



If you were to make a list of the world's great rivers, the uMngeni (Umgeni) River wouldn't be one of the first to spring to mind. Rising in the mistbelt of KwaZulu-Natal province, South Africa, it meanders a couple of hundred kilometres down to the sea at Durban. But to the people of this region, it could hardly be more important. The uMngeni basin or catchment area accounts for 15% of South Africa's economic output, almost all of it dependent on fresh water, and supplies water to more than 4 million people in the cities of Durban and Pietermaritzburg.

Yet this is a river in trouble. While much of KZN is lush and green (and we'll experience plenty of rain during the course of our week here), water stress is growing. In South Africa as a whole, if current patterns continue then by 2025 there simply won't be enough water to meet rising demand. The implications of that are frightening.

Forest plantations are one of the major land uses in the upper and mid uMngeni catchment, and a major water user. Water scarcity is a business risk for the sector – and it's also the sector's responsibility to be part of the solution. And that's why NGP is here on this study tour.

But plantations are only one part of the picture. Water is the ultimate shared resource, and finding sustainable solutions means bringing together everyone who has an impact on the river basin. It's only by working together to develop new thinking and new models that we can secure what WWF-South Africa calls "resilient landscapes" – where natural ecosystems continue to provide vital resources like fresh water and to underpin our social well-being and economic prosperity, now and in the future.

So as well as the usual forestry suspects, our study tour group includes representatives from the sugar and dairy industries, retailers and manufacturers, banks and insurance companies – all of whom, ultimately, depend on water security and resilient landscapes. We're 42 in total, exactly half from South Africa, the rest from all corners of the globe from Chile to China, Russia to Mozambique – 17 countries in all.

## Monday 10 November

Our story begins at the end – at the mouth of the uMngeni River. The “Blue Lagoon”, as the tourist board calls it, looks grey. It’s a popular recreational spot, despite the busy road bridge that crosses the river, but today there’s just a single fisherman and the odd jogger along with seagulls, geese and waders. The river meets the sea through a small channel, 20 metres or so wide. But it should be much wider – a large sandbar in the river’s mouth is evidence of low water levels, the result of low rainfall and rising demand.

As the man who used to be in charge of Durban’s municipal water supply, Neil Maccloud knows what this means. Over the years, like most places, eThekweni municipality (of which Durban is the main centre) has looked to engineering solutions to ensure water security. Dams have been built upstream, storing up to two years’ worth of water. Most recently, water has been pumped across from the neighbouring river basin, to take advantage of the higher rainfall in the Drakensberg mountains. And while that’s significantly improved water security for now, it’s not enough.

South Africa has progressive legislation aimed at ensuring an “environmental reserve” flows through the river to sustain ecological needs – but this doesn’t always happen in practice. Leaving aside the damage to embattled freshwater species, that means poorer quality water, which means higher treatment costs, which means already steep water prices become sharper still. And if river pollution were to start affecting Durban’s tourist beaches, that would have a vast economic impact.

Besides this, Durban is growing – fast. In just 10 years the urban population has jumped by 20%, from 3 million to 3.6 million. Many of the new residents are living in informal settlements with no sanitation facilities, often right by the water’s edge, where their homes and lives are at risk from floods – the flipside of water insecurity.

By 2015, once again there’s not going to be enough water to go round. So then what? More dams? More transfers from other basins? Neil and others began to realise that “Doing the same thing over and over again isn’t going to get different results.” Instead of civil engineering, could investing in “ecological infrastructure” provide a new approach? Could irrigation and farming practices be more efficient upstream? What about restoring natural vegetation and the wetlands that have been drained and damaged (wetlands act as natural sponges, soaking up rainfall and releasing it slowly – without them, the rain runs off and is soon lost to the system, also bringing flash floods and erosion)?

It’s unusual to hear a civil engineer talking this language. And it’s more unusual still to see others buying into the vision – government at different levels, the water sector, producers, business and civil society, as well as academics and environmentalists. But that’s what’s being witnessed here over the last couple of years. A wide range of stakeholders is starting to come together to improve water stewardship in the catchment in a variety of ways – to turn the whole uMngeni basin into a resilient landscape. It’s early days, but things are happening – with lessons, hopefully, that all of us can learn from and build on.

