

Coal's hidden water cost to South Africa

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Published in June, 2012

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Designed by: Kai.Toma Creatives

Printed on 100% recycled post-consumer paper with vegetable based inks.

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Introduction

A water war is looming in the north of South Africa and coal is right in the middle of it.

For years the Soutpansberg in Limpopo, an area with the rainfall equivalent of the Kalahari, supported little but die-hard game rangers and a few farmers with access to the limited irrigation.

But beneath the arid land lies a ridge of coal that makes miners' eyes light up. Mining companies like Coal of Africa, who recently launched their Makhado coal mine project near Makhado (Louis Trichardt) in the Soutpansberg. Other mining houses are also sniffing in the area.

The mine was given the green light by the Department of Mineral Resources without having a clear view of where it will find the water it needs to begin mining. This has inflamed some members of the local community, who fear that they will lose their water rights to make way for the mine.

Coal mines need water. Miners have to wash the coal and control dust levels at the mine. The surrounding communities fear the mine would pollute the remaining water and cause borehole water levels to drop. It is a stalemate and every meeting around water threatens to erupt into a brawl, with communities crying over their lack of access to water and farmers about mines stealing their water.

"There is a huge fight coming," says Jonathan Mudimeli, chairperson of the Mudimeli Royal Council, whose community is in the middle of the proposed mine. "We fear our boreholes will dry up if this mine is allowed."

"The miners are taking our water that our community needs. They are taking away our drinking water, water for our crops and nature's water," says Mphatlene Makaulule, from Dzumo La Mupo (Voice of Nature), a new Venda environmental group. "Look what coal mining did to Mpumalanga. Look at the scars. We don't want that."¹

Makaulule fears another Olifants River disaster in her home valley in Limpopo. In that catchment area in Mpumalanga, decades of coal have poisoned the landscape and driven the Olifants River to a crisis point. It has become a wasteland in some parts, where abandoned mines have underground fires that have been burning for decades and there are streams that are so acid, they kill everything near it.

The catchment struggles with Acid Mine Drainage, and the demand for quality water in the area outstrips what is actually available.²

Acid Mine Drainage is the flow of polluted water from old mining areas, including coal. The water may contain high levels of salts, sulphate, iron, aluminium, toxic heavy metals such as cadmium and cobalt, and radioactive elements. This contaminated water can pollute soil and water supplies as it spreads underground and flows into streams and rivers.

The flow of Acid Mine Drainage into South Africa's surface and groundwater systems is having devastating consequences that are both far-reaching and long-term. These consequences include degrading the quality of the country's water systems, poisoning of food crops, endangering human health, and the destruction of wildlife and eco-systems, infrastructure and heritage sites.

It is in this area - near Standerton in Mpumalanga - where South Africa's power utility Eskom is building the country's newest coal power station. Kusile will be one of the biggest in the world and will need a steady supply of water to turn its turbines with steam and cool its towers. It will use 71 million litres of water a day.

Water will have to be piped in from the Vaal River in Gauteng to supply Kusile, because of a lack of quality water in the area. And that is where the debate begins.³ There are questions whether the Vaal will be able to cope in the next 10 years.

While climate change and the cost of carbon emissions are well documented, communities such as those in the Soutpansberg are waking up to the fact that there is another price to pay to keep South Africa's power stations and industry chugging along: Water.

The quantity of water available for each person in the world is declining steadily; nowhere is the rate of decline as dramatic as we continue to see in Africa.⁴ And South Africa's continued reliance on coal goes to the heart of whether we can keep our taps running with clean water.

¹ Attended Water Users Meeting on 23 March 2012 in Tshipise regarding water use of Makhado mine.

