

**In this section:**

- Introductory video: 2–3-minute overview of the nine ways canals can help fight climate change
- More detail about each of the nine ways, with supporting real-world examples, video clips and data
- Flexibility to discuss all or select the one(s) most relevant to your pupils

# Part 2: The environmental impact of canals

## 1) Active travel and low carbon transport

Around a fifth of the UK’s greenhouse gas emissions come from road transport. To reach net zero by 2050, the UK needs to improve the infrastructure for active travel, to promote walking and cycling, and reduce reliance on road travel. Canals and rivers provide more sustainable ways to move people and freight.

### Moving people

Towpaths are traffic-free, active travel routes. Almost 40% of people visiting canals and rivers use towpaths to travel somewhere. Millions more use them for running, cycling, walking and other recreational activities. Towpath improvement schemes for inner city and urban locations will enable more active, environmentally friendly travel such as walking and cycling, the lowest carbon forms of transport.

### Moving freight

Thousands of tonnes of freight are moved along larger waterways, which removes around 12,500 HGVs from the roads annually. This helps ease traffic congestion, reduces greenhouse gas emissions and noise pollution, and improves air quality.

### How canals can help in the fight against climate change

The waterways can play an important role in the UK’s fight against climate change. There are nine ways canals can help:

1. Providing options for active travel and low carbon transport
2. Low carbon heating and cooling systems
3. Reducing urban temperatures
4. Transferring water
5. Addressing flooding
6. Utilising hydropower
7. Low carbon energy for boats
8. Helping nature recovery
9. Providing doorstep destinations

### Increase in towpath and canal usage during 21 March 2020 to 5 July 2020



- |                 |                       |
|-----------------|-----------------------|
| Burnley – 306%  | Blackburn – 181%      |
| Sandwell – 277% | Torfaen – 186%        |
| Ilkeston – 208% | Tottenham Hale – 159% |

### CO2 emission estimates

Mode of transport	g/tonne-km
Road	207-280
Inland waterways	40-66
Air	1160-2150

**Note:** Moving freight by water is cost and fuel efficient but transit times are slower and less predictable, and the network is much older than road and rail alternatives. It is only really feasible if the origin and destination for goods are located on navigable waterways.

## 2) Heating and cooling systems

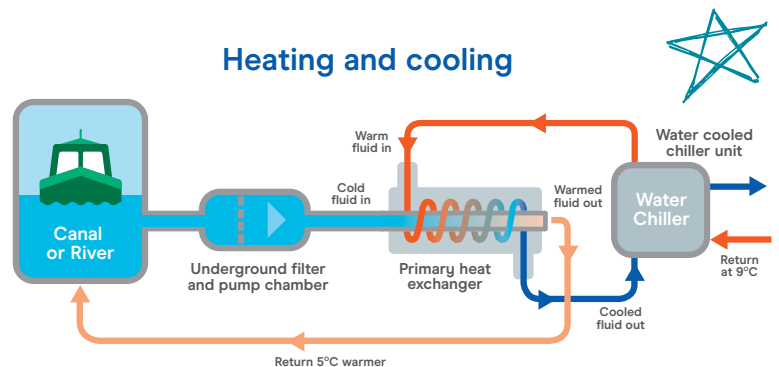
Water from canals and rivers can be used to heat and cool waterside buildings. It is estimated that the canals of England and Wales could provide enough energy to support the heating and cooling needs of around 250,000 homes, saving 1+ million tonnes of CO2 per year.

### PowerPoint activity:

- Informed decision-making

Water-sourced heat pumps are more efficient, longer-lasting, and quieter than air-sourced pumps.

They compress a fluid that absorbs the heat from water, raising its temperature to provide heating and hot water. They can convert water temperature from 5°C to 45°C.



Water from the network is already being used for heating and cooling in buildings such as art galleries, visitor centres, hotels, and the historic York Guildhall.

