Establishing a common operating picture of local climate risks

Climate Security National Foresight Group

Report 5

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This report provides a summary of tools that can be used to understand local climate risk now and in the future. It then concludes with recommendations and further questions for consideration by the Climate Security National Foresight Group.

Reports by this group will provide key insights on topics of importance tasked by this group or key stakeholders. They intend to provide a context and start point for discussions.

The target audience for this report is Local Resilience Forums, or public services and stakeholders. This is not necessarily contextualised as a national tool, although the tools described in here are scalable.

Contents

Understanding your local climate risks

We have put together this guide to aid those at the geography of a local authority to understand their local climate projections, risks and opportunities. Tools for understanding local climate risk all require a combination of local knowledge, data awareness and in it may also be beneficial to have a working understanding of geographic information systems (GIS) expertise within teams if you plan to utilise data locally within your own platforms. These data tools can be used to help inform local community risk registers and other planning activities and assumptions.
We have reviewed a lot of the supportive tools and practices available and recommend four key tools for understanding your local climate risk.

1) The Met Office Data Portal:

   - Allows a range of data to be explored (you're in control of what and how you use the data)
   - It's scaled data
   - It allows you to overlay your own data on to their data
   - You can export the data to Excel or Power BI to integrate it into your own data products
     - https://climate-themetoffice.hub.arcgis.com/
     - https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/summaries/index

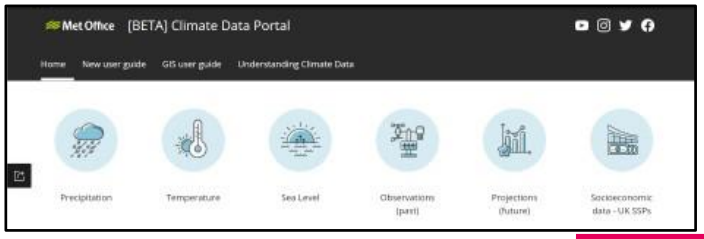
2) The University of Reading/UK Climate Risk Indicator Explorer: https://uk-cri.org/

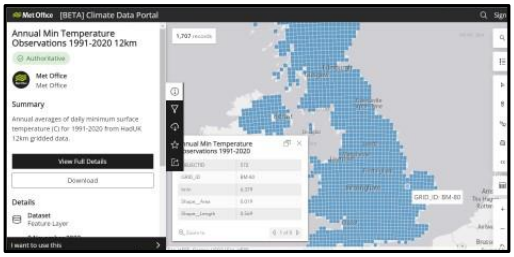
3) The University of Exeter has developed the Local Climate Adaptation Tool (LCAT) to understand the likely adaptation needs of your local area based on the climate changes and risks nuanced to your local area: https://www.lcat.uk/

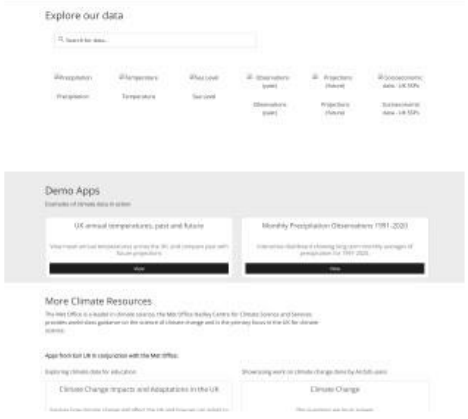
4) The Climate Just Local Resilience Tool to map risks and vulnerability data across your communities (preparedness, ability to recover, emergent and existing need): https://www.climatejust.org.uk/about

Tool 1: The Met Office Data Portal

Met Office Data Portal: What can it do?







2100
2300
Temperature
UKCP18
Monthly
Projections
Annual
Average
1991-2020

Reproduced from the Met Office: https://storymaps.arcgis.com/stories/1e9ba72a0b75473cb45a33c82cf23800

The data portal uses a broad range of data sets to match, map and aggregate displays of climate risks within a geographical area against other data such as:

- Observational data (Temperature and Precipitation)
- Climate projection data which includes emission scenarios as well as warming levels (Temperature, Precipitation and Sea level)
- UK socioeconomic data (by local authority or groups of authorities)

There are lots of opportunities to layer the data in the portal, as well as different timelines to contextualise and layer the data for nuanced understanding of future ~~pathwayswithin.~~pathways. As we consider those different timelines and changes~~, so~~ there is a greater chance that society will have changed to ~~reflecxt~~reflect these developing climatic ~~scenarioso.~~scenarios. If we are considering the likely projected development of climate risks in 2100, advances in how society lives, works and plays are likely to have changed by then, independently, or connected to, the changing climate. The portal considers five scenarios that were developed to be consistent with the global SSPs used by the IPCC. Specifically it tries to create a likely sets of parameters of how the global economy and society might change between 2020 and 2100, as our climate response would likely interweave with the likely projections of changes to our climate. Within that, the portal provides the following datasets by local authority, for the projections to be layered with other data to inform scenario planning and preparedness. Data includes:

