

Article

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TEACHER AS LEARNER: USING SEA-LEVEL RISE
TO COMMUNICATE THE SERIOUSNESS OF CLIMATE CHANGE

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INTRODUCTION

This article reflects on one effort to better communicate the seriousness of how global climate change will impact New Zealand society (McKenzie, 2022). The article excavates the author's own learning as an educator over the last decade. In a social context where scientific information and public discourse about climate heating continue to change, both the content of and approach to teaching have had to be continually revised to meet the needs of students and other learners. Climate concerns have been politicised and denied by vested interests for decades (Garrett, 2017; Leonard, 2019). Moreover, most manifestations of climate change are hard-to-see, almost unimaginable, amorphous problems, that are difficult for ordinary members of the community to 'get' (Norgaard, 2011).

Even clear communications like Al Gore's (2018) *An Inconvenient Truth* or Naomi Klein's (2017) *This Changes Everything* have yet to shift governmental and business behaviour. The graph-lines of atmospheric CO₂ and temperature rise continue steeply upwards. The diffuse elements of enormous scale, long timespans and the local limits of human observation, where people live and act, make it hard for people to register just how serious climate change is. Motivating new environmental, recycling and other mitigating practices are all parts of the solution to our enormous planetary social problem. It is difficult, however, to create motivation for such broad conditions, circumstances for which action does not make an immediately observable difference.

Motivational models derived from individualistic forms of psychology are relatively ineffective in securing understanding and buy-in from more than a small proportion of society. For the rest of us, the discursive force of public opinion is a more powerful motivator, especially for middle adopters and laggard adopters resisting the serious importance of climate change. Government regulation and encouragement in participating in public discourse about the urgency of social change is becoming more central as each day goes by (Blennow & Persson, 2009). In motivational terms, for tackling complex social problems an alternative way to think of environmental motivation for the bulk of the population is *after the fact*. Acquiring an electric car, actively recycling household waste or planting a farm gully has those involved much more articulate *afterwards* on the benefits or moral desirability of what they have just achieved.

Discourse as headwind or tailwind?

Teaching or communicating always happens within prevailing discourse (Christoff, 2013). An idea or opinion is not just a molecule of information or evidence by itself. A fact is always a fact within a context, viewed and motivating (or not) from one perspective or another, perhaps from a place of privilege, Western-ness, gender or race, perhaps from the vantage point of the 'one percent' or from a particular political position. Further, facts are interpreted *against* other interpretations (Garrett, 2017). Like other strategies that de-value the views of women or Māori, getting environmental and climate change facts moving is not simply a matter of stating clearly

and compellingly different information and the need to change (Van Den Berg et al., 2022). Before articulating the need for change – since this cannot be done simply by asserting truth or reality – ways have to be found to cut through, at least to some extent, the current dominant voices in the conversation, so new information gets an opportunity to be heard (Kline, 2021).

BACKGROUND AND CONTEXT

Within my regular practice of pedagogical analysis of tertiary education, I have found that some writing reflects on the teaching craft more particularly (Kaufman & Schoepflin, 2009). Recent examples include Burns (2016, 2017, 2018, 2020a, 2020b). Reflection usually involves reporting on experiences and lessons learned as a teacher in relation to theorising how better to assist students to understand a concept or principle drawn from academic or professional literature, or considering empirical teaching circumstances. In this discussion, that broad personal agenda continues, albeit incorporating two contrasts from previous writing. First, the content here is about environmental change rather than gender, ethnicity, spreadsheet use, mentoring or research methodologies. Second, in my current role, sometimes with students and sometimes with local and rural constituencies, my orientation is communicating core climate and environmental ideas in as simple terms as possible, in both classroom and community.

The present article reflects on the pedagogical problem of communicating climate change and on personal progress to date in this area, feeling that there is much more to do. In creating an active pedagogy that reaches beyond the science and the need to change politics, Kopp (2021) observed recently:

At the most basic level, the facts about climate change have been clear for a long time, with the evidence just continuing to grow. As a result of human activities, the planet is changing at a rate unprecedented for at least thousands of years. These changes are affecting every area of the planet.