Water can provide energy for larger scale district heating systems. A new development in Merseyside will use water-sourced heat pumps to take water from the Leeds & Liverpool Canal. This will help provide energy for more than 9,000 homes and 4 million square feet of commercial space at Liverpool Waters. This will save 4,200 tonnes of carbon each year.



**Note:** Air-source pumps also take heat from a renewable resource (air). They can be used for most buildings and are cheaper to install than water-sourced pumps because they don't need pipework or energy to pump fluid around the system. However, their efficiency depends on air temperature which changes with seasons and the time of day, so they may end up costing more in the long run.

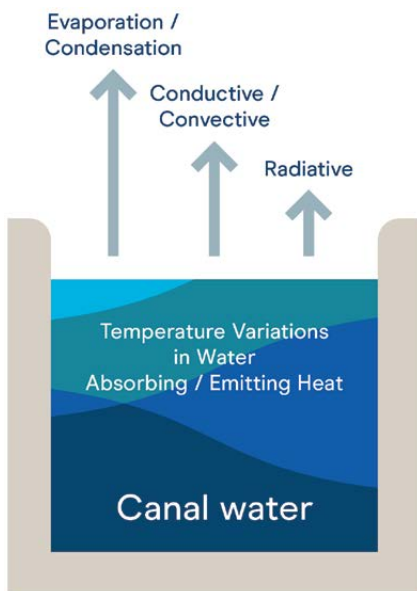
### 3) Reducing urban temperatures

By 2050, heat waves are expected to happen every other year in the UK causing difficult living conditions across the country, but particularly in towns and cities. Structures such as buildings and roads absorb and re-emit the sun's heat more than natural landscapes. Urban areas become 'islands' of much higher temperatures than nearby rural areas. This 'Urban Heat Island' effect is set to worsen as temperatures rise.

#### PowerPoint activity:

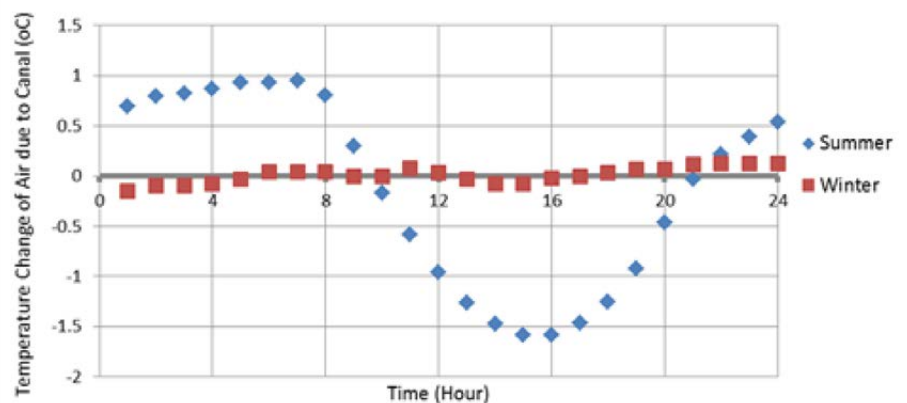
- Data interpretation and analysis

A study, led by University of Manchester and carried out across Birmingham, London, and Manchester, revealed that canals can help to reduce temperatures in our towns and cities. Data modelling showed summer temperatures reduced by up to 1.6C in urban areas next to canals, without undesirable cooling in winter. Trees along the waterways also provide much needed shade for people and wildlife.



Heat energy inputs and outputs from the canal  
(Adapted from Lu (2008))

Temperature change of air due to canal (summer vs winter)



**Note:** The study measured air temperature within a 100m wide, 10m high area. The cooling effect varied between 0.3C and 1.6C at different locations. The orientation of the canal, building height and distance of buildings from the canal affected results. There was less of a cooling effect where there were larger buildings very close to the canal. This provides useful guidance for future planning and building design.

