

“We forget that the water cycle and the life cycle are one.”

- Jacques Yves Cousteau

## What is South Africa's water situation?

South Africa is located in a predominantly semi-arid part of the world. The climate varies from desert and semi-desert in the west to sub-humid along the eastern seaboard. Average rainfall, around 450 millimetres (mm) per year, is well below the global annual average of about 860 mm. Evaporation is comparatively high. South Africa's **water resources** are, from a global perspective, **extremely limited**.

## Does South African legislation regulate timber plantation water use?

Yes. The National Water Act (Act No 34 of 1998) declares timber plantations (afforestation) as stream flow reduction

activities (SRAs). As SRAs, all existing commercial plantations must be registered as water users and will, in time, be licensed. Only lawful plantations will be granted a licence. The rules of legality for plantations are quite complex, but simply put, are as follows:

- Afforestation that occurred prior to 1972 is lawful and may be registered and licensed.
- Afforestation that occurred after 1972 but before 1999 is lawful provided the plantation was planted in accordance with a valid afforestation permit.
- Afforestation after 1998 must be in accordance with a valid licence.

## How much water does forestry use?

Commercial forestry plantations in South Africa account for a little less than 3% of total water use.

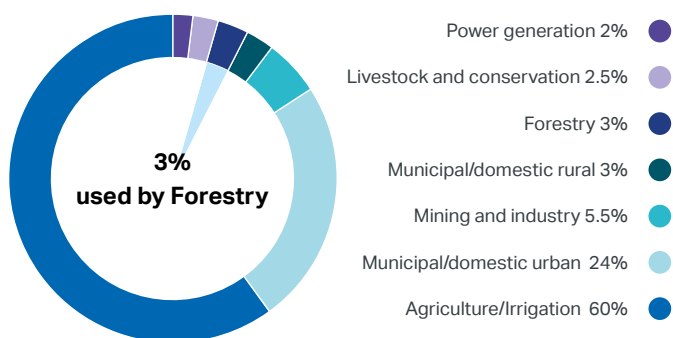
Plantations are not irrigated; they only intercept rainfall, which reduces runoff into rivers and streams.

Agriculture and crop irrigation are the dominant users of water in South Africa.

## Fast facts

- With an average annual rainfall of only 450 millimetres (mm), South Africa's water resources are limited - the global annual average is 860 mm.
- Commercial forestry plantations account for 3% of total water use in South Africa.
- We focus on using less water per ton of product produced.
- By managing water quality and quantity, we reduce the impact of our plantations on streams, rivers and wetlands.

## Water use by sector in South Africa<sup>1</sup>



## Do eucalypts use more water than pines?

Statements are often made that *Eucalyptus* trees use more water than pine trees. Recent investigation by members of the SA water research commission (WRC) have pointed out a lack of scientific evidence supporting quoted differences in water use between *Eucalyptus* and pine species. Recent research also showed that water use by trees could be more affected by soil characteristics (soil depth), environment (slope and landscape position) and climate than the genus planted. Research results from various studies comparing water use of pines to that of *Eucalyptus* varies greatly and does not consistently show that one genus uses more water than the other. There are a number of factors that could play a role here. A common mistake made when assessing the differences in water use between *Eucalyptus* and pines occurs when trees are measured at a common age and not at a common crown development (leaf area) stage. The pattern of water use over the stand-development period is similar to that of nutrient use and follows the growth-curve pattern. It increases from planting, until it reaches a peak at the time of canopy closure and thereafter decreases over time. It is not accurate to compare the water use over just the first five years of the rotations. Thus, water use over two *Eucalyptus* rotations of 10 years should be compared to that of a 20-year pine rotation. If the comparisons are made over a longer time-span, differences in water use between *Pinus* and *Eucalyptus* are not statistically significant. It has even been demonstrated in South Africa, that the water use of very old plantations returns to levels of water use in the natural vegetation prior to afforestation. Many of the water use figures reported in South Africa originate from sapflow measurements.

These have been done on a single tree or a very small number of trees on a stand only. It has been shown in other studies that single tree water use cannot be upscaled to reflect the stand-level water use, as it introduces significant error. Due to the cost of equipment required to measure tree water usage, the replication of treatments was also very limited in past (and current) studies.

