

## Chapter 15

# **Ethno-ecology in the shadow of rain and the light of experience: local perceptions of drought and climate change in east Sumba, Indonesia**

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*Scholars are apt to consider pre-existing symbolic systems or the influx of external discourses in order to explain local knowledge of ecological relationships. This chapter proposes an alternative model that takes into account phenomenology to explain views of climate change among Sumbanese in eastern Indonesia. Phenomenological experiences such as shade, moisture, dew, heat, fire and sunlight, form the basis of their explanations for drought as well as a means to reorganize external information about global climate change. Their use of experience largely explains why the Sumbanese ecological model focuses largely on the role of vegetation in altering climate patterns and ignores industrial pollution and carbon emissions both of which are commonly reported by the national media.*

### **Introduction**

People often depend upon their own experience to understand changes in their ecological context. Communities on the island of Sumba in eastern Indonesia interpret a perceived regional drought by using their experience of ecological interactions to formulate theories about climate change. Scholars are apt to consider pre-existing symbolic systems or the influx of exogenous discourses in order to explain local knowledge of ecological relationships. This chapter proposes an alternative model that takes into account phenomenology to explain Sumbanese ethno-ecology of climate change. Instead of explaining drought solely within their traditional religious beliefs or media reports of global warming, Sumbanese create an integrated ecological model for drought based on sensations of elements in the environment, or what is often termed phenomenological experience. We will define phenomenology as the experience of the world that is closely rooted in physical sensation and distinct from largely cognitive and symbolic cultural constructs. Phenomenological

experiences such as shade, moisture, dew, heat, fire and sunlight, are the basis of east Sumbanese explanations for drought as well as a means to reorganize external information about global climate change. Their use of experience largely explains why the Sumbanese ecological model focuses solely on the role of vegetation in altering climate patterns and ignores industrial pollution and carbon emissions both of which are commonly reported by the national media. The example of Sumba illustrates how local knowledge of ecological systems is, in many cases, not solely the result of cultural or exogenous discourses but instead is best described as an idiographic process of integration and analysis using multiple categories of knowledge such as sensation and discourse.

### **East Sumba**

The island of Sumba is located in eastern Indonesia approximately 1,500 km south east of the capital of Jakarta. Though it is nearly twice the size (11,153 square km) of the island of Bali, it has remained relatively isolated from Indonesian modernization. Modernization and integration into the Indonesian national economy have often been brought about by logging, industrial agriculture and mineral and oil extraction which have also collectively denuded forests and substantially impacted environments. On Sumba, the anthropogenic alteration of the environment, though present, has largely remained constant for generations and its environmental history is vague for local inhabitants as well as ecologists. This is not to imply that the environment of Sumba has not changed. Much of the sandalwood forests, which gave Sumba its colonial name, were felled before the 20th century but this remains unknown, or at the least, unmentioned by local communities. Thus, ecological isolation from development has left Sumba an appropriate place to examine local perceptions of climate change.

Differences in rainfall, subsistence strategies, language, culture and ancestry lead anthropologists and ecologists to divide Sumba into east and west cultural and ecological zones (Forth, 1981; Hoskins, 1996; Forshee, 2000). This chapter will focus on the district of east Sumba which is located in the rain-shadow of the western part of the island. In the largely tropical country of Indonesia, east Sumba has an atypically semi-arid climate (Monk et al., 1997; Fisher et al., 2006). This has resulted in two distinct features in east Sumba. Unlike much of the more humid regions of Indonesia, east Sumba has a low population density of 28/km<sup>2</sup> compared to the population density of 2,007/km<sup>2</sup> in Java. Subsistence activities in east Sumba are based upon smallholder livestock production of goats, cattle and pigs accompanied by gardens rather than intensive wet rice production common in western Indonesia (Onvlee, 1980; Kabupaten Sumba Timor, 2004). Though pastoral activities are a common adaptation to a semi-arid climate, the grasslands of east Sumba are not solely the result of low rainfall but rather managed by inhabitants through seasonal burning of brush to promote the growth of edible grasses for livestock (Fox, 1977; Dove, 1984). The experience of using fire to remove vegetation is

significant to how communities in east Sumba conceptualize larger climatic variation regarding rainfall.