Such confirmed and inarguable evidence, matched by little realistic action, is a problem addressed explicitly by a group of scientists and planners: it is not the science, nor is it the general population's lack of will that is at fault. Glavovic, Smith and White (2021) see a popular disconnection with the science, even though "Governments concur that the science is settled on the reality of climate change" (p. 2). For this reason these authors propose a moratorium on science research, arguing that "the tragedy of climate change science" (p. 3) is the failure of governments to act on the social contract between science providing the information and government taking requisite actions on behalf of the population. Their second option (between science-as-usual and objecting to more science research) is:

intensified social science research and advocacy on climate change. It focuses on better understanding why action has not occurred, and how to enable the behavioural and institutional changes required to contain global warming and climate change impacts. To date, funding has been dominated by the natural and technical sciences. ... We recognize that in recent decades much more work is being done in this realm by political scientists, sociologists, economists, human geographers and the like, and this has exposed the powers and vested interests that have impeded climate action ... In parallel there has been a recognition among both scientists and the public of the need for increased advocacy by the scientific community. (pp. 2–3)

Sadly, almost despairingly, they continue:

However, even with more social science research, scientific advocacy and significant support from civil society, there have been no signs of systemic change in government action. There

is no evidence that more social science research and traditional forms of advocacy will lead to transformative action within the timeframes required to avert dire climate change consequences. (pp. 3–4)

In summary, they acknowledge that in light of the urgency of climate change this “second option is therefore also not tenable.” These authors advocate choosing a more intransigent third option, namely rejecting doing more science, asserting that further money spent is wasted since the science is clear – “unequivocal” in the phrasing of IPCC6 (Kopp, 2021).

In supporting such grave concerns as Glavovic, Smith and White express, my own interest in sea-level rise provides one important bridge for talking in everyday terms to a range of student and non-student audiences.

SEA-LEVEL RISE AS A ‘HEARABLE’ TOPIC

Talking about sea level seems to avoid trigger words and the retreat from technical and academic language. Even today, the phrase “climate change” can elicit reaction or resistance. Important terms like “anthropogenic,” which are becoming central in policy discourse, can leave individuals behind, missing the personal consequences needing their attention and action. Even words like “biodiversity,” which have become part-and-parcel of environmental discussions about bush, forests, farming or urban environments, are technical terms that ordinary folk do not use or immediately understand (Myerson & Rydin, 2006). Overused terms like “sustainability” become susceptible to green-washing, plus a more critical challenge – do we seriously want to *sustain* an already degraded environment? Each part of climate change – heating, CO₂ emissions, sea-level rise, biodiversity loss, land and water degradation, plastic and chemical contamination – is, of course, interlinked with others in multiple ways.

How can we open the conversation to help people appreciate the seriousness and urgency of what humanity is facing? My search for ways to better communicate climate change continues to build year by year. Figure 1 and the chronological discussion that follows describe my personal learning progress about sea-level rise and the need to alert learners to the seriousness of climate change.

Year	Process	Substance
2015	Teaching sociology	Climate denialism, environment – society link
2016	Conference paper	SLR – impacting Australian university campuses
2017	Finding articles	Demystifying the science for non-scientists
2018	Finding articles	Sea-level measurements – updated studies
2019	Finding articles	Shifting to a new research environment
2020	Presentations	Regen ag, soil, erosion; people in community
2021	Poem; Teaching geography	First-year subject, “Environment and Society”
2022	Using hands to show SLR	Science/human impacts; latest IPCC6 report

Figure 1. Understanding sea-level rise (SLR) to teach environmental and climate change.

Any complex learning process contains threaded chronologies of learning: partial insights, going back and re-learning, as well as learning something new about what was previously known, connecting this to additional information, or ways that ideas might be applied. All of us need to learn about the dire climate circumstances we and our descendants are now living in.

