How to save water

A householder's handbook

WATER RESEARCH COMMISSION

SP 93/15

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THINK ABOUT **WATER**

Water is a safe, wholesome commodity available in your home 24 hours per day. But water does not arrive by magic – it starts as runoff into streams and rivers. Then it has to be caught in dams, purified, pumped, stored and finally piped to your house. The cost of operating the water supply system is recovered through the sale of water.

South Africa is a water scarce country. We only get half of the world's average annual rainfall, and only 9% of that rainfall lands up in our rivers (the rest is lost to evaporation, to plants and to infiltration into the soil). We have less than 1 000 cubic metres of water available per person a year, and we have to use that water wisely.

If we use more than we should, the storage, supply and wastewater treatment facilities will have to be enlarged sooner than planned for – increasing the cost of water. Furthermore, during droughts, we could find ourselves with little water for longer periods.

Think about water. It is precious. By conserving it you could save yourself a lot of money, and also contribute to our national survival. Without water we are doomed.

There are various ways in which you can conserve water. First, find and repair any leaks in your own water system. Second, use the available water more efficiently. Finally, if you are in the process of building or renovating, plan for an efficient water-supply system.

The information necessary to help you conserve water in these three ways is contained in this booklet. It is in your interest to read it – and then act promptly. Don't wait until your water supply stops – that will be too late.

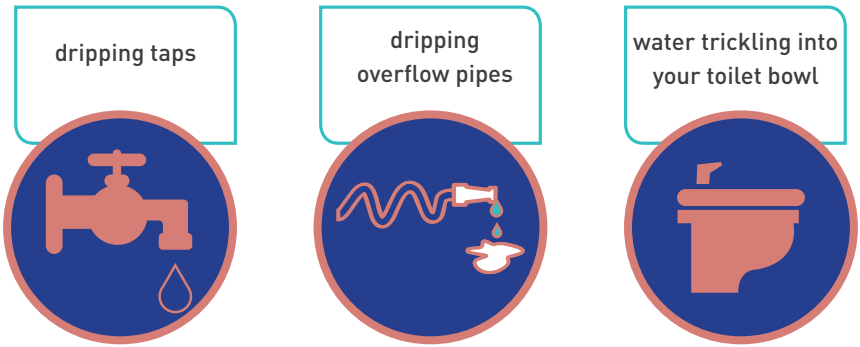
LEAKS: **FIND THEM AND STOP THEM**

The metered water arriving on your premises is used both indoors and outdoors. The first step to water conservation in the home is to check for leaks. Studies have shown that dripping taps and leaking toilets can account for as much as 5% of all water used inside the home. For example, a dripping tap can waste as much as 60 litres a day or 1 800 litres per month.

Leaks are not only wasteful but also expensive, particularly if it is hot water that is leaking (The water replacing the leaking hot water in the geyser needs to be heated. Geysers can use half the electricity in your home). Fortunately most leaks are relatively easy and inexpensive to repair.

Finding leaks

The first step is to look for those leaks which are obvious, such as dripping taps, dripping overflow pipes or water trickling into your toilet bowl.



If you find a drip, fix it, using the procedures described below. Don't forget to check your garden taps! Also, if you have difficulty finding that silent trickle into your toilet bowl, try pressing a piece of toilet paper against the inside back surface of the bowl. If the paper gets wet, you've found a leak! Another handy way of checking for a slow toilet leak is to put a few drops of food colouring into the toilet cistern. Wait about 15 minutes. Watch the water in the bowl – if it becomes coloured then you have found a leak. (Don't let anyone use the toilet while you are conducting this test)

When you have fixed all the obvious leaks, make sure that all taps are turned off. Then, find your water meter and check to see if water is flowing through it. If your meter is the digital type (Figure 1), you will have to check the readings over a period of about one hour, making sure that nobody in your house uses water while you are doing the check (remember, a toilet cistern can take up to 10 minutes to fill before the water flow is totally shut off)