Variable	Description	SSPs available	Resolution
Demography	Population age structure split into 19 age classes; e.g., 10-14 years	SSP2	ONS LAD boundaries simplified to 10m resolution
Life Expectancy	Life expectancy at birth	SSP1, SSP2, SSP3, SSP4 and SSP5	ONS LAD boundaries simplified to 10m resolution
Inequality	S80/S20 income quintile ratio. The S80/S20 ratio is a measure of the inequality of income distribution. The ratio is the total income received by the 20% of the population with the highest income (the top quintile) against the total income received by the 20% of the population with the lowest income (the bottom quintile).	SSP1, SSP2, SSP3, SSP4 and SSP5	ONS NUTS3 boundaries simplified to 10m resolution
Population	Headcount	SSP1, SSP2, SSP3, SSP4 and SSP5	2km grid
Rail Infrastructure	Railway lines per area	SSP1, SSP2, SSP3, SSP4 and SSP5	ONS LAD boundaries simplified to 10m resolution
Social Cohesion	Share (%) of population reporting neighbours willing to help expressed as a percentage	SSP1, SSP2, SSP3, SSP4 and SSP5	ONS NUTS3 boundaries simplified to 10m resolution

How does it work?

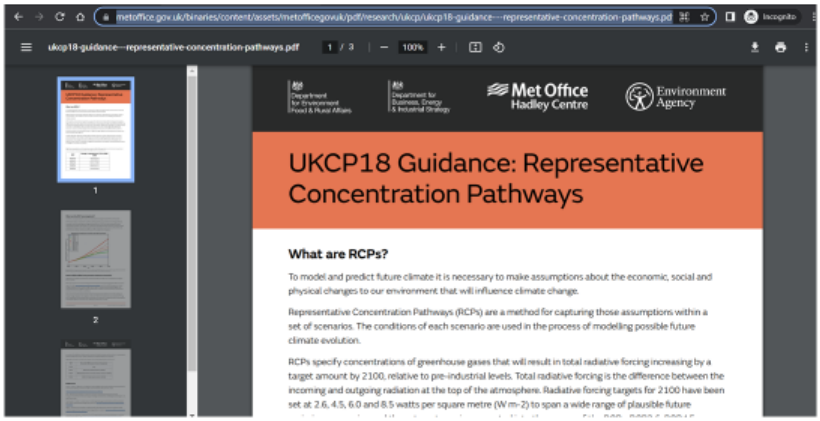
By combining the UK SSPs with climate data, we can consider how societal and economic changes may affect climate change mitigation and adaptation plans.

The 'storymap' created on the MetOffice pages explores a few simple examples, using the SSP2 (middle of the road) scenario, alongside some UKCP projections of climate averages under the RCP8.5 (high emissions) scenario.

The five scenarios

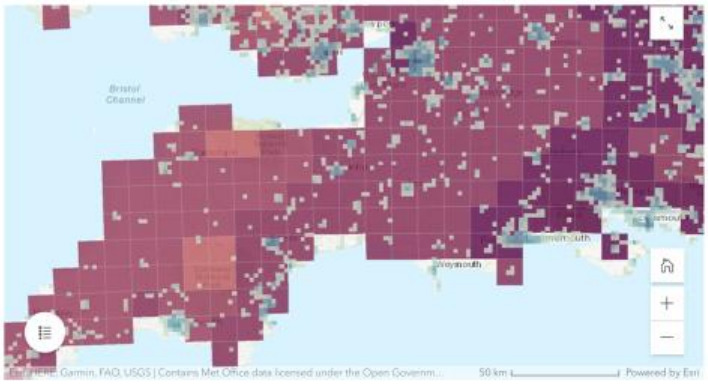
The data is available for five scenarios, which are different storylines of possible societal and economic futures. These scenarios are independent of climate change or climate change policies.

The RCP pathways represent a broad range of climate outcomes, they are neither forecasts nor policy recommendations. They include a wide range of assumptions regarding population growth, economic development, technological innovation and attitudes to social and environmental sustainability (adapted and abridged from the Met Office definition)



Population and Monthly Temperatures (Aug)

- As average summer temperatures rise, the health impacts of high temperatures may affect larger areas of the UK. And at the same time, as average winter temperatures rise, the health impacts of cold temperatures may affect smaller areas.
- The socioeconomic impacts of this will depend on the number of people in the affected areas, which is where adding SSP data can help. Where temperatures are higher, and population density is projected to be higher, we can predict the type of pressure on resources in those areas and the type and scale of FRS resources can start to be predicted.



