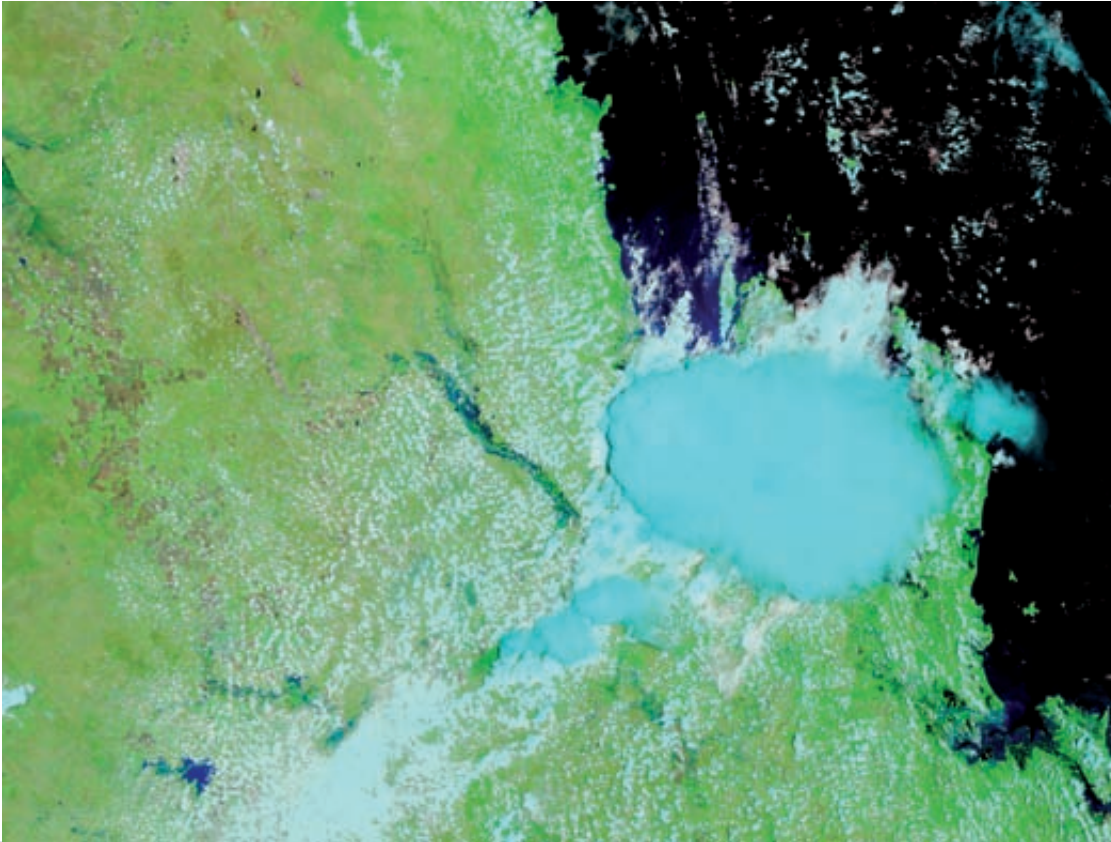


# Making Sense of Climate Change: How to Avoid the Next Big Flood Management Lessons for the 21<sup>st</sup> Century

Prof. dr. Gail Whiteman



Inaugural Address Series  
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**Making Sense of Climate Change:  
How to Avoid the Next Big Flood  
Management Lessons for the 21<sup>st</sup> Century**

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# **Making Sense of Climate Change: How to Avoid the Next Big Flood**

## **Management Lessons for the 21<sup>st</sup> Century**

### **Inaugural Address**

Address given in shortened form at the occasion of accepting the appointment  
as Ecorys NEI Professor of Sustainability and Climate Change  
at Rotterdam School of Management, Erasmus University Rotterdam  
on Friday, 1 April 2011

by

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## Synopsis

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Tijdens de afgelopen twee decennia is het aantal managementonderzoeken met betrekking tot duurzaamheid sterk toegenomen, en recentelijk meer in het bijzonder naar klimaatverandering.

De milieuproblemen zijn er echter niet mee opgelost en de meeste top-management journals blijven zich richten op het bedrijf en niet op het systeem. Dat is zowel een paradox als een kans.

Het jaar 2010 was het warmste geregistreerde jaar ooit, waardoor dit het warmste decennium was sinds 1880. In bepaalde gebieden zoals Australië en de Noordpoolzone zijn de gevolgen van de klimaatverandering reeds merkbaar. Indien CO<sub>2</sub> gehalten verder blijven stijgen, kunnen we in de toekomst nog meer extreme weersverschijnselen verwachten, waaronder overstromingen, droogte, branden en smeltende ijskappen. Dit heeft verregaande gevolgen voor de manier waarop we onze maatschappij inrichten en besturen.

Voordat iets gemanaged kan worden, moeten we inzicht opbouwen in de situatie. In een complexe omgeving moeten mensen aandacht besteden aan subtiele tekenen, hindernissen overwinnen en samen helder inzicht krijgen over organisaties heen. Indien hier niet voldoende aandacht aan wordt besteed, resulteert dat in een 'voorspelbare verrassing' – een crisissituatie die voorkomen had kunnen worden, maar toch ontstaat ten gevolge van bestaande sociale en economische structuren.

Deze oratie geeft in overweging hoe we een beter inzicht kunnen krijgen in klimaatverandering.

## Abstract

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Over the last two decades, management studies on sustainability have grown considerably, including a recent surge of research on climate change. However, environmental problems have not been resolved, and most of the top management journals remain focused on the firm, not the system. This presents both a paradox and an opportunity.

The year 2010 was the hottest year on record, making it the warmest decade since 1880. In certain places (like Australia and the Arctic), the impacts of climate change are already apparent. In the future, as CO<sub>2</sub> continues to rise, we can expect more extreme events like floods, droughts, fires, and melting ice caps. This has profound implications for the way we manage and organize our societies.

Before we can manage something, we have to make sense of the situation. In a complex environment, people need to pay attention to subtle cues, overcome barriers, and collectively develop 'sensemaking' across organizations. If people do not pay sufficient attention, they will encounter a 'predictable surprise' – a crisis situation that could be avoided but isn't because of existing social and economic structures.

