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Interactive comment on "Mātauranga Māori in geomorphology: existing frameworks, case studies and recommendations for Earth scientists" *by* Clare Wilkinson et al.

Marc Tadaki

marc.tadaki@cawthron.org.nz

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This paper provides a comprehensively researched and carefully drawn road map for conducting bicultural geoscience. After reviewing studies of indigenous knowledge and distinguishing Western science and matauranga as systems of knowledge production, the authors compare three theoretical frameworks for bicultural knowledge production, and then compare three more specific 'models' for weaving Maori knowledge and fluvial science together. These examples are extremely helpful, though the He Awa Whiria framework and the Sustainability Assessment Model are not detailed enough to enable a practical comparison against the others. The paper also describes New Zealand-

based geoscientists' specific obligations to support Maori knowledge through Vision Matauranga, and how that operates through funding structures. In assessing the different theoretical and practical approaches to weaving knowledges, the authors draw out implications for geomorphology both locally and internationally.

A unique strength of the paper is its careful treatment of matauranga Maori. Although I cannot evaluate the cultural validity of the authors' treatment of matauranga, I would say that it is among the more sophisticated and ethically nuanced social scientific treatments of matauranga that I have read. The authors clarify that the matauranga described in the paper (e.g. the concepts and values in the glossary) is not their own and that it belongs to the communities that have produced it. They urge that matauranga should not be conceived as simply a body of knowledge but as an entire system through which the world is known and experienced. The concept of whakapapa (translated as genealogy) is "a structured methodology for creating matauranga" (L179) and as such the question of who produces knowledge matters as much as what kind of knowledge is produced. The authors also usefully reinforce the point that "Scientists cannot rebuild or revitalise matauranga; that is for Maori to do (Broughton et al. 2015)". This nuance helps geoscientists to understand their roles as supporting Maori as matauranga producers. In the account of Te Ao Maori (the Maori world view) presented here, the social relations of knowledge shape its validity as much as the method by which it is produced. Together, these nuanced points about matauranga enable geoscientists to build respectful relationships (and respectful boundaries) with Maori communities.

The paper, while necessarily selective, is one of the most comprehensive of its kind while remaining concise, accessible, and focussed on the 'so what' for geoscience-trained researchers. The paper provides a useful guide for geoscientists (or even social scientists!) who are interested in conducting research in ways that seek to respect and enhance the dignity of indigenous peoples and their knowledges. The paper is effectively organised, well written, and tailored to its geoscience audience.

One big question that the paper made me reflect upon is this: can we do more to

convince geoscientists that indigenous knowledge has value beyond just 'filling in the historical record'? Within this paper and others – even those about matauranga specifically – the typical argument from scientists is that indigenous knowledge of ecological change can help to fill in historical data points and enable science to proceed as usual. This means that science per se does not need to change, and that indigenous knowledge can help them to do even better science as they have always known it. Many scientists can understand and agree with this argument, and Sections 1 and 2 of the paper convey this argument effectively. Yet this argument has the effect of placing indigenous knowledge under the evaluative lens of science, and creates an extractive and assimilative rather than respectful relation between science and indigenous knowledge. In this formulation matauranga must prove itself as a version of science to be considered valuable, whereas the reverse is not true. Is it possible to convince geoscientists to value and respect indigenous knowledge without making this 'instrumentalist conceit'?

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