Population 2060 (SSP2) and August average temperatures 2050-2079 (median projection from RCP8.5)

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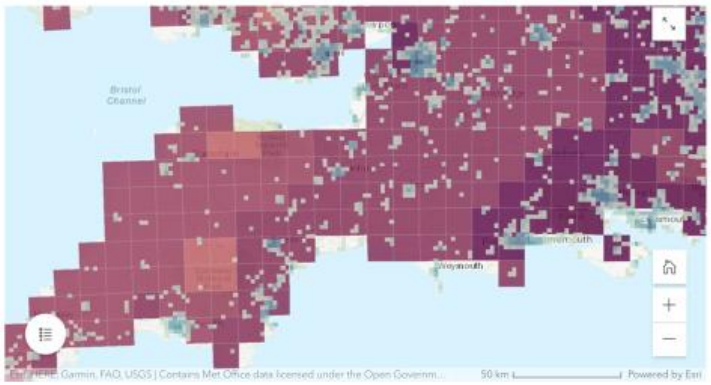
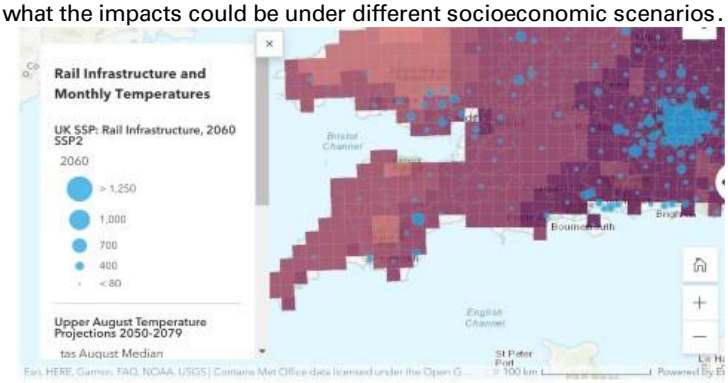


Population 2060 (SSP2) and August average temperatures 2050-2079 (median projection from RCP8.5)

Rail Infrastructure and Monthly Temperature

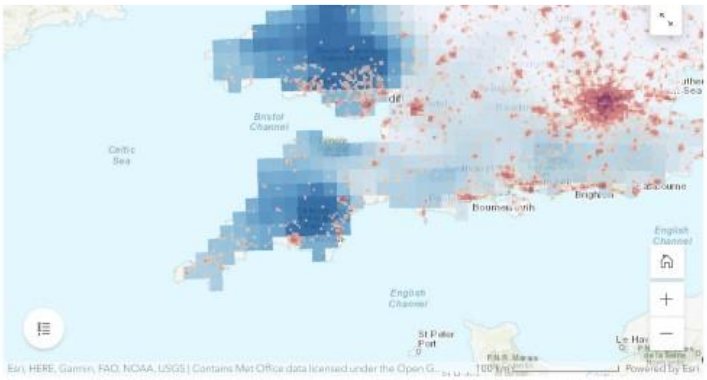
- During high summer temperatures, train tracks can buckle. Comparing areas with highest projected temperatures and the density of the current rail network could help assess the potential impacts of this.
- Using SSP projections for the rail network, instead of just the current network, allows us to consider the range of what the impacts could be under different socioeconomic scenarios.



Rail Infrastructure in 2060 under SSP2 (in m/km2 by local authority district) and August average temperatures 205
2079 (median projection from RCP8.5)

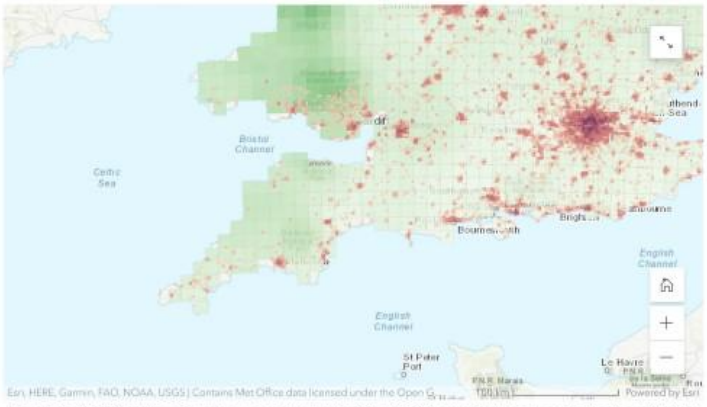
Population and Monthly Precipitation (Jan)

- Projections of wetter winters and drier summers are expected to impact on water resources.
- By including the SSP population density data, we can see that the highest density of populations are in the South East (under the SSP2 scenario). This could increase the potential impacts of the low rainfall averages in these areas.