This lecture considers how to make better sense of climate change. Professor Whiteman argues that it is essential for managers and academics to take a more systemic approach and collaborate with the natural sciences and local people. She ends with management lessons for the 21<sup>st</sup> Century.



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# 1. Introduction

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*Dear Rector Magnificus of Erasmus University,  
Dear Voorzitter of Erasmus University and members of the College van Bestuur,  
Dear Dean of Rotterdam School of Management, Erasmus University,  
Dear colleagues, friends, students and members of the audience,*

Thank you for joining me for my inaugural lecture entitled “Making Sense of Climate Change: How to Avoid the Next Big Flood.” In my presentation today, I will use a well-known management concept called ‘sensemaking’ (Weick, 1993), and relate this to theory and data from the natural sciences. In doing so, I will identify what I think is a paradox in management studies on climate change, and end with some future recommendations for research and practice.

Sensemaking is an interpretive theory in organization and management research. The basic idea is that before we can manage something, we have to make sense of the situation. We make sense of situations by noticing certain things, ignoring others, and by attaching meanings to the things we’ve noticed until we develop a plausible story. We keep this plausible story to help guide us in future sensemaking (Weick, 1988; Weick, Sutcliffe and Obstfeld, 2005). The first step – noticing – is the most basic and most important because what we don’t notice, can hurt us.

Management scholars are interested in this because the ability to make sense of complex, ambiguous or uncertain situations improves the performance of teams and organizations over time (Maitlis and Lawrence, 2007; Weick, Sutcliffe, and Obstfeld, 2005). In particular, research has shown that individuals and groups bounce back after surprise when they are able to effectively make sense of weak cues arising from a situation, and share this across actors. Sounds easy, right?

Not always. There are many barriers to sensemaking. Most people are not regularly observing the world around them, which makes it hard to notice subtle signs that indicate change. The farther away we are from a situation, the harder it is to pay attention. The labels we give situations can both help or hinder our interpretations. People tend to rely too much on past experiences and miss out on new things. It’s also hard to share sensemaking across groups – we all have our own mental models of the world, and often these don’t overlap.

The good news is that we do know what qualities help groups and organizations build a common sense of a situation. Organizations that accept change and uncertainty, that track small failures, and rely upon front-line local knowledge, are able to build a dynamic situational awareness which allows them to anticipate and contain surprises (Weick and Sutcliffe, 2007). This ability makes them resilient to crisis.

Through management and organization studies, we have a pretty good idea about how people make sense of our social world. But there is less understanding of how we make sense of changes to our physical and natural world (Orlikowski, 2007; Whiteman and Cooper, forthcoming). This is rather surprising because all organizations and societies are dependent, to some degree, upon Earth systems. Making sense of physical changes to the Earth, such as those occurring within our climate system, is one of the most important challenges facing humankind (Rockström et al., 2009).

Before I discuss this kind of sensemaking in detail, I want to share a story. A few months ago, in mid January, I grabbed *The Times* as I boarded a flight to Dublin. I was headed for a meeting with Mary Robinson, the first female President of Ireland and former United Nations High Commissioner for Human Rights. I was interviewing her for a book I am writing on 'Generation CO<sub>2</sub>'. I wanted to get her opinion on how to kick-start more effective action.



I was preoccupied with the upcoming interview. But the cover of *The Times* caught my eye. The image was haunting: a man and woman and their 9-year-old boy trapped on the roof of a white car, surrounded by swirling water.

The woman wore sunglasses and a skirt, the man and boy in shorts. They were residents of Toowoomba, a small city west of Brisbane in Australia. It looked, for a moment, like an idyllic holiday scene. And in fact, the family had been travelling home after a short vacation on the Gold Coast. But life changed suddenly. As they drove home from their well deserved break, they were blindsided by a flash flood that carried off their car and turned their surroundings into something more like the Amazon than a safe drive home.

No one in Toowoomba expected a flood, despite the fact that it had been raining heavily for the past few days, and indeed throughout the previous two months (National Climate Centre / Australian Bureau of Meteorology, 2011a). The rain actually made a welcome change, given that Toowoomba had been facing a decade-long drought. Indeed, only a year before, the residents were celebrating a new pipeline that would bring water into their waterless area. People were used to dealing with water shortages, not managing flood lines. But in November and December 2010, the rains returned. And this was a *lot* of rain, the highest amount on record. See Figure 1.

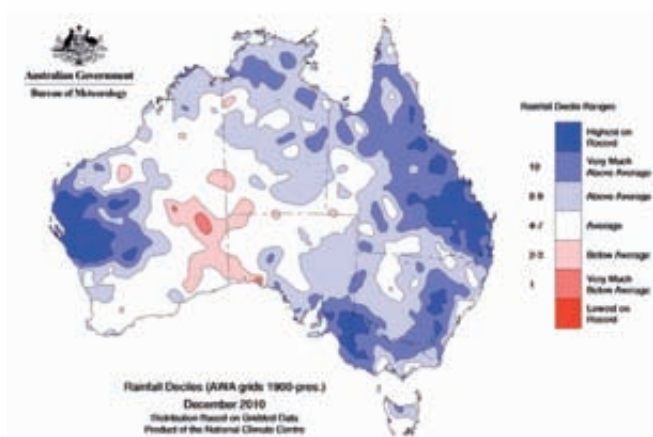


Figure 1: Australian rainfall for December 2010. (Source: National Climate Centre 2011a).

“Four major rain events affected large parts of the eastern states during this period, resulting in widespread flooding on many rivers, especially in Queensland and New South Wales” (National Climate Centre / Australian Bureau of Meteorology, 2011a: 2). Parts of Queensland, especially north and west of Brisbane, also experienced intense “one-hour rain fall in excess of 60 mm occurring on both 10 and 11 January...” (National Climate Centre / Australian Bureau of Meteorology, 2011b: 4).

From 10 to 12 January (the day I left for Dublin), “Three-day totals exceeded 200 mm over most of the area bounded by Brisbane, Gympie and Toowoomba, including the majority of the Brisbane River Catchment” (Ibid.). See Figure 2.

