

Can ethnoecological knowledge be used to adapt to climate change or even mitigate it?

Some evidence from Penan and Kenyah responses to El Niño droughts in East Kalimantan

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Ethnoecology and Climate change

Why bring these two concepts together?

1. Add a temporal dimension to studies of local knowledge?
2. Understand climate change better by studying ethnoecology (or ethnoclimatology)?
3. Study how peoples use ethnoecological knowledge to adapt to or mitigate climate change and its effects?
4. Extract ethnoecological knowledge and make it available to be used outside its original context?

Kenyah Badang, Penan Benalui

The Lurah River Valley,
Kayan Mentarang National Park
East Kalimantan, Indonesia



PENAN BENALUI - FORMERLY NOMADIC HUNTER-GATHERERS

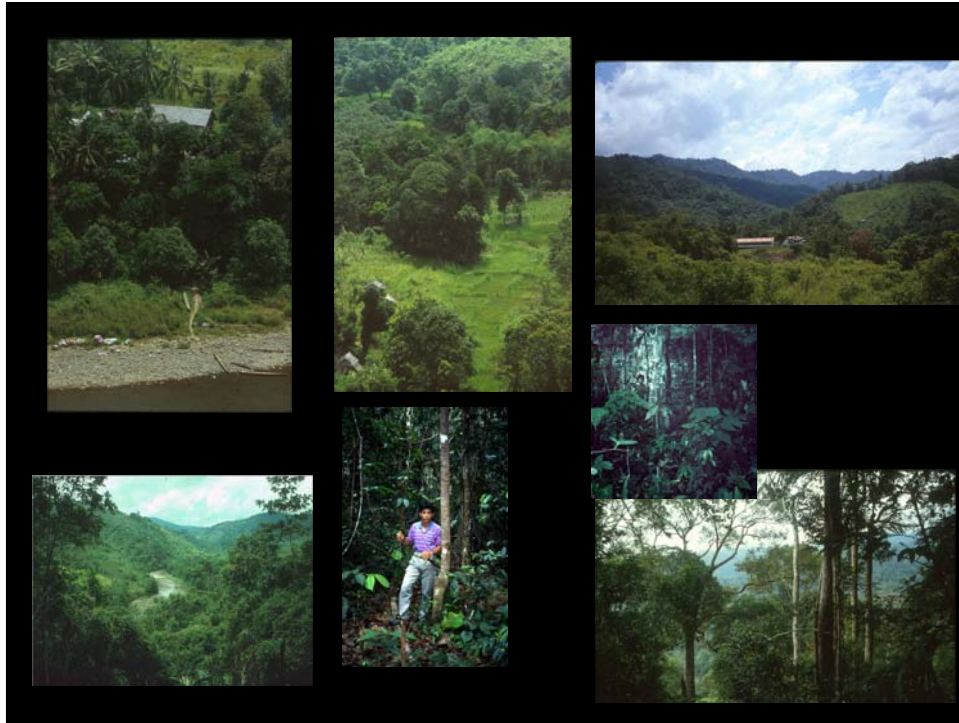
15-80 people:
forest camps, villages, swidden camps, Kenyah Villages
Egalitarian
HUNTING, GATHERING
SAGO PROCESSING
TRADE IN FOREST PRODUCTS (RATTAN, GAHARU, BIRDS, MEAT, ANIMAL PRODUCTS)