2011–2015: SEA-LEVEL RISE AND SOCIETY

Over the last decade I have taught into a large first-year Introduction to Sociology course in Australia. All three editions of the textbook used over that time included a final chapter on society and the environment. That chapter was written by a sociologist practicing his environmental commitment through annual trips to help a small Indian village. But environment was only an adjunct to the serious topics of work, leisure, gender, ethnicity, technology and similar. Sociologists were then beginning to critique their discipline's lack of engagement with the environment and climate change (Lever-Tracy, 2010; Urry, 2010).

Teaching in both Australia and New Zealand has created connections between race and climate activity; about working with nature, rather than unilaterally imposing our human will on it; about including humans within nature, not endlessly exploiting it. While climate change is indeed apocalyptic in planetary terms, Indigenous scholars understand that as humans they are part of nature, and need to respect nature. But Western knowledge about looming climate disaster may not help deepen understanding of the problem (Davidson & Da Silva, 2021). After all, whose apocalypse are we talking about? Whose actions are causing the problem? Congruent with this critique, it may be that talking about sea-level rise better focuses on what the facts mean, since most people think climate change is about science.

Another personal influence in this period was Hurricane Sandy's damaging impact on New York in October 2012. Commentators described how a small rise in sea level created very much larger surges that could encroach on places and people beyond the reach of higher water levels as conventionally understood (McInnes, Hemer & Hoeke, 2016). Every so often, I read yet another scientific journal article updating information about sea-level rise from glacial or Arctic melting caused by climate heating.

2016: THE RISE AND RISE OF SEA LEVEL

Students seemed to find sea-level rise the least controversial part of climate change discussions – despite being factual, historically documented and implying obvious consequences for society. At this time, I found myself fascinated by online interactive global maps that allowed clicking on different levels of sea-level rise to show what would happen to major coastal cities that most students knew by name. An example of such a map is the “Sea-Level Rise Viewer” (<https://coast.noaa.gov/slr/#/layer/slr0>) in which any world city or region can be viewed to see these changes by selecting a range of SLR expressed in feet or metres.

Working with an outstanding Honours student, I prepared a paper for the Australian Sociological Association conference, assembling a series of maps for our presentation from the interactive sea-level rise map tool (Burns & Ireland, 2016). We chose the example of Australian coastal metropolitan university campuses. Many of these campuses are located close to sea level. My own campus several kilometres inland seemed relatively safe, but Melbourne, Victoria and Monash universities would have potential problems. The concept was simple, the results followed the science, and the results were alarming. Why had those sea-level rise websites bothered to include several-metre rise options to interact with? Certainly, while this was not the virtual game *Sim City*TM, clicking sea-level rise amounts meant inundating cities and coasts, being godlike for a moment. We imagined ourselves speaking to university campus property managers who plan decades or even longer timescales ahead, deciding where multi-million-dollar investments in university buildings should be made.

2017–2020: MORE KNOWLEDGE, MORE WAYS OF SAYING IT

Shortly after this, I was invited to give the social science lecture in an Environment and Society subject taught out of a science faculty. The social and human aspects were peripheral to the personal focus and sense of expertise of the ecology lecturers on the course. I read voraciously around then-current science, feeling I was being put on

my mettle in front of 'real' scientists. The subject co-coordinators asked me could they sit in to listen to a social science perspective, and afterwards in the debriefing they seemed surprised at how I had spoken plainly about how sea-level rise and other data points would very seriously impact people and populations. I learned about the tensions surrounding science neutrality – “just the facts” – that often hold scientists in thrall, over against the importance of getting the point of the science across to people in society.

The article by Hansen et al. (2015) which I read at this time illustrated the crossover between social science and the clear social message of at least some biophysical and climate scientists: ice melting, glaciers retreating, more extreme storms and sea surges, hotter temperatures causing ocean expansion and encroaching coastlines. These authors explained the evidence and the historical record of our modern centuries was graphed simply and clearly – there is only one way that sea-level rise is heading. More than that, however, their sense of urgently needing to speak plainly impressed me. Reading Friedman's (2010) folksy analysis further sharpened my understanding: Mother Nature is neither threatened nor offended by human environmental over-reach, but she is not impressed either, always simply following the physics, biology and chemistry.