## 4) Transferring water

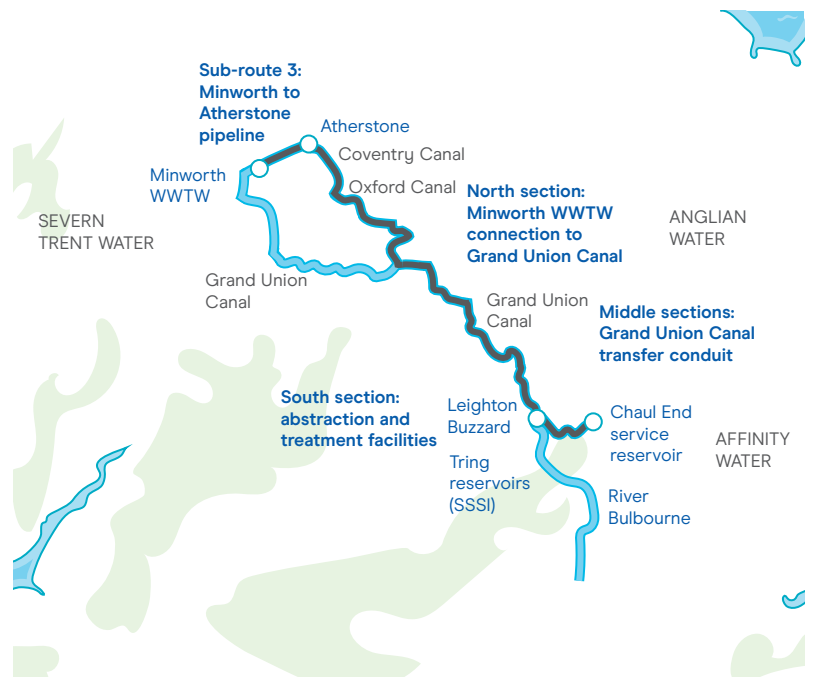
It is predicted that droughts will become more frequent, more severe, and more widespread in the coming years. Canals are used to move water supplies around the country in a sustainable, eco-friendly way, at a relatively low cost. They supply enough water for 5 million homes as well as supplying water for industry and agriculture. Water can be moved from areas with a surplus to those with shortages.

**PowerPoint activity:**

- Route planning using infographic/map

Some parts of the UK already rely on canals for their water supply, and new schemes are underway to combat future risk of shortages.

- Drinking water in Cheshire is provided via the Llangollen Canal
- 245 million litres of water a day pumped from the River Severn in Gloucester and supplied to Bristol via the Gloucester & Sharpness Canal.
- Severn Trent Water plans to move 115m tonnes of water (enough for 700k residents) from a site in Birmingham, along 131km of canals to a site near Leighton Buzzard.



**Note:** Severe weather makes the task of keeping the interconnected system open, safe, and resilient, increasingly challenging. The reservoirs that store water to keep many of the canals topped up are some of the oldest in the country. Over £50million has been spent on safeguarding these structures since 2020.



## 5) Addressing increased flooding

Climate change is likely to cause heavier rainfall and higher sea levels, leading to an increased risk of flooding. Canals are artificial channels that can play a role in mitigating the impact of flooding.

### PowerPoint activity:

- Understanding and plotting data

Canals can intercept drainage, hold up flows, and move water away from towns and properties at risk. Many structures in rivers (weirs, sluices, locks) can be modified to improve flood risk management.

- To prevent flooding during Storm Babet, a sluice gate was opened so that flood water could be pumped into the Chesterfield Canal and taken away from populated areas.
- Another scheme uses the Rochdale Canal as an overflow system. Excess flood water is directed into the canal, transported down to an overflow weir and onto a flood plain.



**Note:** Excessive rainfall can breach canals and collapse the side of reservoirs and other structures. Reservoir dams and canal embankments are critical for flood management and need to be well maintained. They protect households, properties, businesses, telecoms, and utilities, as well as infrastructures such as electricity sub-stations, transport, and schools.

