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CLIMATE CHANGE AND NEW ZEALAND ARCHAEOLOGY – THREATS AND OPPORTUNITIES

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That significant and potentially dangerous climate change is already happening is now pretty well established. The cause – primarily anthropogenic CO₂ – is well described although there is considerable debate on the medium- and long-term effects. We would not expect climate scientists to be archaeologists nor to understand our professional debates, and we do not pretend to understand the details of climate science. The broad details are, however, well described and we accept them as fact.¹ Accordingly, rather than reference this paper in the usual way, we present some ‘Further Reading’ at the end of this paper, a small part of the huge literature bank now available.

The Intergovernmental Panel on Climate Change (the IPCC), a United Nations body, has predicted a 2°C global average warming by 2100 accompanied by an approximately 0.8 m sea level rise. This sea level rise is largely the result of the thermal expansion of the oceans; in other words, as they absorb the extra heat, so they expand, and the only way they have to go is up. The IPCC has, however, been criticised as being both cautious and conservative. The panel consists of both climate scientists and government appointees and operates by consensus. Some climate scientists, notably Jim Hansen of the Goddard Institute at NASA, have predicted 5 m of sea level rise or more this century. The extra water comes from the melting Greenland and West Antarctic ice sheets and anyone who follows the news will know that these are already melting at a much faster rate than predicted. At a recent meeting of climate scientists in Copenhagen, several commentators asserted that it is already too late to avoid 2° of warming, and we ought to expect 4°. This is pretty scary stuff and has

¹ “We”, in this case, means the two authors, one of whom is an archaeological contractor, the other a heritage manager. This paper represents our personal views rather than those of any professional body, institution or agency.

implications for every aspect of our way of life. It is the potential implications for archaeological heritage that we are concerned with here.

The most obvious threat is from rising sea levels. New Zealand is an island nation and the heritage and identity of our peoples, both indigenous Maori and European settler, is intimately linked to the sea, and that heritage is located on the coast. Climate change and rising sea levels will result in the destruction of archaeological and heritage sites all around our coast. Even the minimum predicted sea level rise of 1 m this century will undermine and destroy the fragile dunes in which much of this heritage is located, while a 5 m rise will effectively destroy all early period Maori archaeological sites. There are perhaps 10,000 archaeological sites in the coastal zone under immediate threat.

Currently we have no firm idea of exactly how vulnerable this heritage is, how to measure that vulnerability, what might be saved and how we might go about saving it. If whole classes of heritage sites are destroyed, what research questions can we ask of them? Importantly, how aware is the archaeological community of the threat?

Sea level rise is not the only threat. Others include increased flooding and ‘weather bombs’, tropical cyclones, desertification, fire, and vegetation change to name a few. Inland sites, particularly in the hill country, are probably under almost as much threat as coastal sites – these include pa, gold mining and pastoral sites. The latter remain an under-researched category. However, these other threats are neither so imminent nor so engulfing as sea level rise – while they must be kept in mind, we are concentrating here on sea level rise.

We should also point out that in the long term there may be as great a threat to heritage from population growth. Our current population is about 4.2 million, with an annual growth of less than 1%. New Zealand is probably one of the countries best suited to survive major climate change, as we are two temperate islands in the southern latitudes surrounded by ocean. Other countries may not be so lucky, in which case many millions of people will be knocking on our door demanding somewhere safe to live. Former NASA scientist James Lovelock, originator of the Gaia hypothesis, predicts a 95% cull of the human population this century and certainly under a business as usual scenario we can expect many millions of people to die as a direct result of climate change. The Global Humanitarian Forum calculates that already, in 2009, climate change accounts for deaths at 300,000/year, with direct impacts on 325 million people and an economic cost of \$125 billion. This will only get worse. So under any scenario we may become ‘lifeboat New Zealand’ with a

population of many millions, high intensity agriculture and large, dense cities. Massive development equals massive heritage destruction.

The two main questions that come out of this discussion are: how long do we have, and what can we do about it?

The first question cannot, of course, be answered with any certainty – we do not have a crystal ball, but we can make some reasonable assumptions. Given a 5 m rise in sea level this century, which we can assume to start slowly and gather momentum, then the effects on coastal heritage should start to become pretty dramatic around mid-century. This is a long time, 40–50 years, but it is also a pretty short time. Serious archaeology in New Zealand is barely older than that and there are still plenty of unanswered questions. The time for answering some of them is running out.