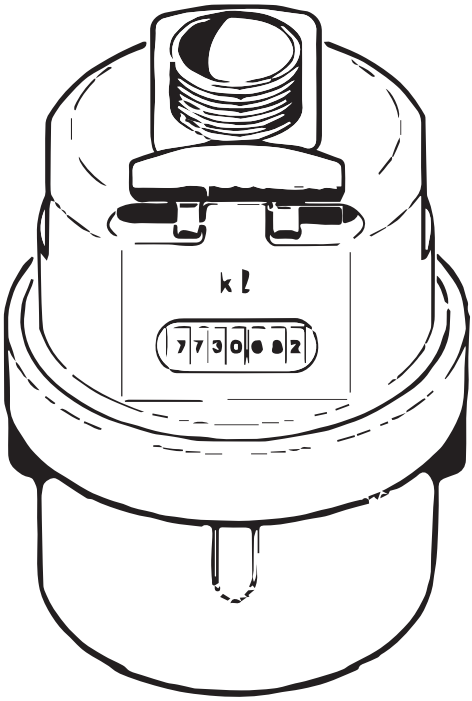


Figure 1: digital-type water meter

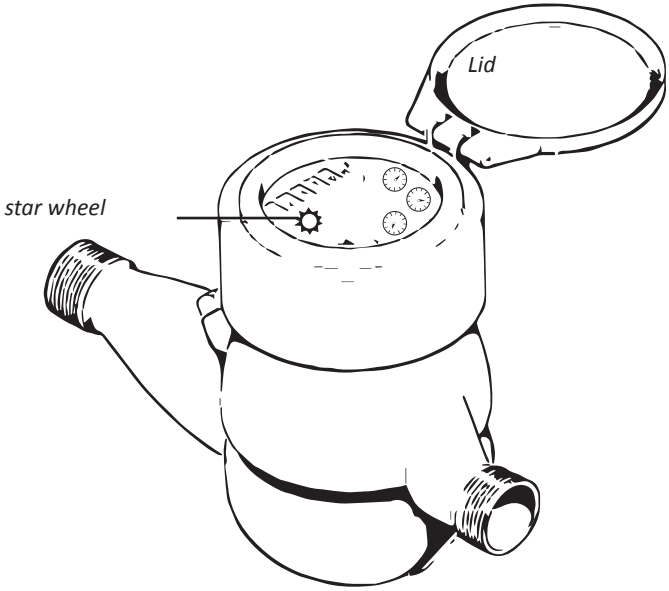


Figure 2: dial-type water meter

If the reading changes, water is flowing through the meter and you have a leak somewhere in your piping system, more often than not underground.

If your meter is of the dial type (Figure 2), you will simply have to observe whether the star wheel is turning. A steady movement of this wheel, when all your taps are turned off, nobody in your house is using water and all cisterns are filled, will show you that you have a leak somewhere in your piping system.

It's a good idea to read the meter twice. Take the first reading at night after the day's water use has ended, or when the whole family has gone out for a period.

Ensure that nobody uses water during the period while you are conducting this test. Take a second reading in the morning, or when the family returns, before any water is used.

If your water meter shows that you have a leak in your supply pipes, call in a plumber and ask him to repair the leak.

NOTE: If the plumber is going to replace a pipe, ask him to install some kind of corrosion-resisting pipe, such as high-density polyethylene, particularly under the paved areas. Alternatively, ask him to treat buried galvanised pipe against corrosion by, for example, wrapping it with special adhesive tape.

If you do have the underground pipes replaced, make a drawing of the route of the piping, showing the distances of the pipes from buildings and boundaries. Keep the sketch in a safe place, preferably with the other plans of your house.

Another possible area of undetected leakage could be the swimming pool. In some cases, leakage through a crack in the pool or from the pipework, may cause an abnormally green patch of grass near the pool. However, a more reliable indicator is the frequency with which you need to top up the water. If the level of your pool drops by more than about 50 or 60 millimetres per week, you probably have a leak.

If you think your pool is leaking, fix it yourself if you can, or call in a pool-repair expert.

