

COOLING YOUR HOME AND OTHER BUILDINGS



Heat can have many negative effects on health, including increasing risk of heat exhaustion and cardiovascular and respiratory illnesses.

One of the ways of reducing the effects of heat on people is to keep their living environment as cool as possible. This is especially the case at home, where households need to refresh themselves, rest and sleep, and where especially vulnerable people, such as young children, and the elderly, often spend much of their time.

There are a number of factors which influence how to maximise cooling at home. Homes can take all sorts of shapes and sizes. They can be located in a dense, built-up neighbourhoods with other dwellings, buildings and hard surfaces close by or they can be surrounded by small or large areas of garden and green spaces. They can be multi-story apartment blocks, semi-detached or detached houses. Homes can be formally or informally constructed (i.e. self-built), and they certainly vary widely in age, materials, maintenance and access to services. Also, households can have preferences and traditions which lead them to use their homes in different ways. All these factors can influence how a home can be adapted to reduce the effects of heat in summer, on especially hot days or during heat waves. Since there is no 'one-size-fits-all', households will need to adapt the options discussed here to best suit their home environment, resources and preferences.

Where electricity and resources allow, air-conditioning offers good quality cooling within homes and fans assist with effective heat management for many households. However, using this equipment is not possible in every home and continual use often costs more than many can afford. Other ideas for keeping your home or workplace cooler during hot weather and heat waves are discussed here.

Passive & Natural Cooling Techniques



Night Ventilation

Open windows and doors during the night to allow cool air to move into the home and push out the hotter air accumulated indoors during the day. Night ventilation also helps to cool the building structure itself. During the day, it may be helpful to keep doors, windows and window coverings fully closed, to prevent hot air and sunshine from entering the building. BUT avoid completely closing up a house made of radiating materials with little thermal insulation such as metal sheeting or if you live in a very humid area where poor ventilation and high humidity could cause indoor temperatures to become extreme.



Shading

Creating shaded areas on the immediate outside of a house reduces daytime heating. Attached to houses or included in building design, wide roof overhangs, verandas, awnings, and pergolas which can be draped with plants lowers the heat absorption of a building by protecting the exterior. On the outside of homes, placing grass mats or latticing with wattle, or other flexible natural materials or having vegetation up close to the building will also help to reduce heat absorption from the ground and any hard surfaces surrounding the house. Creeping plants that grow on vertical or horizontal (pergolas) are very effective in shading a building.



Natural Cross-Ventilation

Consider your immediate environment if there is cooler breeze outside, then open windows, doors, and air vents on opposite sides to allow air to flow through the building. Hot air rises within houses, so if you have windows or adjustable vents that are high up you can open them to release some of the heat.



Landscaping

Plant trees and vegetation around the building to provide shade and reduce air temperatures around the structure through evapotranspiration. Trees and shrubs growing relatively close to housing structures can also block direct sunlight from hitting walls and windows for at least part of the day.



Evaporative Cooling

Where possible, placing water features, such as ponds or fountains, near openings can help to cool the air as it enters a home. Placing a bowl of cold water or ice in front of a fan or in a doorway or window where air enters can also help to lower indoor temperatures.



Reduce Internal Heat

Extra heat can be generated within a home, and all potential sources of heating should be reducing to lower indoor temperatures in extreme heat conditions:

Turn off unneeded lights, computers, and appliances that generate heat.

Unplug electrical items not in use, such as washing machines as they can generate heat.

Hot water storage can cause a home to heat up, therefore the temperature of electric geysers should be managed by lowering temperatures or turning

off geysers for part of the day.

Remove furniture or obstructions from in front of windows and in any passages to encourage uninterrupted air flow.

