

Results and Impact of First Phase of Project

Commonalities and Variations in Cultural Models of Nature.

We have focused on small communities¹ of primary food producers. These communities are all directly affected by environmental change, including climate change. Members of these communities perceive and explain only some of the changes because of the ‘filtering effect’ of their cultural models of Nature. One common finding so far has been that explanations and interpretations of climate change induced effects, while they vary across communities, are typically attributed to local phenomena and not to global or world-wide ones. In addition, at times contradictory explanations are provided, either within the same individual but in different contexts, or across the community at large, also in different contexts. The contradictions lie in the use of different cultural models of Nature to explain different sorts of relationships within Nature—e.g., humans are one with nature vs. humans are separated from nature.

This differential use of contradictory cultural models is associated with the inherent flexibility in the way cultural models are mentally constructed. Significantly, cultural models contribute to the generation of interpretations of the world—which in turn may lead to the generation of specific behavior. At the same time, they are still used independently of each other, that is, constructed on the spot—and brought on line—as a unique response to communicative or explanatory needs, i.e., contexts. Thus, they may lead to contradictory uses by an individual or by a community. Strauss (2012: 98) has pointed out this phenomenon and articulated some of the possible arrangements among different and at times contradictory cultural models as “integrated,” “compromised,” and/or “compartmentalized.” The latter modality seems to prevail in the reported cultural models of Nature we found. One of the foci of this second phase of the project is understanding which type of cultural model is used in which context and why.

The inherent quality of a cultural model makes it possible to choose and modify one based on variations in context and goals (for instance, short term versus long term costs and benefits). As a consequence, it becomes relevant to understand in which contexts certain cultural models are chosen and what the intentions of the individuals are at that time. It is also important to see if these decision-making processes can be generalized within each group of primary producers that comprise the researchers’ project. Variation in the uses of cultural models calls for the implementation of further discourse analyses. Once a model/s has/have been clarified, the researcher can revisit the transcribed interviews to see which model/s is/are used and when, and also establish if this/these use/s is/are shared in the community.

The researchers have reported that the perceived changes in the environments of the communities investigated appear to be influenced by the individual’s or the community’s productive mode (e.g., farming, herding, fishing) and the distribution of productive roles (e.g., plowing, harvesting, etc.). Changes in the economy, mobility, and mass-communication (to mention a few) in a community can also contribute to an individual and/or collective focus on specific types of changes. We hypothesize that intra-community (local) variation and inter-community variation (across field sites) are due to different factors. That is, the perception of

¹ We define a community as characterized by a salient set of interactive modes.

specific changes in one's environment is the combined result of changes within the community and the use of one or more cultural models of Nature. Inter-community variation instead may be due to fundamental differences in the environment as well as to the locally-specific content of the cultural models employed.

Results from Interviews.

Through our research we sought to gain an understanding of the types of cultural models of Nature employed by the communities studied and how, when (under what conditions/contexts) and why (the function the cultural model plays) they use them. The semi-structured interview questions were formulated during the first NSF-sponsored workshop in 2011 (see Bennardo, 2012:126). The questions were mainly about daily productive activities of the individuals interviewed. Since the interviewees are primary food producers, the expectation was that cultural models of Nature would be activated and used to answer the questions.

We have reported on fieldwork research conducted in periods of 4-12 weeks in communities located in 12 countries on 6 continents: China, Ecuador, Japan, Kenya, Italy, Lithuania, Namibia, Pakistan, the Philippines, Poland, the Kingdom of Tonga (Polynesia), and the United States. The researchers used interpretive ethnographic analysis based on their extensive professional involvement with these sites. They also analyzed the transcribed interviews using a combination of analyses— key word, gist, semantic role, metaphor, reasoning and causality. Team members discovered features of cultural models of Nature (each model consists of a list of propositions) and hypothesized such cultural models as shared by the members of the community (see Table 1).

Results from Free Listing.

All scholars administered free listing tasks (i.e., memory tasks), that is, they asked subjects to list as many members of the following components of Nature: plants, animals, physical environment, weather, humans, and supernatural. In many sites, these components were modified to reflect emic-salient categories. For example, in Tonga, the PI used animals, fish, and birds instead of animals—the Tongan word for animals refers only to mammals. The basic assumption for this task is that the first remembered, the most frequently cited, and the highest average ranked items are the most culturally salient (De Munck, 2009).

The collected lists provided clues as to the conceptual building blocks of the cultural models of Nature that were later hypothesized. The results of these lists will also be utilized to refine further the suggested cultural models. Specifically, the more salient (e.g., more frequently mentioned) elements in the lists will be used to conduct sorting tasks in the next phase of the project. These tasks will elicit fundamental categorical classifications—some of which are likely the ones employed in the construction of cultural models of Nature.

Preliminary Hypotheses about Cultural Models of Nature.