Stopping leaks

Repairing leaky water fittings is usually fairly simple and well within the capabilities of the average home-owner. However, if you are going to do your own repairs, you will require a few basic tools, such as those shown below.

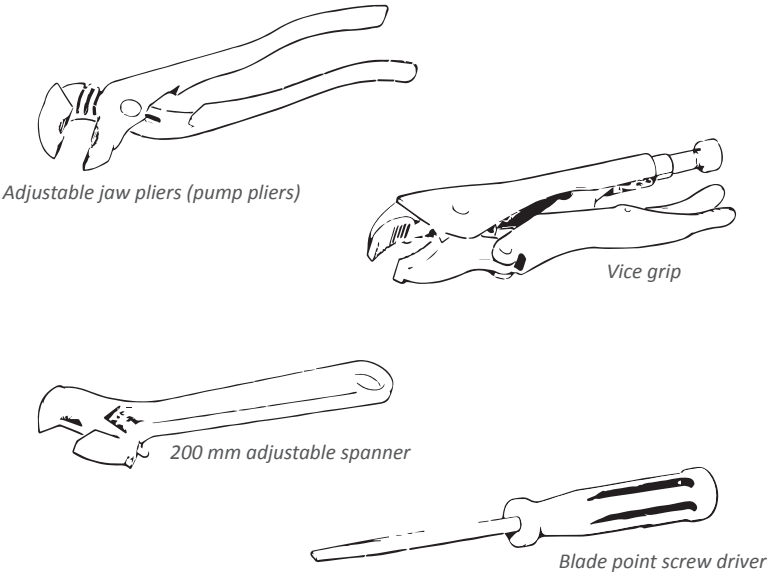


Figure 3: Tools for repair of water fittings

NOTE: Before carrying out any repairs on your water system, close the stopcock in the main supply pipe to your house. This stopcock is usually located next to your water meter.

Taps

A dripping tap is caused by the failure of its washer. Simply replace the worn washer as shown in Figure 4. When you have finished the repair, re-open the stopcock in the main supply pipe and check the tap for leaks.

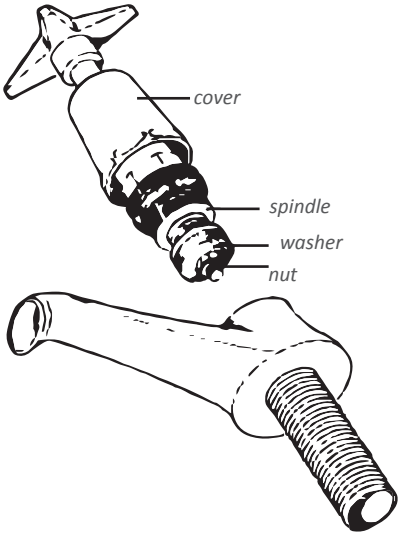


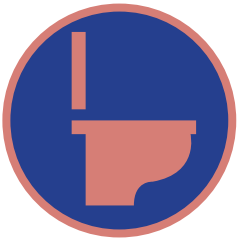
Figure 4: Replacing a tap washer

The eight-step guide to replacing a tap washer

1. Close the stopcock (the main supply tap to your home).
2. Open the tap fully.
3. Unscrew the cover.
4. Unscrew the spindle.
5. Unscrew the washer-retaining nut and remove the washer.
6. Fit a new washer and replace the nut.
7. Reinstall the spindle and screw down the cover.
8. Close the tap, restore the water supply and check for leaks.

NOTE: When you have replaced a tap washer, be careful not to over-tighten the tap. New washers feel comparatively 'soft' and will be damaged if they are over-compressed.

Toilet cisterns



A leaking toilet can waste up to 100 000 litres of water in one year. That's enough to take three full baths every day. There are two places to look for leaks from your toilet cistern – either a silent trickle into the toilet bowl or a leaky overflow pipe which is dripping out of doors.

If the cistern has been found to be leaking, proceed as described below.

