

The last Vicmanian lessons for an uncertain future

About 13,000 years ago the last Vicmanians were confronted with a terrible reality - their land was drowning. Through human induced climate change we are now committing ourselves to a similar fate. Unlike the Vicmanians we can foresee the future. If we are to do anything about it, we need a new understanding of the services our natural environment provides, including our crust.

What were the last Vicmanians thinking confronted with the terrible reality that their land was drowning? The Vicmanians occupied Bass Strait during the first 30,000 years or so of human occupation of Australia. Prior to 10,000 years ago sea levels were lower than today, and Bass Strait was largely exposed. At the height of the last ice age 18,000 years ago sea levels were about 130 metres lower. Between 18,000 and 10,000 years ago the sea rose to present heights, progressively drowning Vicmania. Around 13,000 years ago, sea level was 65 lower and rising fast, at more than 2 meters per century, destroying the last land bridge and thus creating Bass Strait. The last Vicmanians were confronted with a fateful choice. Those that chose to stay south, the first true Tasmanians, forever separated from their northern cousins.

At 2 meters per century, the last land bridge must have been severed within the lifetime of one individual. Presumably there was a period when the bridge was shallow enough to bridge in low tide. But gradually the risks became too great. Presumably there were casualties; drownings, possibly family separations. Who knows, for all this is now 65 metres below sea level explaining just why we have such a fragmentary record of the first Australians. Their land is now largely submerged beneath the sea.

We now know that changes in sea level go hand in hand with the amount of CO₂ in the atmosphere. Between 18,000 and 10,000 years ago, the concentration of CO₂ rose from about 200 to 280 ppm (parts per million) at the rate of about 1 ppm every 100 years. We know this because we can measure it in tiny air bubbles trapped in the great ice sheets of Antarctica and Greenland. These trapped bubbles tell a remarkable story of how our planet changes through time, and how it will change into the future. Over the last 50 years atmospheric CO₂ has been rising at rate of well over 100 ppm's per century. That is more than a 100 times as fast as when the last of Vicmanians witnessed the drowning of their land. What does it mean? To those of us versed in reading the record of our planet it can only mean one thing. We are committing to rising sea levels. Higher CO₂ levels go hand-in-hand with higher sea level - that is the undeniable message from the rocks!

Of course we might ask why haven't sea levels already risen significantly, since CO₂ levels are already way outside the range of the last few million years. The reason is that sea level rise is function of ice melting. As CO₂ increases, the atmosphere heats, and the ice begins to melt. We have increased CO₂ so rapidly that the atmosphere has not yet had time to heat the ice. But we know it is happening. Sea levels have begun to rise. Seas are getting warmer and expanding and the ice is beginning to melt. The last time in geological history we had so much CO₂ in the atmosphere there was very little ice on the planet and sea levels were very much higher than today, by between 60 and 70 meters higher. We can see this all around southern Australia. Five million years ago, the sea extended hundreds of kilometres inland across the Murray Basin as far as Kerang in northern Victoria. Australia was very different place, as it will inevitably become once again if atmospheric CO₂ levels remain at 400 ppm.

How long it will take we do not precisely know. But we do know that 13,000 years ago when the last Vicmanians disappeared and CO₂ was rising at just 1% present rates, sea levels were rising by at least at 2 meters per century. Our problem, or at least the problem for our children's children, is that we are committing to sea level rises of at least that magnitude. The history of our planet, the only history relevant to this story, tells us so. It is written in the rocks.

Most of the evidence of the first 30,000 years of occupation of this continent is now submerged beneath the sea, along now drowned former coastal fringes. Just like the first Australians, much of the evidence of our occupation will also be submerged. The CO₂ we are putting into the atmosphere is committing the melting of the ice. Once the ice is gone sea levels will be 60-70 metres higher. Almost all the great cities of today will be submerged. At 2 metres per century we are talking just 3,000 years hence. The story of the rocks tells us so!

Climate change is the biggest issue of our time. Climate projections point to a range of possibilities. There is uncertainty; modeling is just an informed estimate of potential realities. Many are alarmed. Others cannot see the changes happening, and are skeptical. Where is the sea level rise, they ask? We who read the story of the rocks know there is nothing new in such change, and future change is expected as part of an ongoing cycle. We attribute that change to different things and still have important lessons to learn. But we should not be confused. Our planet has never had so much CO₂ in the atmosphere with so much ice on the land. The most important history, the history of our planet, tells us something must give. Just when, we do not precisely know, but the record of Earth's past is unambiguous. Our seas must rise and we will have to adapt.

The cause of our problem is simple. We have taken for granted a fundamental service provided by our natural environment. For 10,000 years we have lived with an equable climate, at least when compared with the preceding 100,000 years. We have assumed the climate is a given. We have built our cities along the sea front, as hubs based around our ocean going transport systems. We did not understand that sea levels could change. Now we know sea levels have changed in the past and surely will in the future. We also now understand that change is imminent because the CO₂ we are injecting into the atmosphere is compromising this most basic of natural services. Because of the CO₂, our climate can no longer balance the amount of ice and water on the planet required to maintain stable sea levels at these historical levels.

Understanding the services that the natural environment provides is essential to adaptation to future change, and this includes the services provided by our crust. Within the story of the last Vicmanian is a powerful lesson that tells us of our own predicament and should align geoscientists with a new sense of purpose. We need urgently to understand the capacity of our the services provided by our natural environment on which we have become so crucially dependent, including those provided by the rocks beneath.