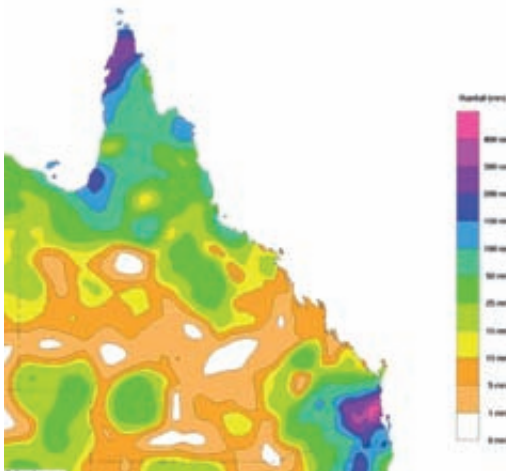


Figure 2: Three-day rainfall for Toowoomba area (Source: National Climate Centre 2011b)

Catchment areas could not manage the sudden influx after months of rain, and the area was hit by what the Queensland government later called an ‘inland tsunami.’ A wall of water, reportedly 7 metres high, rushed through the Lockyer Valley and the family car was carried off with the occupants trapped inside. Somehow they escaped to the roof, but were towed along with the wild, unexpected surge. There was a power line dropping down into the water near them, and they were worried that they might be electrocuted.

A television crew rushed to the scene by air and spotted the family, but could do little more. The helicopter, being hired to do the news, didn’t have a rescue winch. The crew was afraid that if they went any closer, the young boy might be blown off the roof by the back draft from the chopper. So the news crew took a video and went back to send a rescue crew. The images were broadcast around the world.

On the day of *The Times* cover story, nobody knew if the family had survived. But people who saw these images were worried. After I returned from Dublin, I searched for news online. What had happened to the family? How could this have happened?

At this point in my story, you may be asking yourself, what exactly does Toowoomba have to do with organization studies? I will argue: quite a lot. There are at least three ways that the opening story helps me make a contribution.

First, the story of Toowoomba highlights the physical, material nature of climate change. It illustrates, with heart wrenching clarity, the difficulties of dealing with the very real impacts of global warming.

Secondly, it begs us to consider how we can make more effective sense of climate change at the local and global level, and act upon this knowledge.

Thirdly, Toowoomba also alerts us to a paradox facing management studies on sustainability – should we remain firm-focused in our research agenda, or become more system-focused?

Taken together, these insights also help me generate a few prescriptions on “How to avoid the next big flood” or what I am calling “Management Lessons for the 21<sup>st</sup> Century.”

## 2. The Material Nature of Climate Change

2010 was the hottest year on record, in terms of average temperature. 2010 tied with 2005 in terms of overall highest temperature, making the period from 2000 – 2010 the warmest decade since 1880 when temperatures began to be recorded (Hansen et al., 2010). While the average temperature in one year is not that important in isolation, the decadal trend is deeply concerning, especially when combined with palaeoclimate data which shows a longer trend of global warming since the industrial revolution.

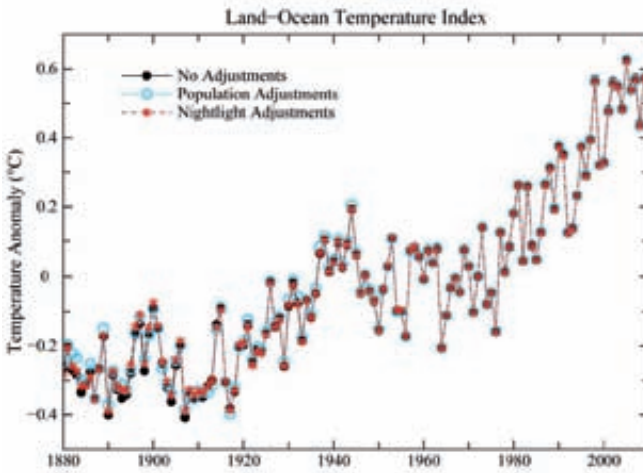


Figure 3: Global mean annual mean land-ocean temperature index for three alternative treatments of the urban adjustment (Source: Hansen et al., 2010)



Photo: 2010 Image from the National Snow and Ice Data Centre

In 2007, the Intergovernmental Panel on Climate Change warned of impending climate crisis. By the end of that year, satellite data showed that Arctic maximum summer sea-ice melt was higher than ever before. For the first time in recorded history, the summer ice melted back to about 4 million square km (about twice the typical melt), and the Northwest Passage in the Canadian Arctic Archipelago became totally ice free, thirty years ahead of climate model projections (Carmack, personal communication). This melt is related to higher global temperatures caused by human-produced greenhouse gases (NSIDC, 2010).



*Photo: taken by author*

The loss of Arctic sea ice is worrying for the rest of the world. The Arctic system has a significant role to play in regulating global climate (Richter-Menge and Overland, 2009). According to NASA climate scientist, Jay Zwally, “The Arctic is often cited as the canary in the coal mine for climate warming. Now as a sign of climate warming, the canary has died. It is time to start getting out of the coal mines” (quoted in Borenstein, 2007). Recent studies confirm that the pace of climate change and other ecological problems (rate of biodiversity loss, phosphorous and nitrogen loads, etc.) is *faster* than anticipated in the last IPCC reports (Lenton et al., 2008; Richardson et al., 2009; Roberts et al., 2010; Rockström et al., 2009).

This is bad news for the polar bear; it also poses significant management and organizational challenges for human society. For instance, in a report issued at the Cancún climate conference in December, 2010, Munich RE, the global reinsurance company, reported that “Aggregate losses from weather-related natural catastrophes since 1980 now total US\$1,600 billion, insured losses increasing on average by 11% per year.” Munich RE relates these business risks directly to global warming: “the growing number of weather related catastrophes can only be explained by climate change.”

Toowoomba is a long way from the Arctic. But this town is also experiencing unprecedented and extreme shifts in weather. While individual weather events cannot be related on a one-off basis to climate change, the increased incidence of extreme weather events is related to climate change generally (IPCC, 2007), and also specifically to this area. According to a 2010 report issued by the State of Queensland’s Office of Climate Change in Australia, the floods (and the earlier drought) are consistent with the scientific assessment on the regional impacts



of climate change. Flash floods, like the one that trapped the family on roof of their car, are also consistent with what scientists forecast for Queensland, particularly during a La Niña period as in late 2010.