Remove the cistern cover and look at the water level inside. The water level will be in one of the three positions shown in Figure 5.

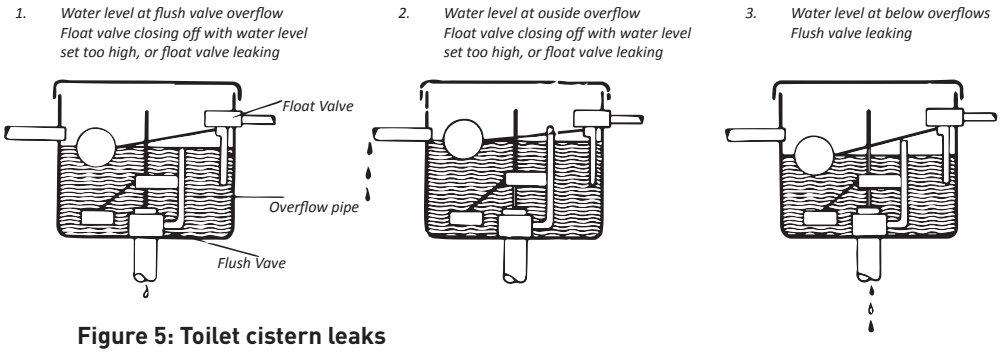


Figure 5: Toilet cistern leaks

If the water level is at the top of the flush valve overflow pipe or at the level of the outside overflow pipe, then the float valve may be closing off with the water level set too high. Check this by flushing the toilet and then lowering the float valve setting. This is done either by bending the float arm slightly downward or, if the valve is fitted with a screw-type adjuster, by turning the screw to lower the float slightly.

The water level should now rise to a level below the overflow, and the float valve should close off. If the water level continues to rise and the cistern starts to overflow again, then the float valve washer needs replacing (see Figure 6).

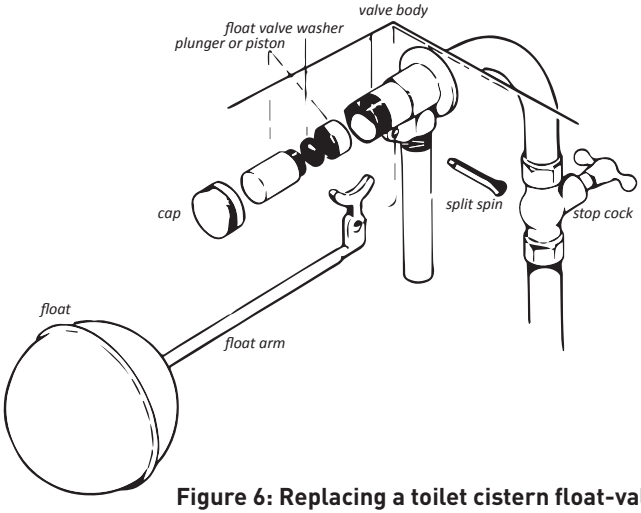


Figure 6: Replacing a toilet cistern float-valve washer

Seven steps to replacing the float-valve washer

1. Close the stopcock
2. Remove the split pin and the float arm.
3. Unscrew the cap.
4. Withdraw the plunger using water pressure to push it out (open the stopcock slightly).
5. Screw the brash plunger apart to remove the washer held inside it.
6. Fit a new washer and reassemble parts.
7. Open the stopcock and check that float valve closes off when the water reaches the full level.

If the water level is below the two overflow levels, but water is trickling into the toilet bowl, the flush valve washer needs replacing (see Figure 7).