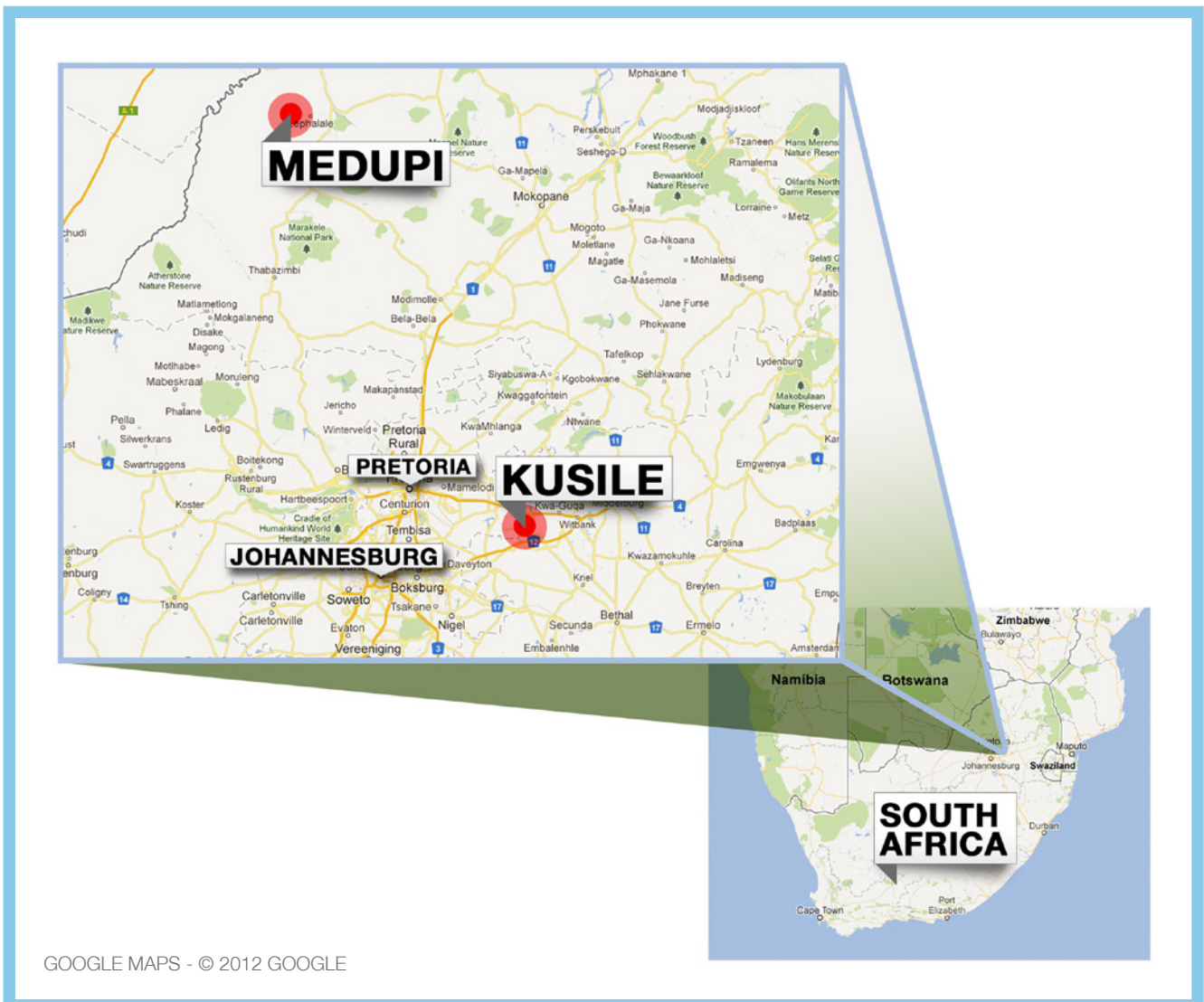
² Christine Colvin, 23 November 2011, Coal and Water Futures in South Africa: The case for conserving headwaters in the Enkangala grasslands'. WWF-SA

³ Environmental Impact Assessment Kusile, February 2007, Ninham Shand (Pty) Ltd, Eskom

⁴ Ashton, P.J., D. Love, H. Mahachi, and P.H. Dirks. 2001. "An Overview of the Impact of Mining and Mineral Processing Operations on Water Resources and Water Quality in the Zambezi, Limpopo, and Olifants Catchments in South Africa." Contract Report to Mining, Minerals, and Sustainable Development Project/Southern Africa. Pretoria, South Africa and Harare, Zimbabwe: CSIR-Environmentek and University of Zimbabwe, Geology Department.

Inside the Kusile-debate is a Pandora's box of who gets the first bite (or sip) of South Africa's water, who should get the most water, and who is messing with our water. And who is willing to fight to keep their water.