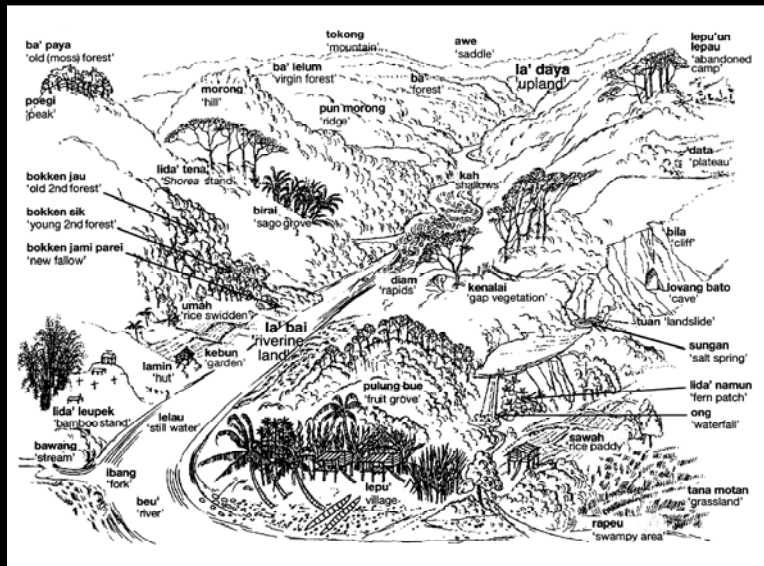
KENYAH BADANG - LONGHOUSE SWIDDEN AGRICULTURALISTS

40 - 500 people:
villages, swidden houses
Stratified
RICE SWIDDEN AGRICULTURE
GARDENING (*CASH CROPS), GATHERING
FISHING, HUNTING, TRAPPING
TRADE IN FOREST PRODUCTS

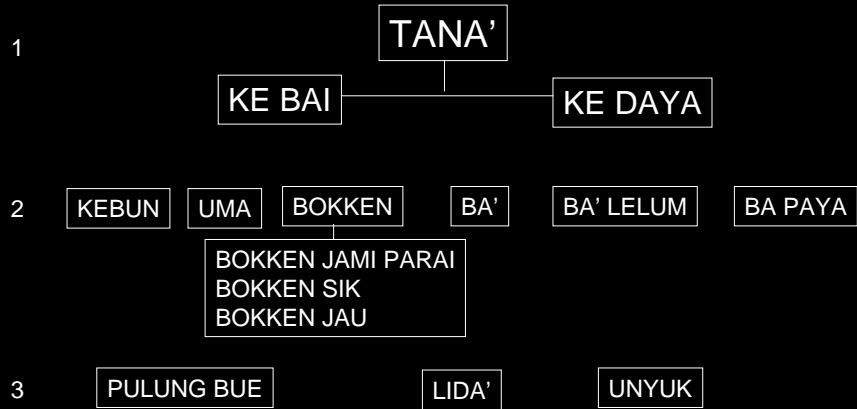




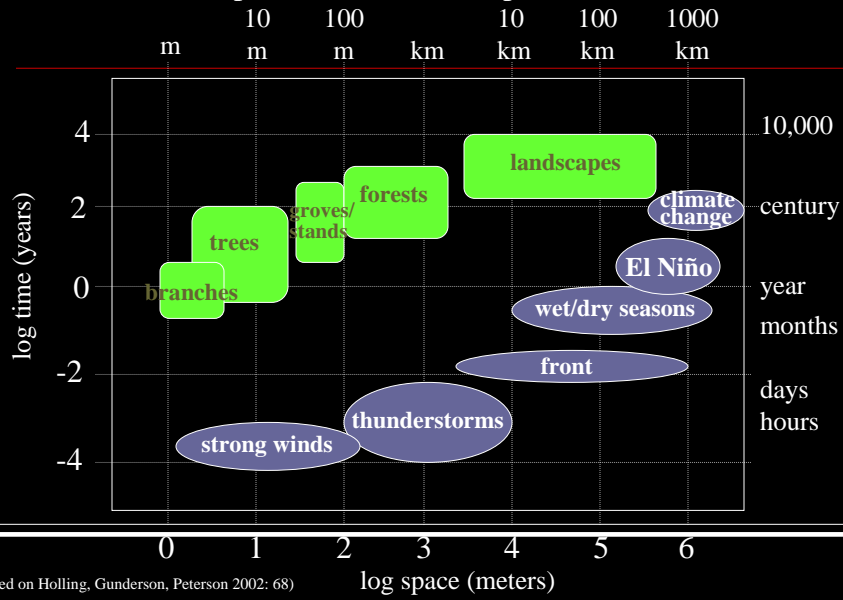
Penan Benalui Ecological Representation



Penan ethnoecology



Hierarchies of vegetation, landform structures, and atmospheric processes for the Tropical Forest



