Chapter 14

Sceptical environmentalism

Christiaan J. Pauw

Nova Institute NPC, Pretoria, South Africa
Department of Religion Studies, University of Pretoria
christiaan.pauw@nova.org.za

Abstract

Using an autoethnographic approach, the author examines the evolution of his scepticism towards the environmental movement, influenced by personal experiences and reflection. Key themes include the challenges of integrating faith and critical thinking, the practical implementation of air quality initiatives, the critique of environmental activism, and the potential of blockchain technology for environmental impact accounting. The narrative highlights the complexity of integrating environmental protection and human development goals, advocating for freedom of speech and evidence-based approaches.

Keywords: autoethnographic, economy of attention, environmentalism, open society, political influences on science, scepticism and coercion

1. Introduction

This book is about development in the Anthropocene. Most people would likely interpret the title as juxtaposing human development and environmental protection, thinking that the challenge is to strike a balance between the two. In recent years, I have found myself becoming increasingly negative about what can broadly be termed environmentalism. This is not because I do not love nature or think that CO_2 does not absorb and re-emit infrared radiation, but because I think, to use a

metaphor, the medicine that is prescribed for the disease may be more dangerous than the disease. I am inclined nowadays to think that we should vigorously pursue human development (even under the traditional understanding of the term) and that environmental benefits will follow, as has happened in developed countries. From where I am now, an environment-first approach looks misguided and dangerous. I fear that excessive attention and resources are being allocated to the so-called environmental crisis at the cost of other, more important issues. Although I think that I have reasons to believe what I do, I admit I am inclined nowadays to view the prescriptions of the environmental movement (such as reducing consumption, mass adoption of renewables, carbon taxes, disincentivising travel and changing diets) with a large degree of scepticism. The realisation that somewhere along the way, I may have turned into an environmental sceptic prompted me to ask how this came about. This chapter takes an autoethnographic approach to the question of attitude and perspective around the main theme of this book. How are ideological positions formed, and how does one act to make up one's mind on issues that are so complex that no one can claim to be an expert, all while acknowledging the emotional component of the cognitive and ideological positions that one takes? In answering this question, I will try to trace key moments that impacted the emotional and the cognitive elements (or, attitude and opinion) of my stance towards the theme of this book.

2. Theological education

After a year as a white conscript in the Signal Corps of the South African Army (I was still 17 in January 1991 upon conscription), I started studying Theology at the University of Pretoria. I was not a particularly successful school pupil, but I took to my theological studies with great enthusiasm and dedication, possibly because of my sense of conviction that this was my calling and also because university suited me much better than the constricted environment of the school. I performed surprisingly well in the biblical languages, Hebrew and Greek,

which is sometimes a huge obstacle to students, and eventually also in the other subjects.

I do not think that I ever had a particularly literalist reading of the Bible. Even at a young age, it seemed obvious to me that from all classes – from labourers to teachers and doctors – the creation accounts in Genesis were not to be taken literally. However, the introduction to literary and historical criticism of the Bible necessitated significant personal and intellectual recalibration for me. I have been warned earlier, by people of a certain theological sway, that the professors at the University are too clever and that my faith will suffer from exposure to all their talk. Once one is induced into the way of thinking of historical and literary criticism, it is impossible to ever read the Bible again in a naïve literal sense. The personal impact is limited when literary criticism is applied to the parts of the Old Testament, like Genesis 1–11, where one already had the intuition that a literal reading wasn't called for. However, once you start looking at the Gospels and realise that the accounts of the words and deeds of Jesus came to us through a complicated process of oral and written transmission, a fairly dramatic reorientation has to take place. This reorientation is not successful for all. Some feel that they must give something up: either their studies or their faith. The integration of faith with critical thinking is, in a sense, the task of theological education because theology is the church's self-critical assessment of its own life and beliefs. In the end, the truth matters, especially in a theological sense, because, as the epistle of John says, the Spirit is the truth. One lesson which I have learned in the process of my theological studies is to discern between criticism and scepticism. A critic is someone who wants to discern the truth, often by pruning away spurious ideas and unwarranted beliefs. If the Spirit is the truth, and the truth will set us free, criticism is a holy calling. A sceptic, on the other hand, is someone who does not want to believe, regardless of reason or evidence.

As a student, I participated in and eventually led outreaches from the Universiteitsoord congregation of the Dutch Reformed Church to rural areas in the then Natal and Venda. Universiteitsoord was a white, Afrikaans-speaking congregation

with a large number of student members. In Venda, near Thohoyandou, we worked with the Uniting Reformed Church's Tshilidzini congregation. Tshilidzini was a mostly Venda-speaking congregation that had members with varied social backgrounds, from labourers to professionals. This was the first time that I had entered the houses of black people and encountered the day-to-day life of low-income rural people in South Africa. I became friends with Wilhelm and Claire van Deventer. Wilhelm was the minister at the Tshilidzini congregation, and Claire was a doctor at Tshilidzini Hospital. Wilhelm had a friend, Attie van Niekerk[1], who wrote a book, *Dominee, are you listening to the drums?* (Van Niekerk, 1982) which we read as part of our second-year course in Philosophy. Wilhelm gave me his contact details. A friend who studied under the *Hervormde Kerk*[2] (and later went on to become an ordained minister, a chartered accountant, and an advocate) and I went to speak to Attie one afternoon at his house in Garsfontein about the theme that he had been thinking about for years: Africa, the West and Christianity. I became married in my sixth year of study. In that same year, Attie was one of our lecturers and taught a course on culture and Christianity.

After completing three degrees, I was licensed as a probationer in the Dutch Reformed Church and immediately enrolled for a DD (Doctor Divinitatis) degree. At the beginning of my doctoral studies, my future path was somewhat unclear to me. At that stage, I went to a few interviews for positions such as pastoral assistant, youth worker, and the like. Then, the Dutch Reformed Church had about 400 additional ministers and probationers on its books while membership numbers were declining. It soon became clear to me that even if I wanted to enter the ministry, it would be hard to do so. My experience at the interviews also made it clear to me that I was not the type of person most congregations wanted. In the year in which I started my doctoral studies, I landed a temporary post as a

1 Editors' note: Also mentioned in the previous chapter, Chapter 13, and author in this book. Attie van Niekerk clearly has an important mentoring role in this environment.

2 Another of the Afrikaans reformed churches. It's difficult to explain what the differences are.

lecturer in Old Testament for the first year. I enjoyed teaching. Maybe an academic career was an option?