## 6) Utilising hydropower

Flowing water can generate low-cost, sustainable energy (hydropower). Water flows over river weirs continuously, making it possible to generate energy 24 hours a day, 365 days a year.

### PowerPoint activity:

- Study of photograph, discussion



Hydropower plants such as the one at Knottingley on the Aire & Calder Navigation, generate 20 million kilowatt hours of energy - enough to power 6,200 homes and save around 9,500 tonnes of CO<sub>2</sub> a year.

Most of the supply from the Knottingley plant goes to a flour mill nearby, which operates round the clock, so has a constant need for power. The Trust is working to identify more sites with similar high water flow rates, accessible land, and potential customer(s) nearby.

“We’ve actually got another 10 schemes on the table, fully consented, ready to go. The issue is one of economics. What we need is a subsidy or support from the government to make it even more viable. Hydropower can’t solve our energy problems alone. But it can be part of a mixed solution.” *Sam O’Neil, utilities business manager, Canal & River Trust*

## 7) Low carbon energy for boats

As part of the Trust's plans to reach net zero emissions by 2050, electricity charging points are being installed at urban moorings.

**PowerPoint activity:**

- Plotting and interpreting data



A growing number of fully electric and hybrid boats (with rechargeable battery cells and a diesel engine) are being built. Others are being converted to use solar power and batteries for heating and propulsion. Greener diesel substitutes (e.g. hydrogenated vegetable oil) are also being considered.

Electric/hybrid boats perform well but cannot rely solely on energy gathered from solar panels. In a recent test only a third of energy required was collected via the panels.

Overnight charging is needed and charging points would have to be installed across the entire network to make it possible for all boaters to access. This would require considerable investment.

**Note:** Most boats using the waterways have diesel engines and solid fuel stoves. Boater's fuel and oil are toxic to fish and other aquatic life and need to be kept out of the water. There is no obligation for boats to convert to electric or cleaner fuels currently, and the cost of converting is prohibitive for many boaters. It is unlikely this would be possible without some form of exemptions, grant or financial incentive.





## 8) Helping nature recover

41% of the UK's wildlife species are in decline. Many habitats have become fragmented or have vanished from the countryside. Canals and rivers provide the longest unbroken network of waterway habitat. 46% of the network is designated for wildlife, with 70 Sites of Special Scientific Interest and over 1,000 county wildlife sites, providing habitats for wildlife under threat.

### PowerPoint activity:

- Survey and presenting data

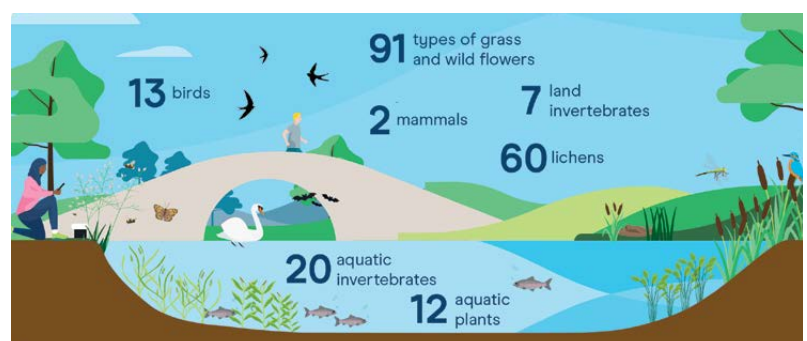
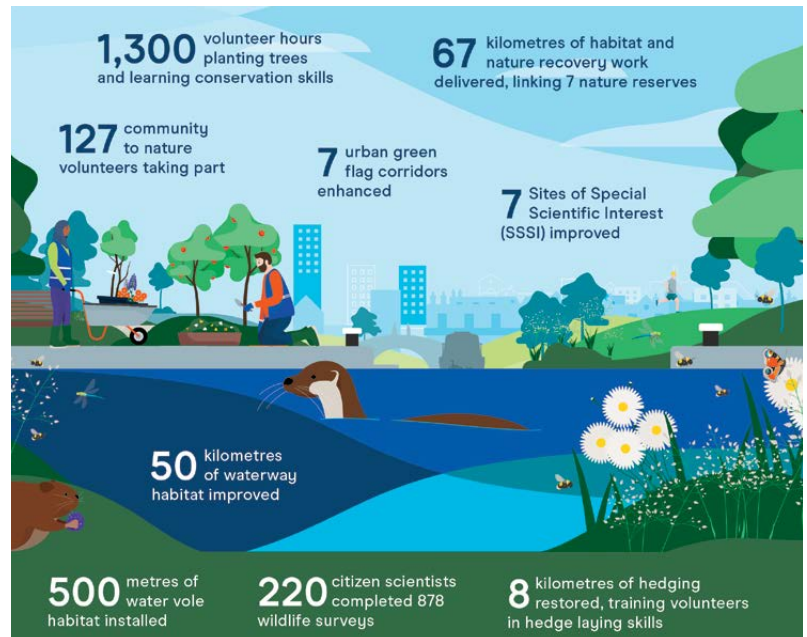
Canals act as vital corridors, helping to connect habitats so species can spread, recover, and thrive. Trees and hedgerows along the towpaths provide food, shelter, and places to breed.