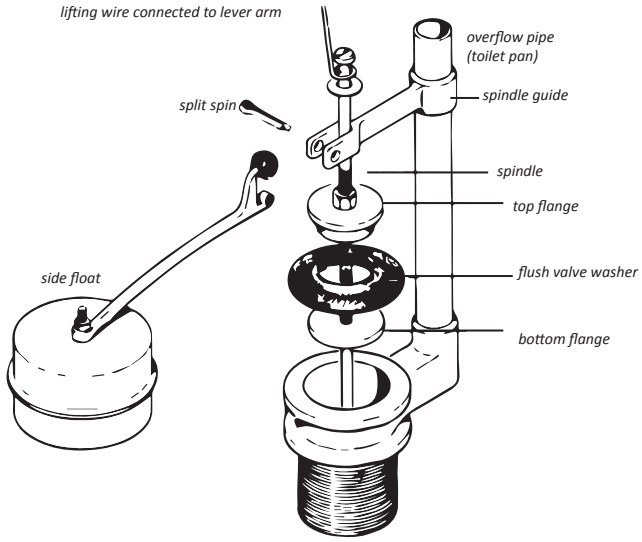


Figure 7: Replacing a cistern flush-valve washer

The eight-step guide to replace a cistern flush-valve washer

1. Close the stopcock.
2. Disconnect the lifting wire from the lever arm.
3. Remove the split pin wire from the lever arm.
4. Withdraw the spindle assembly.
5. Unscrew the bottom flange and remove the washer.
6. Install a new washer with the sloping side uppermost.
7. Re-assemble the parts.
8. Open the stopcock and test the system for leaks.

Hot water system

There are several different designs of storage water heater (or geyser). All these water heater systems have one thing in common – an overflow facility. Geysers often leak (drip) through the pressure control valve overflow pipe. This is normal as the water in the geyser heats and cools.

Up to two litres of water can flow out of this overflow pipe each day. Why not collect this water and reuse it on your garden plants?

However, anything more than a few litres a day usually indicates that the pressure control valve is faulty. This valve should be replaced if there is a constant steady drip from the overflow pipe. An occasional dripping after water has been drawn from the geyser is fine.

Owing to the complexity and possible difficulty of fixing leaking geysers, it is best that you call a qualified plumber to fix the problem.

HOW YOU CAN USE WATER MORE EFFICIENTLY

Now that you have repaired the leaks, the tips given in the following section could help you reduce your water consumption by as much as 40% or more, without inconvenience, and, with one or two exceptions, without having to occur any expense. In fact, if you follow the advice you will definitely save money.

We will start by showing you the amount of water usually used in various activities in a home, compared to the reduced amount you could use. See Table 1 on page 20.

In the bathroom

The average bath holds between 150 and 200 litres when filled to the overflow level. Except perhaps for an occasional soak, you should not fill your bath to a depth greater than 100 mm. Mark the depth on the side of the bath with an indelible felt marker pen or piece of masking tape, for the family to work to.

Where practical, more than one person in the family should use the same water. You can also use the previous night's bath water for pre-soaking dirty washing.

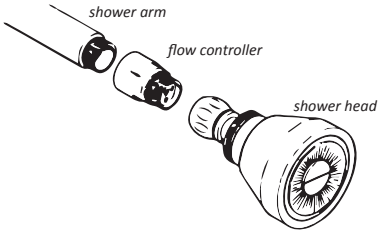
One of the easiest ways to save water and electricity in the bathroom is by taking a short, quick shower instead of a bath. A short shower is more water- and energy-efficient and the hot water lasts longer if many people want the shower.

Reduce the shower flow rate to the minimum necessary for a comfortable shower and cut showering time to a maximum of 5 minutes. A shower timer shows how

much time you have spent in the shower, and can help you save water. When the sand empties from the top, turn off the flow. If everyone used a shower timer, we would save enough water to supply one million homes every day.

A further saving could be achieved by turning off the shower taps while you soap up, only opening them again to rinse off. You could also shower standing in a plastic tub. This would allow you to collect the water for some other purpose.

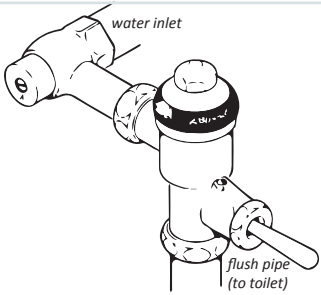
There are many water-saving shower devices on the market today. Aerated showerheads reduce the amount of water in the flow, but maintain pressure by mixing air in with the water. Just like a normal showerhead, they produce a steady, even spray.