In Table 1, we present the shortened preliminary hypotheses (lists of propositions) about each cultural model of Nature based on the analysis of the ethnographic (nature walk), linguistic (semi-structured interviews), and cognitive (free listing) data collected in the first phase. This

partial list of propositions for each site (see Appendix A for a full example about Tonga) is used to illustrate the findings and represent a small part of the results obtained.

Table 1. Field Sites and Variation in Cultural Models

Community/ies	Productive Activities	Major Facets of Hypothesized Cultural Model(s)
Brazil: Villages at confluence of 3 rivers: Amazon, Tapajos, Arapiuns	Horticulture, fishing, hunting, gathering, herding	<ul style="list-style-type: none"> Nature encompasses all existing spaces, beings, and forces; Human volition and intentionality are ambivalently distributed between diverse animals, humans, and spirits; Domestic is different from wild, and agriculture, hunting and fishing activities are associated with variable forces of sun, moon, soil, and rain.
China: Five mountain villages	Hunting; gathering; forestry; livestock; horticulture; small-scale agriculture	<ul style="list-style-type: none"> All things in the world flow according to the temporal rhythms of the world (seasonal rhythm and those specified in the divination table); When human desires expand out of control/rhythm, they must repair the synchronization between humans and nature via animal sacrifice; If the synchronization could not be resumed, things will flow away, and humans will be left behind.
Ecuador: Small volcanic mountain village	Small-scale agriculture	<ul style="list-style-type: none"> Urbanites and the Christian God are conceived as outside of nature; Plants, animals, most spirits, environmental features, rural dwellers and climate are part of nature and Mother Nature; Mother Nature and God are sometimes the same.
Ethiopia: Highland village	Rain-fed cultivation of cereals using oxen-drawn plow and rearing of cattle	<ul style="list-style-type: none"> Nature consists of two concentric circles. The outer circle is earth, sky, and space between, with humans, non-human living things (i.e., plants, animals), physical environment, meteorological events and supernatural forces. The inner circle includes the biophysical environment : land, animals, plants and resources on which humans depend for survival; Natural resources are divine expressions of God's kindness to humans.
Italy: Small mountain village	Gardens; pastures	<ul style="list-style-type: none"> If humans take care of woodland (physical environment and plants), woodland gives back to humans; Increased woodland fosters the presence of more wild animals; weather affects human activities, humans do not affect weather.
Japan: Areas surrounding cities	Rice, wheat, plums, pigs, a variety of garden vegetables	<ul style="list-style-type: none"> Nature is not natural until it is humanized; Nature should not be below human to be used to achieve utilitarian gain (it should co-function with humans); When nature is too raw or powerful and beyond human control (e.g., natural disasters), it is not "natural."
Lithuania: Small towns in different regions	Small- and large-scale agriculture and dairy; gardens	<ul style="list-style-type: none"> Farmers see themselves, nature, and farm-work as seamlessly interrelated; Farmers see themselves both as "in" or as a "part" of nature, acting on nature, and also as nature acting on them, depending on context; Farmers see nature as bimodal—in their role as farmers, they see it as a dynamic resource which they struggle with but they view as an unconditional good; In their non-farming role, they see nature as a space to rest and purify themselves from the pollution of urban life.
Namibia: Rural desert	Hunting; gathering; cattle; farm labor	<ul style="list-style-type: none"> No rigid boundary between separate spheres of nature; Nature includes man-made elements that seamlessly merge with biophysical environment.
Pakistan: Small village in hills	Irrigated and non-irrigated agriculture	<ul style="list-style-type: none"> People's interaction with earth is mediated by Allah, as a sole God, plus various non-human benign and bad spirits and saints; Urban immorality causes Allah to change climate/environment.
Philippines: Two coastal villages	Fishing	<ul style="list-style-type: none"> The earth, like a human, has a natural life cycle; it may be coming to the end of the cycle or returning to an earlier phase; Humans are not the cause of and can do nothing about changes in weather patterns and climate; they can only adjust to them; Human activities in the immediate vicinity are responsible for local environmental changes; There will come a time when the system of nature is "broken" beyond repair and humans won't be able to adjust.
Tonga: Small coastal village	Horticulture, fishing, gathering	<ul style="list-style-type: none"> Physical environment, weather, plants, humans and animals belong together; Supernatural/God is separated from nature; it masters nature; Supernatural/God is not separated from nature; it is everywhere.

Table 1 shows that there are often more than one cultural model of Nature—and even contradictory ones—in the same population. In many of the societies the source for the

contradictory models is in the supernatural realm—typically originating at the confluence of an indigenous belief system and conversion to a major world religion. We believe it important to examine the potential fluidity in moving between cultural models of Nature and how this affects both perception and motivation for action. In terms of perception, some populations continue to rely on biophysical information that might not currently appear functional—in Namibia, hunted species that have recently disappeared from the land remain salient symbols of nature to foragers; and, in Ecuador, people continue to plant according to received past wisdom regarding the distribution and timing of rainfall despite a shift in the timing of rains.