Population 2060 (SSP2) and January average precipitation 2050-2079 in mm/day (median projection from RCP8.5)

Population and Monthly Precipitation (Aug)

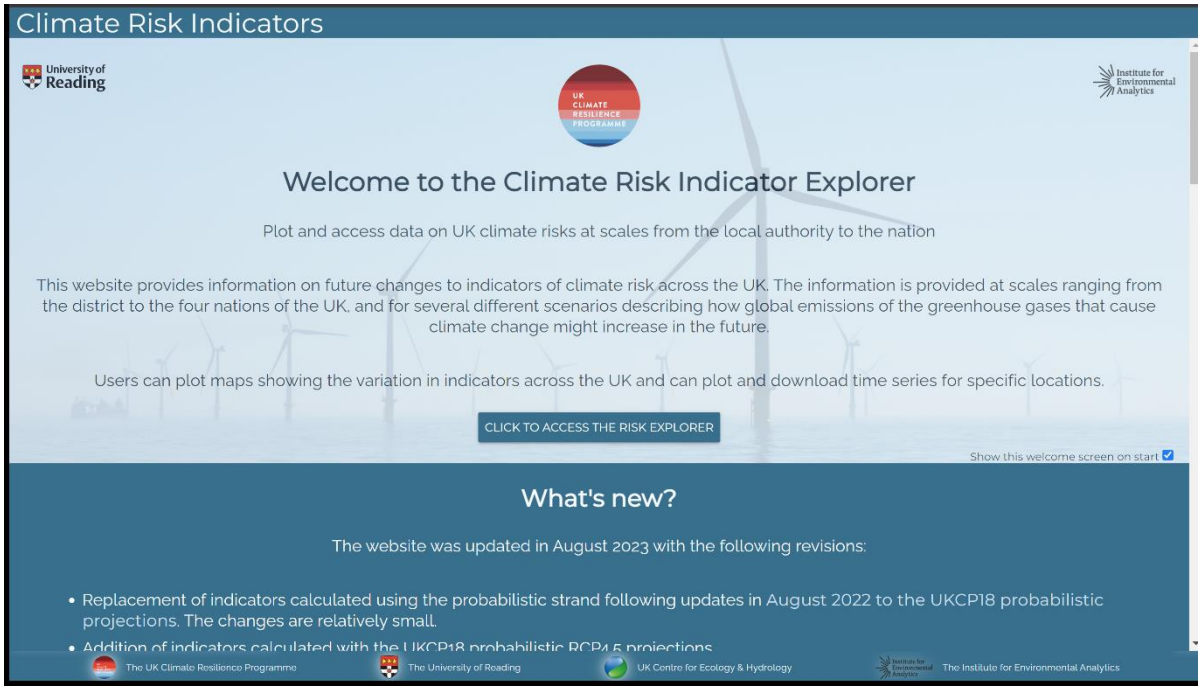


Population 2060 (SSP2) and August average precipitation 2050-2079 in mm/day (median projection from RCP8.5)

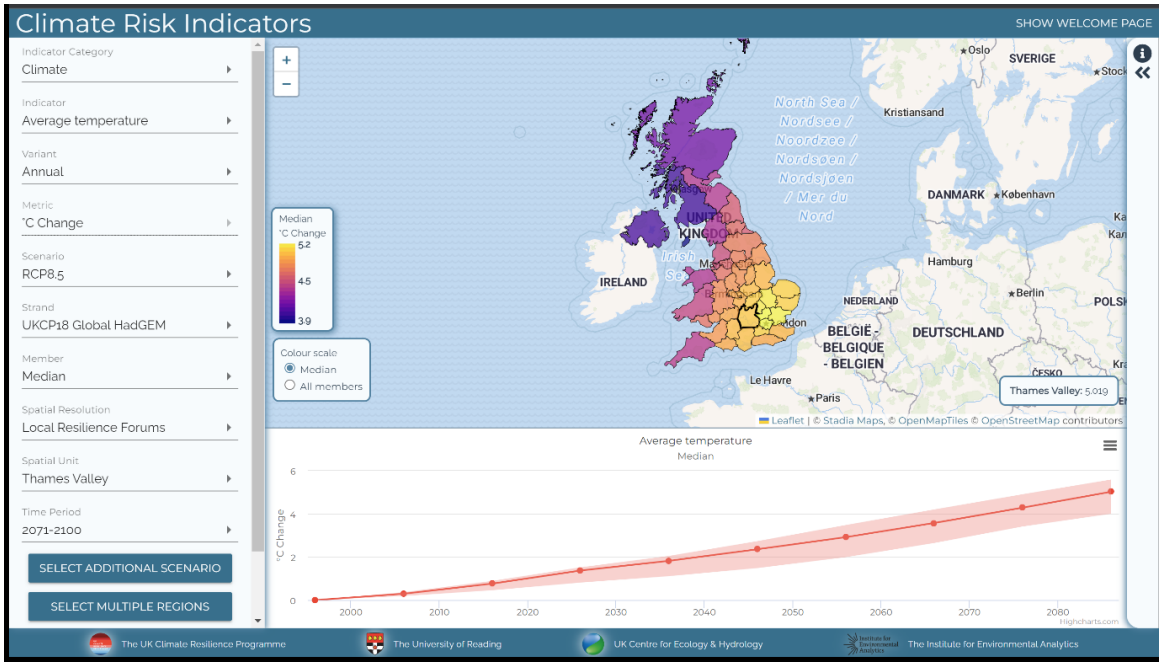
Tool 2: The Climate Risk Indicator Explorer