The DD degree at the Faculty of Theology at the University of Pretoria has two components: a series of qualifying oral exams (*tentamena*) in three theological subjects, ending with an oral doctoral exam before an examination panel, followed by a dissertation. I switched my main subject from Old Testament to Systematic Theology because I became convinced that the main theological problem is not understanding the biblical text but the integration of everything that we believe. In the second half of the first year of my doctoral studies, Attie approached me to help on a project that he was working on with a not-for-profit company of which he was a director. The company was called The Nova Institute. The project had to do with pollution from domestic coal burning in a township near Secunda. Little did I know what an important role Nova would play in my life.

3. Forays into air quality

The first township I then came to know intimately was eMbalenhle[3], near Secunda on the Mpumalanga Highveld. We worked in Extension 14, where there was no electricity and only informal houses. The settlement had dirt roads, but the houses were numbered, and stands were fenced with simple wire fences. Most households used coal. The project that I worked on was an in-use evaluation of measures to reduce pollution from coal use that was set up as an experiment. We tested new smokeless coal stoves, LP gas stoves, insulation, low-smoke coal, repaired chimneys, and repaired stoves (many stoves were old and had cracks) compared to a control group. The success of the interventions was judged by people's satisfaction with the technology and the difference in indoor air pollution between the different treatment groups and a control group. Together with a local fieldworker, I conducted surveys, weighed coal, and delivered low-smoke coal. With our service provider, who repaired the stoves, I swapped stoves and climbed on roofs to fit

3 Editors' note: By now familiar to the reader and discussed intensively in Chapter 11 amongst others.

chimneys. With a contracted air quality expert, we arose before 04:00 in the morning and went house-to-house in the smoky pitch-dark to our participating households to switch on the pumps on the instruments that measured the air quality inside the houses. I also had to conduct meetings with stakeholders and attend meetings with the project sponsor. All these experiences were new to me.

I learned a lot on the practical but also philosophical level. The philosophy underlying the experiment was that interactions between complex systems, such as nature, technology, and Western and African culture, cannot be predicted (that is what *complex* means), but one can heuristically explore the interactions and find optimal solutions (Le Roux et al., 2024, p. 190). I also learned the value of direct engagement with the intended end users of a technology or service. Another lesson that I learned is that since success or failure cannot be predicted, keeping the scale small while one is experimenting together with the end users is a good way to proceed.

This project had a good result in the sense that the experiment was a success and a lot had been learned, but it took a while for an implementable solution to emerge. I was not directly involved in air quality for about five years, but I kept up to date with developments through interaction with Attie.

4. The dismal science

After this project, I found a job from a privately funded education trust to promote education for job creation in Soshanguve, north of Pretoria. As part of this, I had to read up on the relationship between education and employment. It was not as simple as I thought. I decided that since I was now professionally involved in an economic problem, I should at least be literate in Economics. I enrolled on first-year Economics at Unisa. At this point in my life, I already knew how to study, so I completed my assignments, sat for the exam, and passed with distinction.

I further learned the value of a quantitative approach and a systems perspective, and how the system is made up of the interaction of all the individual choices. I also learned

that there is a tension between intentions and outcomes and that the power of the state is limited; for example, you can create a famine by capping the price of food. I learned about the importance of incentives and that the system follows the incentives. I learned that supply and demand are independent and that it is the supply side (the real production possibilities) that drives the economy. I did find the anthropology expressed in our handbook and by our lecturer to be flat and unrealistic.

Now that I was at least literate in the field, I started reading other economists, Manfred Max-Neef[4] (Max-Neef et al., 1991; Murray &Pauw, 2022), Paul Ekins (Ekins & Max-Neef, 1992) and Amartya Sen (Sen, 2001). Max-Neef had a view of humanity that I could relate to and formulated a rich and nuanced view of what human needs and satisfiers are. Together with colleague Montagu Murray (whose doctorate is also in Systematic Theology), we later made extensive use of Max-Neef's work for the quality-of-life instruments that Nova uses, as discussed in this book, inter alia in Chapter 12. Ekins has an elegant way of talking about the means of production. Sen emphasises the importance of freedom as the real possibility to realise valued states.

5. Into the carbon market

Between 1999 and 2003, Nova's air pollution initiative moved out of research and development, through a pilot phase, into full-scale implementation of the alternative top-down ignition technique for coal fires (known as *Basa Magogo!*)[5]. In 2003, the national government became involved and implemented a project in Orange Farm and thereafter in Tembisa. A tender came out to determine the effect of the Tembisa project. We tendered with Business Enterprises at the University of Pretoria and landed the job. This was the first full-scale survey that I coordinated end-to-end. It was clear from the results that the contractors who worked for the government did not use the

4 Editors' note: Important source for this book. We have already emphasised the role of Max Neef in a previous note.

5 Editors' note: Should also be known to the reader by now. See Chapters 9 and 12.

same implementation methods as Nova and achieved inferior results. Our results, as well as the results of the evaluation of the Orange Farm implementation, seem to have countered Nova's initial idea that a solution could be discovered, developed, and refined by someone such as Nova and that the implementation and monitoring method could then be transferred to the government. The realisation grew that if the alternative ignition technique was ever going to have a large impact, we were going to have to undertake it ourselves.

Nova undertook an internal strategic development process in 2005 with the help of a management consultant. As a result of this process, I received some new responsibilities. I found an email from a broker in London in a string of unanswered emails when I took over my new function. The broker dealt in greenhouse gas emissions reductions – carbon credits, as it is colloquially known. After reading up on the concept, we began to wonder if this was not the funding avenue that would enable us to perform it ourselves. It was indeed. Between 2006 and 2016, we implemented the project in areas with significant coal use in four provinces. We sold more than 200,000 Gold Standard verified emission reductions (VERs). To achieve this, however, we had to develop a baseline and monitoring methodology that could be used to quantify the reduction in greenhouse gases that resulted from the project. We also had to develop the management and business processes that would enable us to operate and monitor multiple projects over a vast area.

The enduring legacy of our experience in the carbon market is that we bought into the value of outcome-based financing. The ideal situation for both a financier and an organisation with a specific mission, as well as the intended beneficiaries, is that money flows must be connected to verified outcomes. We would later try to implement this paradigm in other areas as well (such as water credits). At the time of writing, we are working on an initiative to implement the outcome-based finance model for a broader range of planetary well-being goals using 4IR (Fourth Industrial Revolution) technology.

6. Telling the truth with statistics

There is a, by now, pretty lame saying about "lies, damned lies and statistics". I developed a great appreciation of statistics mainly because my wife and my father-in-law are statisticians. The first time I worked for Nova, I was impressed to see how my colleague Pierre Schoonraad (also an old Theology student recruited by Attie) created a database to organise data from a household survey that we conducted. After further studies, Pierre moved on to a job in the civil service. For some reason, I became the one who did the data processing - maybe because I could ask my wife for help. I learned to use statistical software, for which the University had a license, to quickly summarise data, perform data transformations, and conduct simple statistical tests.