From the river mouth, we head to the heights above Durban to visit the Umgeni Water treatment works. Umgeni Water is a state-owned business, that buys bulk water from the government Department of Water Affairs and sells clean water on to clients – namely eThekweni municipality and other local authorities in KZN. In total, it provides around 1.2 billion litres of water a day to 4.8 million people. And most of it comes from this plant.

Water is piped downhill by gravity from a number of reservoirs in the catchment, and passes through several stages in its treatment here – from adding lime to adjust the pH, filtering out the solids, to adding chlorine as a disinfectant. You may be able to taste a trace of chlorine in the water closer to the treatment works, but most importantly, all the water in the system is safe to drink. It's clear from the scale of the process, though, that this doesn't come cheap. The poorer the quality of the water coming in from higher up the catchment, the greater the treatment costs – with a knock-on effect on everyone from big businesses to poor families.







## Tuesday 11 November

Our first field visit takes us to Ozwathini, a densely populated tribal area. It's a misty morning, but a grassy hilltop gives us a view into a steep-sided valley. It's a patchwork landscape of homesteads, vegetable gardens out the back, pockets of gum and black wattle (eucalyptus and a type of acacia, both deliberately planted and "escaped"), thickets of native woodland, grazing areas. What's interesting is that, despite appearances, there's a sort of order to this chaos that gives the system an inherent resilience. The invasive trees are a good example: local people use them for timber, stopping them spreading further.

Steve Germishuizen has been working in the area for several years, as part of a project to help smallholders get their timber certified by the Forest Stewardship Council (FSC) as well as to get an area of threatened grassland (that's also used for grazing) designated as a nature reserve. All the big commercial players in South African forestry are FSC certified, but for the small growers around here – who typically grow timber in woodlots of a hectare or two – the certification process is prohibitively expensive and complex. That limits their opportunities to sell timber into markets that demand sustainability – even though they arguably have less negative environmental impact, and more positive social impact, than big certified companies.

Assessments show that their timber operations have minimal impact on soil, water and biodiversity. And satellite images dating back to 1999 show no change in land use. As Steve says, there's no point imposing complex systems on approaches that are working anyway. The plan is to distil the hundred-plus FSC indicators into a manageable checklist of 25 that deal with local realities, and will be enough to guarantee legal compliance and landscape resilience.





Our next stop a few minutes away is still within a tribal-owned area, though here things look much more ordered. From the grassland use for communal grazing, we see households with neat vegetable plots and small sugar fields (mixed livelihood strategies like this – crops and livestock for subsistence, a cash crop, along with other paid work – are another feature of resilient landscapes). Sugar used to be farmed on a commercial scale here, but production collapsed with the end of Apartheid. Now Illovo Sugar, which owns the big sugar mill nearby, WWF, government and other partners are supporting small-scale sugar growers. Local people plant and harvest, almost entirely by hand, on their own land, and the money they receive stays in the community. Thanks to the rich soil and good management practices, many are achieving higher yields per hectare and higher quality sugar than the big commercial producers. They're also in the process of applying for Fairtrade certification, which will provide a premium to support much-needed community development.

Informal systems within the community also help to strengthen resilience, as Nonhlanhla Luthuli, a local small grower, explains. She and her neighbour both grow around a hectare of sugar, and they harvest on alternate years in order to spread the income. She's also a member of a savings group run by local women. Recently the group has started dispersing funds in January, so families can afford to send children to school, rather than in December, where the money would disappear into Christmas – a harsh lesson, but a valuable one that brings home the importance of long-term thinking. It's interesting to note, too, that it tends to be the women taking care of both the cane farming and the finances.