Most of us live far away from both Toowoomba and the Arctic. On a normal day, the effects of climate change may seem minor or ambiguous. As my son Max said to me last year, “The Earth’s not sick. If it was, then we’d be sick too because we’re in it.” He had a point. If we relied upon the view from our window, there is nothing to worry about. “See, Mom, the Earth looks fine.” He was right: it did look fine, at least from that specific geographic location and moment in time.

I don’t want to alarm him, then or now – I’m his mother. But in some parts of the globe, like Toowoomba or the Arctic Archipelago, the experience of extreme events gives one an entirely different, more *material* perspective on climate change, one that is relevant for mothers and management scholars.

What do I mean by a ‘material perspective’ on climate change? ‘Materiality’ is defined by the Oxford English Dictionary as “[t]hat which constitutes the matter or material of something”, the “quality of being composed of matter; material existence; solidity,” and the “material or physical aspect” of something. This is a clever way of saying something ‘real’ or ‘tangible’ in a physical sense. Materiality has become a new anchor for theory building in management and organization studies, a field which, in the eyes of some of us, had become too discursive in focus (Leonardi and Barley, 2010; Orlikowski, 2007). In the (somewhat ironic) words of Karen Barad (2003: 801), “Language has been granted too much power.” A variety of studies now consider how organizations and organising processes are influenced by physical artefacts such as tools, technology, buildings, infrastructure, etc., as well as through language and other social processes.

### ***Materiality Matters: 2 Examples (James Bay and Mann Gulch)***

In our forthcoming *Academy of Management Journal* paper, co-author William Cooper and I extend this to the natural environment. We argued that materiality also arises from nature – e.g., oceans, mountains, rain, fire, ice, volcanoes, earthquakes, waterfalls, trees, animals, insect and virus outbreaks, are not human inventions (although their names may be). Furthermore, under certain conditions, ecologic materiality becomes an important constraint for society to manage within – consider how the volcano eruption in Iceland grounded air travel in Europe for more than a week. Or more frightening, the recent earthquake and tsunami in Japan. This kind of materiality has not been previously addressed by

management theory, perhaps because the context seems so unusual. But novel situations can be powerful places to discover new theory (Bamberger and Pratt, 2010). To address this gap, we coined the term ‘ecologic materiality’ and defined it as “the interaction of dynamic biological and biophysical processes and organic and inorganic matter over space and time” (p. 10). It may seem like an obvious point – the Earth is material and we should pay attention to changes over time – but management studies has historically operated as if “organizations lack biophysical foundations” (Gladwin et al., 1995: 875).

Social and organizational processes are logical areas for our field to study – managing and organizing are human endeavours (Drucker, 1986). But a singular reliance on this kind of expertise only makes sense under certain conditions, like when the natural environment is stable and therefore relatively benign.

Indeed, “the planet’s environment has been unusually stable for the past 10,000 years...” (Rockström et al., 2009, p. 472). The world as we know it is related to the stabilization of global temperatures, which allowed human society to progressively engage in agriculture, and other economic activities throughout the Holocene period. But take note: ecological data indicates that our hospitable, stable natural environment is changing. “Now, largely because of a rapidly growing reliance on fossil fuels and industrialized forms of agriculture, human activities have reached a level that could damage the systems that keep Earth in the desirable Holocene state” (Rockström et al., 2009, p. 472). In a changing natural world, we need social *and* ecological expertise to guide management practices.

Bill Cooper and I examined this issue and studied two events that in some ways remind me of Toowoomba. The first case was a rather straightforward but nevertheless surprising fall down a rockface in subarctic Canada by yours truly. It is an autoethnographic moment from my PhD field studies. Because I could not make sense of the subarctic landscape, I nearly died when I fell near a large set of rapids. This is an example of meeting my own material limits.

The second case was a reassessment of a famous historic event – the extremely volatile Mann Gulch wildland fire in Montana, which was originally studied by Weick (1993) in his classic article on sensemaking. We identified something that Weick missed: firefighters who survived the blaze were the ones that were able to make sense of the natural world – and the complex interaction between fire, wind, vegetation, climate and landscape.

This may also seem obvious: people need to be able to make sense of the natural environment under changing conditions. The point of our paper is that many people (including managers) are no longer able to do this. While our ancestors may have understood the ways of the wild, most of us who live in big cities have lost our skills at ecological sensemaking. Normally, urban life doesn't demand these skills unless we like to sail or mountain climb. But big cities, especially those lying in coastal areas or those at risk of drought and flood, are particularly vulnerable to the effects of climate change. We might not need to be able to make sense of the environment today in Rotterdam. But we may need to do so tomorrow.

In our research, we found evidence that actors who are ecologically embedded (Whiteman and Cooper, 2000) – those who are deeply rooted in the land in a physical and cultural sense – are better attuned to changes in ecological conditions and more actively interpret material cues across landscapes and time. Furthermore, the individual and organizational ability to make sense of a changing ecosystem reduces vulnerability and increases the chance of survival. From these two cases we developed a number of research propositions. Here is one:

*Proposition: The salience of ecologic materiality – and hence the need to mindfully bracket and interpret material cues – is affected by the dependence of actors on natural environments and the complexity of ecologic change and topographical variation.*

### ***Back to Toowoomba***

Scientists and government officials knew that the Queensland region faced risks of flooding and drought from climate related changes to regional precipitation patterns (State of Queensland, 2010). So managers knew that local communities were both dependent on the natural environment and likely going to face volatile changes over time. Our proposition suggests that they – at the individual and organizational level – should have been paying much more attention to local ecological fluctuations and planning how to manage extreme events given specific topographies like the Lockyer Valley.

But not everyone was. Flashfloods were so far away from the everyday life in Toowoomba, that this kind of event was probably not on the radar screen for most people, even though the ecological data provided enough information to conclude that such events were possible.

This is an example of what Max Bazerman and Michael D. Watkins (2004) call a ‘predictable surprise’ – a crisis situation that could be avoided if people and organizations paid attention to subtle warning signs, but isn’t because people marginalize the risk and maintain the status quo because of existing social and economic structures. We see what we want to see (Weick, 2005). When the world is not changing, this strategy may work. But a changing natural environment can quickly break through the business-as-usual.

