

URGENT SUBMISSION TO THE SAICE COUNCIL ON THE LIKELIHOOD OF SEVERE WATER RESOURCE DROUGHTS

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Summary

Civil engineers and climate change scientists are on a collision course. The outcome could have very serious, nationally important consequences. These differences should be resolved as a matter of urgency.

In this submission it is demonstrated with a very high degree of assurance that southern Africa, and possibly the rest of the world as well, is about to enter a period of severe droughts commencing within the next twelve months. There is an estimated 20% likelihood that they will be as serious as the Great Depression Drought of the early 1930s. These drought sequences could have disastrous consequences for South Africa if the authorities are caught unawares.

This prediction is based on the well researched multi-year periodic behaviour of the hydro-meteorological processes. It is shown that this periodicity is in turn causally related to synchronous variations in solar activity. This linkage is well documented, and has been studied in South Africa for more than a hundred years.

However, climate change scientists vigorously deny both the predictable, multi-year periodicity in the hydro-meteorological processes, as well as the solar linkage. The study of the solar linkage with the hydro-meteorological processes does not feature in the Water Research Commission's recently released publication on future research for the period 2008 to 2013. This period coincides with the predicted occurrence of severe drought sequences. The drought sequences will be causally related to the 'quiet sun'. This is raising concern among international solar physicists.

This is an urgent, national policy issue.

Introduction

Just before the outbreak of World War II Albert Einstein fled from Germany to the USA. He warned President Roosevelt that the Germans were developing nuclear weapons. The Americans assembled a

group of scientists, who examined this possibility. They eventually developed their own nuclear weapons. Two of these were used in Japan, and brought World War II to an end.

I now find myself in a similar position. Based on my exhaustive studies, starting in 1970 through to the present day, it is my duty to report that there is a very real possibility (about 20%) that South Africa and other parts of the world could experience drought sequences of severity equal to the Great Depression drought experienced in the early 1930s. This was a global drought. It was called the Dustbowl Drought in the USA.

This led to joblessness in both South Africa and the USA. Governments launched large construction projects to relieve unemployment. These included the construction of the Vaal-Harts and other large water supply projects in South Africa, and the Boulder Dam and other projects in the USA.

I personally recall seeing 'white labourers' pushing cocopans for upgrading the roads, while on my way to school. My parents had to support three of my cousins, whose parents lost their jobs.

In later years, from 1970 to 1984, I was directly responsible for developing national scale policies for flood routing through South Africa's major rivers, and more importantly, drought operation procedures for our major dams. I developed drought operation procedures for the Vaal and Mgeni River systems for use by their water boards.

I can assure SAICE Council that a repetition of the droughts of the 1980s could potentially cause considerable damage to South Africa's economy on a scale equivalent to the consequences of present electricity shortages. A repetition of the Great Depression droughts would be disastrous, particularly if, as is quite likely, they occur concurrently with the restrictions on electricity usage, and the global economic recession that has already started to occur. These droughts will increase the incidence of poverty, malnutrition and disease in South Africa, and more so in the countries to the north of us.

Drought predictability

In 1970 the multi-disciplinary, national Commission of Enquiry into Water Matters produced a comprehensive report. Its recommendations led to the establishment of the Water Research Commission and the post of Manager: Scientific Services in the Department of Water Affairs. I later occupied this post.

Regarding drought analyses, the commission recommended that research be undertaken on the development of a river flow prediction model, however approximate it may be, and that the possible connection with solar activity be researched.

This possible linkage with sunspot activity was not new. It was well known that in the 1850s British astronomers reported that a linkage existed between sunspot activity and famines in India. Here in South

Africa, in 1892 DE Hutchins published an extensive report *Cycles of drought and good seasons in South Africa*. He demonstrated that there was a predictable linkage between sunspot activity and temperature, rainfall and river flow. During the first 50 years of the past century there was sporadic mention of the linkage in the reports of national drought commissions.

I was appointed as Chief of the Division of Hydrology in 1970. Together with my staff, we addressed the predictability issue and the linkage with sunspot activity. I published a comprehensive technical report in 1978. I reported that although a linkage existed, it was too weak for predictive purposes. In retrospect, the reason for the lack of success was the shortness of the hydrological records at that time. As we were later to demonstrate, it was not the single (about 11-year) sunspot cycles that were important, but the double (about 21-year) sunspot cycles.