The afternoon takes us to a commercial-scale farm owned by Roland Renken. Roland inherited the farm from his father, with the instructions that he “had to leave it for the next generation – don’t mine it”. And that attitude to sustainability is common among many farmers. Over the last 12 years, WWF has been working with farmers in this area to come up with a suite of best management practices that bring environmental, economic and social benefits, as well as ensuring legal-compliance. The result is a self-assessed sustainable farm management system, or SUSFARMS ([I wrote a story on this last year](#)). It’s not intended to be a certification scheme, and farmers are clearly reluctant to have standards imposed upon them from the top down. It should, however, make it easier for growers to get certified by Bonsucro – the global eco-label for sugarcane production supported by WWF and increasingly favoured by big buyers like Coca-Cola.

Roland’s farm spreads across its own mini water catchment, and at the base of a valley is a healthy-looking wetland. This had been drained when Roland took the farm on, but he blocked off the drains and rehabilitated the area. As well as benefiting the environment and water users downstream, maintaining wetlands can have a direct benefit for sugar growers. The biggest pest in this area is the Eldana stem borer moth. Native to coastal wetlands, where it eats reeds and sedges, it moved into sugar farms when many of these areas were destroyed – and it’s had a devastating impact. Research has shown, though, that infestations can be prevented by providing sufficient wetland habitat on the farm – particularly when coupled with a native grass that acts as a natural repellent and good farming practices. It’s a good example of a lesser-known regulatory ecosystem service.





But how much wetland habitat is “sufficient”? Roland has restored about 5% of his property to wetland. If he were to rehabilitate it all, it would take around 20% of the farm – and as well as the loss of growing area, keeping the wetlands free of thirsty alien weeds is expensive. Sugar farmers already operate on narrow margins. Following a long drought and heavy frost, next year’s crop will be down 50%, and it only takes two bad years to put you out of farming altogether. And if the whole business becomes uneconomic, eventually the mill will close – a disaster for the area. Not a great deal of resilience built into this system... “For most farmers the will is there when it comes to conservation,” says Roland. “But it all comes down to finances.”

It’s unreasonable to expect producers to bear the cost of conservation alone – which is why the resilient landscapes approach emphasizes the importance of bringing in other players in the value chain. Could insurance companies offer reduced premiums to farmers implementing best practices, or banks offer them better terms for credit? What incentives can buyers provide? What about the government: how might the carrot of compensation complement the stick of legislation?

All these stakeholders are involved in our discussions, including representatives from Santam Insurance, Nedbank, Coca-Cola and Woolworths. Their presence on this study tour shows these companies are serious about engaging. Coca-Cola, for example, has a global goal of being “water neutral” by 2020, through conservation and water access projects that ensure the company puts as much water back into river systems as it takes out (although this only applies to the liquid volume in the drink – not the much larger footprint of growing sugar).

But there are complex questions, and a lack of data to address them. What would the true price of a kilo of sugar be, if environmental externalities were factored in? How do you calculate the value of restoring a hectare of wetland and the environmental services it provides? How do you weigh the cost of investing in ecological infrastructure against the possible cost of *not* investing in ecological infrastructure? Modelling exercises can help – but ultimately, it’s only through taking action that answers will emerge. In order to know, you have to do.



### Wednesday 12 November

We're on the slopes of Mount Gilboa, at 1,600m above sea level, shivering in the buffeting wind and rain. Sometimes it's hard to believe South Africa has a water problem.

The site we're visiting is a wetland and grassland nature reserve of 700 hectares on Mondi's property. More than 500 species have been recorded here, and over 100 of them are of special conservation concern. A wide expanse of marshes and reed beds drains into a rocky river, and it all looks beautifully pristine – but in fact the landscape we see today is the result of extensive rehabilitation work over the last two decades.

Realizing that water issues affect its long-term viability and its social licence to operate, Mondi began working with WWF and the Wildlife and Environment Society of South Africa (WESSA) through the WWF Mondi Wetlands Programme (now part of WWF-South Africa, and our hosts for this study tour). One of its major achievements has been to pioneer a simple system for delineating wetlands – which has gone on to have a massive effect on land use and the environment. Rather than looking at the physical signs above ground or the level of the water table, which can vary from season to season, the method looks at the underlying soil chemistry and wetland plants to delineate the boundaries of wetland areas.