So, what to do? Climate change is a distinct threat to archaeology, but it is also, perversely, an opportunity. Nothing, surely, is off limits any more. Most archaeology in New Zealand is undertaken in reaction to the threat of site damage through commercial or infrastructural development. But these threats are local, contained and open to negotiation. The threat from climate change is none of those things – it is comprehensive and inescapable. Our thinking needs to change.

First, we need to understand that there are no practical solutions that can save coastal sites from a 5 m sea level rise – maybe Wairau Bar and a few other sites of very high significance could be saved from, say, 2 m, but only to provide a temporary reprieve. Wairau Bar, unless it is hit by an earthquake, as it has been in the past, and rises 5 m, is bound to be destroyed by gradual erosion, along with Houhora, Shag River Mouth, the Sunde site, et al. So, this really is a case of rescue by record.

We will only have the resources to rescue a fraction of our coastal archaeology, so we need to be sure of what we are rescuing, and recording, and why. This calls for a series of well constructed case studies – regional, thematic and methodological. The purpose here is not to dictate the direction of archaeological research, which is clearly undesirable. Rather, we seek to focus people's minds and look for ideas and solutions. Recognising that our opportunities are limited, we need to recognise that we also have a one-off opportunity to do some very useful archaeology.

One example of a thematic case study might be shell middens. Currently our most common site type, it is set to become one of our rarest. It follows that there is a limited opportunity to study these sites. Some might think that there is not much to middens – they are a pile of shells that are nasty to excavate and boring to analyse – so, why bother? Forty-six years ago Wal Ambrose published a short article in this journal in which he pointed out that middens

were structures reflecting a range of activities rather than just food waste with relevance to diet. This structure is dependant on, at a minimum, size, shape, position, function, environments, time frames and relationships to subsistence and settlement patterns, as well as post-depositional factors. The following year (1964, to save you doing the sums) Janet Davidson completed her MA thesis and also published a short piece in this journal pointing out that middens were not homogenous, they were quite varied internally. However, no methodology for dealing with the structure and variation in a midden has been developed. They still tend to be treated as homogenous deposits that only minimal sampling is required to characterise.

The information that can be gained from a midden is limited primarily by the sampling strategy, and if middens are sampled as though they were homogenous then the results will reflect this assumption. Sampling needs to be related to the midden structure, but Wal Ambrose noted that, in 1963, such structures had not been closely examined and this situation has not changed in nearly 50 years. Structure refers to the way the midden is built up, through the activities that occur on or beside it – dumping, digging, burning, raking out, redeposition – as well as activities that occur after the midden has ceased to be used – digging, trampling, erosion, historic period ploughing. In order to understand the activities that built the midden, it is necessary to understand this structure.

If we are concerned with sampling middens, we need to remember that we cannot save them all. We need to employ some sort of site triage in order to figure out what to rescue and what to let go. Letting sites go without investigation is difficult for archaeologists, but we may have to do it. Even within a landscape of middens, such as we find at Papamoa and many other places, it might be more productive to examine a number closely and in detail, with the sort of questions in mind we have mentioned in the last two paragraphs, rather than sample all middens at a low level with a 20 tonne backhoe. Let the others go, or take minimal samples.

And, how to deal with eroding middens that need urgent sampling? At present we need to obtain a section 18 authority from NZHPT just to take a sample. But going home, getting an authority and waiting until we are back in the neighbourhood several months later (we wouldn't make a special trip and burn unnecessary fossil fuels) only to find the site now gone entirely is not very useful. We need to change the way we do things, perhaps obtaining blanket authorities that allow us to sample a threatened midden where this is justified. Can we just take a few samples, collect some data and hope to interpret it later? In order to do that, we must have questions in mind to ask of the site, collect

our data accordingly and recognise that interpretation happens at the edge of the trowel. What we do now constrains what we can do in the future.

And, what will we do with all these samples? Must we analyse them immediately, or might we store some for future generations of archaeologists and students to work on with new questions and new techniques. If so, where? We currently have no storage facilities set up to look after tonnes and tonnes of samples long-term. Our response to climate change needs to be thought through in detail, thinking in the long term and thinking practically.