Government reports studied show how water-stressed South Africa is on the precipice of radically shifting its water priorities. Agriculture will ultimately be the big loser and industry the big winner.^{5 6}



Map: the location of the Medupi and Kusile coal power plants currently under construction in South Africa.

⁵ Van Rooyen et al, National Water Resource Strategy, Department of Water Affairs, 2009

⁶ Department of Water Affairs, Water for Growth and Development Framework

It's not only about the power stations

Eskom's power stations supply in excess of 95% of South Africa's electrical energy, and about half of the electricity used on the African continent. And last year it used 327 million mega liters to produce that electricity, about 2% of South Africa's water.⁷

Last year, Greenpeace published 'The True Cost of Coal in South Africa' report that examined the water costs of Eskom's Kusile project.⁸ Despite using the latest technology, for every unit of electricity produced, Kusile will use 173 times more water than wind power would use, the organisation said.

While environmental activists have already questioned the water footprint of South Africa's new power stations Kusile and Medupi, the hidden water footprints of the mines supplying the coal are often forgotten.

In South Africa, water quality data from individual mine properties is not openly available to the general public.

These data are collected by the mines and are submitted to the Department of Water Affairs and Forestry as part of routine pollution control monitoring operations. This information is considered to be "commercial in confidence" and access is restricted.⁹

Environmentalists continually question how polluted the water resources around the mines really are.

It is only recently that research from the CSIR about the Olifants River showed the immense damage that coal mining and the related industries have done to the water resources of Mpumalanga.

Kusile will get its coal from the new Anglo American New Largo mine. However, environmentalists and activists are concerned about the impact the mine will have on wetlands, and activists are gearing up for a fight to keep the mine out of the wetlands.



⁷ Eskom Integrated Annual Report 2011

⁸ Greenpeace, 2011. The True Cost of Coal in South Africa: Paying the price of coal addiction. Available: <http://www.greenpeace.org/africa/Global/africa/publications/coal/TrueCostOfCoal.pdf>.

⁹ Ashton, P.J., D. Love, H. Mahachi, and P.H. Dirks. 2001. "An Overview of the Impact of Mining and Mineral Processing Operations on Water Resources and Water Quality in the Zambezi, Limpopo, and Olifants Catchments in South Africa." Contract Report to Mining, Minerals, and Sustainable Development Project/Southern Africa. Pretoria, South Africa and Harare, Zimbabwe: CSIR-Environmentek and University of Zimbabwe, Geology Department.

Expensive water

South Africa is projected to experience a 17% gap between water supply and demand by 2030 - a shortfall of 2,7 billion cubic metres - according to the global initiative encouraging big business to report their carbon footprint, the Carbon Disclosure Project. Some of SA's most economically important catchment areas, including Gauteng province, would be worst affected.¹⁰ Gauteng gets most of its water from the Vaal catchment, the same river that will be supplying Kusile.

South Africa is using too much water for it to be sustainable. Russell Lamberti, strategist at ETM Analytics told the Bruce Whitfield show on Talk Radio 702 that we are drawing 40% of our annual freshwater resources, the highest in the world.

"We've come to the limit of what we can take out of our water resources," he said.

Johan van Rooyen, director of National Water Resource Planning at South Africa's Department of Water Affairs agrees.

"As a nation we have already - for many rivers - taken more water than is good for the functioning of those rivers," he says. "We have an obligation to try and restore the balance if our rivers are to continue to provide ecosystem services."

Van Rooyen says South Africa has enough water if we implement all our infrastructure plans and make the necessary savings. But it is the cost of getting quality water to households, industry and farmers that will make water a scarce and valuable commodity. And more importantly, how that water should be used needs to be taken into account.¹¹

"We have the whole sea around us, so South Africa will never run out of water. But it is the cost of building those desalination plants for example that adds the question marks around sustainable water use."

At the moment South African households pay more or less between R7 and R12 per kiloliter of water, but economists like Lamberti warned that this could triple if South Africa is to keep its taps flowing.

Independent water expert Anthony Turton says: "I predict the price of water has to increase dramatically, to double or even treble. If we don't do that we won't catch up with our growing (infrastructure maintenance) backlog."

And any price hikes are met with resistance. End-users will not be happy.