All told, the floods in Queensland covered an area the size of Germany and France with water, displacing thousands, causing 22 deaths and approx AU\$16 billion dollars of damage. According to Dr. Martina Linnenluecke at the University of Queensland School of Business, the floods also affected key business sectors in the region “including the coal industry, logistics service providers, the agricultural sector as well as retail, insurance, and construction. First estimates suggest that the floods will lead to significant cuts in Queensland’s exports of coal and agricultural production which could amount to up to AU\$ 6 billion or 0.5% of GDP – not including clean up costs.”<sup>1</sup>

The obvious point in the opening story is that subtle changes in global temperatures over time can suddenly result in dramatic effects in specific places like Toowoomba or the Arctic. Once a material threshold is surpassed, events like a flashflood and melting ice can impose serious physical constraints on human action and infrastructure, regardless of our social constructions.

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<sup>1</sup> <http://climatechangeadaptation.wordpress.com/author/linnenluecke/>

### 3. Making Sense of Climate Change

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People can't pay attention to everything, so we need to narrow our focus. This action is not random; often we notice the same things we've noticed before. When things appear to be different, sometimes we just ignore them, or if we do notice them, we aren't able to connect the dots. This leads to misinterpretations and vulnerability. If we don't notice correctly that things are changing, we'll never be able to interpret what these changes actually mean, now and in the future (Weick, 1988).

Studies have looked at sensemaking in many different contexts, but all have found that how we talk about the world affects how we see it. Karl E. Weick, the father of sensemaking theory, explained, "When we say that meanings materialize, we mean that [s]ituations, organizations and environments are talked into existence" (Weick, Sutcliffe and Obstfeld, 2005:409). Indeed the very process of 'naming' something helps us 'discover' its very existence.

As our climate warms, the ability to adapt and manage relies upon our ability to make sense of changes in the natural environment. Bill Cooper and I call this the process of 'ecological sensemaking'. You could also call it the ability to listen to the canary in the coal mine.

Who has this ability? There is plenty of scientific data that illustrates how ecologists (and those in related disciplines such as climatology, oceanography, biology, geography, etc.) make sense of elements of the biosphere (species, processes) over time and try to integrate these within a systemic perspective (e.g., the integrated Arctic subsystem). Studies and models related to climate change are summarized in the IPCC reports, State of the Arctic Report Cards, and the Millennium Ecosystem Assessment. But making sense of climate change using natural science data is not easy for the non-expert.

Consider this example from ocean physics:

*"The nature and role of chimneys as a mode of open-ocean winter convection in the Greenland Sea are reviewed, beginning with a brief summary of Greenland Sea circulation and of observations of convection and of the resulting water structure. ... The longest-lived chimney yet seen in the world ocean was discovered in March 2001 at about 75°N 0°W, and subsequent observations have shown that it has survived for a further 26 months, having been remapped in summer 2001, winter 2002, summer 2002, and April-May 2003. The chimney has an anticyclonically rotating core with a*

uniform rotation rate of  $f/2$  to a diameter of 9 km; it passes through an annual cycle in which it is uniform in properties from the surface to 2500 m in winter, while being capped by lower-density water in summer (primarily a 50-m-thick near-surface layer of low salinity and a 500-m-thick layer of higher salinity)... This has important implications for ideas about chimney formation, for deepwater renewal in the Greenland Sea, and for the role of Greenland Sea convection in the North Atlantic circulation.” (Wadhams, 2004: 1).

This certainly sounds smart, but for a non-expert, it doesn’t mean much. Ocean chimneys seem to be important, but what the heck are they? Why are they so important? To the non-oceanographer, this seems like unintelligible flux (Chia, 2000). Even a diagram doesn’t help much.

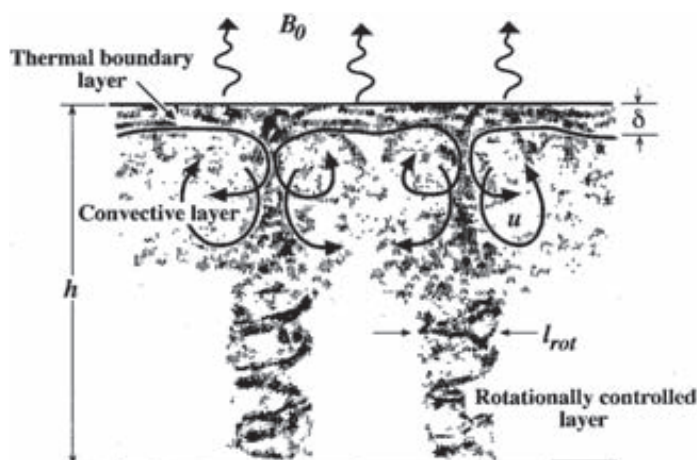


Figure 4: Marshall and Schott (1999)

Yet in 2005, Peter Wadhams at Cambridge made headlines in *The Times* by monitoring these chimneys. During a submarine trip to map the Arctic Ocean using sonar technology, Wadhams’ team found only 2 chimneys in the Greenland belt, and both were weak in strength. Normally there should be seven to twelve giant chimneys operating as part of the North Atlantic Drift. The media said this was partial proof that the Gulf Stream was slowing down, a much feared side-effect of climate change.

Changes to the Gulf Stream have major implications for Europe. But how should managers and business academics make sense of such headlines? Do we rely upon the media, or do we go find Wadhams and ask him what’s it all about? I suggest the latter.

And what about the weather? This past winter, much of Europe froze. I don't know how many of you in the audience were stuck in the '*file*' (traffic jam) outside of Utrecht on December 17 or stranded before Christmas at Heathrow or Schiphol because of the huge amount of snow.

Unusual cold in Europe does not mean that global warming is an elaborate April Fool's joke. "Global temperature is rising as fast in the past decade as in the prior two decades, despite year-to-year fluctuations associated with the El Niño-La Niña cycle of tropical ocean temperature" (Hansen et al., 2010). Research from the Potsdam Institute in Germany relates the winter freeze in Europe (with record cold temperatures) to the loss of Arctic ice in the Barents-Kara Sea north of Norway and Russia (Petoukhov and Semenov, 2010). As the Arctic ice melts, the air circulation pressure is lessened, allowing cold Arctic air to find its way south.

