

Climate School 180

Temperature management options for your school grounds

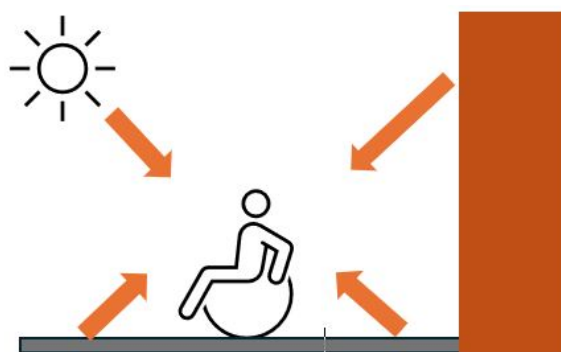
Introduction

This document will provide you with a range of nature-based (and other) solutions for helping to manage the temperature in your school grounds – whether that is overheating or cold winds sweeping across your site.

Some of these you will be able to implement yourselves, but other may require additional professional advice e.g. if you are planting for shade near a building

Overheating

The incoming radiated heat from the sun is the most important factor in school grounds temperatures. However, this is made worse by reflected heat and conducted heat, both of which affect air temperature and how the heat feels on your skin.



You must understand the direction the school faces and where the sun passes over during school hours. This will form the foundation of your plan to cool your school.

Surfaces really matter here. Materials such as tarmac, concrete, artificial grass and rubber safety surfacing trap, store and radiate significant heat compared to natural surfaces such as grass, plants and shrubs. Shading also really matters, which prevents heat getting through to ground level by reflecting heat away and/or shading the surfaces and children below. Anything you can do to replace hard surfaces such as these with grass and planting and create significant shade will have a benefit.





Another factor is the interaction of building and outdoor areas. Due to conduction, reflection and radiation, a hard playground surface right up to a hard building wall will create even hotter areas outdoors and indoors.

Our final factor is air flow. A well-designed outdoor space will enable air flow by not trapping hot air, or even creating temperature difference to create airflow.

How to create shade in school grounds

It is important to remember that the shade created by any plants or structures will move over the course of the day. So, having seating directly under a shade sail, for example, may not mean it is in shade when most needed. It is possible to use shade pattern information to calculate where shade will fall at different times of day throughout the year, or pupils can go outside to measure shadows on the ground, so that you can make sure you add shade structures and planting where it is needed most.



In very heat-exposed situations you need to aim for over 60% shading to achieve real reduction in temperatures. This shade also needs to allow for heat to escape upwards. A solid roof or ridged tarpaulin may trap heat, whereas tree leaves and angled tarpaulins will allow heat to escape and create air flow.



Changes to surfaces

Changes to surfaces can get very expensive, and many hard surfaces are there for a reason. This can include things such as access to the school, sports facilities, access for deliveries, or fire access.

That said, there are a few options to reduce the amount of hard surfacing you have.



Raised beds or planters break up the large areas of hard surfaces and introduce plants which can potentially create shade. Planters and raised beds can be planned around underground services or access issues, making them ideal for all sorts of situations. You can also choose the plants and shrubs carefully – you need plants which can survive extremely hot spells. This may mean choosing plants, shrubs or trees which are non-native or more typical in a hotter UK location.

Do consider maintenance, however, as a raised bed or planter in a hot area will lose water through evaporation quickly. Using mulch such as woodchip or gravel works well, but you will still need to water the beds during heat waves.



If you are fortunate to be able to remove a hard surface and replace it with grass, plants, trees or shrubs then that is even better. Some surfaces are expensive to remove, but you



may have some paving slabs you can lift and replace with fresh soil and planting. While grass is good, longer grass is better, and a more varied planting better again. See our advice on grass and meadows, carbon gardening, hedges and trees for more insight.

You may also be able to create modest 'green walls' alongside buildings. This can involve planters and trellis, raised beds and wires on walls, or perhaps hedging around the building perimeter. This can significantly reduce heat around the building, as shown in a case study from Manchester: <https://www.educationnaturepark.org.uk/creating-green-wall-co-op-academy>

Shading options:

Trees and other planting

Having deciduous trees and shrubs means that they create more shade when most needed. Willow domes, hedges, trellis and other vertical planting can all help to create shade, including outside your classrooms and other well-used spaces, plus they can be installed on tarmac areas.

Trees should be placed to shade pupils from the midday sun, and the varieties chosen to suit the location while also creating the best shade possible. This means that the trees should be spaced to allow children and adults to access in-between trees, with play areas and seating also placed under the shade of trees or other planting. Many existing school trees are around the boundary, whereas we suggest that trees are planted around the main areas where pupils congregate and perhaps close enough to shade parts of the building. Look at spaces between sports pitches or the boundary of tarmac areas as good places to introduce trees or hedges.

