

BRIEFING NOTE: ENVIRONMENTAL GUIDANCE FOR BOATERS

This briefing note, updated in August 2023, provides background information and guidance to boaters about ways to minimise pollution.

Air Pollution

The principal emissions of concern are Carbon Dioxide (CO₂), because of its contribution to global warming, and Nitrogen Oxides (NO_x) and particulates less than 10 microns in diameter (PM10s), because of their damaging effects on the respiratory system. Sources include boat engines, wood-burning, solid fuel and oil stoves, and central heating boilers.

Emissions from inland waterways boats are currently relatively small. IWA's Sustainable Boating Group estimates that boats on the UK's inland waterways account for about 0.05% of retail fuel sales in the UK while the draft London Environment Strategy suggests that boats on the Thames contribute only about 1% of the total NO_x and PM10s produced in the London area. However, these can still be significant, especially at the local level in residential areas, and will become more so as pollution from roads is reduced. Canal & River Trust has noted that local authorities in Oxford, London and Bath & North East Somerset are particularly affected because of the high concentrations of residential boats.

Legislation

The Clean Air Act 1993 gives local authorities the power to make a 'smoke control order'. Properties falling under such an order are subject to restrictions on the emission of smoke from chimneys attached to buildings. This Act was amended by the Environment Act 2021, which fundamentally changed how smoke control orders work and how the rules are enforced by local authorities.

Under the amended restrictions, it is unlawful to emit smoke from a property that falls under a smoke control order. Officers of the council can issue a financial penalty where they witness the emission of a "*significant quantity of smoke from a chimney*", regardless of the appliance being used or the type of fuel burned. Timber or logs need to be burned in a DEFRA approved stove or smokeless fuel used.

As well as a change to how smoke control orders work, there has been one to their scope. Local authorities now have the discretion to extend the scope of smoke control orders so that their restrictions include moored vessels (i.e. river and canal boats), although emissions are still allowed from an engine used to move, or provide electric power to, the vessel.

Propulsion

Most boats on inland waterways have diesel engines, which is not ideal from a pollution perspective. While newer designs of diesel engines are cleaner in many respects than their predecessors, in particular producing reduced NO_x and PM10s, they are often less fuel efficient and thus produce more CO₂.

Two simple behavioural changes can significantly reduce fuel use, and thus emissions (and costs). Stopping engines and using ropes when locking and reducing cruising speed by about 10% can each give a reduction of up to 30% (potentially halving overall fuel consumption), while adding only 4 or 5 minutes per hour to cruising times after allowing for locking.

Biodiesel is now mandated to be added to all mineral diesel at the rate of 7%, shown by the marking 'B7' on fuel pumps, a requirement currently met almost entirely by the addition of Fatty Acid Methyl Ester (FAME). While this represents a small step towards Carbon neutrality and reduces other emissions it causes problems in marine engines by producing sticky deposits and increasing the risk of 'diesel bug' by attracting water. Either can result in fuel system blockages and thus breakdowns.

Fortunately, a superior alternative is now available in the form of fully hydrogenated vegetable oil, retailed as 'HVO' or 'Green D+'. This is fundamentally different chemically to FAME so causes none of the latter's problems, and, being much purer than mineral diesel, reduces particulate and NO_x emissions significantly while also being about 90% Carbon neutral. Its use is approved by just about every current manufacturer of diesel engines worldwide and a series of trials in a range of domestic appliances and older engines, including semi-diesels, arranged by IWA's Sustainable Boating Group were all successful. Unfortunately, conflicting Government subsidy and tax regimes mean that it is currently both expensive and difficult to obtain.

Alternatives to diesel are limited. Petrol and Liquefied Petroleum Gas (LPG) are less widely available, have safety issues and offer only modest environmental advantages, though the development of electric drive systems has now reached the point where they deserve consideration. Battery-powered boats charged by shorelines are already used by trip operators and one company has a number of hire boats using this type of system. However, other than on the River Thames, the number of charging points (other than in marinas) is minimal and, as solar panels can provide only a (variable) contribution to the power needed for electric propulsion, a generator-based charging option is essential. Fortunately, electric drive systems, by dint of being more efficient than diesel ones, are inherently less polluting.

Two basic systems exist, often termed Serial and Parallel Hybrids, though the former isn't strictly a hybrid. In this a small generator charges a large battery bank which then powers an electric drive motor. In the latter, a standard propulsion engine with a large alternator charges a more modest battery bank while cruising; this then powers an electric drive motor for part of the time. Either can also take power from solar panels and/or landlines and either can support an electrical domestic system. IWA's Sustainable Boating Group has produced an *Introduction to Electric Boating*^[1] in which these options are examined in more detail though, to summarise, the former system will prove more fuel efficient than the latter in most circumstances.