Other examples of my reading about the science of sea-level rise, like DeConto and Pollard's (2016) analysis of past and projected influences on polar melting, widened my science knowledge. I read with the aim of enhancing my social science understanding, including Chapman, Lickel and Markowitz (2017) on the role of human emotion in deepening understanding and commitment to change. Each year I practiced different ways of saying what I was learning. In the early years of the decade students off farms would respond in class with statements like, “My Dad doesn't believe in climate change,” but by mid-decade such responses had ceased.

2021: CLIMATE SADNESS, THE POEM

Attending a conference in Cambodia, I found myself marvelling at oceans of rice fields and the amazing hydrology of Tonlé Sap, the large lake–river system at the centre of the country and the economy, which will be obliterated by any significant rise in sea-level. I wrote a poem called “Climate Sadness” as a new way to communicate sea-level rise – bringing the human emotional impact of climate change together with the science (Burns, 2021, p. 1):

The poem is sad for Tonlé Sap, for Cambodia, and implicitly for all of us on this planet. For thousands of years people have lived around Tonlé Sap, adapting to weather, the flow of water from mountain to sea, and the changing ebb and flow of civilizations. Anthropogenic sea-level rise challenges all of this human history, unnecessarily.

This statement reflected my feelings visiting Tonlé Sap that something more than academic analysis and discussion was needed – rather, something visceral and human – to communicate the seriousness of climate change.

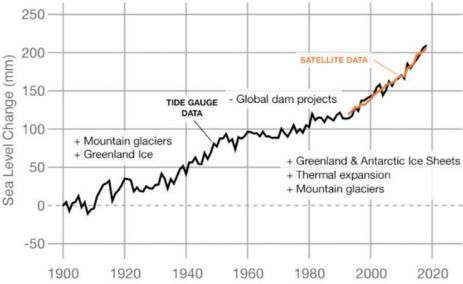
At a recent public presentation to an informed but non-specialist audience, I found myself locating the importance of regenerative agriculture within the context of global climate change. How much longer would the oceans be a sink for carbon? As global heating and sea-level rise continue, oceans lose their capacity to hold carbon, releasing large amounts of CO₂ and triggering yet further rounds of heating and then even further sea-level rise. How to get that across? Going back to my science reading over several years, I found that the exact quantification of sea-level rise in millimetres is readily available (NASA, 2021; see Figure 2). The width of my left-hand fingers and thumb represented sea-level rise across the twentieth century – my audience's parents' and grandparents' lifetimes (nearly 100mm). The width of my right hand and thumb represented sea-level rise in the last 25 years (over 100mm) – accelerating in our own lifetime. I said, “You mightn't be able to see it, but that's what's happened.” Short, clear, summative of the science, and personal.

SLR across the twentieth century

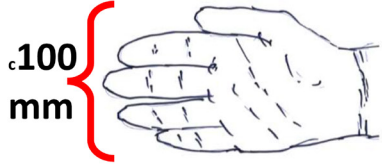


SOURCE DATA: 1900-2018

Data source: Frederikse et al. (2020)
Credit: NASA's Goddard Space Flight Center/PO.DAAC



SLR over the last ¼ of a century



SATELLITE DATA: 1993-PRESENT

Data source: Satellite sea level observations.
Credit: NASA's Goddard Space Flight Center

RATE OF CHANGE

↑ 3.4
millimeters per year

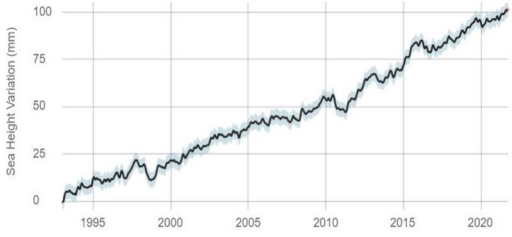


Figure 2. Visualising NASA (2021) sea-level rise data in human terms.

