



Indigenous perceptions of climate anomalies in Malaysian Borneo

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ABSTRACT

Local perceptions of climate anomalies influence adaptation behaviour. Specifically, perceptions that are more accurate and homogenous at the community-level are more likely to facilitate the collective action required to adapt to the local effects of climate anomalies experienced by many indigenous communities. We combine primary data on perceptions of climate anomalies from 200 individuals in six Penan villages in Sarawak, Malaysia with instrumental climate data. We find that perceptions of climate anomalies vary substantially in terms of occurrence and magnitude, and do not generally correlate with instrumental climate data. We operationalise the Penan forest sign language (*Oroo'*) as a measure of traditional ecological knowledge (TEK) and find only weak evidence of a systematic statistical association with perceptions of climate anomalies among our sampled respondents. Our findings suggest caution in advancing adaptation strategies in indigenous communities that are predominantly premised on TEK. Instead, our findings suggest that in designing adaptation measures, indigenous communities may benefit by engaging in forums where community members and external stakeholders can come together, share their perceptions and observations of climate change, and reach a collective consensus on the community-level effects of climate change and pathways towards adaptation.

1. Introduction

Many indigenous communities are among the most vulnerable to the impacts of climate change (Salick and Ross, 2009; Ford et al., 2018). With livelihoods that are often highly dependent on the environment, the increased frequency and severity of climate anomalies can significantly affect indigenous communities (Pyahala et al., 2016; Savo et al., 2016; van Gevelt, 2019). Recognising that many indigenous communities have continuously adapted to environmental change over their histories, there is an emerging consensus that empowering indigenous communities to leverage their traditional ecological knowledge (TEK) may be key to their successful adaptation to the local impacts of climate change (Bridges and McClatchey, 2009; Byg and Salick, 2009; Turner and Clifton, 2009).

At the same time, there is a growing literature exploring local perceptions of climate change and the pathways through which perceptions influence adaptation behaviour. This literature provides compelling evidence suggesting that local perceptions of climate change – usually measured as extremes or anomalies – shape adaptation

behaviour through a number of different mechanisms, such as a Bayesian updating process or through salience effects (Hansen et al., 2012; Howe et al., 2012; Deryugina, 2013; Howe and Leisworowitz, 2013; Lee et al., 2015; Demski et al., 2017; Zanocco et al., 2018). One of the key messages emerging from this literature is the importance of understanding local perceptions of climate change in order to devise appropriate climate adaptation policy responses (Larcom et al., 2019).

Combining the insights from these two strands of literature, we suggest that a detailed understanding of indigenous perceptions of climate change is essential in order to assess the potential for indigenous communities – with the appropriate enabling environment – to adapt to the local impacts of climate change (Berkes and Jolly, 2001; Alessa et al., 2008; Boissiere et al., 2013). Specifically, we submit that there are at least three major questions that need to be addressed in further detail. Firstly, to what extent are perceptions of climate change homogenous within and among contiguous indigenous communities? This is important given that collective action is required to adapt to the effects of climate change at the community-level (Adger, 2003; Ostrom, 2010). Secondly, to what extent are indigenous perceptions broadly

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