A big breakthrough, although slow in the making, was when Nova changed our statistical software to the open-source R language at the end of 2008 (R Core Team, 2014). R is more difficult to work with initially, but it offers much more control and the ability to programmatically control and customise every aspect of the workflow. We needed this when we started rolling out carbon credit projects at scale. I eventually mastered R and took a first-year and later a second-year course in statistics at Unisa. In between, I learned about epidemiology through an online course and improved my programming skills through books, online resources, and practice. At the end of 2008, we decided to henceforth only capture data on mobile devices (and not on paper). This revolutionised the way that we worked and mushroomed the volume of data to be processed. My role as an accidental analyst grew into an information business unit in Nova that currently has four full-time personnel apart from myself.

In the beginning, we analysed and reported on a lot of survey data, but later, our analysis task also included data from sensors as well as air quality data. During the process of formal and informal studies, and learning by doing, I developed literacy in, and an appreciation for, the quantitative disciplines. The quantitative disciplines are inherently conservative since they

place constraints on the conclusions that one can draw from your data and they force one to express your conclusions in terms of probabilities.

Nova's capacity grew through our large-scale implementation, monitoring, and reporting and through the process of having our process and results audited numerous times per year. The way in which we acquired, quality-controlled, and analysed our qualitative and quantitative data became quite sophisticated. We continued the practice of a tried-and-tested approach to developing interventions by engaging with households to test solutions at a small scale while at the same time taking objective measurements of the success of the intervention[6]. Work in the field of air quality, with or without a link to climate change, continued to be our largest source of income from 2007 onwards.

7. Encountering environmentalism

7.1 Meeting the other kind of NGO

In the course of our work on air quality and climate change mitigation, we occasionally encountered environmental activists. I had the opportunity to attend two climate conferences: COP 18 in Doha, Qatar, and COP 27 in Sharm el-Sheikh. Coming from a background where we endeavour to be accurate, balanced, and realistic, the ethos of environmental activism struck me as something different. The activists struck me as more belligerent (and therefore more self-righteous), more prone to exaggeration, and more irrational than I expected them to be. The local environmental activist group focusing on air pollution were also not very informed on the basic facts of air pollution (e.g., understanding the difference between environmental *pressures* and *states*).

I concluded that there were two kinds of NGOs: screaming NGOs and doing NGOs. I wanted to be on the doing side: Thinking, then doing a little bit, then thinking again (learning),

6 Editors' note: This is evident from several of the preceding chapters.

then doing a bit more – the point of view that I learned from Attie when I first started is that of complexity. Where complex systems interact, one cannot be sure what will happen. Seeking to understand is the first essential step in the quest for a beneficial solution. One needs to proceed carefully and not let the scale of implementation outrun the scale of understanding. Another thing that I learned from Attie, as well as from my Economics studies, is that you can do harm by trying to do good. I rarely encountered this type of thinking in the environmental activists whom I met in person or whose documents I studied.

7.2 Increased scepticism

Two events cemented my scepticism against a certain kind of environmentalism (the screaming kind). The one was a video by an environmental organisation about air pollution on the Highveld. The overall message was that the power stations and the large industries were to blame for air pollution on the Highveld. There is one scene where a group of children sit around a smoking *mbaula* (brazier). This immediately struck me as strange. I have seen many burning *izimbaula* in the course of my work. The typical practice is that one lights up the *mbaula* in the furthest corner of the stand (especially if you are not using the alternative top-down ignition technique), and then wait for the smoking to stop and the coals to glow red before using it as either a heat source or for cooking. The scene in the video was of children around an *mbaula*, clearly ignited from the bottom, still smoking, and with no glowing embers. At this stage, there is no appreciable heat. Sitting around an *mbaula* at this stage has no utility and considerable disutility from the smoke – which is why no one does it. The whole scene appeared to me to be staged for maximum emotional effect: poor children sitting around in the smoke. Apart from the fact that the scene was staged and inaccurate, and a cheap attempt at emotional manipulation, it is active child abuse. The producers of the video apparently orchestrated the children to sit in the smoke – thereby deliberately exposing them to the very thing that they pretend to protect them against. The other irony is that local sources, such as domestic coal burning, are indeed important

to address, but the video is part of a campaign that targets the power stations and big industries – sources that generally cost more to address and achieve less in terms of their effect. This whole thought process went through my mind in about a second – it filled me with an immediate sense of loathing. It made me think of the first time that I saw the video of Greta Thunberg speaking at the UN (United Nations) (Thunberg, 2019). Although she was young, the completely unwarranted and exaggerated sense of victimhood[7] was striking. I also wondered who orchestrated her appearance at this event.

The other, slower, experience that deepened my scepticism towards the screaming sort of environmental activist was my experience in engaging with other stakeholders around air quality offsets. In 2010, I was the co-author of a conference paper on air quality offsets with Theo Fischer, an environmental scientist with EScience Associates. We proposed a framework for air quality offsetting. The paper was very well received. Shortly after, we were invited by Eskom for a discussion on the topic. In the end, EScience was contracted by Eskom to conduct a pre-feasibility assessment on air quality offsets as an alternative way of compliance for Eskom's power stations. They, in turn, subcontracted Nova for a part of the work. Together, we had the opportunity to develop the technical framework and set in motion the process that would lead to the practical implementation of air quality offsetting. As part of the process, we consulted with the government and other stakeholders. We discovered that the government was also working on the idea and had a fairly mature conceptual framework for environmental offsets in general. The government published a draft air quality offset guideline in 2013 and gazetted a final version in 2016 (RSA, 2016). After our pre-feasibility study, we moved into the feasibility phase, where we tested intervention concepts on a small scale and conducted substantial measurements of objective and subjective success criteria. In parallel, we worked for Sasol on a similar programme. Sasol's programme would

7 "You have stolen my dreams and my childhood with your empty words."

eventually lead to the first successful full-scale implementation of an air quality offset project in South Africa.

The idea behind air quality offsets is that one should try to compare two alternative courses of action and select the most beneficial one. I thought that this principle could hardly be controversial and that the discussion would centre around how a beneficial outcome is to be defined and measured (i.e., impact metrics) or around how one would know what the outcome of a certain course of action would be (i.e., quantification methodologies) or how to compensate for uncertainties (safety margins). Throughout the whole process in which I was personally involved, and in the media reports and documentation I read subsequently, the environmental activist organisations were hardly ever interested in these themes. This made me wonder what it was that they were interested in.