Also in 1978 I held a course on water resource and flood analyses at the department's Hydrological Research Institute. This proved to be very popular, and I received requests for repeats from the Department of Agriculture and from Professor Rooseboom at the University of Pretoria. Together with colleagues I continued presenting these courses every two years from then on. As and when time permitted, I continued my research on the predictable linkage.

I retired from the Department of Water Affairs and Forestry at the end of 1984 after a long and very satisfying career. I then accepted (with alacrity), the offer of a post as professor in the Department of Civil Engineering (now Department of Civil and Biosystems Engineering) at the University of Pretoria. In addition to my undergraduate teaching, I continued my research. Together with colleagues, I also continued with our popular Hydro courses. These have been attended by some 2000 participants to date, many of them repeats.

Climate change

My first experience with the climate change issue commenced in 1993 when, at the request of the Department of Water Affairs and Forestry, we hosted a small discussion group on this subject. Some of the participants expressed concerns that climate change would have an adverse effect on South Africa's water supplies.

By then I had already undertaken further studies of the hydrological data for my own research as well as for our Hydro courses. I informed the meeting that there was no evidence in the data that could be attributed to climate change.

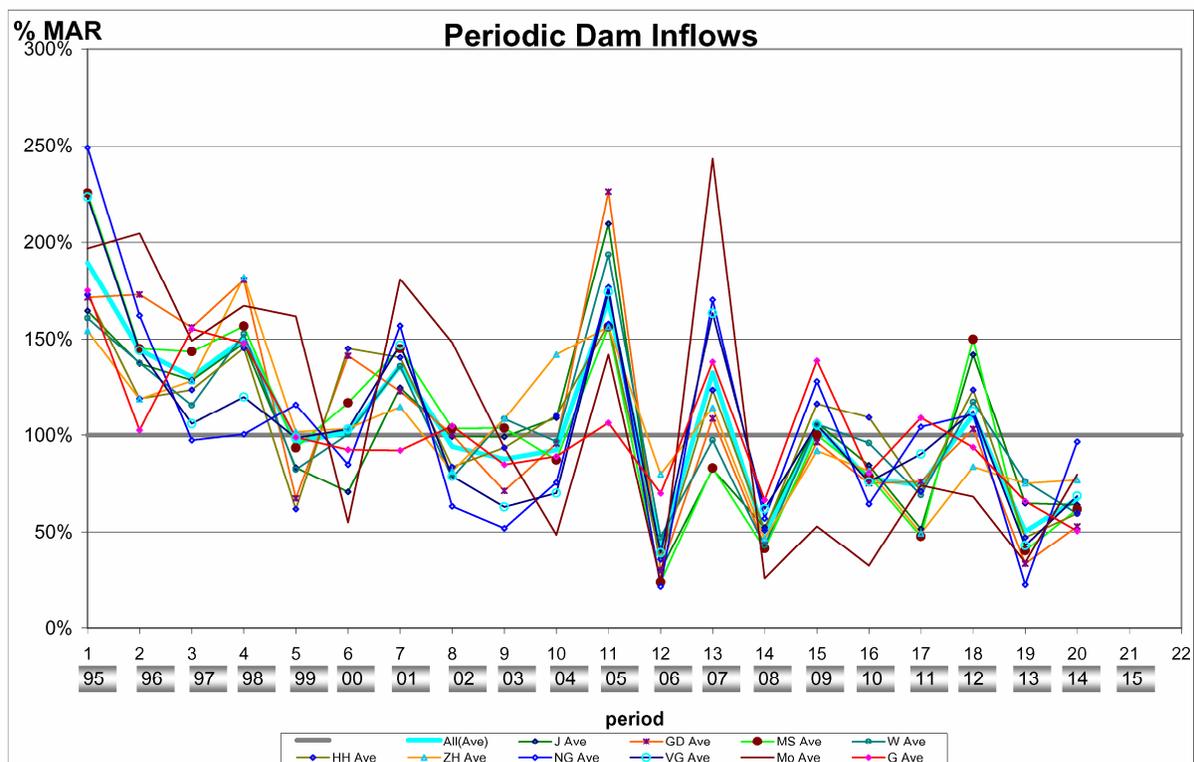
This was obviously a very important issue, so I decided to follow the publication route in peer reviewed journals, where I specifically addressed the predictability issue and the solar linkage. By then it was obvious from my studies that there was a predictable, multi-year periodicity in the data and that this was