The closely related indigenous ethnic groups in east Sumba have blended in language and culture into what is now called the Kampera or east Sumbanese. The Leiden School of anthropology famously used east Sumbanese multi-family *uma* (households), monolithic tombs, symbolically organized villages, polygyny, and asymmetric marriage alliances to develop an early form of structuralism in the first half of the 20th century (van Wouden, 1968; Needham, 1987; Otterspeer, 1997). However, the great majority of east Sumbanese now live in dispersed homesteads, attend church in addition to performing indigenous rituals and practise monogamy which is no longer based on clan relationships. This generally describes the rural highland and lowland communities that were interviewed about climatic change. Their responses were compared to urban office workers, including agricultural professionals, in the district capital of Waingapu.

### **Perceived drought?**

As we will examine more closely in this chapter, most east Sumbanese were adamant that there has been a decrease in rainfall over the last 5 to 15 years. Though how they link their experience of ecological interactions to larger processes is the subject of this chapter and not the accuracy of their assessments, we compared precipitation data for both east and west Sumba from two sources: rain stations and satellites. Rain station data provided by Global Precipitation Climatology Centre (GPCC) show that in the period from 1980 to 2007 Sumba received a mean rainfall of 1,435 mm and in the period 1998–2007 it received 1,473 mm.<sup>21</sup> NASA's satellite-based Tropical Rainfall Measuring Mission (TRMM) show that this trend of increasing annual rainfall appears to have continued through 2009.<sup>22</sup> Using the GPCC dataset, we also examined longer trends in rainfall. During the 107-year period from 1901 to 2007, rainfall patterns were uniform with the only major spike in rainfall coming during the Second World War which may have caused measurement errors. Given the lack of evidence that Sumba has received less precipitation over the last 5, 15 or 100 years, this chapter will focus on how the east Sumbanese perceive drought. We argue that perceptions of drought are best explained as phenomenological observations and exposure to national media's coverage of global warming. Whatever the origin of east Sumbanese views on drought, they use the idioms of bodily experience and global warming to express them.

### **Method**

During March 2010, individuals in the regency of east Sumba, Indonesia were interviewed about the local weather and its longer-term variation in the Indonesian national language of bahasa Indonesia. The interviews had

three tiers designed to assess the subjects' 1) recognition of climatic characteristics and variation; 2) understanding of what caused such changes; and 3) means by which an individual came to hold those views. The informant's location, occupation and gender were also recorded. Only individuals who had lived or worked in Sumba for more than five years were used. In order to prevent leading questions, the interviews began as a conversation about the weather using the expression, 'matahari panas hari ini' (the sun was hot this afternoon), which is a common invitation to talk about the weather regardless of the actual temperature. The informants were then engaged in a conversation about climate by asking if the weather was normal for this time of year and then in more general questions about whether it was atypical over a longer period of time. All informants, except one office worker in the city of Waingapu, said that the weather was drier than normal. The informants were then asked why they thought it was so dry or hot. If they did not mention global warming, they were asked at the end of the conversation if local weather was linked to other climate patterns at the provincial, national or global levels. After these conversations, individuals were informed that this was part of a research project and asked for permission to use their responses as part of this study. All informants consented.

## Findings

We interviewed 35 participants; 24 from rural villages (14 lowland and 10 highland) in their local communities and 11 urban office or professional workers, including six agricultural professionals, in the city of Waingapu. The dispersion of these interviews covered an area of approximately 1,300 km<sup>2</sup>. We interviewed an equivalent number of men and women in villages, though all agricultural professionals in Waingapu were men. We found no distinction between male and female responses. Although we inquired about both temperature and rainfall, respondents were less interested in discussing temperature than rainfall.

For this reason, we will focus on east Sumbanese perception of rainfall. All but one office worker said there had been less precipitation over the last 5 to 15 years. The singular explanation urban and rural east Sumbanese gave for what caused the decrease in precipitation was deforestation. When asked why it was becoming drier, 88 per cent of rural pastoral/horticulturalists thought it was a result of deforestation during the last 10 years in areas of Sumba with only two answering that they did not know. Though rural villagers thought that deforestation was the origin of the perceived drought, where they placed the location of this critical deforestation differed. Of the 14 lowland villagers, 85 per cent said the deforestation took place in the highland regions of Sumba with the remaining two claiming they did not know why there was less rain. Of the 10 highland villagers, 90 per cent said that the critical deforestation is occurring in the adjacent district of west Sumba. When asked who was committing this deforestation, 75 per cent of villagers in the highlands and

lowlands said it was the central government. Without prompting, 67 per cent mentioned *pemanasan global* (global warming) when talking about deforestation in the highlands or west Sumba, and all had heard of it.