7.3 Deep environmentalism

Having had at least an introduction to macroeconomics and from my experience in domestic energy and my participation in climate change mitigation projects, I also developed an interest in the macroeconomics of energy and the environment. As far as I could determine, the best long-term prospect to meet humanity's energy needs is a combination of renewables (in the niches where they work well) with a backbone of nuclear power. Practically no one will dispute that nuclear cannot be beaten for energy density. Delving into the available information also convinced me that it is far cleaner and safer than popularly perceived. I wondered why the international environmental movement (such as Greenpeace) was so vehemently opposed to nuclear power.[8] The other thing that they are opposed to is genetically modified food crops. This struck me as strange: why would an organisation that supposedly cares about the future of humanity and the preservation of biodiversity, oppose the exact technologies that can provide the physical basis for the achievement of that objective? The hypothesis that I came up

8 I first noticed this on own soil when Greenpeace activists illegally entered Koeberg Power Station to place a banner reading NUKES OUT OF AFRICA (Smetherham, 2002).

with was that somehow, deep down, they hated humanity. While some articulate the view that humans should cease to exist[9], most environmentalists would vehemently deny being anti-human. Yet, the opposition to what appears to me obvious, long-term solutions to food and energy makes it hard to believe that there is not at least an unconscious anti-human element in organisations such as Greenpeace. My daughter noticed another feature: nuclear power and genetic engineering represent human mastery of nature on a very fundamental level, that of the atom and the gene. It is almost as if there is a feeling that nuclear energy and genetic engineering represent humans stepping into nature's holy of holies. I started to see a religious substructure. That realisation remained an indelible part of my understanding of environmentalism.

7.4 Playing for the pavilion

Since I was involved in air quality, I started paying attention to how particular environmental NGOs communicated in public about air quality issues in South Africa. Three aspects stand out: they almost always exaggerate the scale of the negative consequences[10], there is a lack of awareness that the situation is complex and that optimal trade-offs must be found, and the underlying narrative is often anti-industrial. At some point, I realised that there is an economic principle at work. Messages about more impactful events attract more attention. Negative news generally attracts more attention than positive news (see Kätsyri et al., 2016, p. 2 for sources). If one were to construct an attentional hierarchy of potential messages, news of immediate impending doom would come out on top. However, like the boy who cried wolf, this trick cannot necessarily be repeated too often. Impending doom in the not-too-distant future is a far

9 Such as Stop Having Kids (https://www.stophavingkids.org/) and the Voluntary Human Extinction Movement (discussion in La et al., 2023

10 For example: Euripidou et al. (2022) use the estimate of Myllyvirta (2014) that "Eskom's coal-fired power plants (CFPs) would be responsible for 2,400 premature deaths per year" (Euripidou et al. 2022, p. 1) but the estimate of Myllyvirta is in all likelihood a significant overstatement. For details see Langerman and Pauw (2018).

safer bet. You can generate interest but stave off the falsification until a bit later. For an organisation that receives donations from the public, attention is an economic incentive. The NGO with a message such as: 'Nature, society, and the economy are complex systems that all have their own internal logic, constraints, and requirements. We must collaboratively seek optimal trade-offs and slowly forge ahead towards an optimal solution', is clearly at an economic disadvantage to one with a message of: 'Pollution from filthy industries owned by heartless capitalists is killing thousands of poor people as we speak. We are the brave ones stopping them, but you must help us.'

8. Brooding during lockdown

I think I am as sceptical of politicians as a group as the next person. I was also aware that there was a disproportionate number of psychopaths amongst CEOs (see for example Kets De Vries, 2012; Babiak et al., 2010). I was growing increasingly sceptical of environmental activists as well as of the reporters who presented their views in the media. However, I never deeply questioned the scientific community. I quite liked the scientists whom I came to work with and appreciated their methodical and disciplined approach. My criticism of the environmental NGOs was exactly that they were not scientific enough in their approach.

A new dynamic emerged for me during the coronavirus disease 2019 (COVID-19) pandemic. Governments worldwide appealed to science to enforce hitherto unknown restrictions on public life. When the pandemic started, I took to the habit of looking at the statistics every day. I also followed the discussion about the possible treatment options and how the pandemic would end. There was one report in May 2020 that I continued to think about for a long time. A group called *Pandemics Data and Analytics* (PANDA), led by actuaries, compared the projected number of fatalities caused by the virus to the projected number of deaths caused by the lockdown measures in South Africa. They showed that a tipping point emerges very soon when the lockdown, because of the physical restrictions and the economic damage, leads to more deaths than the virus. As

they said, *Viruses kill. But the economy sustains lives, and poverty kills too*. PANDA was viciously attacked by *The Daily Maverick* and consequently lodged a case with the Press Council, which upheld a small part of their complaint and dismissed the rest (Press Council of South Africa, 2021).

The improvised and haphazard nature of the measures did not give me the impression that the people who made the decisions really knew what they were doing. When they opened the schools at the height of the wave, which was characterised by a variant that affected children, after shutting the schools during the waves that did not make sense?

A doctor whom I have known for a very long time, and whom I trust unreservedly, mentioned using an old medication, called *Ivermectin*, prophylactically and in the early stages of the disease. I also noticed it being mentioned in circles where, shall we say, more unrestrained speculative theorising around the nature and causes of the pandemic was in vogue. I also noted the dismissive reaction from official sources locally and internationally, often descending into condescension while side-stepping the available facts. Something bothered me about this. There seemed to be at least prima facie evidence that *Ivermectin* could help, and it was cheap and had a proven safety record (literally billions of doses had been given). This was confirmed when a local civic rights organisation won a court case to allow doctors the emergency use of *Ivermectin* for COVID-19 without having to wait for the South African Health Products Regulatory Authority. Thus, if the high court could be convinced, it meant that there was not a lack of evidence. Why did the official health authorities not at least initiate large-scale clinical trials?

I found an online resource that ran a real-time meta-analysis on *Ivermectin* for COVID-19[11]. Having worked on automated statistical reporting myself, I was impressed by the site just on a technical level. My wife had an academic interest in meta-analysis, and I had some exposure to the technical side of epidemiology, so the analytic aspects also triggered my

11 https://c19ivm.org/meta.html

interest. The site was updated daily; it linked all the original research and differentiated between the stage of the disease where the medication is given, the types of outcomes, the study designs and indicators of data and research quality. As far as I could see, it followed the best practice for meta-analysis. I thought this was a prime example of what public science should look like. The meta-analysis, no matter how you constrained it (all studies, only peer-reviewed studies, only randomised controlled trials), all pointed in the direction of a significant effect, especially as prophylaxis and early in the disease. I was so perplexed by the difference between the official position, as I understood it from the media, and the available data that I started wondering if I was missing something. I asked a friend who was a professional medical researcher to check it out and gain some input from colleagues. I thought if this was the work of Russian hackers, they really outdid themselves this time. But we spoke a while later, and the consensus was that the site and its content were legitimate.