We get to try it ourselves. Starting in the reedbed close to the stream, we use an augur (a tool like a giant corkscrew) to dig down into the ground to pull up a soil sample. As you'd expect, the soil here is saturated, almost black in colour with a rich marshy smell: definitely wetland. We move gradually backwards away from the stream; the samples become lighter brown and more crumbly, and eventually take on a reddish hue from the iron that signals we've reached dryland soil.



Mondi began using this method voluntarily, pulling its plantations back from wetland soils and leaving a buffer zone of at least 20 metres. This subsequently became part of the FSC standard and national forestry regulation in South Africa, and is also now being adopted by other sectors. In total, Mondi has lost around 5% of its plantation area. Losses to the industry as a whole were estimated at US\$80 million a year in 2008. But the long-term value of healthy wetlands far outweighs this.

The WWF Mondi Wetlands Programme has also supported wetland restoration, which has helped to catalyse a massive government wetland restoration programme nationwide, called Working For Wetlands. The wetland here had become severely degraded – the drainage channel was eroding fast (probably as a result of the way the road had been built) and water was draining too quickly. A couple of small concrete walls have been built to stop the erosion – they don't look too pretty, but they've been effective in restoring the wetland and the ecosystem services it provides.

In another hands-on exercise, we carry out a survey of the health of the stream. Mark Graham, from environmental consultants GroundTruth, specializes in this area. He's helped develop a tool called Stream Assessment Scoring System or SASS, which uses the presence of macroinvertebrates – dragonfly nymphs, crabs, shrimp, beetles and so on – as an indicator of water quality. Under the guidance of Mark and his team, we carry out a simplified version called [miniSASS](#), which lumps the various species into 13 groups, easily identified through a flow chart. It's intended as a tool that anyone can use – schools, community groups, concerned citizens – to monitor the health of their rivers. Despite its simplicity, the results tend to correlate closely with the more comprehensive SASS.

We're soon sorting out our caddisflies from our mayflies and totting up our score. Different groups get different values – nobody's pretending a single survey gives the complete picture – but overall the water quality is assessed as fair to good. The score would probably be higher a little further downstream, once the flow and these hard-working minibeasts have had a chance to clean the water that drains off the marsh. In a river basin, everything connects: four bugs in a stream to 4 million people further down the river.



Later, we check the results of a similar survey further down the river, after it's run through more areas of forestry and dairy farming. The quality is still fair, but the water is notably more turbid as it's picked up sediment and algae, a tell-tale sign of higher phosphate and nitrate levels from fertilizer run-off.

We're shown a map of water quality across the whole uMngeni basin, colour-coded from green (very good) to purple (very poor), alongside the various land uses and industries. There's a lot of variation, but it's not hard to see that water quality is highest in the headlands, and declines after passing through urban/industrial areas and areas of intensive agriculture. But it's also interesting to note that the quality improves again after streams flow through more natural areas, underscoring the importance of freshwater ecosystems to overall resilience.

In between, we take a stroll through an area of natural forest at Karkloof, on a steep scarp face. Our guide is John Roff, a man who clearly knows and loves these woods. As John explains, the forest here provides a source of water and a "reservoir of resilience". Moisture from the ocean condenses when it hits the ridge, forming the mists which this part of KZN is known for and which allow the forest here to continue absorbing and releasing water even when there's no rainfall. It's an area of high biodiversity, and the hundreds of thousands of microorganisms in the soil and leaf litter easily spread to nearby plantations, helping to maintain ecological cycles.

And there's one more way natural forests help to build resilience, that's often overlooked. As John points out, we all feel better for a walk in the woods, and it's true: as a group, we're noticeably relaxed and re-energized. Whether you talk about it in terms of human resilience, physical and mental health, or recreational/cultural/spiritual ecosystem services, the value of this is impossible to overstate.