https://uk-cri.org/

This is another way in which you can use a tool to understand the risks of the changing climate within your area. The Climate Risk Indicator tool, built by Reading University, uses seven indicator categories and a number of different scenarios built through their climate resilience programme.



This operates in a similar way to the other tools. It has similar datasets and the ability to spatially size your local area as you wish.



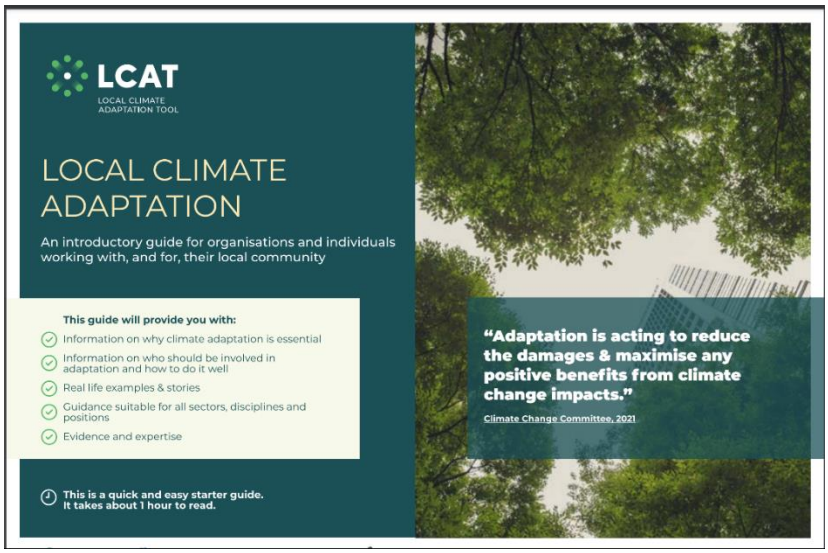
Tool 3: The Local Climate Adaptation Tool

The website says that this tool will help to outline:

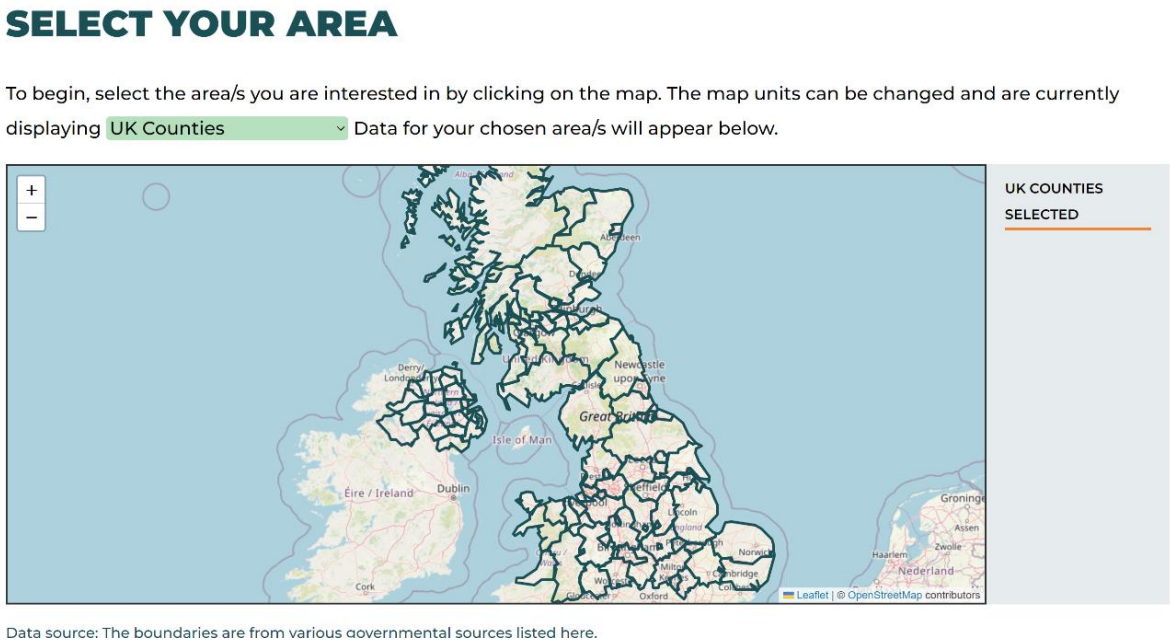
1) How local climates will change
2) What health and community impacts may occur as a result
3) Who will be most vulnerable and why
4) Which adaptations to consider

