CLIMATE CHANGE

South Africa facing a weather extreme future as world heats up

The severe rainfall experienced over last parts of South Africa at the start of 2022, coupled with unprecedented heat waves in the Western Cape, again placed the consequences of climate change in the spotlight. In 2021, the United Nation's (UN's) Intergovernmental Panel on Climate Change (IPCC) released its most comprehensive assessment of our planet's future. This document informed global climate negotiations in November. Jorisna Bonthuys unpacks some of the findings with regards to water.

The UN's ***Sixth Assessment Report*** (AR6) has been described as a 'code red for humanity'. Climate negotiators grappled with its findings during the UN's recent climate negotiations (COP26) in Glasgow. This landmark study, which will be released in four stages over the next few months, warns of a key temperature limit being broken in just a decade.

The scientists involved say there is serious cause for concern. They foresee the crossing of the 1.5 °C threshold rise in temperature from pre-industrial levels may likely occur in the early 2030s. This latest assessment was compiled by 234 climate scientists who considered 14 000 peer-reviewed studies to inform its content.

The report contains five scenarios based on varying levels of CO_2 and other greenhouse gas emissions. Under the high and very high emissions scenarios outlined in the assessment, global heating is predicted to reach 3.6 °C and 4.4 °C above pre-industrial levels, respectively, by the end of the century. Even in the intermediate scenario, global warming of 2 °C would be extremely likely to be exceeded.

"Earth is warming faster than previously thought, and the window is closing to avoid catastrophic outcomes," says Prof Francois Engelbrecht, a distinguished professor of climatology at the University of Witwatersrand's Global Change Institute. Engelbrecht is one of the lead authors of this report, considered the IPCC's starkest yet.

"We are getting close to exceeding dangerous thresholds of global warming," he warns. "Unless there are immediate, rapid, and large-scale reductions in greenhouse gas emissions, limiting warming to 1.5 °C (over pre-industrial levels) will also soon be beyond reach."

The IPCC's recent findings should serve as a serious wake-up call for governments and industry sectors, including the water and agricultural sector, as well as disaster risk management, Engelbrecht says.

Changing world, changing realities

It is now indisputable that human activities are causing climate change, making extreme climate events, including droughts and heatwaves, more frequent and severe.

This was highlighted by Dr Pedro Monteiro, the chief oceanographer of the CSIR, during an online media briefing on the topic. Monteiro is another of the South African scientists who participated in the IPCC's process as one of the report's lead authors.

Some of the strongest drying trends that are projected globally are to be found in Southern Africa. As a result, the region is forecast to warm at twice the average global rate.

"This is a region that is projected to become drastically warmer and at the same time generally drier," Engelbrecht says. "'Drastically warmer' applies to the case of low mitigation climate change futures where we reach 3 °C or 4 °C of global warming somewhere in the second half of this century."

Massive change is already underway, and this is expected to have significant impacts on livelihoods, peoples' wellbeing, and ecosystem services. Periods of drought are already projected to occur more frequently at 1.5°C of global warming, and more so as the level of global warming increases.

"That is why our region is considered so vulnerable and why it is regarded as a climate change hotspot — when a dry and warm region becomes warmer and drier, the options for adaptation are greatly limited," Engelbrecht says.

Every bit of warming matters

"With every 0,5 °C of warming, there are clear increases in the intensity and the frequency of a large number of extreme event types," Engelbrecht says. "This means every bit of global warming matters."

Although rapid-onset disasters often have devastating effects, slow-onset climate events, such as droughts, can also be detrimental. The recent multi-year drought conditions in many parts of South Africa are still having a severe impact on the sustainability of many farms, says AgriSA. Many farmers in the Northern Cape, Western Cape, Eastern Cape and Limpopo are still under threat from the continuous drought.

In cities and towns, climate-related challenges such as increased flooding and droughts also pose significant challenges. In recent years, the Western Cape experienced a high frequency of flooding events associated with intense winter frontal systems and cut-off low-pressure systems. Ten significant flooding events occurred from 2003 to 2008, followed by five high-impact flooding events between 2011 and 2014.

Unprecedented climate impacts

Engelbrecht says scientists have already documented examples of unprecedented climate impacts in southern Africa in recent years.

Included on this list is Cape Town's 'Day Zero' situation in 2018 and the devastating effects caused by cyclone Idai in Beira (Mozambique) in 2019. "During the last major El Niño event, we also had a four-year drought that ended in September 2016," Engelbrecht adds. "This particular El Niño was the strongest event of its kind measured yet."

Cape Town came close to a 'Day Zero' scenario during the recent multi-year drought. Dealing with water scarcity during the water crisis threatened a shutdown of the water supply to the city's inhabitants. According to the IPCC report, climate change added to the city's water woes. The frontal systems that bring South Africa its winter rainfall are increasingly being shifted towards the South Pole as the planet warms, leaving cities like Cape Town increasingly vulnerable to drought.

But a potential Day Zero situation where the taps could run dry is not only a problem in Cape Town and its surrounding areas. Engelbrecht considers a potential Day Zero drought for Gauteng as the "single biggest climate risk South Africa faces in the near term" (over the next 10 to 20 years).

"We already came close to such an event in Gauteng in recent years and too few people realise that," Engelbrecht points out. "During that drought, the Vaal Dam, which supplies around 50% of Johannesburg's water, dropped below 25%.

"If you speak to water engineers or people concerned with water quality, for example, colleagues in Rand Water, they will tell you that should the dam's level fall to below 20%, Gauteng's supply is compromised for water quality and engineering reasons in terms of pumping the water uphill towards, for example, Johannesburg."