closely, but not exactly, synchronous with the double sunspot cycle. A flip-flop mechanism was also present. There were sudden climatic reversals from low to high runoff conditions and back again.

It is very important that readers of this submission should note that at all times in my studies, I used periodicity in the data as the prediction tool and NOT the sunspot cyclicality. In our joint SAICE paper last year my colleagues and I demonstrated that there is a causal relationship between the predictable multi-year periodicity in the data, and the acceleration and deceleration of the sun as it moves along its trajectory through galactic space.

The diagram below is our river flow prediction model prepared by my co-author Alwyn vd Merwe. We are presently in period year 13 (2007-08).

Note the very clear, well above average recorded river flows for the present hydrological year (13). Even more importantly, note the succession of below average river flows in the period years that lie ahead (14 to 20). Analyses of other long hydrological data series show similar characteristics.



Once again, our prediction model based on this thoroughly studied, synchronous linkage between periodic solar activity and the hydrometeorological processes has been tested and verified. The

likelihood of prolonged, severe droughts from next year onwards is very real. My research over the years and the successful predictions based on it, were reported in the following published papers and reports.

Alexander, W.J.R. 1978. *Long range prediction of river flow – a preliminary assessment*. Technical Report TR80, Department of Water Affairs, Pretoria.

Alexander, W.J.R. 1995. *Floods, droughts and climate change*. *S Afr J Sci* **91**, 403-408. [**Successful prediction. Widespread, drought-breaking floods commenced five months after publication. Year 1 in the model.**]

Alexander, W.J.R. 1997. *Predictability of widespread, severe droughts, and their effect on water resource management*. Proceedings, 5th International conference on southern hemisphere meteorology and oceanography. Pretoria. Invited guest presentation.

Alexander, W.J.R. 2002. *Statistical analysis of extreme floods*. *J S Afr Instn Civ Engg*, **44** (1) 2002 20-25.

Alexander W.J.R, 2005a. *Development of a multi-year climate prediction model*. Water SA Vol 31 No 2 April 2005.

Alexander W.J.R, 2005b. *Linkages between solar activity and climatic responses*. Energy & Environment, Volume 16, No 2, 2005.

Alexander, W.J.R. 2005c. *Flood alert*. Issued in November 2005. [**Successful prediction. Widespread, drought-breaking floods commenced three months after publication. Year 11 in the model.**]

Alexander W.J.R, Bailey F, Bredekamp D.B., van der Merwe A and Willemsse N. 2007, *Linkages between solar activity, climate predictability and water resource management*. *J S Afr Instn Civ Engg*, **49** (2) June 2007.

Alexander, W.J.R. 2008. *The likelihood of a global drought 2009-2016*. Article in press. [**Year 13 in the model. My present prediction.**]

It has become increasingly clear that the South African hydrometeorological database is one of the best in the world. This, together with our geographical location within the band of maximum rate of poleward redistribution of incoming solar energy, makes southern Africa the ideal region for testing the validity of climate alarmist theories.

My predicament

All the above is a straightforward lead-up to my prediction of an imminent severe national, and probably global, drought.

There is, however, another very important but unpleasant issue that I'm obliged to bring to the SAICE Council's attention. Since 1993, I have become increasingly aware of the considerable body of scientific opinion that maintains that continued global increases of undesirable greenhouse gas emissions, principally carbon dioxide, from coal burning power stations, heavy industries (including cement manufacture) and transport, will create a greenhouse effect in the atmosphere. This will result in increasing global temperatures.