1. Ethnoclimatology

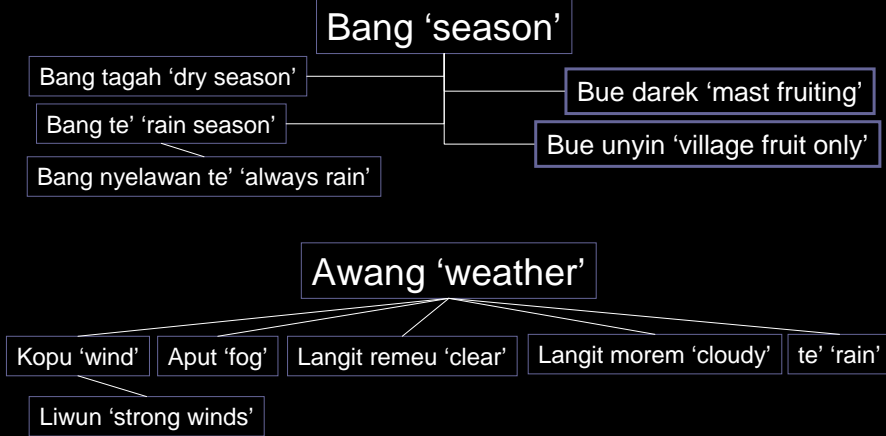
- Classification of variation in weather on a temporal scale
- Hierarchical:
 - daily weather (morning fog, noonday sun, afternoon monsoon)
 - spells (Indian summer)
 - seasons (may be indicated by animal and fruit behavior);
 - inter-annual variation (El Niño droughts or floods)
 - Long term changes: climate
- Covert categories and understandings found in practices : study actions, responses to climatic variation
- Behaviours in response to climate/weather

Climate/weather knowledge

- **Verbal or Declarative:** learned through direct instruction or story telling.
 - Examples: verbal instructions, stories songs epic poems, proverbs, **names of weather categories** (rain, snow, etc)
- **Behavioural:** knowledge and skills learned through observation, imitation, trial and error experience.
 - Examples: pruning, turning soil, building earthworks (canals)
- **Performance:** learned through experience as well as verbally through transmission from others
 - Examples: weather forecasting; managing activities, reacting to contingency, emergencies: floods!



Penan ethnoclimatology



Schematic Calendar of Penan and Kenyah seasons

J	F	M	A	M	J	J	A	S	O	N	D
P: Bang te' (WET) K: Sio' ojan			P: Bang taga (DRY) K: sio' taga'				P: Bang te' (WET) K: Sio' ojan				
						P: Bang bue' lepu K: Sio' bus leppo' (VILLAGE FRUIT)		P: Bang bue' ba' K: Sio' bue ba' (FOREST FRUIT)			
						P, K: Dalo babui nyatong (PIGS MIGRATE IN)				(PIGS IN FOREST)	
P, K: majau (HARVEST)			P: manu kebun, K: oyen kebun (MAKE GARDENS); P: tebeng, K: neppeng (FELLING); P: ngederik, K: ledik (CLEARING)			P: m e n y u K: n o t o n g (BURN)	P: mula K: mola (PLANTI N G)	P, K: mabau (WEEDING)			

Penan and ENSO

- No supra-generic rank for inter-annual variability in climate,
- Indirectly, understand variability in drought, fruit seasons and pig migrations. E.g., Bua darek, bua unyin
 - 2006: El Nino drought causes rice crop failure: "strange weather, no distinct seasons: rain followed by drought followed by rain"
 - Also no fruit in forest, monkeys raid fields!
- Don't see drought flood link
- Can't predict variation



Tungan Tau: Kenyah forecasting?



2. Some ethnoecological contributions to climate science

- Peruvian fishermen identify “El Niño” warm currents
- Forecasting Andean rainfall and crop yield from the influence on El Niño on Pleiades visibility (Orlove et al 2000)
- Others??