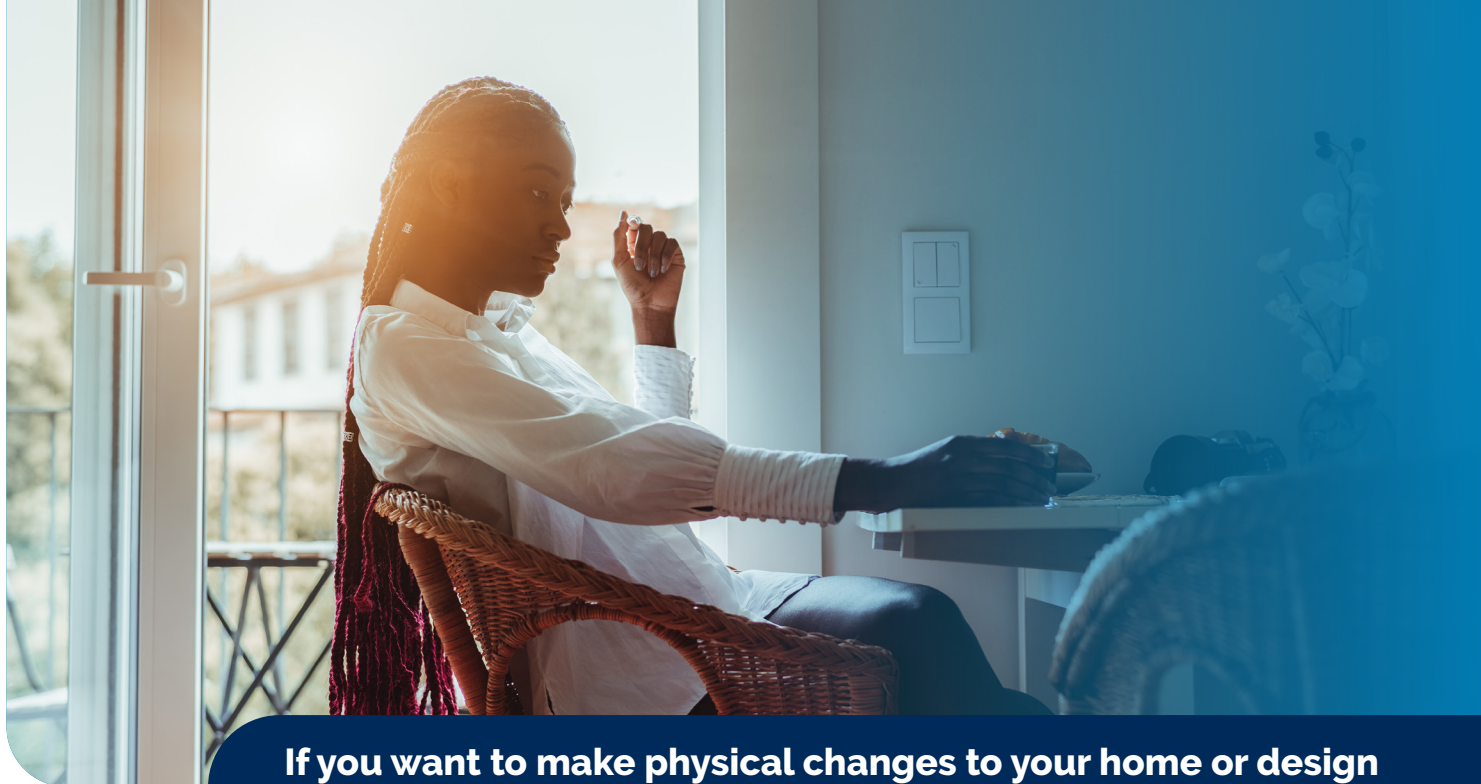
Simple changes to everyday habits can also reduce heat generation, for example, eat cold food such as sandwiches or cook outdoors rather than using an oven or

cooker indoors, especially during the hottest times of the day or when you are trying to cool a home through night ventilation.

Understand how the direction that rooms and buildings face can impact temperatures indoors and surrounding the house. Buildings and rooms that face north will tend to be warmer than rooms which face south. Try to spend more time in south

facing rooms that will not have received as much direct sunlight as north facing rooms. During the afternoon, walls and windows which face west will be hotter than east facing spaces. Preferably use east facing spaces that will be cooler in the afternoon.

Use curtains (or outdoor covers) to shade west facing windows to cool the west facing rooms.



If you want to make physical changes to your home or design a structure to maximise cooling opportunities

You may decide to invest in air conditioning or ceiling fans if these feel appropriate. However, passive design can offer cooling solutions for homes and buildings without relying on energy- and cost-intensive air conditioning. Passive design can be low-cost designs which use nature to offer cooling or adaptations which respond to nature in order to limit heating.

- **Consider cooling from the roof:**

- use reflective, white, or light-coloured roof paint or materials. These reflect solar radiation, which can reduce internal temperatures by up to 4°C.
- insulate roofs (and walls if appropriate) to reduce indoor heating, this is a very cost effective method to lower indoor temperatures.
- (re-)angle roofing to minimise the time that roofing is directly facing the sun
- Make use of **ceiling fans** these are cost-effective solutions that provide some cooling.
- **Raised or high ceilings** allow hot air to rise away from living areas and make rooms feel cooler
- **Optimal orientation** of a building on a site reduces heating of structures. In the Southern hemisphere it is best to position the longest, most-used sides of

a structure facing towards the north/south. This orientation means the larger north and south facing sides of a building receive less direct sun and can be most easily shaded. The east/west facing sides receive the most direct sunshine for longer periods of the day and are harder to shade. Refrain from placing any windows on the western side, while consider the size of your windows on the northern and east facing sides. A rule of thumb suggested that if the total window area is between 15-20% of the room's floor area then it should be sufficient

- Add **external shading devices** that shade your windows for the full summer period (September to March in the Southern hemisphere).
- Consider adding **external shading and planting** where it will most reduce the effects of direct sun on the building.
- **Additional doors or windows** can increase air circulation and cross-flow. Where possible, orientation of windows and doors to catch daily or seasonal cooling breezes will offer much relief from heat. This requires that you identify the direction of the main airflows on a site before deciding where to place new openings.