I was not in a high-risk category, but I was vaccinated on the premise that vaccination would help prevent the spread of the disease. Looking back now, that seems a bit gullible. I thought that there were many uncertainties related to the mRNA-type vaccines, so when I had the chance to receive the Johnson & Johnson vaccine, I went for it. I tried to better understand what was going on with the mRNA vaccines as best I could by accessing the original sources whenever possible. One such source that puzzled me for a time was the article in the *New England Journal of Medicine* that reported on the 6-month follow-up of the Pfizer BioNTech mRNA vaccine (Thomas et al., 2021). It mentioned that there were more deaths in the treatment group than in the placebo group (not statistically significantly more, but more nonetheless)[12]. I understood the

12 "During the blinded, placebo-controlled period, 15 participants in the BNT162b2 group and 14 in the placebo group died; during the open-label period, 3 participants in the BNT162b2 group and 2 in the original placebo group who received BNT162b2 after unblinding died. None of these deaths were considered to be related to BNT162b2 by the investigators. Causes of death were balanced between BNT162b2 and placebo groups (Table S4)."

explanation that death was not the outcome of concern, but since prevention of death seemed to be the ultimate aim of the whole exercise, that explanation left me unsatisfied. At least it showed that with a treatment and placebo group of ~22,000 each, over six months, no difference in all-cause mortality could be proven. Another aspect that I wondered about was the fact that Thomas et al. reported the vaccine efficacy[13] (which is high at 91%) but not the reduction in absolute risk (which is about 3%). I was under the impression that it is a good practice to report on the absolute risk reduction of a treatment because that gives a better idea of the real-world impact of the treatment.

The reluctance of the people behind the *Ivermectin* meta-analysis to take credit for their obviously thorough work was my first clue that all was not well. I have always understood that science is embedded in a social and economic substrate, but that never prompted any serious reservations about the scientific undertaking in general. The way in which coercive measures were implemented inside democratic countries, supposedly with scientific justification, during the COVID-19 pandemic, disturbed me. I repeatedly picked up the message that this or that measure was backed by settled science (or equally that an alternative proposal was not backed by science) as if science were like dogma or law in which there is one and only one correct answer to which everyone must agree or face excommunication. I viewed science rather as a collaborative process of discovery that is never really finished but that succeeds asymptotically, and one in which the lone dissenting voice often represents the start of a leap forward. I started following news about experts, such as Dr Jay Battacharya, who had dissenting views, or even just pertinent questions and experienced professional persecution of some kind. I realised that if science progresses by disagreement and openness to a re-evaluation of established positions in the light of new (or

13 "Vaccine efficacy was calculated as 100 × (1 − IRR), where IRR (incidence rate ratio) is the ratio of the rate (number per 1,000 person-years of follow-up) of confirmed cases of COVID-19 in the BNT162b2 group to the corresponding rate in the placebo group" (Thomas et al., 2021, p. 1767).

even sometimes the same) evidence, then censorship of data or scientists is science's enemy number one.

I don't think I am a sceptic yet, but I have come to appreciate the emotional impact of coercion on one's attitude towards certain matters. Looking back at my journey, I am convinced that few things create mistrust as much as coercion. Especially if an authority changes its position but retains its arrogance. I also started to develop the intuition that one should pay more attention to how economic and ideological incentives shape the creation of scientific knowledge and how it could derail scientific and societal progress.

9. Climate and blockchain

Although we achieved a lot in climate change mitigation projects, our focus was always primarily on the quality of life for low-income households rather than on climate *per se*. The Nova Institute's vision is *A healthy household culture in Southern Africa*. We used the market for voluntary greenhouse gas emissions reductions (the so-called carbon market) primarily to fund projects that had an air quality and quality of life benefit. The premise on which the carbon market is based is that a beneficial outcome, that would not have occurred outside of a project activity implemented specifically for that purpose (this is called *additionality*), can be objectively verified and turned into a sellable asset. Our work on air quality offsets focused on the quantification and verification of an air quality benefit, but not necessarily on the commodification of that outcome.

We wanted to extend the principle we learned in the carbon market, namely that one can create assets based on verified additional communal benefits, to a much larger range of benefits than just greenhouse gas emissions reductions. Although we had success in air quality offsets, it was initially unclear how the ideal of creating assets based on a much broader range of outcomes could be implemented until the boom in cryptocurrencies and blockchain-based assets in 2017. The emergence of blockchain technology provided a potential mechanism to create a decentralised ecosystem for

the definition, quantification, and verification of such assets. In 2018, we started working on a concept of an ecosystem for defining, creating, verifying, selling, and using cryptographic tokens of communal benefits.

Distributed ledger technology (which includes blockchain technology) is revolutionary because it allows solutions for self-sovereign identity and trustless transactions. Trustless transactions are those that can take place without a trusted intermediary (Uggla & Hallström, 2018). We envisioned that these technologies could help us to set up a network where independent producers and verifiers of a wide range of assets (conceivably covering all planetary well-being goals) could transparently create and verify assets. Trust would be facilitated through the cryptographically guaranteed transparency mechanisms provided by the technology. We also envisioned that the technology would enable us to create a reputation system that gives reputation to actors based on their history of contribution to the network.

After developing our basic concept, we realised that the first step would be to create a basic framework into which all types of impact accounting could fit. In 2020, a colleague and I joined the Hyperledger Foundation's Climate Action and Accounting Special Interest Group (CA2SIG). The Hyperledger Foundation is a non-profit consortium hosted by The Linux Foundation, that fosters and supports the development of enterprise-grade, open-source distributed ledger technologies. In the CA2SIG, we formed a standard working group that took it upon itself to develop a formal ontology for Anthropogenic Impact Accounting (known as AIAO) using standard semantic web technologies such as the Web Ontology Language (OWL). This provides a consistent vocabulary for describing how a particular activity impacts an environment. The work on this has progressed far, but is continuing.

10. Speaking the truth in love

There is a biblical exhortation to speak the truth in love. The opposite of that is cynical lying (having no love and not telling

the truth) or cynical scepticism (having no love and being unwilling to believe the truth). Between truth and love, truth is the easier one to incentivise. There is not much one can do about the intentions of other people, but there are ways to incentivise telling the truth or to present evidence in such a way that people can understand and believe it.