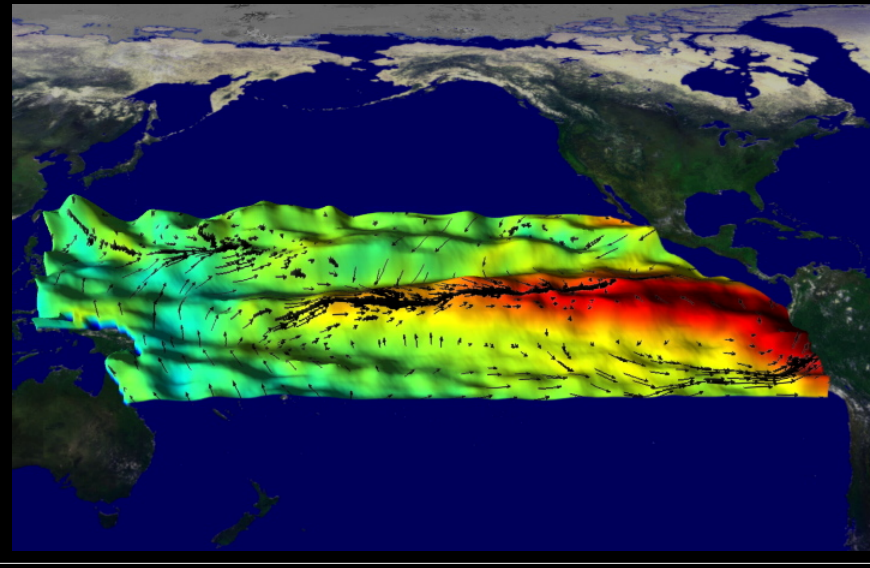
3. Ethnoecological knowledge and responses to climate change

- Most research focuses on responses to drought, flood, food stresses, natural disasters
- Foragers and farmers (and urbanites) differ in responses...but usually a hierarchy of responses enacted as conditions get worse (e.g.,drought is prolonged)
- EE Knowledge: secondary plant foods, famine foods, diverse agroecosystems, alt. water sources
- Social alliances also important, but limited by ability to maintain them at distance and overtime with gifts and visits

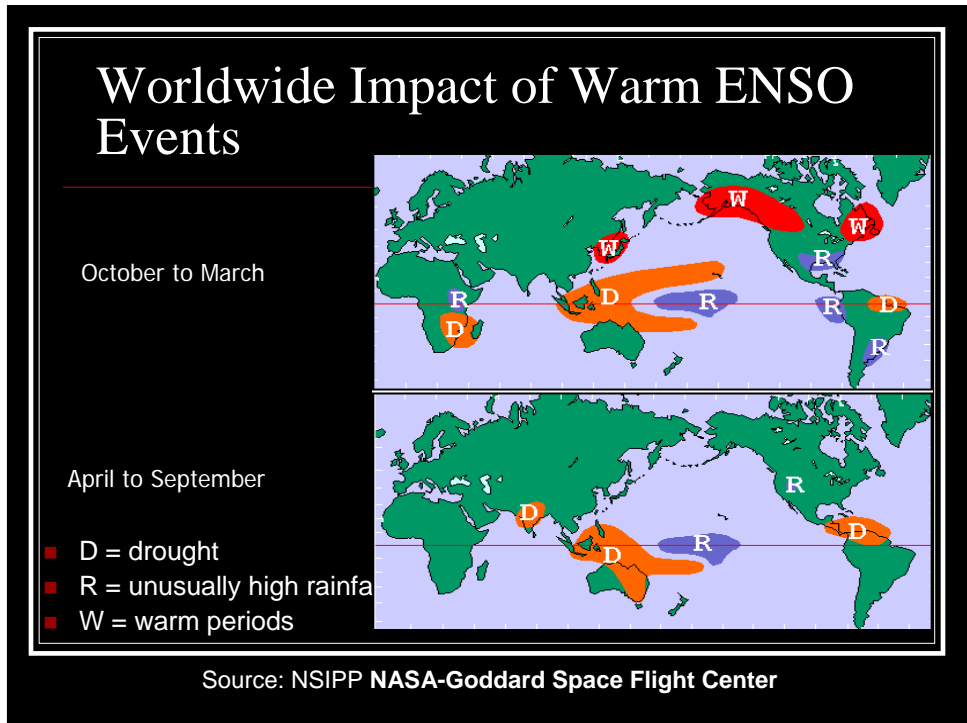
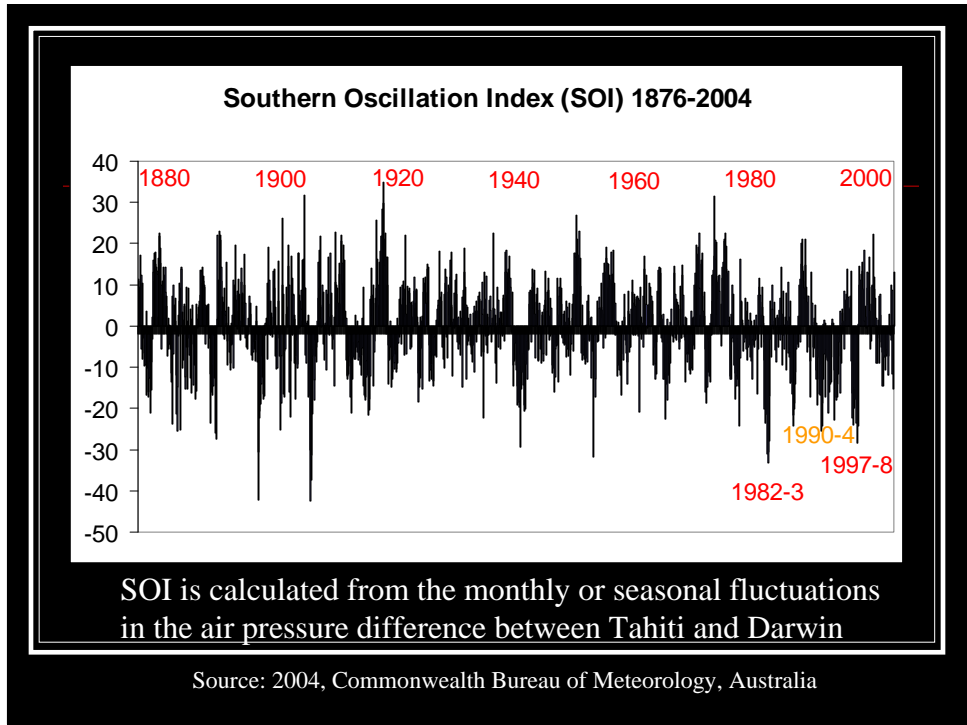
ENSO in Borneo and Western Pacific