Van Rooyen's report for the Department of Water Affairs¹² states that almost all major sources of readily available water have already been harnessed.

The burly government engineer says it is absolutely essential that we reduce our water requirements, because our options to source water are becoming more limited and expensive.

One of the most controversial solutions is to reallocate water, mostly from the thirsty agriculture section.

"Changing the use of this water may be far more sensible than implementing new schemes - but these are not decisions to be taken lightly," said Van Rooyen. "The future cost of water can be expected to become a major incentive with regard to the location of growth and development nodes."

The question remains whether coal mining is such a growth and development node, and also whether the water pollution and water consumption resulting from coal mining and coal-fired power stations is sufficiently featured in when it comes to growth and development for South Africa.



¹⁰ Sue Blaine, Coming to terms with looming water crisis, Business Day, Published: 2012/03/16

¹¹ Johan van Rooyen, Personal Interview and Powerpoint presentation, Department of Water Affairs offices, 10 May 2012

¹² Van Rooyen et al, National Water Resource Strategy, Department of Water Affairs, 2009

Eskom's water footprint

At the moment, agriculture uses the bulk of South Africa's water at 62%, mining round about 3%, and Eskom 2% of South Africa's water. Eskom does not get discounted rates, but pays the industrial rate suited for the particular area of South Africa where its power stations are located.

Eskom is the only 'strategic' water user under the National Water Act, which means that the Department of Water Affairs has to provide it with water, come hell or high water.

Eskom requires water at the highest levels of assurance to provide steam for the turbines, to cool and clean machinery and to scrub pollutants. Eskom averages around 316 billion liters of water per annum and the utility requires good quality water.¹³

The utility promises that it is reducing its water footprint. Eskom's general manager for water and environmental

operations Nandha Govender told the media Eskom was producing more electricity using less water, and had taken a "step change" in its water management practices. He said its water usage would peak in 2021, and then start dropping after this date as the new dry-cooled power stations, Medupi and Kusile, came on line and the more water intensive power stations came to the end of their lifespan. But Van Rooyen at Water Affairs admitted that Medupi and Kusile would push up Eskom's water usage considerably in the next decade.

Last year April Eskom implemented a water accounting framework at each of their coal-fired plants to support water conservation amidst rising criticism on the power stations' water footprint. But a criticism remains that the reports are not detailed enough to show how exactly Eskom accounts for its water usage.

Shifting priorities: Ditching agriculture for coal

According to Van Rooyen, in 2012 South Africa stands before a huge political decision on how it will use these dwindling and increasingly expensive water resources in the future.

And it seems the government is leaning politically towards allocating its water to industrial projects that are big money spinners, rather than to farmers.

The vast majority of South Africa's water rights are found in irrigation, and the food security debate will be at the centre of any decision to relocate rights. Recent reports that the Department of Water Affairs has commissioned, indicate that the South African government is contemplating taking away water rights from farmers and handing them over to

industries that can derive 'maximum benefit' for the local South African economy.¹⁴

The question is whether the expensive water resources should be allocated to an industry - the coal power industry - that will have to downscale because of an international carbon reduction treaty that is likely to kick in by 2020, with a potential huge polluting footprint in the form of Acid Mine Drainage?

While the water department has a number of plans to keep South Africa afloat in the coming decades, the department says that the next five years might present some water shortages should South Africa enter a drought cycle.¹⁵

¹³ Christine Colvin, 23 November 2011, Coal and Water Futures in South Africa: The case for conserving headwaters in the Enkangala grasslands'. WWF-SA

¹⁴ Department of Water Affairs, Water for Growth and Development Framework

¹⁵ Johan van Rooyen, Personal Interview and Powerpoint presentation, Department of Water Affairs offices, 10 May 2012

Current water crisis: Medupi

It is in another water-stressed part of Limpopo, the Waterberg, where Kusile's predecessor Medupi is being built.

At the end of last year, a leaked World Bank Inspection Panel (IP) report revealed that it was worried about the lack of consideration for water scarcity in the Waterberg region.

Local community members have been challenging the illegal sand mining used for the construction of Medupi as it has affected the water flow from the local Mokolo River, and threatened security of water supply to water users.

The World Bank report roasted the South African government for not considering the expansion of the Grootgeluk mine in Medupi's environmental impact assessment and the extra water the mine will be using.