The Trust's team of experts works to actively preserve and increase biodiversity, and help nature recover.

Some ways in which they help are to:

- Plant trees and maintain hedgerows
- Keep water free of harmful pollutants
- Tackle invasive species
- Install fish passes to help species navigate their way to breeding grounds
- Replace hard edges with soft banks
- Add floating reeds to give plants, insects, water voles and young fish the habitat they need to thrive

A Bioblitz project, carried out on the Grand Union Canal at Aylestone Meadows in Leicester, identified over 200 different species on just one day.



**Note:** With more boaters on the canals and more people on the towpath than ever before, canal ecosystems are under extra strain. Canal habitats wouldn't exist without intervention. They need constant care to keep them flowing, full of water, clean and wild. Any work or development needs to be done sensitively, balancing the needs of wildlife with the working nature of the canal network.



## 9) Providing doorstep destinations

Nearly nine million people live within 1km (10–15-minute walk) of a canal or river. They are free, open and accessible green and blue spaces on the doorstep, for walking, running, cycling, canoeing, fishing, or a day trip in nature.

Taking advantage of these doorstep destinations cuts down the need to drive to leisure destinations, reduces CO2 emissions, and improves physical health and wellbeing amongst the people that visit.

### PowerPoint activity:

- Interpreting information from infographic and discussion



Over 750 miles of the network now has a Green Flag Award, providing accessible, safe, and inviting places for communities to enjoy.

The canal network is especially important for millions of households in England and Wales in urban areas with green space deficit or limited access to private outdoor space. The waterways provide these communities with vital spaces for improving mental wellbeing, increasing physical activity, and reducing loneliness.

Over **1,000** people took part in Trust-led activities leading to:

- ✓ Significant improvements in mental wellbeing – an increase of 23% in wellbeing scores.
- ✓ Increased levels of physical activity.
- ✓ Improved self-efficacy, reduced loneliness and improved perceptions of health.
- ✓ Reported benefits relating specifically to the experience of being in nature.



### Urban green space deficit



**85%** of the UK population lives in an urban environment.



**8 million** households do not have access to green space.



In a third of local authorities, more than **70%** of the population is further than a 15-minute walk to a natural space.

(Research (2023) by Alliance of Green Groups)

**Delivery in the classroom:** The accompanying PowerPoint slides are designed to help you deliver key information and stimulate discussion. You can select the slides you want to use and adapt to your needs.

The slides also facilitate activities which encourage students to apply their skills and knowledge, including deriving information from video and photographs, and plotting and interpreting data.