The question I ask myself is how one can implement the principle of speaking the truth in love in the area where I work, namely, on the interface between society, technology, economy, and the environment. Love means that one seeks the benefit of the one loved. Truth is about how the representations one makes correspond to reality. Those representations also include the ones that one makes to oneself.

The interaction between societal, technical, economic, and environmental systems is complex and knowing and speaking the truth is difficult. Knowing how to act is also difficult – especially when realising that harm can follow from trying to do good.

One part of the antidote to scepticism is clear articulation because clear articulation enables the counterparty the opportunity to evaluate what is communicated. During the discussions of the CA2SIG standards working group mentioned earlier, I realised that prescribing a specific universal standard for anything cannot be done. In the US, they still weigh things in pounds. Even if you think the metric system is better in some way, it would be naïve to think that the metric system should be universally adopted in the US. A simpler solution is to make sure that the unit is always communicated with a measurement and that the conversion formulae are known.

Following this line of reasoning, the standards working group decided to create a consistent language for talking about anthropogenic impact rather than prescribing a universal accounting standard for anthropogenic impact (that had no chance of ever gaining universal recognition). In the context of the Hyperledger Foundation, we were thinking specifically of digital artefacts, typically ones representing greenhouse gas emissions or reductions. Even within the carbon market, there

are differences of opinion about matters such as whether using emission reductions is an acceptable offset for emissions or whether only true sinks can be used for this purpose. Giving the prospective buyer of a digital environmental artefact clear information based on which they can decide according to their own priorities seemed to be a better approach compared to pretending that these differences can ever be solved.

With the use of precise and strictly defined terminology, articulation is part of the scientific discipline. This includes the empirical social sciences. At Nova, we make extensive use of social indicators[14] when we monitor communities over time, where an indicator is precisely defined, and its data collection and calculation method is explicitly defined.

But science must describe. The question is to what extent this is true for normative disciplines, such as Auditing, Accounting, Management, Public Administration and Development Studies. In these undertakings, there is value in stating one's goal because it enables other people to judge the outcomes in a particular light. Articulation is at least part of the antidote to scepticism. At Nova, we try to pursue the ideal that we say what we do and do what we say.

When I first worked with the World Business Council for Sustainable Development (WBCSD) / World Resources Institute (WRI) Greenhouse Gas Protocol (WBCSD et al., 2004), I was struck by the elegance of its five accounting principles: relevance, completeness, consistency, accuracy, and transparency. As with clarity of expression, transparency enables the counterparty to evaluate the evidence and determine their position. When we were operating multiple greenhouse gas emissions reduction projects, we submitted up to ten monitoring reports per year. All those had to be audited. During that time, I started taking an interest in the concept of *reproducible research*. Reproducible research is the approach to reporting research results that keeps the data and reporting together and directly links the reported results to the underlying data. This is done by making the data, the code that generates the output and the

14 Editors' note: The topic of Chapter 12.

output itself available as one unit. Reproducible research is a way of realising the ideal of transparency.

Together with a former colleague, I became involved in a community that develops distributed ledger-based software systems to make reporting things such as climate impact transparent on a large scale. This work is also continuing.

Trust is an interesting concept in the context of distributed ledger ecosystems; in fact, *trustlessness* is a key concept. It means you do not have to trust the counterparty or a central authority, such as a bank, to transact since the validity and security of transactions on the network are cryptographically guaranteed. At face value, this seems like a very attractive feature for the sceptic. The problem is that trustlessness only applies to transactions on a distributed ledger. Full trustlessness only applies to transactions of pure cryptocurrencies. This is because pure cryptocurrencies represent nothing outside of the network. Even then, it is just the validity of the transaction and now what it represents. For example, if you buy a pizza with a cryptocurrency, the counterparty can know when the transaction is written on the distributed ledger, and it cannot be cancelled, but you still have to trust that they will hand over the pizza.

As soon as something in the real world is represented on the distributed ledger (a cryptographic representation of a thing or a right is called a *token*), the process cannot be trustless. Another strategy must be employed where tokens are concerned. The aim is to reduce the likelihood of a misrepresentation. The main mechanism of such a strategy is transparency and redundancy. Distributed ledger technology is well-suited to employing the principles of reproducible research, namely data sharing, code sharing, documentation, and version control. Redundancy means that there are multiple layers of safeguards. The more layered and the more robust the safeguards, the less scepticism is warranted. Safeguards that are traditionally used are the concepts of liability and reputation. Insurance firms protect their clients against uncertainty, but they, in turn incentivise risk-avoidant behaviour on the side of their clients. Insurance translates the degree of uncertainty

or risk exposure directly into an immediate financial cost for the client. Institutions such as banks and audit firms, whose business is built on trust, go to great lengths to protect their reputation (in the first place by maintaining internal discipline) because they realise that the public's or a regulator's trust in them is the basis of their business. We are currently working on ways to employ these same concepts within a distributed ledger ecosystem as a way of ensuring the quality of representation of realised benefits, for example, ecological benefits.

11. The march of folly

Years back, I read American historian Barbara W. Tuchman's book *The March of Folly: From Troy to Vietnam* (Tuchman, 1985). The book is a series of historical case studies of institutions acting against their own interest. Approximately half of the book covers the involvement of the US in Vietnam. The insight of this book is that institutions sometimes vigorously and diligently pursue courses of action that they should know can only result in their demise. Powerful institutions can make poor decisions driven by a combination of arrogance and naivety.

After Vietnam, the US lost two additional wars: in Iraq and Afghanistan. *Lost* is the word that Daniel Bolger, a retired US Army lieutenant general, used already in 2014 in his book *Why We Lost: A General's Inside Account of the Iraq and Afghanistan Wars*. If Tuchman's book were to become like the Rocky films and have sequel upon sequel, what events would be in subsequent volumes? Apartheid may make the list. Communism is a difficult one because it depends on how one defines the interests of the group. The wars in Iraq and Afghanistan are obvious candidates.

As the dust settled on the COVID-19 pandemic, I became aware of studies like that of Classen (Classen, 2021), Michels et al. (2023) and Bendavid and Patel (2024). I wondered if extended lockdowns, school closures and vaccine mandates for students would also be one day counted amongst the follies of history. Even though many mistakes were made, I did not think that the way that many governments acted during the initial waves of the COVID-19 pandemic could be classified as folly.

Things were happening fast and there was truly an unknown and urgent threat. Even now, with the benefit of hindsight, there is no agreement on what should have been done. However, in his presentation to the Actuary Society of South Africa, Nick Hudson, co-author of the PANDA report, described the lockdowns as "acts of immense folly" (Hudson, 2023). Even where experts disagree so vehemently, it is difficult for a non-expert to understand what is going on. What would be clearly folly would be not to learn from the experience.