Another thing we want to do is establish a network or association of heritage practitioners who are interested and willing to address the problem of the effects of climate change on the cultural heritage of Aotearoa / New Zealand, using such means as newsletters, web sites, blogs and forums. By heritage practitioners we mean archaeologists, Maori, local historical societies, governmental and council institutions and anyone else who has valid concerns. This is not a project for just the NZAA or NZHPT, it is for all of us. As a first step we have set up an online forum, currently at <http://archaeopedia.com/climate>, which anyone is welcome to join and to contribute to. We hope you will.

Finally, we note that archaeology is not the only heritage under threat – much of our built heritage in our major cities is coastal, to say nothing of our already fragile natural heritage. And spare a thought for our Pacific brothers and sisters. Nations like Kiribati and Tuvalu are expected to disappear beneath the waves entirely, and their archaeology is a virtual terra incognita. There may be more important responses to climate change: saving human lives, and directly addressing the problem spring to mind. Even so, rescuing what is important to us and our culture remains vital, and that is our task as archaeologists.

Further reading

Here we briefly summarise just a few of the many sources of information available. We do not list technical papers, which are often hard going for non-climate scientists. Readers of magazines like *New Scientist* or *Scientific American* can keep up with the latest research in digest form, and can look up the technical papers if they want. Neither do we list some of the more extreme views, such as those of James Lovelock mentioned earlier. However, Lovelock was once reviled for his formulation of the Gaia hypothesis, but this is now much more openly discussed. Gaia is the perfect vehicle for understanding

the global interrelationships of climate change so perhaps this is one man we should be listening to.

The impacts of climate change on heritage do not seem to have been widely discussed yet, but we must assume that this will change as the implications become clear.

David Archer 2009. *The Long Thaw: How Humans are Changing the Next 100,000 Years of Earth's Climate*. Princeton University Press, Princeton.

The title sums it up – even under the best case scenarios it will take at least 100,000 years before the Earth's climate cycles return to 'normal'. This book is also an excellent beginners' guide to climate change, with the mechanisms of the carbon cycle clearly explained.

Anthony Giddens 2009. *The Politics of Climate Change*. Polity Press, Cambridge.

Giddens explores what is needed on the international political stage for us to address the problem. Though he does not neglect local action, he proposes that without global action nothing worthwhile can happen. Some might consider him tainted by his association with New Labour's 'Third Way' and certainly we think local action (which we are, in effect, proposing) has a great deal going for it, but most of what he has to say is sensible and sobering – it will not be easy but it is doable.

Gareth Renowden 2007. *Hot Topic: Global Warming and the Future of New Zealand*. AUT Media, Auckland.

Renowden outlines clearly and concisely what the implications are for New Zealand. The book is two years old and the predictions have become a bit more dire since then, but this is essential reading.

William F. Ruddiman 2005. *Plows, Plagues and Petroleum: How Humans Took Control of Climate*. Princeton University Press, Princeton.

Ruddiman proposes, perhaps with good reason, that we should by now be in an ice age. The reason we are not is that ever since the expansion of the Linearbandkeramik culture across northern Europe, which involved cutting down and ploughing vast swathes of forest, thus releasing gigatonnes of carbon, and the establishment of paddy rice in China, which releases similar amount of

methane, we have been causing global warming. This remains open to debate but for archaeologists it is a fascinating concept.

Jeffrey Sachs 2008. *Common Wealth: Economics for a Crowded Planet*. Allen Lane, Camberwell, VIC.

This is the most comprehensive item on this reading list. Sachs has a clear view of the causes and costs of climate change and shows, very clearly, that climate change cannot be addressed without addressing population growth and poverty at the same time. The problem is not really carbon, it is people, and too damn many of them.

Nicholas Stern 2009. *The Global Deal: Climate Change and the Creation of a New Era of Progress and Prosperity*. Public Affairs, New York.

Stern was the economist whose report in 2007 focussed peoples minds on the economic costs of climate change. Like Giddens, Stern is a ‘Lord Professor’ and tends to see things in global rather than local terms. Unfortunately, our leaders are not leading us when it comes to climate change, so it might be a mistake to put too much faith in global institutions and the very people who have brought us to this point. And, let’s be honest, economics is tedious if necessary, and this is not a light read, but it does demonstrate clearly that the costs of inaction far outweigh the costs of action.

Gabrielle Walker and Sir David King 2008. *The Hot Topic: What we can do about global warming*. Harcourt, Orlando.

Another excellent book that clearly outlines the science. In this case they take more of a sector by sector approach to the problem, as well as looking at the major industrial and developing countries in some detail.