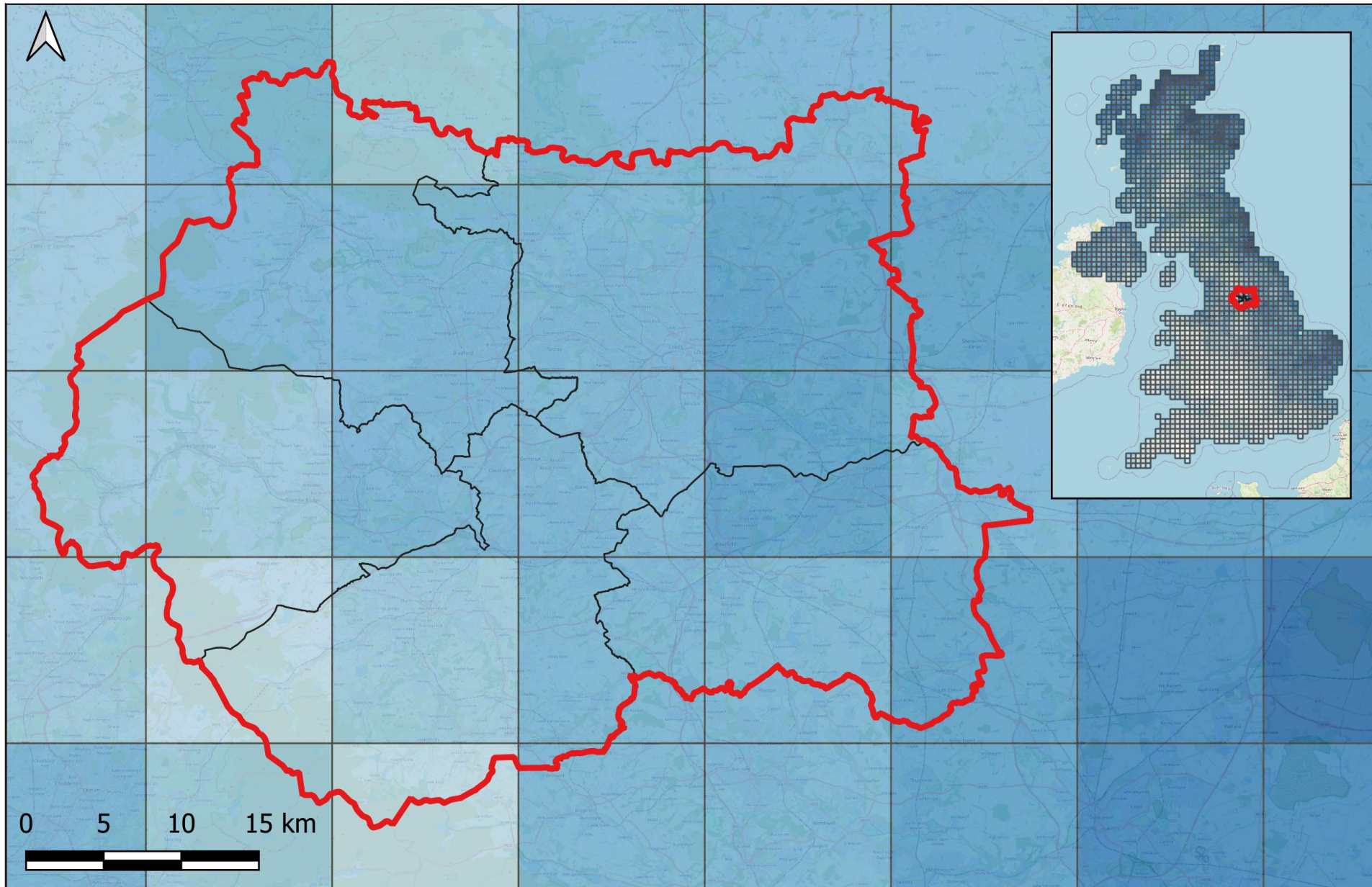
- This dataset shows projected percentage changes in average summer rainfall across West Yorkshire. Changing summer rainfall could increase pressure on water supplies, agriculture, ecosystems and green spaces, while dry ground may worsen the impacts of intense downpours and flash flooding. The projections support water-resource planning, drought preparedness, drainage design and climate-resilient land and infrastructure management.