More agricultural droughts, more heatwaves causing human mortality, and the potential of tropical cyclones making landfall in the region are according to Engelbrecht some of the other major climate-related risks for the region.

Risk of agricultural droughts

There are "clear indications" that southern Africa should expect more droughts in the future, he says. Also, climate change poses a biophysical risk related to heat stress and heat tolerance in cattle and maize production.

"We are faced with serious risks of agricultural and ecological drought in our region," Engelbrecht says. "There is a risk that the maize crop, our staple food in the region, and the cattle industry may completely collapse at 3 °C of global warming, which means about 6 °C of regional warming. But is that the tipping point in terms of the maize crop and the cattle industry perhaps at even smaller levels of global warming? Can we reach that

Ashraf Hendricks/GroundUp

Residents cross a makeshift bridge in Copa where 63 houses disappeared under mud and rocks brought downstream by Cyclone Idai's torrential rain in 2019. Climate change is expected to bring more intense tropical cyclones to the region.

Did you know?

- The year 2020 was tied with 2016 as the hottest years globally since measurements began.
- The five warmest years in the period 1880-2019 have all occurred since 2014.
- Ten of the hottest years occurred since 2005.
- In 2021, scientists recorded devastating extreme weather and climate events across the globe. A signature of human-induced climate change has been identified in the devastating North American extreme heatwave and the floods in western Europe.
- Based on data until July, the global average mean surface temperature from 2017–2021 (based on data until July) is among the warmest on record, estimated at 1.06 °C to 1.26 °C above pre-industrial (1850–1900) levels.

Source: www.wmo.int; www.naoo.gov

point at 2 °C (of global warming)?
"We must remember that sustainable agriculture is not only affected by the biophysical impacts of heatwaves and drought — it also has socioeconomic aspects. How long can a farmer keep going amid three or four or five years of severe drought before it is no longer sustainable?

"This risk is, of course, substantially more significant for the subsistence farmers, and we still have millions of subsistence farmers in Mozambique, Zimbabwe, Madagascar and South Africa. In a world that becomes drastically warmer with more evaporation, with more of these droughts that we've been seeing in the last decade in South Africa, that risk is increasing," Engelbrecht warns.

"Although we are more aware of this risk for Cape Town and Gqeberha, and all along the Cape south coast, multi-year drought risks are a risk that affects the entire country. Many smaller municipalities can also experience 'Day Zero' type droughts," he says.

For humans, heatwaves pose one of the deadliest climate risks. In June this year, nearly 500 people may have been killed by record-breaking temperatures in British Columbia (Canada's westernmost province) due to an unprecedented heatwave.

"This type of disaster can also happen in South Africa," Engelbrecht warns. "The IPCC's findings are very clear — we can also expect unprecedented heatwaves in our region as global warming continues. Extreme heat is life-threatening when living in informal housing without cooling or access to cool water," he says. Authorities should take the potential effects of heatwaves very seriously."

Tracking tropical cyclones

The fourth climate-related risk that Engelbrecht is concerned about is the possibility of more intense tropical cyclones making landfall in the region. In March 2019, more than 1 300 people lost their lives when the tropical cyclone Idai caused havoc in Mozambique, Zimbabwe and Malawi.

"The IPCC's report is very clear that increases in intense tropical cyclones can already be detected across the world," Engelbrecht says. "We are, unfortunately, not exempt from such a risk. As the level of global warming increases, the risk for such events also increases. Already over the last two decades or so, we can detect an increase in these types of cyclones.

In the southwest Indian Ocean, the number of intense tropical cyclones are likely to increase in their frequency as we move to increasingly higher levels of global warming.

"Of course, this risk is highest in Mozambique, but these cyclones can certainly extend southwards into southern Mozambique and the northern parts of South Africa. It is even possible that such a cyclone can reach Richards Bay," Engelbrecht adds. "Just imagine the immense impact this could have in terms of loss of life and also on the South African economy."

The second aspect of concern regarding tropical cyclones is that when these systems make landfall over Mozambique or generally across the world, they bring significantly more rainfall than in the past (between 10% to 20% more than before). This is because a warmer atmosphere can hold more moisture than a cooler atmosphere. Tropical cyclone events coincide with flooding, posing planning challenges.

New approaches needed

The IPCC's AR6 assessment shows that limiting global warming to the temperature threshold of 1.5 °C is still possible. This will mean that all countries achieve net-zero emissions within a calculated remaining carbon budget by mid-century.

Some changes could be slowed and others could be stopped by limiting warming "This is important," Monteiro emphasised. "Even though we are committed to centuries to millennia of impacts of our CO_2 emissions and warming, some aspects can actually be reversed."

But even as the world looks to step up efforts to cut greenhouse gas emissions, the need to adapt to the impacts of climate change remains critical.

An important step towards adaptation to future climate change can be to reduce vulnerability and exposure to present climate variability and risk.

"How we have managed water in South Africa over the last 30 or 40 years is, for instance, not sufficient experience to handle the next 30 or 40 years," Engelbrecht says. "Because we will increasingly be challenged by these long-lasting droughts in future, we also have to find ways to improve how to allocate and manage our available water resources.

"Dealing with the risk of increased droughts requires a critical rethink of our water planning en management in the region, especially in urban settings and given the rising competition for limited water resources among users."

Engelbrecht concludes: "The likely decarbonisation of the big industrial economies in response to the 1.5 °C poses a serious economic, financial and social constraint for South Africa. Are we ready?"

An empty Nqweba Dam, outside Graaff-Reinet. The Southern African region is projected to become drastically warmer and at the same time generally drier.