In his book, *The Open Society and Its Enemies* (Popper, 2013)[15]Karl Popper argues for an open society based on individual freedoms. He warns against what he calls *historicism* (the belief in the inevitability of the unfolding of history), and utopian ideals because these beliefs are used to justify the suppression of individual freedoms. Totalitarian institutions need high ideals and the presence of imminent threats to justify their authority and the drastic changes to society that they bring about. Saving or restoring the environment provides a high ideal and, in the eyes of many, prevents an imminent calamity.

I often wondered if a certain type of environmentalism (the anti-nuclear, anti-GMO - genetically modified organism - type that speaks about a climate emergency) would make it into a sequel to *The March of Folly*. There is certainly an obsessive and self-defeating element. The failure of energy policies in Germany in recent years shows how so-called progressive policies can have exactly the opposite effect than intended. A 2019 survey of 1,811 adults in Germany and Poland found that pro-environmental and pro-climate attitudes correlate negatively with support for nuclear power (Bohdanowicz et al., 2023) and that this effect is stronger in Germany. Ironically, attempts to move away from nuclear power and fossil fuels resulted in dirtier and more expensive energy, with less energy security (Csizmazia, 2023).

As with COVID-19, even experts disagree strongly on how to act on the major environmental questions of our time. Amid

15 Originally published in 1945 by Routledge. Numerous reprints and several new editions followed.

this uncertainty, people like me have to make up our minds personally and professionally. Being aware of the possibility that the actions done in pursuit of a particular ideal can lead to its exact opposite makes this more difficult because it shifts the question away from intentions to future outcomes. Escandón et al. (2021) investigated six false dichotomies (either–or questions) that have been subject to oversimplification during the COVID-19 pandemic. In their analysis, *false dichotomies are pervasive and attractive* because *they offer an escape from the unsettling complexity and enduring uncertainty* (2021, p. 4). In conclusion, they called for *a nuanced understanding of the science,* and they cautioned *against black-or-white messaging, all-or-nothing guidance, and one-size-fits-all approaches.* This advice seems apt also for actions in response to environmental issues. An interesting duel that played out on Twitter is documented in the Institute for Strategic Dialogue's report on climate mis- and disinformation at COP27 – the 27th Conference of the Parties – between the hashtags #ClimateScam and #ClimateEmergency (King, 2023, p. 6).[16] A duel between #ClimateScam and #ClimateEmergency seems to me precisely the *black-or-white, all-or-nothing* thinking that Escandón et al. warn against. I am no supporter of anything that could be labelled #ClimateScam, but I do fear that once #ClimateEmergency wins, the remaining part, namely the *one-size-fits-all* solution, will not be far off.

Another lesson I learned from the pandemic experience is that authoritarian behaviour undermines trust and is frequently counter-productive. Escandón et al. conclude that *conveying uncertainty does not harm public trust* (2021, p. 4), but in my experience, the opposite is also true: simplified messaging about complex issues (i.e., talking to adults as if they were children) creates animosity and mistrust. In the same way, finding out a certain view has been censored makes some people (me, at least) more inclined to believe it – especially if you already have doubts about the censor.

16 The authors of the report seem to suggest that this is somehow orchestrated in favour of #ClimateScam: "The term appears to be trending despite data that shows more activity and engagement on other hashtags such as #ClimateCrisis and #ClimateEmergency".

Some of the knowledge that has emerged after the pandemic came about because of guarantees of civil liberties, such as laws promoting access to information (for example, the analysis by Michels et al., see their discussion on page 975).

Rights such as the right to access information held by the state enable individuals in democracies, at least in principle, to influence, moderate or counter the actions of the state and large corporations or to hold them responsible after the fact. The theme of this book, *Development in the Anthropocene,* should be a joint search for a solution or a joint grand project, something like solving a puzzle or building a house. However, it could also be a battleground between opposing interest groups who compete to deny the other the opportunity to speak. The victory of a specific point of view over another by silencing it would be the worst possible outcome because the ideologically self-assured are particularly prone to acts of folly.

List of Sources

Babiak, P., Neumann, C.S. & Hare, R.D. 2010. Corporate psychopathy: Talking the walk. *Behavioral Sciences & the Law*, 28(2), 174–193. https://doi.org/10.1002/bsl.925

Bendavid, E. & Patel, C.J. 2024. Epidemic outcomes following government responses to COVID-19: Insights from nearly 100,000 models. *Science Advances*, 10(23), eadn0671, https://doi.org/10.1126/sciadv.adn0671

Bohdanowicz, Z., Łopaciuk-Gonczaryk, B., Gajda, P. & Rajewski, A. 2023. Support for nuclear power and pro-environmental attitudes: The cases of Germany and Poland. *Energy Policy*, 177(2023), 113578, https://doi.org/10.1016/j.enpol.2023.113578

Classen, B. 2021. US COVID-19 vaccines proven to cause more harm than good based on pivotal clinical trial data analyzed using the proper scientific endpoint, "all cause severe morbidity". *Trends in Internal Medicine*, 1(1), 1-6. Available at: https://www.scivisionpub.com/pdfs/us-covid19-vaccines-proven-to-cause-more-harm-than-good-based-on-pivotal-clinical-trial-data-analyzed-using-the-proper-scientific--1811.pdf

Csizmazia, R.A. 2023 Exiting and re-entering nuclear and fossil-fuel energy in Germany. *International Journal of Economic Studies and Management (IJESM)*, 3(6), 1870–1881. https://doi.org/10.5281/ZENODO.10382371

Ekins, P. & Max-Neef, M.A (eds.) 1992. *Real-life economics: understanding wealth creation*. London: Routledge.

Escandón, K., Rasmussen, A.L., Bogoch, I.I., Murray, E.J., Escandón, K., Popescu, S.V. & Kindrachuk, J. 2021. COVID-19 false dichotomies and a comprehensive review of the evidence regarding public health, COVID-19 symptomatology, SARS-CoV-2 transmission, mask wearing, and reinfection. *BMC Infectious Diseases*, 21(1), 710. https://doi.org/10.1186/s12879-021-06357-4

Euripidou, R., Irlam, J., Hallowes, D., Lloyd, T. & Loser, N. 2022. The Minimum Emission Standards (MES) and the sabotage of public health. *Clean Air Journal*, 32(1), 1–4. https://doi.org/10.17159/caj/2022/32/1.14026

Hudson, N. 2023 *Actuarial and Statistical Problems Around the Covid Phenomenon*. PANDA, 11 Oct 2023. [Online]. Available at: https://pandata.org/actuarial-and-statistical-problems-around-the-covid-phenomenon/