Among urban residents in Waingapu, deforestation was also viewed as the cause of decreased rainfall. However, urban residents disagreed with one another regarding the location of deforestation. Urban residents who were not working in the agricultural industry did not specify where deforestation takes place. Conversely, urban residents of Waingapu working as government and private industry agricultural professionals said that deforestation in the distant and, at one time, heavily forested regions of Kalimantan and Sumatra caused the lack of rain. They also mentioned that Western corporations played the principal role in deforesting these areas. Urban residents and agricultural professionals mentioned global warming in their responses approximately 82 per cent of the time and all had heard of it from the news.

When asked how they knew that the loss of trees decreases rainfall, villagers used largely phenomenological experiences of heat, moisture, shade and vegetation to create an ethno-ecological response to this question. Eight stated that when one cuts down trees, the lack of shade makes the land hotter and thus less likely to rain. Ten answered that when one cuts down trees around the village, there is less moisture, fewer puddles and water overall. Two individuals talked about how fire, which is used to clear trees and other vegetation to encourage the growth of grass for cattle, heats up the environment and such heat keeps it from raining. One informant did not have an explanation why they thought deforestation reduced rainfall.<sup>23</sup> We emphasize the phenomenological basis of their ethno-ecology because their explanations revolve around the experience of sensations to link ecological cause and effect. Their use of the sensations of heat, moisture, fire and shade for evidence of the effect of vegetation on rainfall will be compared with other potential forms of evidence or justification that east Sumbanese do not employ.

Of the agricultural professionals, all six said local drought was the result of deforestation in other regions in Indonesia. Each explained that regional climatic patterns had been altered by changes in the hydrological cycle in large forests in Sumatra and Kalimantan. When asked how they knew this, they said that they had heard it from Indonesian news sources. Four also spoke about how it 'made sense' according to their knowledge of the hydrological cycle in which water is stored in vegetation and evaporates to cause rain. But none offered any explanation for how deforestation on one island would affect others 1,200 to 2,000 km apart.

When viewed at an aggregate level, these findings form the following basic ethno-ecological patterning regarding decreased rainfall:

- East Sumbanese view deforestation as a cause of their perceived decrease in rainfall.
- Distant deforestation affects local rainfall: lowland villagers attribute lack of rainfall to deforestation in the highlands; highland villagers attribute

lack of rainfall to deforestation in west Sumba; and agricultural professional individuals, who work throughout the province, attribute lack of rainfall to deforestation in Sumatra and Kalimantan.

- A different type of agent causes deforestation: for villagers, it is the central government and, for both local businessmen and government employees, it is a foreign corporation.
- Most informants mentioned global warming in passing while focusing their responses on local and regional deforestation.

## Analysis

The most obvious pattern we observed is that communities often place the responsibility for drought on distant areas and foreign entities. Because most communities extensively cut down trees and use fire to clear vegetation in the region (Dove, 1984; Fisher et al, 2006), this pattern could be expressed in the common Indonesian phrase *lempar batu, sembunyi tangan* (throw stone, hide hand) in which one's participation in a potentially condemnable activity is never admitted. If the analysis stops at this level in which east Sumbanese are only attempting to escape responsibility, either consciously or not, fundamental insights into how they construct an ethno-ecology of climate variation would be ignored. The following section will address how phenomenological experiences of the environment are central to east Sumbanese's knowledge of ecology. Then, we will show how these experiences determine which parts of Indonesian media's climate change reporting is integrated into east Sumbanese ethno-ecological models. Finally, we will analyse how apparent similarities between east Sumbanese and the global climate change sciences, especially the importance they both place on deforestation, mask differences between the two.

