

more hopeful, arguing that the Village Community Agreements used in the KFCP project boosted social learning about REDD+ and enhanced the capacity of local communities to negotiate their interests. However, local power relations, weak negotiating positions, time constraints, and uncertainties regarding the viability of the funding mechanism eventually contributed to community opposition.

Weaver¹⁴ reminds us, though, that REDD+ has the potential, when done well, to be a game-changer in terms of raising finance to improve human-forest relations. The issues identified in the collection, which do not engage with broader debates regarding the ethics of carbon trading, are not enough to call for a rejection of REDD+. They do, however, encourage serious reflection on current practices. Many of the problems stem from a disconnect between global and local interests. Whereas REDD+ industries prioritize forests as economically valuable carbon sinks, affected communities in Asia Pacific are more interested in livelihoods, land rights, and overcoming injustices. Such interests can compliment one another, yet conflicts are clearly emerging. A major stumbling block concerns the long-term viability of the REDD+ mechanism and the scale of funding available — it is hard for people to fully engage with a programme riven with such uncertainty. Such issues are amplified if the price of forest carbon is to be determined by market forces, creating

unwanted risks for already economically vulnerable communities, as has been the case for another high-profile policy, the Clean Development Mechanism.

More important is the need to reimagine REDD+ as an opportunity for affected communities to pursue particular social, political, economic and ecological outcomes. Rather than see REDD+ as a top-down initiative of the global community it should be seen as a negotiation between forest stakeholders who are pursuing diverse goals, most of which have little to do with climate concerns. For REDD+ to be successful it must go beyond financial payments to provide people with opportunities to improve their lives in locally significant ways. This takes time, effort and genuine dialogue between affected parties. It requires creativity and experimentation in coownership, comanagement, and coexistence, in which local aspirations, knowledge and ontologies are taken seriously¹⁵. The artificial separation of forest carbon from people, where the former is embedded as a clear priority in enabling income, risks marginalizing the latter.

The special issue of *Asia Pacific Viewpoint* reminds REDD+ designers of the importance of recognizing people as crucial actors within forest landscapes, and reveals their considerable agency in shaping REDD+ outcomes. A one-size-fits-all approach will not be sufficiently responsive to the diverse contexts in which REDD+ is

being pursued. Instead, flexibility is required to reflect the different geographies, power relations and values associated with forests. This is occurring in some places, and on some issues, but not all. If REDD+ is to live up to its potential, it must engage with and respond to local people in just, significant, and empowering ways. If not, REDD+ projects will be resisted and deserve to fail. More ethnographic research, oriented at understanding local-global dynamics in planned project areas, can contribute to this goal. □

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References

1. Van der Werf, G. *et al* *Nature Geosci.* **2**, 737–738 (2009).
2. Castree, N. *et al* *Nature Clim. Change* **4**, 763–768 (2014).
3. Barnes, J. *et al* *Nature Clim. Change* **3**, 541–544 (2013).
4. Dixon, R. & Challies, E. *Asia Pacific Viewp.* **56**, 6–20 (2015).
5. Astuti, R. & McGregor, A. *Asia Pacific Viewp.* **56**, 21–37 (2015).
6. McGregor, A. *et al* *Environ. Plann. A* **47**, 138–155 (2015).
7. Eilenberg, M. *Asia Pacific Viewp.* **56**, 48–61 (2015).
8. Lounela, A. *Asia Pacific Viewp.* **56**, 62–79 (2015).
9. Mulyani, M. & Jepson, P. *Asia Pacific Viewp.* **56**, 79–95 (2015).
10. Dalsgaard, S. & Pedersen, M. *Asia Pacific Viewp.* **56**, 128–139 (2015).
11. Howell, S. *Asia Pacific Viewp.* **56**, 37–47 (2015).
12. Howson, P. & Kindon, S. *Asia Pacific Viewp.* **56**, 96–110 (2015).
13. Pasgaard, M. *Asia Pacific Viewp.* **56**, 111–127 (2015).
14. Weaver, S. *Asia Pacific Viewp.* **56**, 140–152 (2015).
15. Howitt, R. *et al* *Asia Pacific Viewp.* **54**, 126–140 (2013).

CLIMATE ADAPTATION

Cultural knowledge and local risks

A focus on African American communities on the Eastern Shore of Maryland highlights the ways that local cultural knowledge differs from place to place, developing understanding of local climate risks and resources for adaptation.

Sarah Strauss

One of the key conclusions of the Fifth Assessment Report (AR5) from the IPCC is that vulnerability to the impacts of climate change is not distributed evenly; marginalized communities are more likely to be at risk¹. While there is increasing evidence of impacts on natural systems, there is a much more limited repository of evidence documenting significant impacts of climate change on human systems, as they vary regionally and locally². A study by Christine Miller Hesed and Michael Paolisso³ in *Nature Climate Change* gives concrete evidence of the disparities in the distribution of risks as well as access to adaptive strategies for responding to

climate change impacts. The research focuses on local differences in identifying and addressing vulnerabilities, demonstrating that even in seemingly similar communities, adaptive capacity may be significantly different.

In January 2015, the American Anthropological Association (AAA) released a *Statement on Humanity and Climate Change*⁴. The document reinforces some of the IPCC's conclusions, namely that climate change is expected to intensify existing problems experienced by human communities and that these problems are already affecting communities in uneven ways, with the most vulnerable

at the greatest risk of the highest degree of suffering. This historic document accompanies a detailed report on the anthropological contribution to climate change research that also presents a framework for future directions in research and teaching⁵. The AAA is the largest organization of professional anthropologists in the world, with membership over 11,000. This is not only their first official statement about climate change, but it is also one of the few official positions that the AAA has taken that has strong policy implications extending beyond the association and its membership. The statement highlights the importance of attention to knowledge acquired in specific

places over long periods of time, as the facilitation of adaptation to climate change requires detailed local and regional solutions that cannot be dictated from the top down.