Climate change scientists used complex global climate computer models to predict a whole range of undesirable consequences. These include increases in the magnitude and frequency of damaging floods, droughts and threats to water supplies. They go further, and specifically maintain that there is no linkage between variations in solar activity and climatic responses. They are forced to do this, as an admission would diminish their claims of exclusive human causality of the postulated consequences of global warming.

I emphasise the word 'postulated', because the claims are based on unverified (and unverifiable) computer models. This is the essence of my problem. There is simply no evidence in the hydrological data to support these claims. For example, during the 20 years since the establishment of the IPCC in 1988, there have been no floods or droughts that have exceeded the historical maxima. Nor are there any observable trends in the rainfall and river flow data.

My own position and responsibilities are very clear. Since 1993 I have devoted considerable time and effort in a search for evidence that would support these claims. Had I found this evidence, I would not have hesitated for one moment to report it and include it in my teaching, publications, articles and our Hydro course notes.

I therefore have an equal if unpleasant responsibility. It is to report that there is no observable substance to claims related to the effects of climate change on river flow and South Africa's water resources.

International situation

The IPCC reports claim that the world will face very serious environmental and humanitarian consequences if global greenhouse gas emissions are not reduced, let alone stabilised. There is virtually unanimous international support for these conclusions at the political level. It is the implementation of measures to control these emissions that has become a major economic and political issue.

I attended the United Nations conference on climate change in Bali last December at the invitation of a New Zealand organisation. The purpose of the conference was to develop an enforceable agreement whereby all the nations of the world would pass legislation to reduce their greenhouse gas emissions. However, the major developing nations, China and India, with their rapidly rising industrial activities and consequent increases in greenhouse gas emissions, were not prepared to implement these restrictions

on the basis that the high expenditures would retard their poverty alleviation measures. The conference failed to meet its objectives.

It was then decided to continue the attempts to reach an international agreement by a series of meetings culminating in a final meeting in Copenhagen at the end of 2009.

The first of these meetings was held two weeks ago in Bangkok. A third element entered into the picture. The poor nations, particularly the African nations and the island states, were also under pressure to implement these restrictive measures. At Bangkok, they insisted that the developed nations that had caused the global warming with all its consequences, should compensate them for all the damage that, according to the IPCC documentation has already been caused, and will continue to be caused in the future. These are huge sums of money. It is most unlikely that in addition to imposing economic burdens on their own populations, the major developed countries will be willing to impose further taxes on their citizens for donations of this magnitude to African countries. An impasse has been reached.

The Bangkok discussions not only failed to meet their objectives, but the international political situation has deteriorated still further. The United Nations Commissioner conceded last week that a future substantial international agreement on the reduction of greenhouse gas emissions (the successor to the Kyoto Protocol) was unlikely to be achieved in future. This is particularly so in the light of the current economic recession. Here in South Africa we are already suffering from the delay in the expansion of our coal-fired power generation network. As a consequence, global greenhouse gas emissions will continue to rise inexorably.

To make matters worse, the rising oil prices have resulted in an international rush for coal. Instead of decreasing, South Africa's exports of coal have risen dramatically as has our domestic usage. The same applies to many other countries. Environmentalists are up in arms.

Climate change science

Until about 2001 there was virtual unanimity among climate change scientists that greenhouse gas emissions have caused and will in future continue to cause severe environmental and humanitarian damage.

This has changed. Scientists in the affected sciences, particularly those in the applied and engineering sciences, have started to raise serious doubts regarding the very basis of climate change science. Our research on the solar linkage is an example. Russian and other solar physicists have noted the unusual delay in the commencement of the next sunspot cycle. They are warning that there is a possibility that the world could be entering another cold period similar to the historical ice ages that lasted for decades.

Other scientists are questioning the postulated linkage between rising carbon dioxide emissions and global temperatures.

In my article on the likelihood of a global drought submitted to the SAICE magazine and my more extensive course notes that I presented at the University of Pretoria earlier this year, I demonstrated that a linkage also exists between variations in solar activity and global temperatures. My analyses replicate the slowing down in the rate of increase of global temperatures followed by the present decreasing tendency. This is despite the increases in global greenhouse gas emissions.