Kätsyri, J., Kinnunen, T., Kusumoto, K., Oittinen, P. & Ravaja, N. 2016. Negativity bias in media multitasking: The effects of negative social media messages on attention to television news broadcasts. *PLOS ONE*, 11(5), e0153712, 1–21. https://doi.org/10.1371/journal.pone.0153712

Kets De Vries, M.F.R. 2012. The psychopath in the C suite: Redefining the SOB. *SSRN Electronic Journal* (INSEAD Working Paper No. 2012/119/EFE). https://doi.org/10.2139/ssrn.2179794

King, J. 2023. *Deny, Deceive, Delay: Vol. 2*, Institute for Strategic Dialogue with contribution from Climate Action Against Disinformation: ACT Climate Labs; CARDS; CASM Technology; Climate Nexus; Code for Africa; Conscious Advertising Network; DeSmog; Dewey Square Group; E3G; Friends of the Earth US; Graphika; Media Matters for America; Purpose; Roots-Greenpeace; Union of Concerned Scientists; University of Exeter. Available at: https://www.isdglobal.org/wp-content/uploads/2023/01/Deny-Deceive-Delay-Vol.-2.pdf

La, V.P., Nguyen, M.H. & Vuong, Q.H. 2023. *Unconventional Environmental Theories in the Face of Climate Change and Biodiversity Loss: Re-examination of Deep Ecology, VHEMT, and Primitivism*. OSF Preprints 4f67a, Center for Open Science.

Langerman, K.E. & Pauw, C.J. 2018. A critical review of health risk assessments of exposure to emissions from coal-fired power stations in South Africa. *Clean Air Journal*, 28(2), 68-79. https://doi.org/10.17159/2410-972x/2018/v28n2a19

Le Roux, B., Van Niekerk, A.S., Kruger, E. & Maimela, B. 2024. Enhancing socio-ecological interactions to achieve sustainable decentralised sanitation systems: Why people are not using technical solutions. In: Nhamo, L., Mpandeli, S., Liphadzi, S. & Mabhaudhi, T. (eds.) *Circular and transformative economy: advances towards sustainable socio-economic transformation.* Boca Raton, FL: CRC Press, 188-207. [https://doi.org/10.1201/9781003327615]

Max-Neef, M.A., with contributions by Elizalde, A. & Hopenhayn, M. 1991. *Human scale development: conception, application and further reflections.* New York: Apex Press.

Michels, C., Perrier, D., Kunadhasan, J., Clark, E., Gehrett, J., Gehrett, B., Kwiatek, K., Adams, S., Chandler, R., Stagno, L., Damian, T., Delph, E. & Flowers, C. 2023. Forensic analysis of the 38 subject deaths in the 6-Month Interim Report of the Pfizer/BioNTech BNT162b2 mRNA Vaccine Clinical Trial. *International Journal of Vaccine Theory, Practice, and Research*, 3(1), 973–1008, https://doi.org/10.56098/ijvtpr.v3i1.85

Murray, M. & Pauw, C.J. 2022 A novel tool for quality-of-life assessment in the household context. *International Journal of Sustainable Development*, 25(1–2), 95-113. https://doi.org/10.1504/IJSD.2022.126474

Myllyvirta, L. 2014. *Health impacts and social costs of Eskom's proposed non-compliance with South Africa's air emission standards*. Greenpeace. [Online]. Available at: http://www.greenpeace.org/africa/Global/africa/publications/Health%20impacts%20of%20Eskom%20applications%202014%20_final.pdf

Popper, K.R. 2013. *The open society and its enemies*. Princeton, NJ: Princeton University Press. (New one-volume edn.; intro. by Alan Ryan.)

Press Council of South Africa. 2021. *Pandemics Data and Analytics vs Daily Maverick*. Press Council, 12 May 2021. [Online]. Available at: https://presscouncil.org.za/Ruling/View/pandemics-data-and-analytics-vs-daily-maverick-4548

R Core Team. 2014. *R: A Language and Environment for Statistical Computing*. R Foundation for Statistical Computing, Vienna, Austria. [Online]. Available at: http://www.R-project.org/

RSA (Republic of South Africa). 2016. Department of Environmental Affairs. National Environmental Management Act, 1998 (Act No. 107 of 1998): Air Quality Offsets Guideline. *Government Gazette, No. 39833*. [Online]. Available at: https://www.gov.za/sites/default/files/gcis_document/201603/39833gon333.pdf

Sen, A. 2001. *Development as freedom*. Oxford: Oxford University Press.

Smetherham, J. 2002. *Greenpeace in the dock over Koeberg raid. Independent Online*. [Online]. Available at: https://www.iol.co.za/news/south-africa/greenpeace-in-the-dock-over-koeberg-raid-92017

Thomas, S.J., Moreira, E.D., Kitchin, N., Absalon, J., Gurtman, A., Lockhart, S., Perez, J.L., Pérez, M.G., Polack, F.P., Zerbini, C., Bailey, R., Swanson, K.A., Xu, X., Roychoudhury, S., Koury, K., Bouguermouh, S., Kalina, W.V., Cooper, D., Frenck, R.W., Hammitt, L.L., Türeci, Ö., Nell, H., Schaefer, A., Ünal, S., Yang, Q., Liberator, P., Tresnan, D.B., Mather, S., Dormitzer, P.R., Şahin, U., Gruber, W.C. & Jansen, K.U. 2021. Safety and efficacy of the BNT162b2 mRNA COVID-19 vaccine through 6 months. *New England Journal of Medicine*, 385(19), 1761-1773. https://doi.org/10.1056/NEJMoa2110345

Thunberg, G. 2019. *Transcript of Greta Thunberg's Speech at the U.N. Climate Action Summit*. UN Climate Action Summit 2019, New York, 23 September 2019. [Online]. Available at: https://www.npr.org/2019/09/23/763452863/transcript-greta-thunbergs-speech-at-the-u-n-climate-action-summit [Accessed: 17/6/2024].

Tuchman, B.W. 1985. *The march of folly: From Troy to Vietnam*. London: Sphere Books (Abacus).

Uggla, C. & Hallström, C.J. 2018 *Is It as Trustless as They Say?: A Functional Analysis of the Blockchain and Trust.* Master's thesis in Business Administration, Jönköping University.

Van Niekerk, A.S. 1982. *Dominee, are you listening to the drums ?* Cape Town: Tafelberg.

WBCSD, WRI, Ranganathan, J., Corbier, L., Bhatia, P., Schmitz, S., Gage, P. & Oren, K. 2004. *Greenhouse Gas Protocol: A Corporate Accounting Standard.* Greenhouse Gas Protocol. [Online]. Available at: https://ghgprotocol.org/corporate-standard