Range	Upper	Median	Lower
2021 - 2040 (1.5°C GWL)	7.88	0.03	-19.55
2037 - 2056 (2°C GWL)	2.41	-9.69	-20.00
2052 - 2071 (2.5°C GWL)	1.52	-15.50	-23.31
2066 - 2085 (3°C GWL)	-3.57	-16.11	-29.28
2100 + (4°C GWL)	-14.42	-24.84	-36.92

West Yorkshire Summer Precipitation Change - Projections (12km)



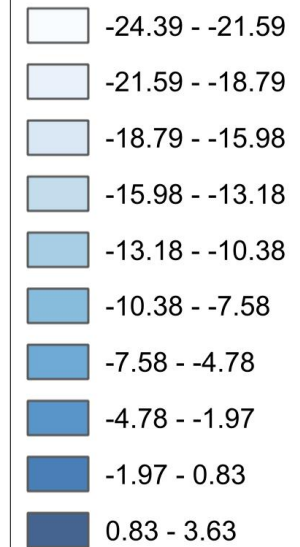
Summer Precipitation Change (%)



Legend

Met Data Projections

Summer Precipitation Change (%)



OpenStreetMap

Global Warming Level 2°C Median

Scale 1:400000

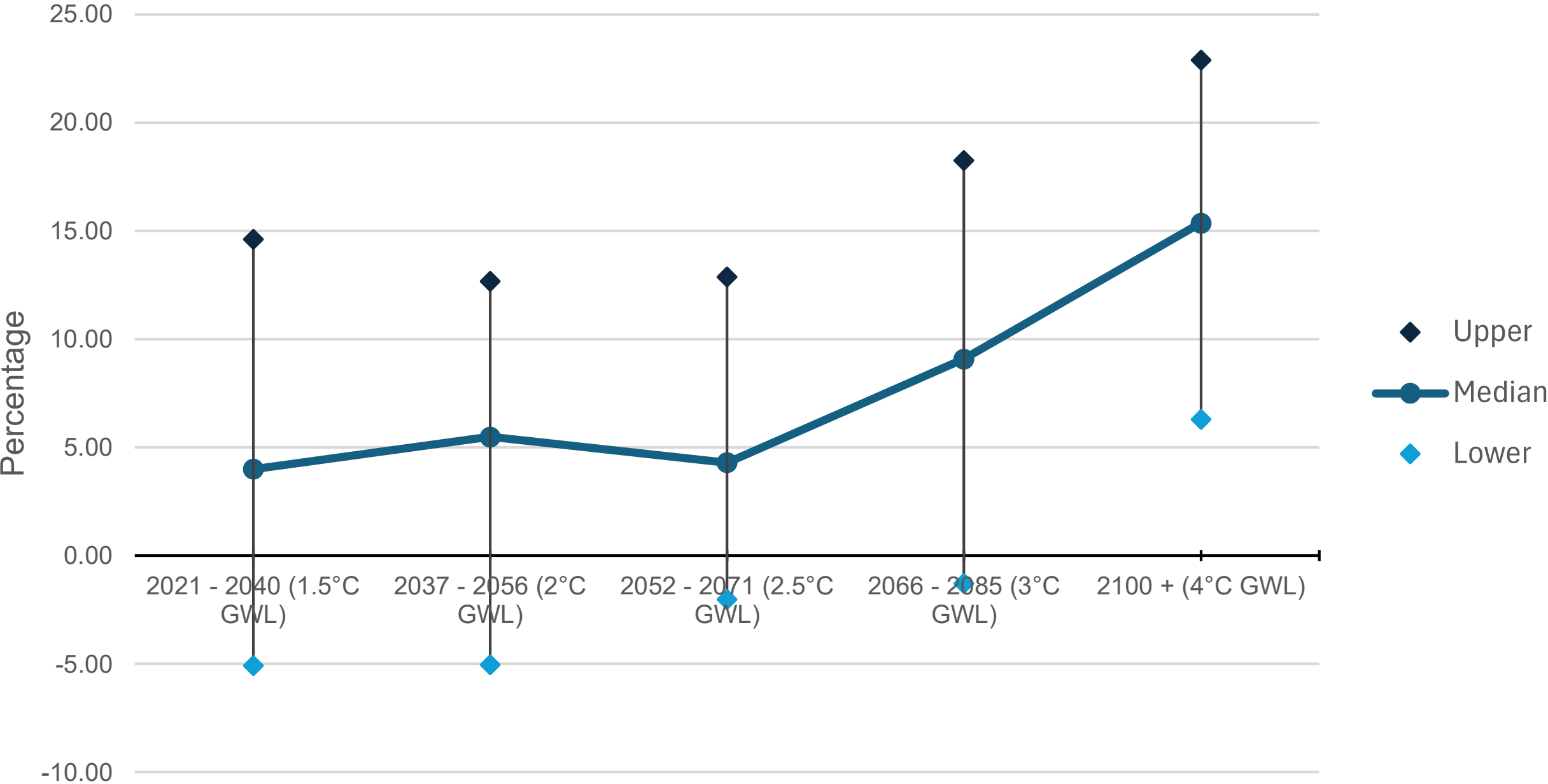
Date: 2026-07-30

Winter Precipitation Change

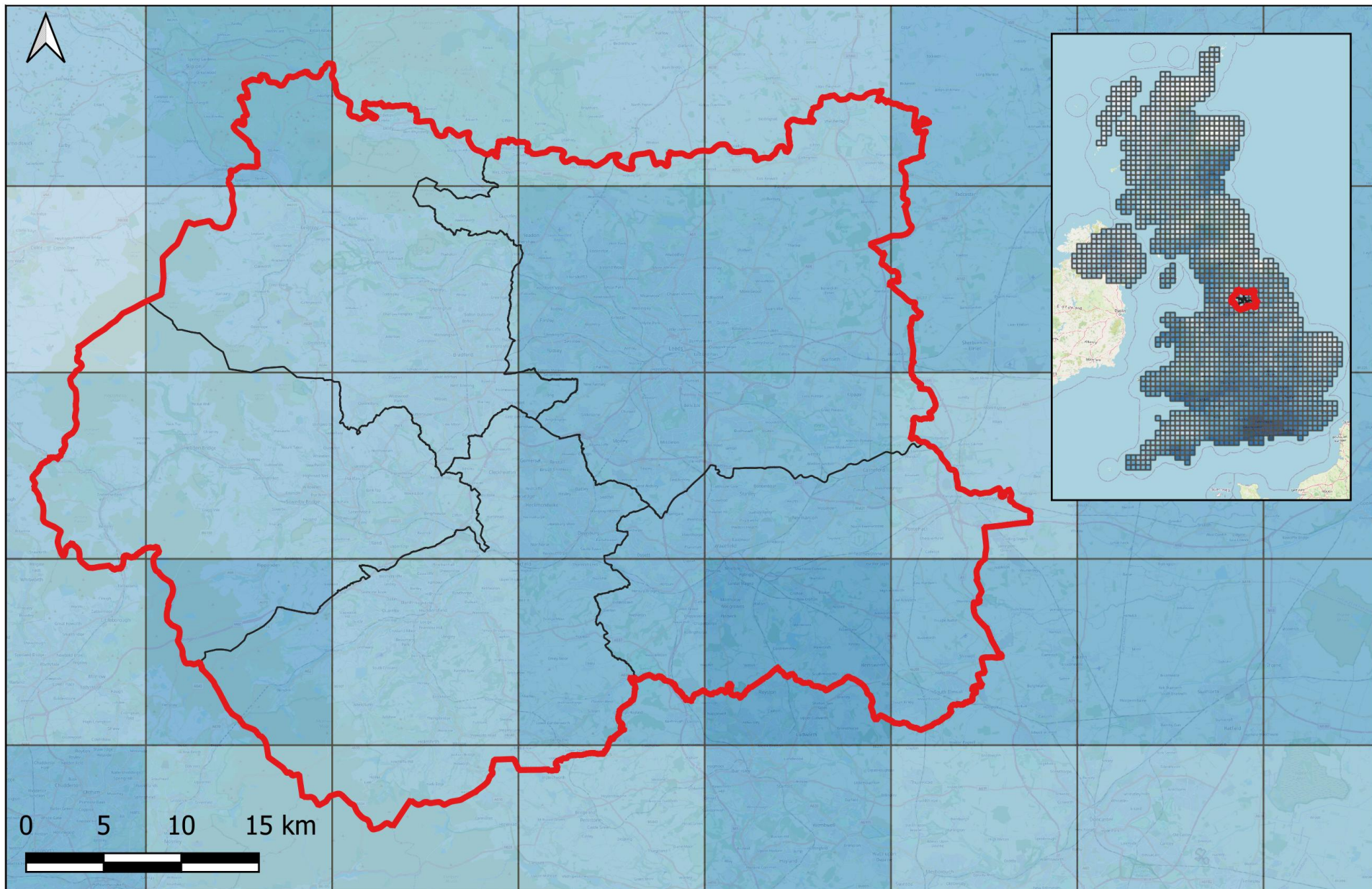
- This dataset shows projected percentage changes in average winter rainfall across West Yorkshire. Wetter winters could increase river, surface-water