Measurement of water use efficiency (WUE) is normally linked to productivity or biomass measures such as stem volume production per unit of water used. Expression of WUE in this manner - as annual stem volume increment per unit volume of water transpired for *Eucalyptus* species across age classes and site types in South Africa - ranges from 0.0008 to 0.0123 cubic metres (m<sup>3</sup>) stem wood produced per m<sup>3</sup> water consumed<sup>2</sup>. There is, furthermore, variation in WUE between varieties (of the same age and on the same site), with the tendency for the fastest-growing genotypes, to consume the least water per mass or volume of wood produced, therefore being more water efficient. Furthermore, from available measurements, on economic WUE (levelised net present value per cubic metre of water), eucalypts tend to be the most water use efficient of all species (in comparison to pine and various indigenous plantations) on a per mass or volume of wood produced, basis<sup>3</sup>.

Scott D. F. and Smith R. E., 1997. "Preliminary empirical models to predict reductions in annual and low flows resulting from afforestation," Water SA, vol. 23, pp. 135–140, 1997.

## How does Sappi mitigate impact on streams, rivers and wetlands?

We avoid **unnecessary water use** by not planting trees too close to riparian zones and wetlands and ensuring that these are kept free of commercially planted trees.

**Water quality** is managed by regulating drainage and minimising erosion, thereby preventing runoff into streams and rivers.

Pesticide use conforms to the strict Forest Stewardship Council<sup>TM</sup> 4 (FSC<sup>TM</sup> N003159) standards, which aim to minimise the use and impact of these on the environment.

The amounts of fertiliser used in plantation forestry are minimal and there is no likelihood of leakage into streams and rivers. Consequently, rivers, streams and lakes are not polluted by forestry operations, although there is some sedimentation.

We have a number of procedures to ensure that **runoff after harvesting is kept to a minimum**. These include leaving harvesting residue on the ground and ensuring that the correct harvesting and extraction methods are used.

<sup>1</sup> Water for Growth and Development in South Africa Version 6, Department of Water Affairs.

<sup>2</sup> Albaugh JM, Dye PJ and King JS. 2013. *Eucalyptus* and water use in South Africa. *International Journal of Forestry Research*, <http://dx.doi.org/10.1155/2013/852540>.

<sup>3</sup> Dye PJ, Gush MB, Everson CS, Jarman C, Clulow A, Mengistu M, Geldenhuys R, Wise R, Scholes RJ, Archibald S and Savage MJ. 2008. *Water-use in relation to biomass of indigenous tree species in woodland, forest and / or plantation conditions. Report to the Water Research Commission. WRC Report No. TT 361/08.*

<sup>4</sup> Our mills and forestry certification details, including FSC<sup>TM</sup>, SFI<sup>®</sup> and PEFC, are available online <https://cdn-s3.sappi.com/s3fs-public/Sappi-FAQs-Our-certifications-5.2.pdf>



## Is Sappi involved in any external water-related initiatives?

Yes, we are. We make water available to neighbouring communities, providing treated water to villages close to Ngodwana and Tugela Mills. In times of drought, Lomati Mill has sent water tankers to the local community.

In addition, we have partnered with WWF South Africa to proactively manage water resources in the uMkhomazi catchment in which our Saiccor Mill is situated. A key component of the partnership is multi-stakeholder engagement in the catchment. The project has four focus areas, namely:

- Improved water governance through multi-stakeholder engagement.
- Enhanced estuary management and downstream water-use efficiency.
- Alien invasive clearing and wetland rehabilitation.
- Capacity development of local communities in natural resource management.

## How and why do trees use water?

To survive and grow, trees, like all plants, need water to transport nutrients from their roots to where they are needed. Another major reason for water use by plants is to cool off. They have a vast effective network of pathways consisting of tissues called xylem and phloem to move nutrients and water. This pathway of water and nutrient transport can be compared with the vascular system that transports blood throughout the human body. The xylem and phloem extend throughout the tree; starting in the roots, transecting up through the trunk, and branching off into the branches and into every leaf.

Trees do reduce their transpiration during water stress periods and water use is lower during the winter, low flow periods. Trees planted close to, or in, riparian zones and wetlands will use more water than those planted further away, hence Sappi implements delineation, (in other words, we do not plant too close to riparian zones and wetlands).

## How a tree uses water

