Addendum to:

"Comments on Jacobs's Methodology Report (Volume 1)"

Consequent upon the publication of:

IPCC, 2021: *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* August 2021

Coastal Ratepayers United
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Kāpiti Coast
New Zealand

INTRODUCTION

In July 2021 Coastal Ratepayers United Inc. (CRU) prepared a review (the "*CRU Review*") of a report by Jacobs NZ Ltd for the Kapiti Coast District Council: *Kāpiti Coast Coastal Hazard Susceptibility and Vulnerability Assessment Volume 1: Methodology*. The Jacobs Report was to "update previous coastal hazard assessments undertaken along the Kāpiti Coast District shoreline" to assist the KCDC's "Takutai Kāpiti: Our community-led coastal adaptation project".

The *CRU Review* addresses a number of professional judgments and technical assumptions made in the report that detracted from its usefulness for KCDC and the community in supporting its stated purpose (1.1), particularly its use for Hazard Assessment under the NZCPS for planning purposes.

Since then then the IPCC, has published *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* August 2021, providing a major update on the climate related aspects of the Kapiti coastal processes.

We have therefore reconsidered the *CRU Review* in light of the IPCC AR6 WG1 report and have prepared this brief addendum addressing two areas where AR6 provides additional insights[1]:

2. Relationship between Global MSL and Local SL.
4. Use of RCP 8.5H+ and de facto Adoption of RCP 8.0 for Sea-Level Rise (SLR).

This addendum should be read in conjunction with the *CRU Review*. In particular, we draw attention to the disclaimers made in the *CRU Review* that also apply to this addendum.

2. Relationship between Global MSL and Local SL.

The *CRU Review* drew attention to the weaknesses in Bell et al. (2018) as used by the Jacobs Report for adjusting the Global MSL rise to give the Wellington Relative SLR. This is needed to assess the impact of GMSL rise on the Kāpiti coast.

The Jacobs Report used Bell et al, 2018 to estimate an average historic rate of RSLR from 1900 to 2017 at 2.28 ± 0.15 mm/yr, compared with a global average rate of rise of 1.7 ± 0.2 mm/yr from 1901 to 2010 (IPCC, 2014). This would suggest applying an adjustment of ~0.6 mm/yr to GMSL projections to get an estimate of Wellington RSL projection, but Jacobs instead applies 1 to 3 mm/yr adjustment into the future, not carrying forward several sources of local change on the basis that they are unpredictable.

Jacobs therefore overstates projected RSLR by using the worst case possible.

IPCC AR6 WG1 (2.3.3.3) revisits its estimates of the 1901 to 2010 global average rate of SLR adopting 1.5 ± 0.1 mm/yr (Table 2, Palmer et al (2021)[2], the basis for IPCC's revision). This change would marginally increase the adjustment to AR6 projections needed to give RSLR at Wellington (~0.8 mm/yr). This is slightly closer to what Jacobs assume, but it still overstates the projections rather than incorporating the uncertainty into the overall projection uncertainty.

Denys et al. *Sea Level Rise in New Zealand: The Effect of Vertical Land Motion on Century-Long Tide Gauge Records in a Tectonically Active Region* (2020)[3] gives a more extensive analysis of these issues than Bell et al. (2018), and Table 6 shows closure across the country (1891−2013) to within the margin of error of the IPCC AR6 global average 1901 to 2010 rates of increase. This would argue for the use of an average adjustment of only ~0.6mm/yr (2.18mm/yr less 1.56mm/yr) to ASLR projections, and also provide the basis for

[1] Carrying forward the *CRU Review* numbering on the two points.
[2] https://doi.org/10.1088/1748-9326/abdaec
[3] https://doi.org/10.1029/2019JB018055

estimating the uncertainties for use of this adjustments in the Monte Carlo simulations as set out in the *CRU Review*.

4. Use of RCP 8.5H+ and de facto Adoption of RCP 8.5 for Sea-Level Rise

The CRU Review made the point that the use of RCP 8.5H+ and de facto adoption of RCP 8.5 for Sea-Level Rise did not give effect to NZCPS Policy 24 because these scenarios didn't represent the "likely effects" of climate change. Our comments were based on the literature describing the AR5 RCP scenarios and their construction, and more recent comment along the same lines from Zeke Hausfather.

This has been further reinforced by IPCC AR6.

AR6 has developed the scenarios further, adding different socio-economic development pathways (SSP) to the earlier representative concentration pathways (RCP). Where AR5 had been silent on issues around scenario likelihood AR6 now explicitly addresses it (1.6.1.4). It states:

> "In general, no likelihood is attached to the scenarios assessed in this Report. …
>
> "… However, the likelihood of high emission scenarios such as RCP8.5 or SSP5-8.5 is considered low in light of recent developments in the energy sector (Hausfather and Peters, 2020a, 2020b)[4]. ..."

This is further discussed in Section 4.2.2 where it notes:

> "… The high-end scenarios RCP8.5 or SSP5-8.5 have recently been argued to be implausible to unfold (e.g., (Hausfather and Peters, 2020); … . However, where relevant we show results for SSP5-8.5, for example to enable backwards compatibility with AR5, for comparison between emission-driven and concentration-driven simulations, and because there is greater data availability of daily output for SSP5-8.5. When presenting low-likelihood high-warming storylines we also show results from the high-end SSP5-8.5 scenario.

Thus, the Jacobs' projections are "implausible", and they are basically only used by the IPCC for comparative reasons.

Further Section 1.6.1.4 then goes on to say:

> "... SSP3-7.0 and SSP5-8.5 are explicit 'no-climate-policy' scenarios (Gidden et al., 2019; Cross-Chapter Box 1.4, Table 1), assuming a carbon price of zero. These future 'baseline' scenarios are hence counterfactuals that include less climate policies compared to 'business-as-usual' scenarios – given that 'business-as-usual' scenarios could be understood to imply a continuation of existing climate policies.... Studies that consider possible future emission trends in the absence of additional climate policies, such as the recent IEA 2020 World Energy Outlook 'stated policy' scenario (International Energy Agency, 2020), project approximately constant fossil and industrial CO2 emissions out to 2070, approximately in line with the medium RCP4.5, RCP6.0 and SSP2-4.5 scenarios (Hausfather and Peters, 2020b) and the 2030 global emission levels that are pledged as part of the Nationally Determined Contributions (NDCs) under the Paris Agreement (Section 1.2.2; (Fawcett et al., 2015; Rogelj et al., 2016; UNFCCC, 2016; IPCC, 2018)."

The world is likely to see more serious emissions mitigation efforts in the future, and so the likely future pathways will be below the current 'business-as-usual'. Thus, adaptation planning should consider SSP2-4.5 as the upper limit of what is likely. While higher scenarios are not impossible, they are very far from

[4] References as per AR6 WG1 Report.

being likely, and should not be central to adaptation planning. Thus, based on IPCC AR6 WG1, the high end of the "likely effects" of climate change would be best represented by the SSP2-4.5 scenarios.