Fitting a 6 litre/minute flow controller between the shower arm and the shower head will ensure that an economical flow rate cannot be exceeded

To check the flow rate of your shower hold a 1 litre jug or milk bottle immidiately under the shower head and measure the time taken to fill the container. Ideally the container should take not more than 10 seconds to fill

Figure 8: Installing a flow controller in the shower



Automatic shut-off flush valves for toilets can be adjusted to give an efficient flush with a minimum of water

Screw (A) varies the flow rate. It also serves as isolating valve for shutting off the water supply should the flush valve fail

Screw (B) varies the duration of the flush.
Normally the flush should take between 6 and 8 seconds

Figure 9: Adjusting an automatic shut-off valve

HOW YOU CAN USE WATER MORE EFFICIENTLY

Low-flow showerheads reduce the amount of water that is used, while still giving you the full feel of a normal shower. By replacing your showerhead with a more water-efficient model it is possible to reduce your water consumption by more than half, while still enjoying a great shower.

Do you leave the wash basin tap running wastefully when you shave, brush your teeth or wash your hair? Rather run a suitable quantity of water into your wash basin. Two litres of water in the basin is plenty for shaving and rinsing, while about 250 millilitres in a glass is more than enough for cleaning your teeth.

The cold water which runs initially from a hot tap or shower can be collected in a container and used to water plants or wash clothes. You can also use your bath water to flush your toilet. Keep a bucket in the bathroom for this purpose.

The toilet can be a formidable water-waster. To be sure that the water in your toilet cistern flushes effectively, you must check that the float valve maintains the water level at about 20 mm below the overflow pipe to optimise the energy available for the flush. If it is not at that level, adjust the float using the procedure described earlier in this booklet.

Having adjusted the level you can now reduce the amount of water needed to flush the toilet by placing one or two one-litre plastic bottles, filled with water, on the bottom of your cistern. Some people use a brick instead of a plastic bottle in the cistern. This is not advisable as it might disintegrate. If, however, you find a brick more suitable, it would be best to wrap it in strong plastic.

NOTE: If you find that you have to carry out a second flush fairly often, after applying these measures, the extra flush will cancel any savings. Replacing the flush valve with one of a modern and more efficient design should improve flushing efficiency.

Since most visits to the toilet do not require a full tank of water the ability to fully control the flush can produce substantial water savings. In the case of older flush valves of the type shown in Figure 7, removal of the side float will require that the user keep the handle down while the flush is in progress – about 8 seconds for a full flush. This means that the user can stop the flush by releasing the handle – 1 or 2 litres being all that is necessary at times. At least 20 litres per person per day can be saved in this way.

A few drops of bleach in the toilet bowl, or a dispenser of coloured antiseptic in the cistern, will postpone the need to flush after urination and keep the trap clean.

If your toilet is fitted with an automatic shut-off flush valve you can reduce the amount of water used in your toilet by ensuring that the valve is correctly adjusted. All you need to do is take a screwdriver and adjust the two screws indicated. The maximum time for a flush should normally be between 6 and 8 seconds. The flow rate should be set so as to ensure that the pan is cleared every time.

Today, many toilets feature a dual-flush option to help you save water. These types of toilets have a split flush function giving the user the choice of pressing a small button or a large button depending on how much water is required to clear the toilet bowl. Look for dual-flush toilets if you are considering purchasing a new toilet for your home.

Finally, remember that your toilet is not a rubbish bin. Do not use your toilet for flushing away waste paper, cigarette ends or other domestic refuse. Put your rubbish where it belongs – in the dustbin.