Such an approach is exemplified by the work of Miller Hesel and Paolisso regarding the African American communities of St. Michael's, Crisfield, and rural Dorchester County, in Chesapeake Bay, Maryland. Through the lens of more standard quantitative measures, these communities might appear to be very similar, with respect to their risk for flooding as sea level rises, their histories and demographics, and their resource base. Yet, the integration of qualitative and quantitative methods allows a more nuanced understanding of the ways that these communities differ in their perceptions of risks as well as resources, affecting their ability to respond effectively to the impacts of a changing climate.

Miller Hesel and Paolisso conducted pile-sorts using terms related to climate change generated within the same region, asking respondents to group the terms that they found similar together, thereby generating a kind of mental map. No two people will sort the terms in the exact same way, but the cultural domains represented by the terms can be aggregated in ways that show the patterns of relationships across the sorted terms; a method called multidimensional scaling. The results of

these analyses are then discussed in detail with the study participants in an iterative process that clarifies the outcomes. Very little has been done so far to engage with the African American experience of climate change, and this ethnographically grounded research brings the field forwards in a substantive way, providing a methodology that can be replicated in other marginalized places. Such an effort supports the quest for improving subnational sociocultural and economic datasets called for by Otto *et al.*².

This work on vulnerable Chesapeake Bay communities also validates the conclusions presented by Barnes *et al.*⁶; that anthropological research approaches have a significant role to play as we work towards a more complete understanding of the human dimensions of climate change. As characterized in the contribution of Working Group II to AR5, in order to develop successful policies that can support resilience, policymakers and researchers generating data must consider the integrative nature of the social–ecological system under study¹. Anthropological research describes local-scale phenomena that illuminate social structures and processes relevant to human cognition and behavior, past and present. By focusing on the broader social–ecological system, Miller Hesel and Paolisso contribute to our understanding of these complex interactions through a holistic view

of human society that is integrally linked to environments as they change over time

It is not sufficient to identify only the climate impacts or hazards arising from our contributions to atmospheric warming, nor to focus only on the institutional and cultural values, policies, and actions that affect the severity of our experiences. An integrated approach is necessary, recognizing social–ecological systems as evolving wholes that cross and sometimes transcend national and other artificial boundaries, rather than placing human actions, beliefs, and engagements outside of the impacts on the non-human world. Miller Hesel and Paolisso's research is a step in the right direction. □

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References

1. IPCC Summary for Policymakers in *Climate Change 2014: Impacts, Adaptation, and Vulnerability* (eds Field, C. B. *et al.*). (Cambridge Univ. Press, 2014).
2. Otto, I. M. *et al.* *Nature Clim. Change* **5**, 503–506 (2015).
3. Miller Hesel, C. D. & Paolisso, M. *Nature Clim. Change* **5**, 683–687 (2015).
4. AAA Statement on Humanity and Climate Change (American Anthropological Association Task Force on Global Climate Change, 2015).
5. Fiske, S. J. *et al.* *Changing the Atmosphere: Anthropology and Climate Change* (American Anthropological Association, 2014).
6. Barnes, J. *et al.* *Nature Clim. Change* **3**, 541–544 (2013).

FOREST ECOLOGY

Tall, leafy conifers lose out

A simple conceptual model helps to answer the question of which forests are more likely to die following droughts.

Maurizio Mencuccini and Oliver Binks

The Rolling Stones famously sang “you can't always get what you want”. However, it is not clear whether forests will be able to always get what they need under conditions of future climate change. This nicely sums up a current theme of research on how forests are expected to cope with the increased frequency and intensity of regional drought events and heat waves predicted under global climate change. Evidence of large-scale defoliation and mortality has been reported for forests around the world¹, but our ability to predict these events remains weak². When and where will droughts occur and what consequences will they have for the world's forests? Writing in *Nature Climate Change*, McDowell and Allen³ discuss a conceptual tool that points out some of the vegetation

characteristics that predispose trees to drought-induced mortality.

Global air temperatures are rising. While the capacity of the atmosphere to hold humidity increases exponentially with temperature, climate models and observations show that absolute atmospheric humidity does not keep pace with warming^{4–6}, especially over land areas⁷. The amount by which humidity increases with warming is a very important quantity as humidity strongly affects the terrestrial biosphere. Plant physiologists employ the concept of leaf-to-air vapour pressure deficit (VPD), the difference in vapour pressure between the humid air spaces inside plant leaves and the surrounding air. Leaf-to-air VPD is predicted to increase strongly with warming^{4–7}.

Plants routinely lose very large amounts of water from small pores in their leaves called stomata and this flux to the atmosphere is referred to as transpiration. The most direct response of vegetation to increased atmospheric dryness is to moderate water losses via transpiration. In the short term, plants regulate these losses by partial or complete stomatal closure. The downside of this is that photosynthesis is reduced because CO₂ uptake is restricted. Therefore, plants are challenged by increased atmospheric dryness and also by the risk of starvation from declining carbohydrates⁸.

The short-term regulation of transpiration by stomatal closure remains one of the least understood aspects of plant physiology. Yet it has important implications for global-scale modelling of carbon and