## Phenomenology in rural east Sumbanese ecology

Many people in east Sumba believe that a lack of trees results in a lack of rain. Whether true or not, this statement appears to be based on observed ecological relationships. However, the evidence and rationale for why this ecological relationship is true is established in phenomenological experience rather than experimental or empirical observation of solely vegetation and precipitation. Rural east Sumbanese do not simply make the statement that deforestation reduces rainfall and cite the interaction of these two variables. Nor do they reference a set of inherited cultural beliefs or the Indonesian news media's accounts of deforestation which we will discuss in later section. Instead, they place their own experience as a physical body of how trees provide shade which is cool and this coolness is associated with wetness in the form of puddles, dew and moisture. For them, the antithesis to the sensations of a cool and wet environment is the experience of fire and sunlight. Fire, per se, provides heat and more importantly leaves the ground and people exposed to

heat from sunlight. This is a hot and dry environment phenomenologically associated with a lack of trees. For rural east Sumbanese, their own bodies become the measuring instruments for understanding broader ecological relationships such as between trees and rainfall. This model is a different method of constructing an ecology than one based on a causal chain in which observably fewer trees result in observably less rain.

The absence of religious explanations also points to the importance of phenomenological experience in understanding the ecological interactions of drought. From early Dutch sources (see Onvlee, 1980) to ethnographies by contemporary anthropologists (Adams, 1970; Forth, 1981; Kuipers, 1990; Forshee, 2000), central to the *merapu* (spirit) religion is the role spirits play in protecting crops and livestock. According to this literature, nature was placed in a moral relationship to communities. Transgressions against spirits, such as incest or failure to conduct certain rituals, would cause drought, locusts and other events leading to crop failure and livestock death. Although people were not shy to talk about the traditional religion of *merapu*, during our interviews religious or moral explanations of decreased rainfall were never mentioned. In several interviews, we asked if a moral or religious transgression might result in a lack of rain. This questioned puzzled them. So we offered some examples: if someone failed to sacrifice the correct animal at a ceremony or a member of the community stole another's property, would this cause the *merapu* to withhold rain? In every instance, these suggestions were met with laughter and an exclamation that such a thing was absurd and amusing. Perhaps, the lack of religious explanation is the result of the growing presence of Christianity in the region. Though we cannot be certain, the fact that traditional *merapu* ceremonies and rites are practised openly suggests that this is not necessarily the sole cause of this change in view. Moreover, local experience strongly shapes what is assimilated from another cultural force in east Sumbanese communities – the Indonesian media.

## Global context

These views of the relationship between forest and rain may appear to solely reflect Indonesian national media's reporting of deforestation and global warming. Though east Sumba is geographically isolated and comparatively poor by Indonesian standards, national media reach distant villages. Approximately one third of rural homesteads have satellite dishes that pick up national programming and most villages have at least one dish and television that is communally used. All participants said that they watch the news for information about the environment. Since the 2007 United Nations Climate Change Conference in Bali and the 2009 World Oceans Conference in Sulawesi, Indonesian television comprehensively covers global warming. Moreover, deforestation receives even more coverage because it has a direct impact on economic and conservation efforts throughout Indonesia. This could lead one to believe that east Sumbanese are repeating the idioms of climate change

from the national media to explain their local situation. Considering the discrepancy between the national media's coverage of climate change and the responses of our participants, it seems unlikely that east Sumbanese simply reiterate what they have heard and seen in the media.

Media likely shape how east Sumbanese understand ecological relationships, but are less likely to dictate how individuals understand their local ecology. Though not as central as deforestation to their reporting on climate change, the Indonesian media also attribute global warming to emissions generated by factories, gas engines and other industrial activities. However, these other sources of emissions are completely absent from east Sumbanese understanding of the perceived climate change. Sumba has a low population density, few automobiles and motorcycles and no factories, therefore descriptions of such factors altering the environment have little traction among east Sumbanese. Thus, deforestation is integrated with local experience while something too foreign, such as industrial pollution, is ignored. The lack of attention given to other forms of pollution could also be a result of not viewing their situation as related to climate global change. However, almost all mentioned *pemanasan global* (global warming) and all responded that they knew about it when asked. This suggests that they conceptualize perceived changes in their environment as part of global climate change – albeit with different causal components.