HOW YOU CAN USE WATER MORE EFFICIENTLY

Table 1: Where the water goes in the home (Average daily indoor water use for a typical dwelling with four occupants)

Place	Non-water saving family		Water saving family	
Bath	2 baths at a depth of 150 mm	180 ℓ	1 bath at a depth of 100 mm	60 ℓ
Shower	2 showers at 7.5 l/min for 5 minutes each	75 ℓ	3 showers at 6 l/minute, for 4 minutes (close taps while soaping)	70 ℓ
Wash basin	Water used freely	30 ℓ	Water used carefully	20 ℓ
Toilet	16 uses at 12 l per flush	190 ℓ	Volume of flush reduced & short flushes used as necessary	51 ℓ
Hand washing	Clothing, floors, windows and other	20 ℓ	Water used sparingly	15 ℓ
Dish washing	Sink filled with water each time	40 ℓ	Water used sparingly	20 ℓ
Drinking and cooking		15 ℓ		15 ℓ
Washing machine	Five uses per week	90 ℓ	Five uses per week	90 ℓ
Total water used		**640 ℓ**		**341 ℓ**

The kitchen

These days the most water-efficient automatic dishwasher can wash a full load of items using only 7 litres of water. Accumulate your dishes in the dishwasher until there is a full load. Before packing the dishes into the machine, scrape them instead of rinsing them off.

Energy-save or eco programs wash your items at a lower temperature and use less water during the cycle. That not only saves water but helps to cut energy costs. Energy-save programs typically save 3 litres of water per wash.

Saving water can even come down to the way you load your dishwasher. While you should load it fully, be careful not to overfill it, as this could prevent some items from being cleaned properly. Loading large items at the back and sides of the racks will minimise the chances of needing to wash again – if big plates are at the front, this can stop the water reaching the detergent dispenser.

When washing dishes in a two-bowl sink, run water from the top tap into the 'rinse' bowl until it is warm, and then swing the tap nozzle over the 'wash' bowl. With practice, it will soon become unnecessary to adjust the temperature by adding cold water.

Do not rinse the dishes under running water. Rather use the sink bowl or a plastic tub in which to dip them. Washing-up water can be used on garden plants (not indoor plants). Collect the water in a bucket underneath the sink.

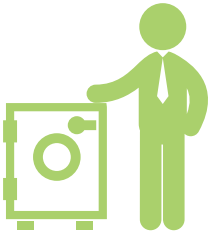
Use a plug in the sink wherever possible – simple, but effective. Do not scrub vegetables under a running tap, use a bowl instead. The leftover water can be used in the garden.

HOW YOU CAN USE WATER MORE EFFICIENTLY

Waiting for the tap to run cold can waste more than 10 litres a day! Put a bottle of tap water in the fridge so you have cold fresh water whenever you want it. Pour any left-over glasses of water onto your houseplants. Unwanted ice is also more useful when thrown on the garden rather than left in the sink to melt away.

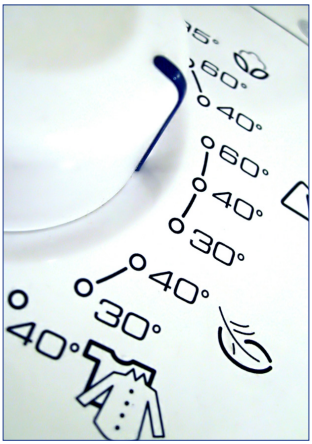
Fill the kettle with only as much as you need, not to the brim. This saves energy and water. Use a lid on your saucepans: they boil quicker, you don't have to put in so much water and the food tastes fresher – but be careful they don't boil over.

The laundry



Washing machines used to use as much water per wash as a person now uses in an entire day – up to 150 litres! Advances in technology over the past 20 years, however, have succeeded in reducing the average water consumption to about 50 litres per wash or less.

When using your washing machine, make sure to use a full load every time. If you need to do a wash, but don't have a full load, use the half load feature on your machine. Remember, though, that some half loads will use almost as much water as a full load, and that two half loads will use more water and energy than one full load.



If you're purchasing a new machine, choose a model with a capacity that is appropriate for your situation. If you're a small household, you probably don't need a model that can wash 10 kg of clothing.