and groundwater flood risk, soil saturation, landslides and disruption to transport, buildings and essential services. The projections support flood-risk management, drainage and infrastructure design, catchment planning and investment in climate-resilient communities.

Range	Upper	Median	Lower
2021 - 2040 (1.5°C GWL)	14.62	4.00	-5.08
2037 - 2056 (2°C GWL)	12.67	5.49	-5.03
2052 - 2071 (2.5°C GWL)	12.87	4.30	-2.02
2066 - 2085 (3°C GWL)	18.25	9.09	-1.28
2100 + (4°C GWL)	22.89	15.36	6.29

West Yorkshire Winter Precipitation Change - Projections (12km)



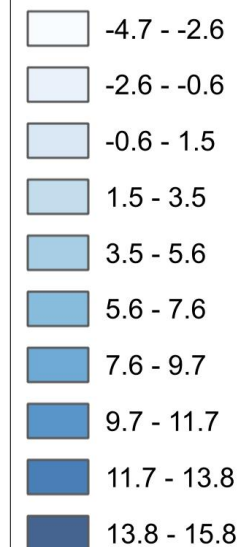
Winter Precipitation Change (%)



Legend

Met Data Projections

Winter Precipitation Change (%)



OpenStreetMap

Global Warming Level 2°C Median

Scale 1:400000

Date: 2026-07-30