A new undergraduate geography class, Environment and Society, necessitated updating references, joining the science and the human implications, looking at questions of inclusion, looming climate impacts, and theorising climate “non-change” (Wörten, 2011). The same demonstration of sea-level rise as shown in Figure 2, waving my arms about, led a mostly younger audience to discussing climate change speeding up and potential step-changes to a much greater rise in sea level, since hotter temperatures could lead to sudden, massive ice-melt events. How can we shift from fatalism, or ignoring the problem, to action?

2022

Wider climate change concerns can be concretised and made real, even though sea-level rise, too, occurs at planetary scale and the millimetres cannot be seen in daily or yearly changes. Drawing on his IPCC6 involvement, Kopp (2021) refers to sea-level rise:

Global sea level has been rising at an accelerating rate since about 1970 ... two main factors ... the melting of ice in mountain glaciers and at the poles, and the expansion of water in the ocean as it takes up heat. ... Sea-level rise is leading to substantial impacts on coastal communities, including a near-doubling in the frequency of coastal flooding since the 1960s in many sites around the world.

On relevant occasions I introduce news stories raising sea-level rise issues to anchor discussion. For example, McGregor (2021, n. p.) describes recent coastal flooding across Pacific island countries, creating “widespread damage to buildings and food crops”:

In a terrifying glimpse of things to come, this current La Niña is raising sea levels by 15-20 centimetres in some western Pacific regions – the same sea level rise projected to occur globally by 2050, regardless of how much we cut global emissions between now and then.

I find myself re-working this point for audiences to counter over-hyping the current 2050 zero-carbon emission policy buzz that can be nothing more than an intermediate goal, given the continuing momentum of global heating and sea-level rise.

This year's class has been re-badged from Environment and Society to A Planet Under Pressure. One of my slides in the final class was a screenshot of Aschwanden et al.'s (2019) abstract, the opening sentence of which reads, "The Greenland ice sheet holds 7.2 metres of sea level equivalent and in recent decades, rising temperatures have led to accelerated mass loss." I dramatised our class discussion of sea-level rise flooding coastal cities by heading the slide "One horse of the apocalypse." I will need more hand-widths of visual imagery in future classes.

Today, global and national science strategies explicitly attend to the consequences of CO₂ for planetary heating, which in turn impacts oceans, with consequential effects for human populations (NASEM, 2021). The current calculation of NASA (2021) shown in Figure 2 is a 3.4mm sea-level rise per year and accelerating. In those commentators displaying an over-abundance of caution (for example, Kopp cited above), it is rare to read what this means for the world's coastal cities: this small figure implies a one-metre rise in the next 30 years, even before an increasing rate of acceleration, or sudden melt event, is included.

CONCLUSION

Experienced educators treasure their accumulation of learning plans and teaching examples. Here, however, new evidence, new graphs, and new implications of climate change necessitate accelerated teacher learning and further development. Discussing sea-level rise engages attention without triggering negative reactions. It makes learning more personal and real, not simply cognitive. It also makes visible the existential threat facing humanity. In this field, the educator's moral imperative is to find ways to communicate the climate message against indifference, naysaying or organised interests. It means bringing the appropriate factual and verifiable science to those yet to appreciate that the science is settled and rock-solid, and that the growing climate-change momentum disfavouring the human species is potentially catastrophic.

The twists and turns of experience, chance meetings, events and the reactions of those listening are all part of educators' continued learning of their professional craft. Learning about sea-level rise has been a cumulative journey to find a 'hearable' message that will convey the seriousness of climate change. Ideals of service and learning, 'turning lights on' in the routines of semester cycles, meetings and seminars are all foundational for expressing such major imperatives for society today.

Edgar Burns has taught in the polytechnic and university tertiary sectors for more than 25 years. He takes an interdisciplinary approach, starting from his core sociology teaching and research roles. In his present role, influencing attitudes to environment and climate are priorities. His recent book, *Theorising Professions: A Sociological Introduction*, was published with Palgrave Macmillan.

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