- When using metal sheeting for the construction of temporary and informal housing you must also include **sufficient thermal insulation** materials, the R-value of the insulation materials must be at least 1.66 m²·K/W. A good alternative is using, well insulated lightweight, breathable materials like wood, chipboard or thick cardboard do not store as much heat. Stone or concrete blocks also offer heat absorption which can work to reduce indoor temperatures.
- **Compact building shapes** reduce the surface area exposed to the sun and therefore reduce heat effects. Compact design is especially helpful in hot-dry climates.
- When using a brick wall, consider the option of using **circular (rondawel) structures**, this reduces the surface area that receives direct sunlight.
- Always try to have an **adequate roof overhang**, these should typically extend between 560mm to 850mm beyond the external wall face to provide adequate summer shading.
- Consider adding a **shaded outdoor space** (like a stoep or veranda) or even a shaded courtyard. These are often cool spaces to rest during very hot days.



Responding to different types of heat and local climate

In different climates heat management can differ in homes. Different parts of South Africa have different climates, which means that 'type' of heat experienced can be different. Take a look at the map to identify (or confirm) what type of heat is most common in your area. Managing heat in your home depends on whether you experience dry heat, high temperatures combined with high humidity or a combination of these types of heat.

As each region has different climates, there are also different solutions for the dwellings in these regions. If you find a dwelling that are cool during hot periods, stop and check why that is the case. You can learn a lot from the built environment around you.

Balancing safety and heat management at home



It is clear that ventilation is vital to reducing the heat within homes and buildings that do not have air-conditioning. However, in South Africa many people feel at risk if windows and doors are left open. Consider ways in which to encourage ventilation while maintaining safety. For example, use gates and burglar bars which offer security but allow for airflow. Try to ensure that windows left open (especially at night) face a private and secure area. Using screens over doors and windows can prevent insects and mammals such as monkeys from entering your home. Also be cautious about using airflow to cool the interior of a building if you are in a highly polluted area as polluted air can cause other negative health impacts.



Cooling in dry heat conditions

During the daytime keep windows, doors, and blinds tightly closed to trap cooler air indoors. Covering sun-facing windows with blackout curtains, reflective blinds or even paper/cardboard blocks solar heat entering a building. During the night (or early in the morning) when the outdoor temperature drops, open windows and doors on opposite ends of the house to create a cross-breeze and flush out trapped heat.

Use the wet sheet cooling method in dry heat: Hang a damp, thin sheet over an open window. As the hot, dry air blows through the wet cloth, the water evaporates and lowers the temperature of incoming air.

Passive design in a hot and dry climate should focus on building with materials such as concrete, brick and stone which absorb, store and release heat which lowers indoor heating effects. Compact building design, minimal windows and the arrangement of windows and vents to facilitate night ventilation and cross flow also improve heat management through passive design. Use reflective outdoor colours (walls and roofs) as far as possible to lower the indoor heat.



Keeping pets cool at home

Pets are also vulnerable to hot weather and need extra care at home. Most pets will benefit from the cooling methods used for people within a household. If possible, pets should be kept indoors or in north/south facing, well-shaded outdoor areas during the hottest times of the day. Ensure they always have access to fresh water, shade, and a well-ventilated space. If pets are outdoors, check ground surface temperatures as extremely hot pavements and other hard surfacing can cause injury and heat exhaustion.

Cooling in humid heat conditions



It is more difficult to cool homes in humid heat conditions. Keep your windows and doors closed during the times of day when it is hotter and more humid outside than it is inside. Although temperature differences between day and night are smaller than in climates with dry heat, night time ventilation should be maximised using cross ventilation methods.

High indoor (and outdoor) humidity stops sweat from evaporating therefore prioritize body cooling over room cooling. If you are able to, use an electric or handheld fan. Fans don't change the temperature, but moving air disrupts the warm, damp layer of air clinging to your skin. When it is extremely hot and humid, fans work best when directed to blow right onto people in a room. At night, sleep on the floor or 'sleep low'. Cool air settles at the lowest point of a room. Moving mattresses directly onto the floor may offer some respite. Avoid activities which increase indoor moisture. For example, limit boiling of water, hot showers, or drying laundry inside.

Do not use the "wet sheet" method in humid conditions as it will increase indoor humidity and make a room feel muggier.

Use extensive roof overhangs and verandas to keep as much direct sunlight out of the interior spaces as possible.

Hybrid cooling is an energy effective strategy in these contexts. This requires shading indoor spaces, using air conditioning to cool the indoor environment to 26 °C and actively using fans to ensure constant air movement. This can achieve an adequately cool indoor environment with much lower energy use.

Sources and additional resources

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