Will this pattern continue? Will it cause other changes? The answers to these questions are important for decisions on infrastructure, transportation, insurance, agriculture and local municipalities. In Rotterdam, should we be getting out our skis, or building bigger dikes?

I am not a climatologist, and I won't pretend to be one today. But I do believe in the academic process of rigorous, peer-reviewed science. It seems clear that natural scientists are experts in making sense of climate change. They are not the only ones.

### ***The Knowledge of Local People***

Many Indigenous People are keenly aware of changes to their local natural environment. Research demonstrates that the observations of Indigenous hunters conveys important information about climate change at local levels. Indigenous People spend so much time out on the land, that they often notice small or abrupt changes faster than would be identified by more quantitative, formal environmental assessments by scientists.

A wide variety of academic studies illustrate how local ecological knowledge can help natural resource management (cf. Whiteman and Cooper, in press). Common across this work is the finding that local inter-generational knowledge of ecosystem functioning allows people to develop effective responses to ecological change and surprise. While Indigenous People are not the typical subject for business management studies, their ecological expertise makes them an increasingly relevant (albeit unusual) role-model for managers of climate change.

My PhD dissertation investigated this question, as did my 2000 *Academy of Management Journal* article. By studying the management practices of the James Bay Cree in subarctic Canada, we discovered that managers who are deeply embedded in their local ecosystem have detailed knowledge of changes in that environment. This kind of daily, routine immersion in the natural environment (Whiteman and Cooper, 2000) significantly enhances the sustainability of natural resource decisions.



Photo: Freddy Jolly, Cree Tallyman, March 5, 1997. Photo: Trapline R-21 (taken by author)

Here are a few illustrative examples from other researchers. At the January, 2011 Arctic Frontiers conference in Norway, one of the scientists from Greenland gave a keynote presentation on the ecological changes occurring in his country. He also shared this story.

A local hunter in Greenland recently discovered a lot of dead red fish in an open piece of water. The hunter had never seen this before, nor had he heard stories from the past about this type of incident. The hunter believed that something serious had changed in the local glacier system, and he alerted the scientific monitoring team. Indeed, the hunter was right. When the scientists took a helicopter reconnaissance trip, they discovered that two ice-dammed lakes had suddenly and unexpectedly drained completely through the glacier. The water drained through the warming glacier to another lower lake, where the dead red fish had been discovered by the hunter.

Red fish have a low ability to adjust to pressure changes. When the glacier melted enough so that the water from the ice-dammed lakes became freed, the



fish were caught in a massive outward flowing current that they couldn't escape from. There was a certain loss of pressure and they died. To the Greenland hunter, a lot of dead fish signifies an important mystery that demands attention. Despite the cost of an unplanned reconnaissance trip, the scientists trusted the knowledge and observation skills of the hunter, who informally became part of a local climate monitoring program.



*Source: photo © author*

Another example is presented by Fienup-Riordan and Carmack (forthcoming) in the journal *Oceanography*: “The ... narrative was told by Peter Kattak of Sanikiluaq, Nunavut, based on his experiences in winter, 2009-10. Of seventy-one seals captured, sixty-nine had shrimp in their stomachs, not the usual capelin. Further, the seals were skinny and tended to sink when shot. Shrimp are a less nutritious prey than capelin. The question is: Did Peter Kattak simply observe an anomalous year, or has he experienced a regime shift that may require adaptation?” Good question.

Fienup-Riordan and Carmack argue that “the experiential knowledge of local people allows the detection of abrupt change and could – if enabled through social networks – provide an early warning system of abrupt ecosystem change” (p. 19). In combination with natural scientists, local Indigenous Peoples are able to make sense of climate change because they have greater personal and ancestral knowledge of the natural environment. Their routine interactions with the land, sea and air give them more opportunity to notice subtle *and* sudden changes.

### ***Listening to the Experts***

Since our climate system is interconnected, we need to make sense of it across time and across different scales. Research suggests that increased variance or

flickering between different conditions within ecosystems are indications of abrupt change (Scheffer et al., 2009). The earlier we notice these dynamics, the better.

I argue that in order to make sense of climate change, it is essential that we listen to the experts: scientists and local people, both of whom are routinely paying attention to fluctuations in the natural environment. This kind of knowledge is valuable for managers and communities around the world, even when they are located far away from glaciers and flash floods, even though it does not, at first glance, seem obviously related to their day to day business.

Local people and climate scientists have knowledge we all need to share, if we want to avoid predictable surprises.

Again, this may sound easy. But there are a few tricky unanswered questions: how do we combine these different kinds of information and different kinds of actors? A climate scientist, a senior executive, a government official, a local citizen and an Indigenous hunter don't often hang out together. So how can we collect and synthesize ecological sensemaking across scales and across different organizations? How can business managers and local municipalities more effectively utilize and act upon this kind of expert sensemaking? What is the role of the media? Can the media really synthesize this data and make it digestible for us?

The trouble is, it's not easy for most of us to read about ocean physics or *The Handbook of Snow*. Climate science is not covered in most MBA programs. It's also not easy to integrate local ecological knowledge of climate change into the modern corporation or municipality. Not many of us know Indigenous hunters who are watching the sea ice, or who are located in a place where they will notice dead red fish.

Despite these challenges, we have to try to make sense of climate change. "In a world repeatedly exposed to change, surprise, and the collapse of crucial socio-ecological systems, it is more than ever imperative to close the gap between knowledge and policy. This is not easy; it means making full use of all forms of knowledge available to us as a species" (Fienup-Riordan and Carmack, forthcoming, p. 1).

We need to share information across a wide selection of actors and locations. This requires a paradigm shift within organization and management theory: from a corporate orientation to a system orientation.