- Maybe 3 million years old, more common during inter-glacials (Colgan 1990).
- > 8000 BP: cooler, drier, little evidence of vegetation adapted to a drought-flood sequence
- < 5000 BP: wetter climate
- 3000 BP: present climatic variability evident in the pollen record (Brookfield 1997)
- Since 1870, fire associated with almost all ENSO events, esp. in SE Kalimantan (peat and *Imperata* sp. grasslands)

Sea surface height, temperature and winds July 1997



NASA-Goddard Space Center (NASA TOPEX and NOAA AVHRR)



“Knockout punches!”

Historical influence of ENSO: a catalyst

- 1200-1 Egypt
- 1450 Aztecs, Mexico
- 1640-1 Ming Dynasty
- 1769-70 Bengal, India
- 1844-6 Portugal/Ireland
- 1888 Ethiopia
- 1891-2 Russia/Europe
- 1930-1 Vietnam

(Fagan 1999. Floods, famines and emperors: El Niño and the fate of civilizations)

Human adaptation to ENSO: coping strategies

- **Coping strategies:** adaptive responses to disaster, that reflect needs, wants, cultural values and social structure of groups
- Are coping strategies simply responses to a fluctuating food supply?
- Some adaptations are clearly responses to inter-annual variation, suggests ENSO influence