In addition, alleged illegal sand mining has also impacted negatively on the Mokolo River's flow. Farmers in the area complain that the consistent mining has taken away their water quality and left them with muddy, useless banks. The World Bank report also highlighted this.¹⁶

Susan Goosen is one of the farmers in the area that has been complaining about the loss of water in the river.

"But the Department of Mineral Resources told us to shut up, because Medupi was in the public interest and the sand and water was needed for the power station," she said. "The planning has been extremely poor."¹⁷

After repeated complaints the Green Scorpions have started investigating the illegal sand mining.

Kusile: Where will the water come from?

The water that Medupi's cousin Kusile will require, will be sourced from the Vaal.¹⁸ Kusile needs its water from the Vaal, because the power station's closest river, the Olifants River, is so polluted by years of coal mining and the associated industries that its quality water has simply dried up.

According to the WWF's report on Coal and Water futures in South Africa, in the Olifants catchment, coal mining has contaminated rivers and streams to the extent that the water cannot be used in the coal-fired power stations. Eskom's water either needs to be treated - costing money and more energy - or it must be supplied from another river system that has not been polluted by mining.¹⁹

Van Rooyen said increasing water supplies to the Olifants water management area would be exceptionally costly. He said the Olifants River could be an early example of South Africa's water future and the challenges the country is likely to face.

"This shifting means that the debate around food security will become very topical and emotional," he warned. "The Olifants River scenario will have a large bearing on the water resource debate."

Kusile's water requirements would have to be fulfilled via the Vaal River Eastern Sub-system Augmentation Project (VRESAP). VRESAP is a project initiated by the Department of Water Affairs aimed at transferring approximately 160 million cubic metres of water from the Vaal River Dam to supply mainly Eskom's and Sasol's growing water requirements. Eskom was assured in the planning phase by the Department of Water Affairs that VRESAP would be able to supply all the proposed power station's water requirements.

Kusile's environmental impact assessment (EIA) states: "It should however be noted that the water that is being transferred out of the Vaal has a lost opportunity cost attached to it. The water could have been beneficially utilised in the Vaal River catchment for agricultural purposes or in industry."

Kusile will operate under Eskom's Zero Liquid Effluent Discharge policy, which states no water or effluent would be discharged into local river systems. But Greenpeace, environmental justice NGO groundWork, and other environmental groups are suspicious of the policy and question whether the policy can be fully implemented.

¹⁶ Inspection Panel World Bank Report on Eskom loan regarding Medupi, November 2011, World Bank

¹⁷ Susan Goosen. Personal communication via email and phone on Medupi illegal sand mining. May 2012

¹⁸ Environmental Impact Assessment Kusile, February 2007, Ninham Shand (Pty) Ltd, Eskom

¹⁹ Christine Colvin, 23 November 2011, Coal and Water Futures in South Africa: The case for conserving headwaters in the Enkangala grasslands'. WWF-SA

Can the Vaal cope? Is there enough water for all if Kusile happens?

Eskom themselves are worried about water supply from the Vaal.

At a water conference in Marseille, France earlier this year senior Eskom and Sasol managers warned that one big drought in the Vaal River catchment area over the next eight years could jeopardise the region's agricultural and industrial output.

They said the period from now until 2020, when the second phase of the Lesotho Highlands Water Project (LHWP) starts delivering water to the Vaal, was one of "major risk".

At the same time extra water will be needed in the Vaal system to dilute the heavily salted water from Gauteng's Acid Mine Drainage problem that will be pumped into the system.

Because of Eskom's strategic water use status, other users will have to bear the brunt if a drought comes along.

Govender told the South African Press Association a drought would see the region "pushing the boundaries" of available water supply.

"The capacity of the Vaal system is a major risk. The risk lies with large industrial water users, agriculture and the municipalities."

In its annual report last year Eskom said on the state utility's request, the Department of Water Affairs is investigating potential infrastructure bottlenecks in the Vaal River water supply systems.

"The department is also planning to mitigate the risk of a water deficit in the Vaal River system up to 2021 by curbing illegal water abstractions and use and enforcing both water conservation and water demand management, as well as mine water treatment and re-use," Eskom said.²⁰

Kusile: The hidden cost

But Kusile has an even bigger secret: its unintended threat to wetlands. Most of Kusile's coal will be sourced from Anglo American's new mine: the New Largo Colliery, near Kusile.