## 4. A Paradox Facing Management Studies on Sustainability: Firm or System Focus?

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Organization and management research faces a paradox: On the one hand, sustainability is no longer a fringe topic and corporations routinely invest in eco-efficiency measures. On the other hand, data from ecology indicates a worsening, and in some cases, alarming state of affairs. Why this disconnect? Part of the problem may be that “[w]e simply do not know to what extent corporate greening actually contributes to ecological sustainability or whether it does at all” (Kallio and Nordberg, 2006: 447). It is also related to the fact that the majority of studies focus on the firm or industry, but not the system.

On the positive side, many multinational companies have progressed from reactive responses to environmental threats to more proactive business strategies (cf. Etzion, 2007). Corporate investment in sustainable initiatives also remains significant despite the financial crisis. A 2010 Ernst & Young report shows that nearly 3/4 of global firms with annual revenue of +US\$1 billion planned to increase their climate related investments. Sustainability is not simply an “add on” when times are good.

On the negative side, greenhouse gas emissions continue with hardly any abatement. The world achieved only a modest 1.3% reduction in 2009 versus 2008 (Friedlingstein et al., 2010). Most of this can be traced back to the financial crisis – and does not actually represent significant shifts to low-carbon economies. Why this disconnect?

At this point, it may be useful to remember that the field of management is a late entrant into environmental research. It wasn't until the 1990s that the topic of sustainability emerged, notably with two high profile special issues in the *Academy of Management Journal* (Starik and Rands, 1995) and the *Academy of Management Journal* (Starik and Marcus, 2000). Research on climate change came much later and did not enter top management journals until quite recently (Ansari, Gray and Wijen, 2011; Goodall, 2008; Kolk and Pinske, 2005, 2008; Levy, 1997; Wittneben, Okereke, Banerjee, and Levy, 2010).

Despite the initial recognition of the value of an Earth systems perspective (Gladwin et al., 1995; Purser, Park and Montuori, 1995), the vast majority of empirical studies seem to have forgotten about the ecosystem.

Most research tries to understand firm or industry level characteristics – e.g., we know that:

- There are a wide range of corporate strategies and responses to climate change (e.g., Jones and Levy, 2007; Kolk and Pinske, 2005).
- Firms are strategic in the face of different institutional pressures, many of which are country specific (Hoffman and Ventresca, 2002; Jesawani et al., 2008; Kolk and Pinske, 2005, 2008a; Levy and Kolk, 2002).
- Companies adjust their approach to climate change in order to generate firm-specific advantages (Berchicci, Dowell and King, forthcoming; Kolk and Pinske, 2008b; Lash and Wellington, 2007).
- The CEO and board can facilitate environmental performance, and personal values make a difference (Bansal, 2003; Bansal and Roth, 2000).
- Environmental performance increases *significantly* when managers' compensation is linked with environmental performance indicators (Russo and Harrison, 2005).
- Information is key to improving environmental performance, but can be 'sticky' and context dependent (King, 1999). Highly interconnected, cross organizational networks help to share relevant local information (Geffen and Rothenberg, 2000; Lenox, King and Ehrenfeld, 2000).
- Consumers buy low-carbon products like the Prius because it helps them gain status (Van den Berghe, Griskevicius and Tybur, 2010).
- Companies can be powerful actors in the transition towards more sustainable societies, but often struggle with a systemic, collaborative approach (Baas and Boons, 2004; Boons and Roome, 2005; Loorbach et al., 2010; Rotmans et al., 2001; Whiteman et al., 2010), and
- Climate negotiations evolve from an institutional and not ecological perspective (Wijen and Ansari, 2007; Wittneben, 2009).

While highly useful for understanding how companies, consumers, and institutions are evolving with respect to climate change and sustainability, such studies do not address how we can make sense of climate change across different organizations and geographic and temporal scales.

It would be nice to believe we can leave this up to the politicians and carbon markets. But that just isn't the reality. In December 2009, the UNFCCC talks in Copenhagen collapsed, and the 2010 talks in Mexico were not spectacular, despite all the political rhetoric. Cancún may have saved the UN process from disintegration, but it didn't make sense of climate change sufficiently. Right now, reduction pledges mean that the planet will warm about 3.5C°. That future is frightening.

This is one of the things I discussed with Mary Robinson in Dublin. With an insider's perspective, she explained, "The discussions in Copenhagen and Cancun ...it was more like trade talks than talking about the end of the world." This kind of negotiating process is linear and rigid, and does not address the systemic nature of our problems.

To summarize: over the last two decades, management studies on sustainability have grown considerably, including a recent surge of research on climate change. However, environmental problems have not been resolved, and most of the top management journals remain focused on the firm, not the system. This is the paradox, and the opportunity.

## 5. How to Avoid the Next Big Flood: Management Lessons for the 21<sup>st</sup> Century

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Climate change has profound implications for the way we manage and organize our societies. This gives rise to a number of preliminary lessons for the 21<sup>st</sup> century. I do not have time to go into great depth on each of these, but I encourage more research in these areas:

### 1. *Focus on the System, Not Just the Firm*

In the words of a well-known Dutch CEO: “As a company we can reduce our carbon footprint dramatically. But the world’s still driving off a cliff. *We need a system change.*” We therefore need more management studies that take a systemic perspective, and analyze cross-scale linkages between firm behaviour and ecosystem functioning. Natural scientists have not given up on us. To the contrary, many are vocalising the need for more studies on the *management* and *governance* of our climate system (Cash et al., 2006; Walker et al., 2009). Our field can make important contributions in these areas.



### 2. *Make Better Sense of Climate Change*

Making sense of our changing climate will increase in importance over time. In order to effectively make sense of climate change, we need to collaborate more deeply with experts from the natural sciences. We also need to learn how to incorporate local knowledge of climate change into our information networks. Managers should also be paying more attention to weak or subtle cues in distant places, and geographic hot spots. What happens in Toowoomba and the Arctic has relevance to us, even though they are far away.

### ***3. Share Ecological Sensemaking across Organizations***

The material impacts of climate change will affect organizations and individuals like those of us in this room. Managers therefore need to learn how to make sense of our changing climate and share this across organizations.

### ***4. Anticipate Predictable Surprises: Be Ready to Adapt***

Toowoomba is not an isolated case. The incidence of extreme weather events will increase alongside global warming (IPCC, 2007). A report from the World Meteorological Organization in Geneva reports that the 2010 fires in Moscow and the extreme flooding in Pakistan are also consistent with IPCC projections (Jacks, Davidson, and Wai, 2010). If CO<sub>2</sub> continues on its current trajectory, we can expect more than one big flood. We need to be ready to adapt to a new system.