Research Impact.

Presentations.

Preliminary results have been presented at organized panels and individual presentations: AAA 2014, 2015, 2016; SASci 2015, 2016, 2017; ANUAC (Italy) November 2015; and ASA (UK) July 2016. In addition, the research projects and results were presented in invited presentations at the Universities of Verona, Padua, and Venice in Italy, and at Sun-Yat-Sen University, Guanzhou in China. In Italy in March 2015, at the University of Verona's Frinzi Library, the team held the workshop *Local Knowledge and Climate Change: Fieldwork Experiences*, with support from the Frinzi Library, The U. of Verona's Dept. of Cultures and Civilization, and NSF.

Manuscripts.

Currently, the research team has 9 related articles published in a special issue of the peer-reviewed journal *World Cultures*. Other team efforts include the 11 papers from the Proceedings of the team's three-day workshop in Verona (NIU Environment, Sustainability, and Energy Institute, 2016), and a contract with Routledge to publish (Fall 2018) an edited book in which the results of the first phase of the project will appear as 11 separate chapters in which the team has begun comparisons and synthetic work. Bennardo has in press related chapters with Oxford UP and Wiley, and a published article "The Fundamental Role of Causal Models in Cultural Models of Nature" in *Frontiers in Psychology*. A paper coauthored by Bennardo, de Munck and 3 students was published as a Working Paper in 2015 (NIU Environment, Sustainability, and Energy Institute).

Intellectual Merit.

The set of cultural models of Nature by primary food producers and the similarities they share enriches the literature about cultural models. At the same time, they foster an appropriate attention to these community-wide knowledge representations that can be investigated only by means of inter-disciplinary approaches. The team's methodology for investigating cultural models (Bennardo and de Munck, 2014) blends qualitative anthropological (e.g., participant observation) and linguistic (e.g., discourse analysis) methods with quantitative approaches (e.g., cognitive tasks and consensus analysis).

Our proposed emphasis on conducting a cross-cultural comparison of responses to a common set of survey questions will provide important information regarding global cultural models used in

communities representing different cultural regions. The questions are specifically designed to target human conception of Nature (see Appendix B) as it impacts on changes in perceptions and behavioral strategies related to climate change. Similarities and differences will be made clear through such a comparison. Wide cross-cultural sharing of fundamental beliefs used in the construction of these models of Nature are expected. If climate change has affected food producing, then there should be some commonalities across cultures in the way these producers (grouped by modality of production, e.g., farming, fishing, etc.) have adapted or responded to these common external stressors. We also assume that those cultures who thus far have shown similarities in their cultural models of Nature will also show similarities in their responses to climate changes—either in action or in narratives regarding their responses.

Broader Impact.

The spring 2015 workshop was reported on the local campus news of the University of Verona, both as an article and as an oral interview for the local radio which a journalist conducted with Dr. Paini and the PI. The research projects and the workshop were also reported in two articles of the local News at NIU and in an article of the local newspaper (Daily Chronicle) in DeKalb, IL, where the NIU campus is located. After daily presentations and discussions of fieldwork results, participants of the Verona workshop realized that aspects of their individual research resonated with the findings of the other investigators. We then worked on how we could consolidate our findings into both local and more ‘global’ results thus yielding outcomes sensitive to cultural differences between the sites as well as being attentive to potential commonalities. The second phase of our research is, in fact, designed to attend to both local and global features of cultural models of Nature. One of our goals is to translate our findings into language and graphs that are easily comprehensible to non-specialists and which are particularly useful to policy makers engaged in local or global responses to climate change. Our preliminary results suggest that cultural models, once generated, are relatively simple to understand and offer a way to connect with primary producers using their own perspectives rather than top-down policies.

Prior support has translated into broader impacts through involving several PIs and collaborators from groups that are underrepresented in science; presenting results to interested colleagues at the University of Verona, Padova, and Venezia, Italy and at Sun-Yat-Sen University, Guanzhou, China; training of three PhD and three MA students in anthropology in facets of the research—especially in methodology—for cultural models; and important connections in many of the field sites with local institutions interested in climate and environmental change.

Beyond the important collaborations at the local level, this kind of work has generated interest at state and national levels in several of the countries. For example, the Director of the Department of City Planning and Energy of the Autonomous Province of Bolzano, Italy asked Bennardo to submit a proposal for research in the Alpine area of the Province using this project as a model to help implement their climate change policies. Similarly, de Munck was contacted by members of the Ministry of Agriculture in Lithuania for consultation on developing a community building project among farmers. This project will be a multinational EU project with the Lithuanian group leading in its development. Lyon was invited by a member of the ruling Justice and Development Party in Morocco to carry out comparable research among rural farmers there. In Belize, Hume

collaborates with the Belize Sugar Cane Farmer's Association, the National Institute of Culture and History, and the Sugar Industry Research and Development Institute.