#### Thursday 13 November

After the rain and cold of the last two days, we're greeted to a beautiful late spring morning. Our first stop is at the Midmar Dam, built 50 years ago. Because the uMngeni is a short river, the dams are vital for storing water: in total, the reservoirs in the catchment can store two years' worth of run-off. Up to 300 million litres a day are piped out from here to the local water treatment works, to supply Pietermaritzburg and the surrounding towns. The map we looked at yesterday shows poor water quality in several of the tributaries that run into the Midmar Dam after passing through dairy and pig farming areas, and there are concerns about sewage and storm water from a township just upstream. Although all the water will be treated till it's safe to drink, the poorer the quality of the water coming into the reservoir, the higher the treatment costs.

Even more costly are the inter-basin water transfer schemes, piping water in from the neighbouring Mooi River. We visit both ends of the pipe: the two dams (one of which has only just been completed) where the water is collected and piped underground, and the outfall, some 20km away, where the water gushes out, impatient to begin the next stage of its journey down the uMngeni River. It costs two Rand to transfer a cubic metre of water into the uMngeni basin – so new forestry or agriculture activities downstream are likely to mean a net economic loss to society if they lead to any significant increase in water use.

No wonder producers are striving to reduce their water footprint – and a number of dairy farmers are leading the way. While forest and sugarcane plantations in the region are largely rain-fed, dairy farmers in the KZN Midlands use irrigation. The area we're visiting today is home to around 50 dairy farmers with some 46,000 cows, so the industry is of huge importance. In recent years, some progressive farmers have made strides in increasing their water efficiency. We're going to visit two of them.

The Drakensberg mountains on the horizon make a stunning backdrop to Mearns Farm – like a “barrier of spears”, according to the Zulu name. James Keane likes to say that he farms grass; his cows happening to be highly efficient machines for processing it. It’s not just a joke, though: unlike US-style “mega-dairies”, where cows are kept in massive barns and milked three times a day, James’ cows graze in pasture all year round. And he’s very serious about growing grass.

Like most farmers in this area, James is a convert to no-till (or minimum-till) agriculture: the soil isn’t ploughed when it’s being sown, which reduces sediment run-off, keeps the soil damper, and improves the soil biodiversity. He also practises a multi-species pasture system. Different species of grass, herbs and brassicas are sown, and there’s some serious science behind it. White clover fixes nitrogen and provides a protein boost; chicory has a deep tap root that reduces soil compaction and brings up leached nutrients (and the cows love it); brassicas like turnip and rape get the bugs and microbes in the soil into overdrive.

All this helps to improve the structure of the soil and the life within it: soil biodiversity may not be as appealing to most people as birds and mammals, but it’s crucial for the healthy functioning of the landscape. (As an aside, the pasture we’re in has almost no cow-dung pats, as they’re broken down so quickly by the insects and microbes in the soil.) Along with the minimum-till system, it also helps lock carbon into the soil. Traditionally, carbon levels would be around 1%; on James’s farm it’s now about 4%, and he’s aiming to get it up to 5%. That leads to a measurable reduction in carbon in the atmosphere, which could be incentivized under a properly functioning carbon market; globally, carbon sequestration in soils has vast but often overlooked potential for climate mitigation.

But there are more immediate benefits too. Increasing carbon levels improves water retention in the soil. James has more than halved his use of irrigation water, from around 10,000m<sup>3</sup> per hectare/year to 4,500 m<sup>3</sup> (which also means less energy for pumping and lower electricity bills). With more nutrients in the soil, he’s also cut his fertilizer use by around two-thirds – the farm uses around 300kg of nitrogen a year, down from closer to 900kg.

James uses a daunting array of technological tools to ensure the farm operates at optimum efficiency. The growth rate in the pastures is measured so that the cows are moved at the optimum moment. Moisture levels are monitored by computer to target irrigation water where it’s needed. Satellite imaging helps determine where fertilizer should be applied. All this requires a significant financial outlay and knowledge base, but ultimately it’s economically worthwhile. He stresses, though, that any farmer can apply the same principles and practices at the level that’s right for them.