The LCAT is evidence-based and designed with and for local decision makers and can be found here, with instructions on how to use the tool: https://www.lcat.uk/

It has some good explainers:



The tool then navigates you through some instructions to operate the tool:



Tool 4: The Climate Just webpages and tool

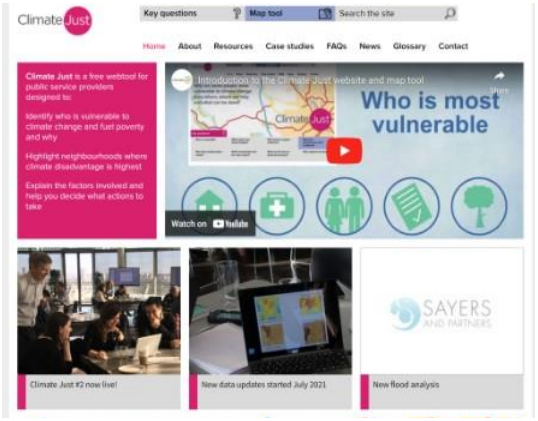
https://www.climatejust.org.uk/welcome-climate-just-web-tool

This tool seeks to overlay local climate projections with community resilience indicators. These include:

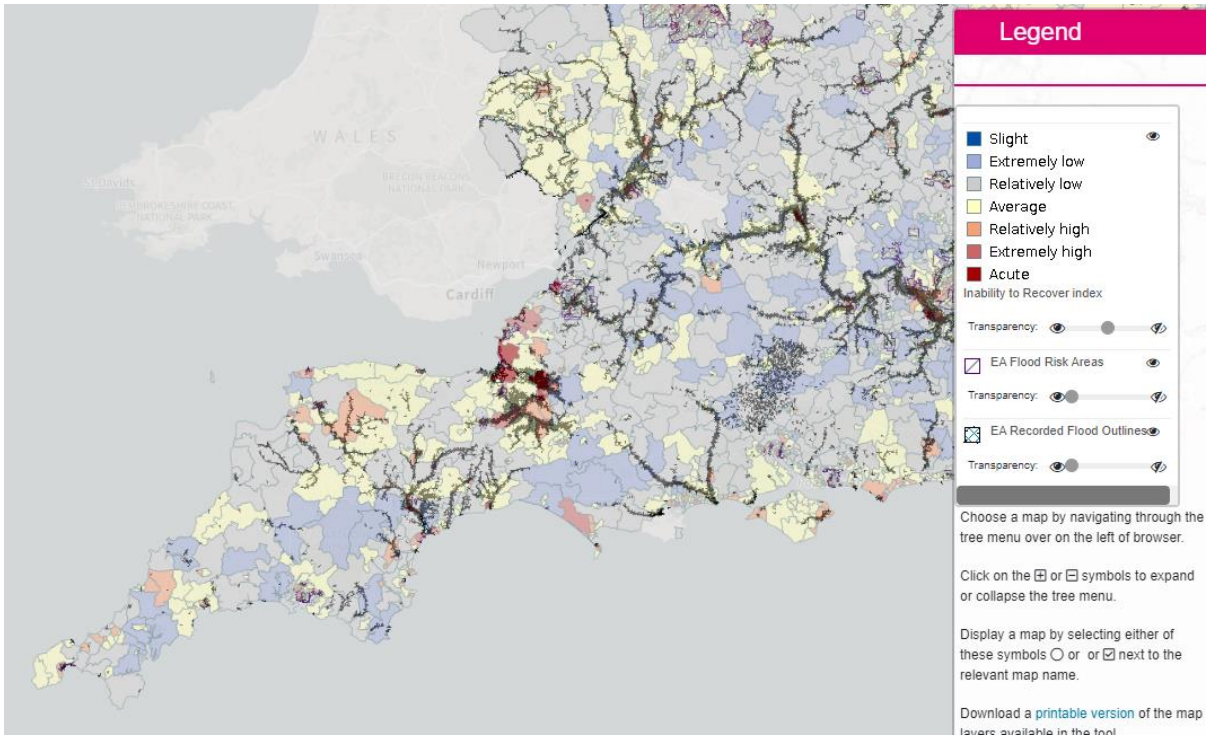
- Neighbourhood Flood Vulnerability Index
- Susceptibility
- Inability to prepare
- Inability to respond
- Inability to recover
- Community support
- Social Flood Risk Index
- River and Coastal
- Surface water