Summary so far

1. There is overwhelming evidence of a causal and predictable linkage between variations in solar activity and climatic responses, specifically rainfall and river flow.
2. There is no evidence of trends in rainfall and river flow data that could be attributed to unnatural climate change.
3. There is increasing worldwide research that questions the fundamental basis of climate change theory.
4. The international political situation regarding the implementation of universal measures to restrict greenhouse gas emissions has collapsed.
5. Recommendations that South Africa should resort to the development of measures to adapt to human caused climate change will fail because they would be adapting to something that does not exist.

Water Research Commission

I now have another unpleasant task. Please accept my assurance that this is not a personal issue.

Yesterday I was shown a copy of a report published by the Water Research Commission titled *Towards defining the Water Research Commission's research portfolio on climate change for 2008-2013*. I was amazed, frightened and disappointed in that order.

The very first requirement when planning future research is to carry out a literature study of existing knowledge. This was obviously not done. The huge volume of decades of research by civil engineers on floods, droughts and water resources were completely ignored. In my 93-page extended summary of my technical report *An assessment of the likely consequences of global warming on the climate of South Africa*, I list 50 references on this subject. A literature study would have demonstrated that virtually all the principal research fields in the WRC document have already been researched.

In the report no attempt at all is made to evaluate the basic assumption that human activities have had and will continue to have adverse effects on South Africa's water supplies.

The well-documented causal linkage between solar activity and river flow is ignored.

My own conscientious and detailed research published in peer-reviewed literature, copious notes, and presented at courses for practitioners from 1978 onwards, some of which are listed above, was completely ignored.

My peer-reviewed paper in the Water Research Commission's Water SA and magazine articles Water Wheel were obviously ignored.

I have no wish to comment on the report in detail, but would gladly do so, if requested.

Department of Water Affairs and Forestry

This brings me back in a full circle. I served with honour and pleasure in the department for 34 years. I fully appreciate that things have changed since I retired from the department. However, there are basics that do not change. The very foundation of all the department's actions and responsibilities rest on an understanding of the properties of river flow. This is all the way from initial planning through to design, construction and operation of water resource development projects.

My major concern, and reason for this submission to the SAICE Council, is that the department does not seem to fully realise the consequences that severe water resource droughts will have on their future drought operations, bearing in mind our recent research and publications. This is compounded by the department's apparent acknowledgement that climate change will have an adverse effect on South Africa's water resources, for which there is no believable evidence.

Recommendations

I've done my best and achieved great satisfaction for the work that I have done for my profession and my country. I cannot shoulder these responsibilities any longer. It is now up to SAICE to decide on what action should be taken from here onwards. I suggest that this submission, plus any comments that the council wishes to add, be submitted by the SAICE Council as a matter of urgency to Director General of the Department of Water Affairs and Forestry, and to the Chairperson of the Water Research Commission, together with the accompanying second draft of my article that is in press.

I recommend that a joint workshop be organised by SAICE, the Department of Water Affairs and the Water Research Commission. It should be held in July this year as a matter of urgency. Its limited objective should be to discuss the likelihood of severe water resource droughts occurring in the near future, and the action that should be taken to minimise the consequences. Notice of the workshop and invitations to attend and participate in it should be distributed as soon as possible and included in the June issue of the SAICE magazine.

My further urgent recommendation is that the Water Research Commission should take note of the unequivocal, predictable periodicity in the hydrological data and its causal linkage with synchronous variations in solar activity. The commission should consider what this undeniable periodicity has on all the commission's future research activities, specifically those linked with climate change as set out in its recent publication on research proposals, where this fundamental causal linkage is completely ignored.

Finally, I urge the Department of Water Affairs and the Water Research Commission to seriously consider the consequences if this warning and its linkage with solar activity are ignored and the droughts occur.

I appreciate that the contents of this document are likely to be hotly contested as lucrative research funding is at stake. This debate should be encouraged, provided it is conducted in an appropriate forum where both sides are given the opportunity to present their views. In this connection I must place on record that my several attempts to have round table discussions on this subject were either refused or ignored.

This submission is not confidential. On the contrary, it is my wish that it be widely distributed. I intend distributing it immediately after my discussions with the SAICE Council.

Pretoria, 11 April 2008