## 6. Concluding Thoughts

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I cannot end my talk today without returning to the family trapped on the roof of the car. What happened? The answer is not an easy one. When I returned from Dublin, I searched the Web. Newspapers first reported that the family was safe, that the mother and son had been winched to safety, followed by the father. That turned out to be wishful thinking. Newspapers revised their reports.

It seems that when the rescue plane returned to where the car had first been spotted, they could find nothing. No car. No family. Only the extreme surge of water. They kept searching. Finally, they found the mother, alive, clinging to a tree, hysterical that she been separated from her child and husband. Shortly thereafter, the boy was found, badly cut and hanging onto a hay feeder in the middle of a rush of water. He was rescued by a helicopter. The father, although fit and under 40, remains missing<sup>2</sup>.

I do not tell this story for its gratuitous emotional effect. I share this story because it helps me answer the so-what question: what is the value of management and organizational research on sensemaking and sustainability?

As our climate warms, we can expect more extreme events. Imagine that it was you and your family driving home from a holiday, thinking about what to have for dinner and all the things you need to do at work the next day. We, too, could be easily blindsided if the world as we know it, is no longer as we know it. Toowoomba is an example of what James Hansen (2009), Director of the Goddard Space Centre at NASA, calls the “Storms of My Grandchildren.”

In the 1995 *Academy of Management Review* special issue, Tom Gladwin and colleagues asked management scholars to consider this fundamental question: “how do we wish to live and what is the role of organizations in such living?” Without providing specific details, Gladwin et al. called for greater recognition of the inherently embedded nature of management studies. Sixteen years later, their question is still relevant.

What kind of world do you wish to live in? I can only answer for myself. I wish to live in a vibrant and resilient world (Holling, 1986; Walker and Salt, 2006). A world where imagination, courage and the collective ability to make sense of climate change, even extreme change, is possible. We can adapt, if we can make sense of climate change.

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<sup>2</sup> [http://www.letsgohorseracing.com.au/index.php?option=com\\_content&view=article&id=1353:james-perry-family-flood-relief-trust-fund-established&catid=42:qld-a-rest&Itemid=69](http://www.letsgohorseracing.com.au/index.php?option=com_content&view=article&id=1353:james-perry-family-flood-relief-trust-fund-established&catid=42:qld-a-rest&Itemid=69)



## 7. Words of Thanks

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My collaboration with Ecorys and the Netherlands Economic Institute (NEI) is a relationship that I look forward to developing. There are many opportunities for engaging in eco-transformation and I hope that together we can create added value. I am thankful for your sponsorship of this new Chair.

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Given my topic, I also believe that it is essential that we ‘walk our talk’. In recognition of this, I would like to mention an experiment in eco-fashion – today I am wearing an eco-toga (the first of its kind), made in collaboration with the fashion label DutchSpirit, the Togamaker, and fabric manufacturer Backhausen. It’s not often that a traditional gown can become a trend-setter. But with imagination, you can do anything.

At an operational level, GreeningRSM continues to make change, and that gives me hope! I was also inspired by the green action launched today by the student club GreenEUR, along with Johannes Kramer and Ingrid de Vries, who has done so many things to help with this oratie. All of us in the auditorium should consider participating – 25,000 EUR acts of green – that is a worthy goal. All of this is captured on film by Stefan de Graaf.

Within Rotterdam, there are a number of important eco-initiatives and networks that I have found inspiring – the Rotterdam Climate Initiative, Rotterdam Pioneers, and the Hub are filled with eco-innovators that are ahead of the curve. I am proud to work alongside them.

To my students, former colleagues, and my PhD supervisor – William Cooper – I also say thanks. To my many coauthors around the world, it has been a pleasure to work with you. Freddy Jolly, my Cree guide, your advice remains with me even when I live in the city.

Finally, to my friends and family – what would I do without you? Today, my mother Jeanette has flown in from Canada (with carbon offsets of course!) and I am so happy that she could be here. My husband Thaddeus has been the family anchor for the last few months, and has long been a supportive critic of my work. And last but not least – our sons Max and Brix – are my *raison d'être*. What better reason to make sense of climate change, than for the future of our children?!



Photo: by T.Müller in the Veluwe

And now, finally, it is time for the Dutch happy ending:

*Ik heb gezegd.*

## Notes on the Eco-Toga: The Start of a New Tradition

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It is the tradition in academia for professors to wear a long black gown during formal cortèges and academic events. It is meant to signify wisdom.

Some traditions become static, while others develop with the times. As a new professor with an interest in Sustainability and Climate Change, I wondered how best to ‘walk my talk’, starting with my toga? An academic gown is made of cloth: fabric that has an impact on the planet like all products we consume. Could it be produced in a more eco-effective way?

This toga signifies a unique experiment in eco-fashion. It has been specially made in celebration of this inaugural lecture and reflects cooperation between the Togamaker, sustainable fashion label DutchSpirit, cloth manufacturer Backhausen, and myself. The cloth is Cradle to Cradle (C2C) certified and care has been taken to produce it with a low environmental and social impact.

Of course, an eco-toga cannot save the world (even if it is the first). But this small act of innovation by like-minded individuals is a step in the right direction. As Gandhi said, “Be the change you want to see in the world.”

Prof. dr. Gail Whiteman, 1 April 2011

Ecorys NEI Chair in Sustainability & Climate Change

Rotterdam School of Management, Erasmus University

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Prof. dr. Whiteman leads the RSM / ERIM Centre for Corporate Eco-Transformation at [www.irim.eur.nl/scr](http://www.irim.eur.nl/scr). Her inaugural lecture, or Oratie, marks her official acceptance of the newly-established Sustainability and Climate Change endowed chair at RSM, sponsored by Ecorys and the Netherlands Economic Institute (NEI). Her lecture considers how human societies and organizations can make better sense of climate change. Prof. dr. Whiteman argues that it is essential for managers and academics to take a more systemic approach and collaborate with the natural sciences and local people. She ends with management lessons for the 21<sup>st</sup> Century.

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