We also visit Dunira Dairy Farm, owned by Derek Green, which sits on the banks of the new dam from which water is transferred into the uMngeni basin. In Derek's dairy – where up to 600 cows an hour are milked on a rotary system (basically a big carousel for cows) – recycling is high on the agenda. The floor of the dairy is hosed down using grey water. There's a system to separate the liquids from the solids, which form a nitrogen-rich fertilizer. The water can then be used again, either for hosing down or for irrigation (with added nutrients). This is now, says Derek, common practice in the industry. After all, water and fertilizers are expensive – anything farmers can do to reduce the amount they buy in will increase their profitability.

I think we all end the day with a new respect for the dairy farmer. Within NGP, there may have been a feeling in the past that the forestry sector was well ahead of agriculture on sustainability issues. Today has been an eye-opener: it's encouraging to see that others are also serious about sustainability issues, and making real progress in addressing them. If this study tour can get different sectors talking, learning from each other and working together to address issues at a landscape scale, then it will have made a significant contribution.



### Friday 14 November

The last day of the study tour is a chance for all of us to reflect. It's also the public launch of WWF-South Africa's [Resilient Landscapes Approach](#) (RLA), and we've been joined by a number of other stakeholders, including NGOs, government, businesses and producers – along with forestry, sugar and dairy, crops and pig farming are also represented. As David Lindley from the WWF Mondi Wetlands Programme explains, before this study tour the RLA was a theory; what we've seen this week has begun to vindicate it. The RLA places a strong emphasis on social learning, and that's exactly what we've been engaging in on this trip – sharing across boundaries, learning together, developing approaches that look at the whole system.

There's plenty more of it this morning, as we discuss some big questions in small groups: "What does sustainability mean to you?", "How can forestry and agriculture sectors work together?" and "What role can your organization play?" We use a social learning tool – the idea is to imagine we're chatting over coffee, and the noise and energy levels suggest this "World Café" has quite a buzz about it. Out of wide-ranging discussions, a few key themes emerge:



- **Doing, learning, sharing** – Many different stakeholders are already taking action on sustainability, water stewardship, landscape resilience and conservation. We need to learn from what each other is doing, work together, do more. Education and mentoring are also important – in particular larger companies/farmers providing support for small-scale, community-based and start-up producers.
- **Big-picture thinking** – Our journey up the uMngeni has highlighted how we're all connected, part of a bigger picture. We need to look at the whole system – we can't stay in our individual sector silos.
- **Structures are already in place** – Water forums and user associations, irrigation boards, even soil conservation committees already exist (although may not be functioning effectively). How can we use and build on what's already out there, rather than reinventing the wheel or adding extra layers and more talk-shops? Nobody wants to spend more time than they already do in meetings.
- **The role of regulation** – The last thing farmers want is more regulation. SUSFARMS has been successful because it's a system of self-regulation, and it's been developed with farmers locally, not imposed from above. Similarly, dairy practices have been improving through farmers sharing information and benchmarking against each other. But while self-regulation may work for the frontrunners, legislated regulation has a role to play in pushing the laggards.
- **Finding a common language** – For different sectors to work together, it's important to be on the same page. Shared concepts (ecosystem resilience, high conservation value areas), guidelines, metrics and words will help everyone pull in the same direction.
- **Information and data** – This trip has highlighted some impressive facts and figures, but also significant knowledge gaps. Transparency is important: instead of keeping information proprietary, businesses should think about sharing it in order to strengthen the resilience of the whole system. Simple tools like the soil delineation system and the miniSASS are also helpful.
- **Business unusual** – Over the week we saw several examples of how farmers have profited financially from more sustainable practices. But that shouldn't be the only driver: creating shared value (one of the pillars of the RLA) is about wider social and environmental benefits that aren't always captured in today's accounting systems. Long-term resilience doesn't just mean making adjustments to business as usual, but finding new economic and social models.
- **Not just water** – Water security is a massively important issue in its own right. But we've also seen examples this week of how taking action on water can have significant co-benefits – from protecting forests and freshwater ecosystems, to carbon sequestration, to reduced fertilizer use, energy use and erosion.

Water is going to be one of the defining issues of the coming decades. By 2030, global freshwater demand is projected to exceed current supply by more than 40 per cent, and almost half of the world's population will be living in areas of high water stress. The uMngeni River may be small, but if new solutions can be found here, its potential is enormous.