Eskom announced last month it may help finance Anglo's proposed 15 million tonne/year New Largo coal mining project, estimated to cost R12-billion.

The Federation of a Sustainable Environment (FSE) is deeply concerned about the impact of this mine on the

area's wetlands, says FSE activist Koos Pretorius. The FSE is questioning the environmental management plan of the mine for failing to consider the impact the mine will have on the wetlands and fresh water in the area.

If pans and their associated catchments are not excluded from the mining area they will cease to exist, the FSE believes.



²⁰ Eskom Integrated Annual Report 2011

Water: The best decision?

In a water scarce South Africa the debate around water usage has only just begun and energy use's water footprint is smack in the middle.

The water footprint of coal power stations is there for all to see, and it is apparent that water might have to be taken away from other users if a crisis such as drought arose to keep the lights on. And it is increasingly becoming clear that agriculture, in the form of irrigation, will bear the brunt of the looming water crisis.

But as Medupi and Kusile both show, there is an even bigger hidden footprint found in the mines that have to supply the coal or sand for the power stations.

With a climate change treaty looming in 2020 that is sure to throttle the coal industry not only in South Africa but around the world, the big question is whether it is wise to allocate precious water resources to an industry that might be out of business by 2050?

At the same time, what can South Africa do otherwise to keep the lights on?

Conflict on the horizon?

It is in a hot, overcrowded room in Tshipise, where the Makhado mines future water rights are discussed that the raw emotions around water rights are detected. The local community's borehole will be depleted. The mine promises piped water to every home to sooth their fears. And job creation is dangled in front of them.

The local farmers' rights are being bought out.

"I'll never sell my rights," one farmer bellows.

Eugene O' Brien, the project manager at the Makhado mine, tries to calm the tempers.

"We have given this commitment and guarantee that we will not take water to the detriment of any community or farmer without compensation," he says.

Another farmer listens quietly.

"The tide is changing. The government wants this mine to go ahead. They want us to sell our water rights to the mine. And if this is what they want, that is what they will get. If the government blesses the mine it will go ahead. We can shout, we can cry. Eventually coal will come to Makhado."



COAL'S HIDDEN WATER COST

START HERE

AN ESKOM COAL PLANT UNDER CONSTRUCTION

KUSILE

WILL USE **2,9 MILLION LITRES** OF H₂O AN HOUR

173 TIMES MORE THAN WIND POWER WOULD USE PER UNIT OF ELECTRICITY

THIS WATER WILL COME FROM THE VAAL RIVER. THE CLOSEST WATER SOURCE, OLIFANTS RIVER, IS ALREADY TOO POLLUTED FOR USE BECAUSE OF COAL MINING AND ASSOCIATED INDUSTRIES.

Gauteng gets most of its water from the Vaal River



NOW WATER WILL BE **DIVERTED AWAY FROM AGRICULTURE AND RESIDENTIAL USE** IN ORDER TO FEED KUSILE COAL POWER PLANT

KUSILE'S COAL WILL COME MOSTLY FROM A NEW ANGLO AMERICAN MINE

Due to ESKOM'S reliance on coal



THAT MINING IS EXPECTED TO HAVE A DRASTIC EFFECT ON LOCAL WETLANDS AND WATER SYSTEMS

ESKOM'S TOTAL WATER USE

10 THOUSAND LITRES PER SECOND

THE AMOUNT OF WATER FOR EACH PERSON IN THE WORLD IS DECLINING

BUT THE RATE OF DECLINE IS MOST DRAMATIC IN AFRICA

Enough to fill an olympic-sized swimming pool every 4 minutes



in 1 day Eskom uses enough water to grow almost **1 MILLION KGS** of maize

Eskom is classed as a 'strategic' water user under the National Water Act



This means Eskom is guaranteed a supply of water, come hell or high water

MIND THE GAP

17% THE DIFFERENCE BETWEEN SOUTH AFRICA'S WATER SUPPLY AND DEMAND BY 2030

WATER PRICES COULD **TRIPLE** AS WATER GETS SCARCE

TODAY'S PRICE OF WATER, PER UNIT

R7-R12