This example below shows how where you plant trees on site really matters. Whilst the overall tree cover is 28% it has 74% tree cover concentrated into the playground area leaving plenty of space for sports courts.





Tree canopy Green Schoolyards America

Shading seating has significant benefits, with pupils on the hottest day needing to retreat into deeper shade. There are lots of options for seats with significant seasonal shade, and you should look to maximise shading here. This is where hedges, willow and climbing plants are as important as trees.

Do take professional advice about how near to buildings and sports courts trees can be positioned if they are planted directly into the ground, as they may affect the structure of the building, underground services, the ground surface or become obstacles.

Using raised beds can help resolve the root problem and can be very effective if you are wanting plants on areas of asphalt that are too expensive to dig up. However, because they will need regular watering and care to keep them healthy.





Permanent shade from structures

Many schools have shaded areas built into the building, and you can maximise access to these areas during hot weather. In addition, many buildings have a shady side and a hot side, and a small change in rules, or a change in how a space is used, can lead to pupils being able to play or study in the shade of a building.



While you can get 'sails' for shade, our experience and research suggests that these are often for style rather than practicality. Much larger covers work better, creating deep shade rather than small patches which move through the day. You may want to consider expanding any shade sails you currently have to create a larger shaded area.

Temporary shade creation

Temporary shade can be invaluable during a heat episode; however it takes thought and planning so that you can install the shade when needed. We would recommend a temporary shade which pupils can help install.

Shade features that can be adjusted over the day can help to ensure there is usable shade all the time. This can be something as simple as tying a tarpaulin to trees or posts, or more complex and include pulley systems. You can also create features, such as



pergolas or gazebos, without roofs where plants will eventually grow up and over. Whilst the plants are growing use sheets, blankets or tarpaulins to create the shade. See also the 'seating and meeting spaces' guidance note.



Air flow and water elements

Planting trees or hedges in the right place, including creating shelterbelts, can help to reduce the impact of wind across your grounds or increase air flow if that is what you need.



Solid structures should be carefully considered before adding as they can increase eddies behind them making it even windier. However, your pupils could experiment with a range of materials with different permeabilities set at different angles to find out what might work best for your site and over what distance it should be with your prevailing wind.

Introducing water elements such as ponds or moving water features such as small streams or fountains can help to increase air flow across your grounds in specific areas. Moving water can help lower air temperature levels as well. In combination, water can be very useful in moderating heat in a school grounds environment.

Checklist of considerations when planning temperature management

Issue	Options	Considerations
Overheating		- Making sure the shade is located in the areas of greatest need
What options to choose		- Use cooler spaces and places at the hottest parts of the day - Consider cost and effect on your site - Consider which can be done straight away, and which will be more long term
Quick solution options	Using temporary shade features such as tents, tarpaulins, garden parasols and dens.	- Make sure other people will not remove or use your features out of school hours - Ensure you have storage if features need to be taken down - Consider where the shade will fall at different times of day
Medium cost solutions	Building pergolas and other permanent structures where most needed	- Whilst you are waiting for plants grow up trellises, pergolas and fences use sheets and tarpaulins to create shade
	Planting	- Deciduous plants will provide shade when needed most - The choice of species will depend on location to be used such as climbers over trellises and pergolas, and trees and shrubs around the grounds - Plan for maintenance
High cost solutions	Permanent structures adjacent or fixed to buildings	- Most suitable for new build or large refurbishment of buildings
Heat from features and surfaces	Consider the materials you are using	- Natural materials are often cooler than man-made materials

		- Planting can not only help create shade but also reduce the temperature of a space through evapotranspiration
Spaces are too cold, especially in the winter	Use warmer spaces and dress appropriately	- Use the warmer spaces, with more sun for outdoor learning and play - Make sure all pupils have access to warm outdoor clothing
Air flow	Increasing air flow	- Consider adding water features – especially with moving water - Planting can increase wind flow but get expert help to plan this (or experiment to find the best solution for your site) - Make sure that heat can escape, either freely upwards or by not blocking air flow with buildings or walls.

Some ‘How to’ guides to help you manage the temperature in your grounds

The following ‘how to’ resources may be useful to help you make the changes to your grounds:

- Hedge planting
- Tree planting

The LtL [Polli:Nation maintenance guide](#) has a section on managing trees, hedges and shrubs as well as a section on orchards. It describes when to undergo different management processes, why you are doing them and who could be involved in that process.

The [National Education Nature Park](#) is producing guidance on developing a range of habitats. This will eventually include planting trees in your grounds. Go to the resources pages of their website to find the resources as they are developed over the next few years.

See also ‘Seating and meeting’ guidance notes.