Just Climate Tool: https://www.climatejust.org.uk/welcome -climate-just-web-tool

What can it do?



This tool aims to dock with policy decisions, by providing further decision tools based on the data output. This is not tailored to the local area, or findings from the data, but a suite of generic supportive resources are provided for local decision makers to enable action.


Legend
Slight
Extremely low
Relatively low
Average
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Acute
Inability to Recover index
Transparency:
EA Flood Risk Areas
Transparency:
EA Recorded Flood Outlines
Transparency:
Choose a map by navigating through the tree menu over on the left of browser.
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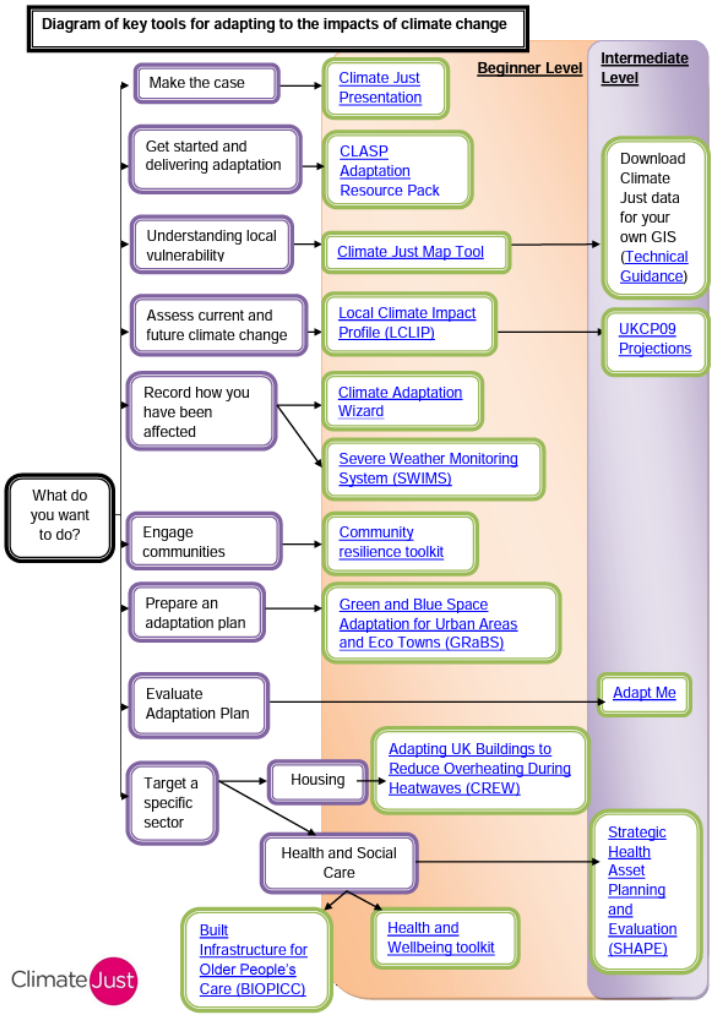
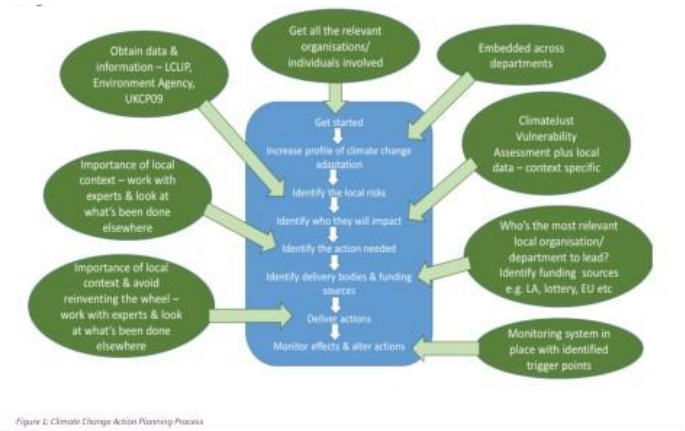
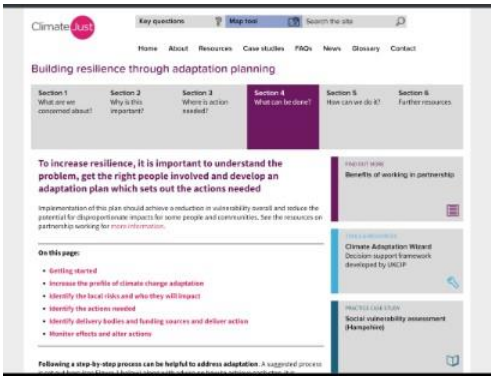
Display a map by selecting either of these symbols ○ or ☑ next to the relevant map name.
Download a printable version of the map