There are suggestions of more radical alternative fuels such as hydrogen, used either directly in spark-ignition engines or to produce electricity in fuel cells to power electric motors. In both cases water is the only emission. However, Hydrogen, like petrol and LPG, presents fire hazards and the production of that currently available uses so much energy that its use as a fuel is arguably worse than using diesel, while

less than a third of the energy used to make Electrolytic (so-called 'Green') Hydrogen can ultimately be recovered for propulsion. Hydrogen is also very expensive. Fuel cells which will run on LPG exist and could be a low carbon stopgap but are not, as yet, available in a form suitable for use in boats.

Electricity Generation

Engines are often run while boats are moored, to heat water and recharge batteries and/or power larger domestic appliances such as washing machines or microwaves. It is generally regarded as anti-social to run engines, including generator engines, outside the hours of 8.00 am to 8.00 pm and many navigation authorities expressly forbid it. Even if not a legal requirement, care should always be taken to avoid making excessive noise or fumes, especially in residential areas. The need to run engines or generators can be reduced by installing solar panels and/or by using shorelines where possible and IWA encourages the provision of more electric bollards.

However, it must be recognised that the running of propulsion engines while moored is a particularly polluting practice and should be avoided altogether if possible. Not only are the emissions not dispersed, as they are while a boat is moving, but a typical modern diesel engine will burn up to 2 litres of fuel to produce just 1 kWh (domestic unit) of electricity. A generator, by contrast, will produce up to 10 times that power from a similar volume of fuel. Buying a small generator will thus be a good move for anyone wishing to charge frequently while moored, though it must be used, and both it and its fuel (likely to be petrol) stored, safely and in accordance with the requirements of the Boat Safety Scheme.

Stoves

The regulations for Smoke Control Areas state that only smokeless fuels should be burned. The exception is that wood may be burned in an 'exempt' appliance that has been tested to ensure that it does not create smoke. A list of exempt appliances^[2] is maintained. Although these provisions are not legally required of boats, it is still good practice to comply with them.

The Europe-wide programme *Ecodesign* came into force in the UK in 2022 with the aim of improving air quality. It is possible to buy stoves that meet this standard and bear the Stove Industry Alliance's *Ecodesign Ready* label – although advice should be sought to make sure that stoves from this list are suitable for use in a boat. Similarly, the UK's wood fuel accreditation scheme *Woodsure* has launched a voluntary *Ready to Burn* label to help consumers to choose wood that is dry and ready to burn. Burning wet or painted wood should always be avoided. Further guidance on reducing smoke from solid fuel stoves can be found on the Canal & River Trust's website.

Diesel-fired stoves became popular as an alternative to solid fuel ones when diesel was very cheap. They emit very little visible smoke but still emit pollutants, the nature and quantity of which vary with how well the stove is set up. Keeping the burning pot and catalyser clean and ensuring a good air supply will minimise these.

Water Pollution

Hydrocarbons in oil and fuels can affect both human health and the aquatic environment. An iridescent sheen on the water and a characteristic smell are signs of spillages of oil, diesel or petrol. Sometimes these result from catastrophic spills, but more commonly they are the result of an accumulation of small everyday events. Correct maintenance of engines will help to reduce emissions and oil leaks, and care should be taken when refuelling to keep fuel out of the water.

Discharges into the water from boat sinks and showers are another source of pollution. Environmentally friendly cleaning products and cosmetics are available and can help to reduce toxic chemicals and plastic micro-beads. Laboratory testing has repeatedly shown such cleaning products to be less effective than their mainstream competitors, though the gap is narrowing and the first 'Best Buy' award has recently been awarded to one of them by the Consumers Association. Advice on green products and services for boaters is available from The Green Blue^[3], an environment programme created by the Royal Yachting Association and British Marine.

If you spot any pollution on a waterway, please report it to the local navigation authority as soon as possible. Contact details for the largest navigation authorities are as follows:

Canal & River Trust^[4] 0303 040 4040 (office hours) or 0800 47 999 47 (out of office hours)

Environment Agency^[5]: 24-hour incident hotline 0800 80 70 60

Port of London Authority^[6] - 0208 855 0315 VHF Channel 14

Notes

1. <https://waterways.org.uk/wp-content/uploads/2023/08/An-Introduction-to-Electric-Narrowboating-Issue-1-1.pdf>
2. <https://smokecontrol.defra.gov.uk/appliances.php?country=england>
3. <https://thegreenblue.org.uk/>
4. <https://canalrivertrust.org.uk/specialist-teams/caring-for-our-environment/what-to-do-if-you-spot-any-pollution>
5. <https://www.gov.uk/report-an-environmental-incident>
6. <https://www.pla.co.uk/Environment/Pollution-Prevention>