Reducing outdoor water use

Do not use a hosepipe to wash your car. A bucket, sponge and car shampoo are adequate. Also, do not hose down driveways, courtyards and swimming pool surrounds.

Evaporation on the Highveld averages about 1 600 mm per year – enough to empty a medium-sized (8 m x 5 m) swimming pool. Covering your pool, from autumn to spring, will reduce evaporation loss by about a third.

Catch rainwater runoff from the roof in storage tanks in the garden and for topping up the pool. Small submersible electric pumps can be used to distribute this stored water. This water may be polluted and should never be used for domestic purposes.

All plants need water. There are, however, ways of reducing the quantity and frequency with which it is required. One way is to reduce the area under grass. Another is to use drought-tolerant or water-thrifty plants. Today, gardeners should give serious thought to their selection of plant material.

HOW YOU CAN USE WATER MORE EFFICIENTLY

In the garden, group together plants with similar water needs, with due regard for the plants' sensitivity to direct sunlight. This will facilitate correct watering, and reduce possible wastage.

The best method of retaining moisture in the soil is by mulching. The top layer of garden soil should be loosened, then covered with a thick layer of organic matter, preferably a mixture of compost and dried grass cuttings. Alternatively, straw, bark chippings, stones or thin plastic sheeting perforated and covered with about 50 mm of soil will suit the purpose. By doing this you can increase soil moisture retention by as much as 50%.

When watering ensure that you apply enough water to reach the roots of the plants. A good watering once a week is more value to plants than a sprinkling every day; in the long run it uses less water. Plastic or other tubes, pushed vertically downward into the soil, can assist water penetration but they must be kept free of soil. Sandy soils should be well mulched to improve water retention.

When plants wilt, make sure that it is not fertiliser they need. It is true that water will sustain life, but only if the necessary nutrients are also present.

Watering is best done in the late afternoon or early morning. Watering in the middle of the day must be avoided because of the high rate of evaporation that takes place.

The use of micro-irrigation systems with micro-sprinklers and drippers may save as much as 40% of the water used by hosepipe. These systems also apply the water in a form preferred by plants, but should not be used when there is a strong wind blowing as the fine water spray is easily blown away from the plants.

Lawns can make do with very little water and they recover very quickly after a drought. In lean times, therefore, use whatever water is available to keep precious plants and shrubs alive.

If you raise the height of your lawnmower cut and mow less often you will increase your lawn's resistance to drought.

BOREHOLES

If you are fortunate enough to have borehole water, you should use it with constraint.

Extravagant use could exhaust a precious water resource, waste energy through pumping and demoralise neighbours who are endeavouring to save water.

SAVING ELECTRICITY WILL SAVE WATER AND MONEY

We have dealt with various ways in which you can reduce the volume of water you use. However, it is important to remember that if you waste electricity, you are also wasting water and money.

It is worthwhile knowing that, each time you leave just one 100-watt bulb on for 12 hours, you will have used nearly 3 litres of water. Moreover, your electricity bill will increase accordingly.

In order both to reduce your electricity account and save water, take careful note of the following pointers:

- Switch off electric lights as you leave a room and do not leave lights burning all night.
- Use a pool cover from autumn to spring to reduce the need to operate the pool pump during this period; 10 minutes only is needed per week to prevent the pump seizing.
- Reduce the temperature setting on the thermostat in your storage water heater (geyser) to 60°C. By doing this, less heat is lost through the insulation and less electricity is consumed.
- Do not use a deep freeze as a refrigerator. That is, do not open your freezer door often. Each time you open it cold air is lost and more energy is needed to regain the correct temperature.
- Never use the oven as a room heater.
- Air-dry the dishes in the dishwashing machine. Turning the machine off after the final rinse and then opening the door slightly can save up to 50% of the electricity consumed by a full programme.
- Switch off the power supply to the water heater at the circuit breaker if you are going to be away for 72 hours or more.
- Check your refrigerator door gaskets to ensure that the door closes tightly. Allow refrigerators and freezers to defrost when the frost becomes 6 mm

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