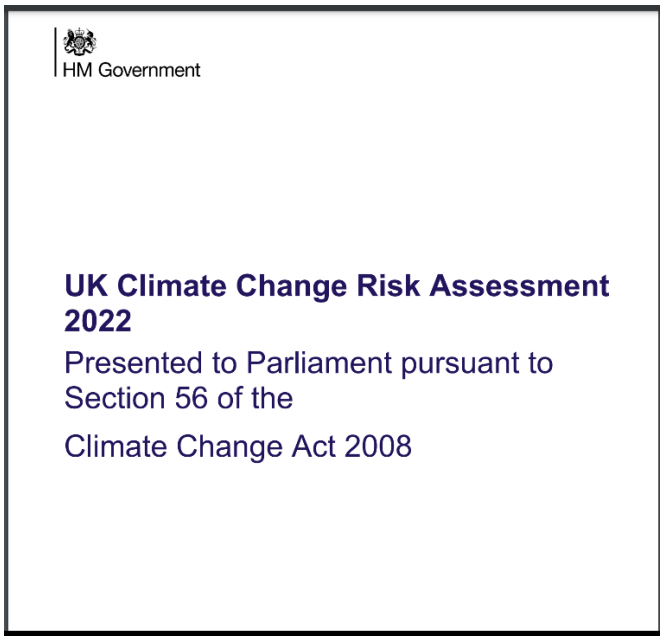


This tool is an important source of information, as it aims to address a complex issue that those communities at higher risk of climate risks, are broadly also the same

communities who are at the heart of the levelling up agenda. Those who will be disproportionately impacted by changes in our climate are the same groups who currently have economic, social, health and wellbeing inequality.

The UK Climate Change Risk Assessment Uncertainties

This helps us to see where the vulnerabilities at national area might be, and then to allow us to use this, and the output from the other tools, to see if these risks and vulnerabilities are present in our local context too.
https://assets.publishing.service.gov.uk/media/61e54d8f8fa8f505985ef3c7/climate-change-risk-assessment-2022.pdf



This version suggest that:

- "Adaptation planning must incorporate unpredictability and sudden shifts in the climate. Taking account of unpredictable extremes.
- There is a gap in the scientific literature around threshold effects. A threshold is the point when a 'non-linear' change in a system occurs because of change in a climate variable. Understanding such effects can inform when action is or is not needed.
- Risks interactions, cascades chains and escalation points, exacerbate existing disparities through its disproportionate effects on disadvantaged groups.
- Measuring adaptation actions can often take a long time to take effect but that there is often an absence of robust metrics or indicators and a lack long-term monitoring of such actions. Adaptation measures mixed with other environmental and socio-economic pressures is not easily detangled. Developing and implementing these indicators will strengthen our ability to understand the benefits of adaptation, and to communicate these to gain support from stakeholders across all sectors."

This helps us to understand how these aspects might influence our longer-term planning and scenario building. These are important considerations about the strength of evidence and the challenges of engaging with longer term risks. Taking these into consideration should enhance and increase the predictive power of your future scenario building, rather than weaken it.

Summary of Local Risk Common Operating Picture

Using all these tools together would be challenging. There is too much overlap to extract the datasets and build an aggregated dataset. However, using them in turn to understand and build a common operating picture of the likely scenario your area or sector is likely to experience and then start to plan, prepare, exercise to respond and recover from these risks is vital work. When trying to understand their application and the preventative work needed to adequately prepare for the changing climate and associated risks, we advocate a horizontal policy approach, across sectors, agencies, activities and services. More on this approach is currently being developed by this team and we will include this in future reports within this series.