Deforestation is a critical element to both east Sumbanese and the scientific community's views on climate change. However, we observed critical distinctions in how the Sumbanese place deforestation in an ecological system. According to climatologists, the role of deforestation in climate change involves the destruction of carbon trapping plants and the release of stored carbon into the atmosphere (IPPC, 2007). The relationship between rainfall, temperature and forests in Sumba is of a different order: east Sumbanese do not attribute decreases in precipitation to deforestation because deforestation alters the composition of a global atmosphere through carbon emissions, but rather because it alters the rainfall patterns of a local ecology. This effect of trees on rainfall has been debated since the 19th century.<sup>24</sup> East Sumbanese describe their experience of moisture and heat and what may be called the hydrological cycle rather than climate change. For this reason, it is incorrect to take the view that east Sumbanese simply recapitulate similar scientific explanations on a local scale. This also suggests that they use their own experience of ecological interactions in preference to reiterating messages from the Indonesian media which place deforestation into a global carbon system. Thus, although exposed to a global explanation or model for climate change, east Sumbanese construct an ecological model based on their own sensations of the environment.

## Conclusion

In this chapter, we demonstrate that east Sumbanese ethno-ecology of precipitation is a hybrid of their own phenomenological experiences and media reports on global warming. Though we found little evidence for

long-term or recent changes in precipitation as stated by participants, the perceived lack of rain is constructed into a localized environmental shift that mirrors, to some degree, global climate change science. The importance placed on deforestation by east Sumbanese and climate change scientists overshadows considerable differences in how each views the effects of trees, forests and deforestation on ecosystems. The case of east Sumba demonstrates that, as scientific information explaining global climate change spreads over extensive geographic and cultural space, differing ethno-ecological knowledge systems result in a mosaic rather than uniform set of knowledge.

## References

- Adams, M. (1970) 'Myths and self-image among the Kapunduk people of Sumba', *Indonesia* 10: 81–106.
- Chang, M. (2006) *Forest Hydrology*, Taylor and Francis Group, Boca Raton.
- Dove, M. (1984) 'Man, land and game in Sumbawa: some observations on agrarian ecology and development policy in Eastern Indonesia', *Singapore Journal of Tropical Geography* 5: 112–24.
- Fisher, R., Bobanuba, W., Rawambaku, A., Hill, G. and Russell-Smith, J. (2006) 'Remote sensing of fire regimes in semi-arid Nusa Tenggara Timur, eastern Indonesia: current patterns, future prospects', *International Journal of Wildland Fire* 15: 307–17.
- Forshee, J. (2000) *Between the Folds: Stories of Cloth, Lives, and Travels from Sumba*, University of Hawaii Press, Honolulu.
- Forth, G. (1981) *Rindi: an Ethnographic Study of a Traditional Domain in Eastern Sumba*. Martinus Nijhoff, The Hague.
- Fox, J. (1977) *The Harvest of the Palm; Ecological Change in Eastern Indonesia*. Harvard University Press, Cambridge.
- Hoskins, J. (1996) 'The heritage of head hunting: History, ideology, and violence on Sumba, 1890–1990' in J. Hoskins (ed.), *Headhunting and the Social Imagination of Southeast Asia*, pp. 216–48, Stanford University Press, Stanford.
- Intergovernmental Panel on Climate Change (IPCC) (2007) 'Summary for policymakers'. In: S., Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds), *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- Kabupaten Sumba Timur, Badan PS (2004) *Sumba Timur in Figures 2003*, Percetakan Usaha Mulia, Waikabubak, Sumba.
- Kuipers, J. (1990) *Power and Performance*, University of Pennsylvania Press, Philadelphia.
- Monk, K. and De Fretes, Y. (1997) *The Ecology of Nusa Tenggara and Maluku*, Periplus Press, Hong Kong.
- Needham, R. (1987) *Mamboru: History and Structure in a Domain of Northwestern Sumba*, Clarendon Press, Oxford.

- Onvlee, L. (1980) 'The significance of livestock in Sumba', in J. Fox (ed.), *The Flow of Life: Essays on Eastern Indonesia*, pp. 195–207, Harvard University Press, Cambridge, Massachusetts.
- Otterspeer, W. (1997) *Leiden Oriental Connections, 1850–1940*, Brill Academic Publishers, Brill.
- Wouden van, F.A.E (1968) *Types of Social Structure in Eastern Indonesia*. (trans.), Rodney Needham. Koninklijk Instituut voor Taal-, Land- en Volkenkunde Translation Series, vol. 11. Martinus Nijhoff, The Hague.

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