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Climate-related community knowledge networks as a tool to increase learning in the context of environmental change

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ABSTRACT

Statements made at the recent UN Climate Conference 23rd session of the Conference of the Parties (COP23) clearly indicated that Pacific islands, countries, and territories (PICTs) are particularly susceptible to sociocultural, economic and environmental impacts of climate change. The Federated States of Micronesia (FSM) are one such group of islands where internal and external climate forcing has observable detrimental impacts on local public health, water quality, agriculture and resource management. Here, we present the outcomes of a collaboration between graduate students and a PICTs-focused non-profit organization to facilitate a climate-related knowledge network that addresses adaptation to climate-related vulnerabilities in Pohnpei, FSM. Through a series of workshops targeting K-8 science teachers, this network strengthens lines of communication between educators, resource managers, stakeholders and environmental leaders and provides a forum for ongoing information exchange to encourage adaptation to climate change in island communities. Additionally, teacher participation in the workshops resulted in a marked increase in community engagement in other local and regional educational venues. We propose that the knowledge network piloted here serves as an interdisciplinary model of a sustainable educational partnership that can be adapted for use in a multitude of PICT communities to improve preparedness and reduce susceptibility to climate-associated stressors, thereby providing an example of means to achieve key goals of the COP23.

1. Introduction

Climate variability, both anthropogenic and natural, is particularly impactful in Pacific islands, countries, and territories (PICTs), each of which has cultural and economic connections to coastal and freshwater resources that are susceptible to environmental

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change (Burns, 2002; Keener et al., 2012; McCubbin et al., 2015; The Steering Committee on Partnerships for Small Island Developing States in Collaboration with United Nations Department of Economic and Social Affairs, 2016). Among the outcomes of the recent UN Climate Change Conference of Parties (COP23) are calls for greater access to information, improved climate literacy, and increased participation in climate-associated negotiations throughout PICTs with the goal being to reduce community susceptibility to climate variability where possible (UN Program on Climate Change, 2018). Managing the consequences of climate variability in these regions requires an understanding of the complex sociocultural interactions that contribute to societal adaptive capacity (Engle, 2011). To this end, it has been suggested that climate adaptation efforts in PICTs should focus on enhancing community resilience to climate change while utilizing *existing* community infrastructure as a vehicle to do so (Nurse and Moore, 2005). The use of internally-sourced community resources is an essential component in designing climate adaptation strategies that are inclusive of both local indigenous knowledges and external western science perspectives (Mercer et al., 2007; Nunn et al., 2017). Such collaborations can inform the construction of a climate-related knowledge network between educators, resource managers, farmers, and the general public, the goal of which is to increase information-sharing on climate patterns and effects throughout the community as a management approach that is more precautionary than reactionary.

Knowledge networks emphasize the constantly evolving flow of information between scientists and stakeholders to build relationships between members of a community to combine, create, and transfer collective knowledge (Feldman and Ingram, 2009). These networks, when applied to climate-related needs, can encourage community resilience and the implementation of adaptation strategies by providing vehicles for the timely and continual dissemination of relevant information. Fostering personal connections and emphasizing the multiple paths of information flow have been key in developing climate adaptation solutions in a diversity of settings (Bartels et al., 2013; Bidwell et al., 2013; Feldman and Ingram, 2009). Furthermore, exchanging perspectives among stakeholder groups, policy makers, and scientists through sustained contact has provided previous examples of successful knowledge networks (Bidwell et al., 2013).

The Federated States of Micronesia (FSM), specifically the island of Pohnpei in the Western Equatorial Pacific, is home to a diverse array of community stakeholders and represents an ideal location for a community-sourced knowledge approach to climate adaptation strategies. The social and environmental impacts of certain sources of internal and external climate variability are also particularly felt in this region of the Equatorial Pacific. As an example, Pohnpei is known for being among the wettest locations in the world during neutral El Niño Southern Oscillation (ENSO) conditions, receiving greater than 7000 millimeters (300 inches) of rain each year (Landers and Khosrowpanah, 2004). Sustained El Niño conditions result in extensive drought and lowered sea level on the island, which often leads to cascading negative agricultural, economic, and public health impacts on the local population (Ebi et al., 2006; Keener et al., 2012). Exposure to the impacts of internal and external climate variability has motivated local-level response in Pohnpei. For example, watershed management strategies have been encouraged by many of Pohnpei's communities to address the impacts of land clearing, erosion, human and animal waste products, and water quality in many of Pohnpei's rivers (Water for Life Project, 2013). Increased information sharing serves to support these management strategies by alerting communities to the magnitude of environmental impacts and connecting stakeholders with professionals who can aid in their implementation. The formation of a community-sourced climate knowledge exchange network in Pohnpei demonstrates the willingness of local communities to address climate-associated changes. It also presents an opportunity to increase climate literacy and design effective resource management strategies that can withstand current and future variability in climate. Additionally, because the magnitude of internal climate variability is expected to increase as a function of increasing anthropogenic greenhouse gas emissions, a community-sourced climate knowledge network on Pohnpei can help build local adaptive capacity to climate change (IPCC, 2014).

Here, we supported the development of a climate knowledge network to increase information sharing and general public understanding of climate variability in Pohnpei. Graduate students from the University of Washington Integrative Graduate Education and Research Traineeship (IGERT) Program on Ocean Change initially partnered with Honolulu- and Pohnpei-based offices of Pacific Resources for Education and Learning (PREL). PREL is an established entity in Pohnpei and maintains programs focused on promoting dynamic reciprocal learning communities that utilize existing social and cultural capital. We worked within the existing structures and relationships of PREL to develop a knowledge network in Pohnpei targeting science teachers to encourage the dissemination of important climate-related information. At the core of this network is the Pohnpei Teachers' Learning Community (PTLC), a teacher professional development group initiated and facilitated by PREL's Pohnpei staff through the National Science Foundation (NSF)-funded Pacific Islands Climate Education Partnership (PCEP) program. The goals of this network are:

1. To connect teachers and local stakeholders to resource managers, governmental representatives, governmental and non-governmental environmental agencies and community leaders.
2. To educate and share information on global patterns and local effects of cyclic climatic phenomena, such as ENSO, as well as externally forced climate change.
3. To strengthen and sustain existing lines of communication, climate literacy, and information-sharing in an effort to ensure that current climate information networks persist into the future.

The design of the knowledge network allows teachers to build on existing relationships and foster new collaborations with local environmental groups and professionals, helping to provide timely access to environmental information and perspectives.

2. Implementation

The implementation of the knowledge network can be subdivided into three steps, corresponding roughly with the

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