History of responses to ENSO in Borneo

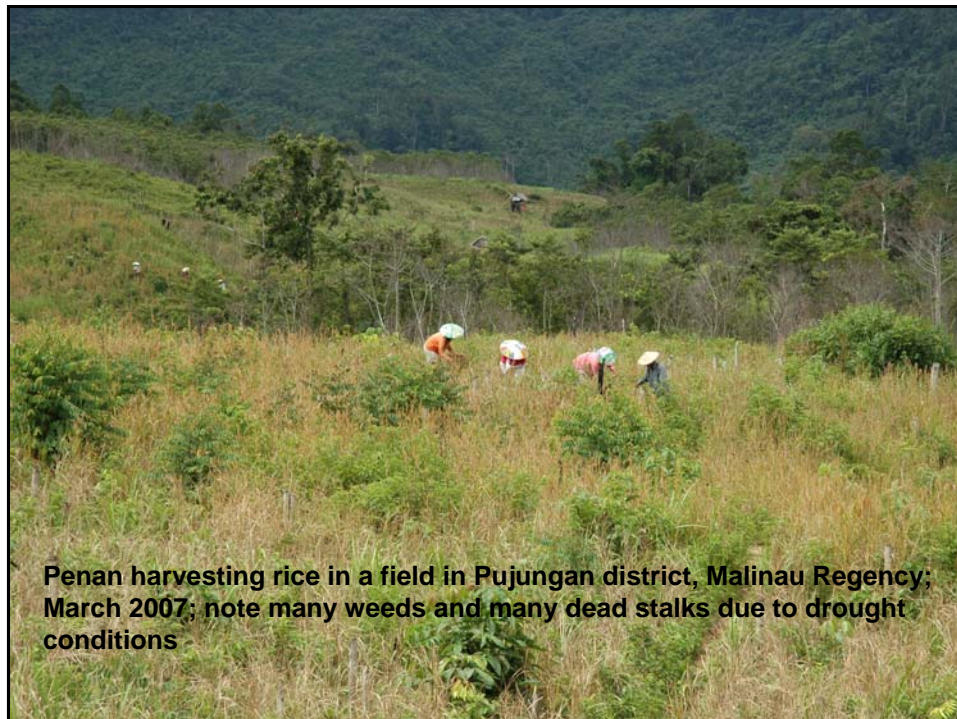
- “risk and uncertainty have always been a fact of life on Borneo,” (Knapen 1997: 121).
- Droughts and floods cause famines, epidemics and warfare
- 17 and 18th C: Isolation
 - rely on their own local solutions;
 - more likely to fight than trade when facing food scarcity
- 19th C: Integration into colonial market economy
 - increasing forest product collection (Rattan and gutta percha);
 - cash crops and wet rice
- Early 20th C: Pacification reduces risks of trading
 - increases movement between coast and inland
 - people could now trade themselves out of a disaster.

History of responses to ENSO in Borneo: scale of response

- Rice varieties adapted to different climatic conditions and staggered planting
- Small fields of secondary crops: Fast growing rice varieties, maize, sugar-cane, sweet potatoes and manioc
- Agroecological zones linked by trade (SE Borneo Knapen 1997):
 - shifting cultivation of rain fed hill rice
 - swamp rice planted in the dry season
 - rice grown in tidal areas at the end of the wet season
- Trade to international markets: rattans, gutta percha, medicinal plants, aloeswood, rhino horn, birds nests
- Appeal to gov't for food aid (rice, sugar, gasoline, kerosine, cooking oil) and transport (charter flights)

Penan Benalui strategies

- Low investment in agriculture, housing; able to abandon farms and return to forest: fruit, sago, hunting pigs, fishing: MOBILITY
- Plant small manioc and banana gardens (supplants wild yams, etc.)
- Maintain patron-client relations with Kenyah, Gov't, traders (trade meat, fruit, forest products, handicrafts, sago for cash, credit, rice)
- Maintain relations with Malaysian relatives infrequently, story
- Knowledge of wild foods (*wild yams*, sago, vines, stems, shoots, mushrooms, honey; animals of all types)



Penan harvesting rice in a field in Pujungan district, Malinau Regency; March 2007; note many weeds and many dead stalks due to drought conditions

Kenyah Badang strategies

- diversify rice field locations: riverside v. hill slope; swamp rice and dryland
- church fields: community reserve
- plant fast rice (3 month)
- plant tuber gardens in two locations (taro, manioc, sweet potato)
- protect hill sago groves (5 sp. of tree palms)
- *tana ulen* reserves: for hunting, fishing, collecting
- knowledge of wild foods (tubers, stems, shoots, vines, mushrooms, greens, clay for detox); revert to HG strategies
- ability to diversify animal diet: fish poison in low rivers; trade with Penan
- access to capital/markets to sell NTFPs through patron-client relationships with traders (cage birds, rattan, gaharu)
- access to government stores and relief

Managed groves of *Eugeissona utilis* palms are often protected and reserved for food shortages. A starchy flour is extracted from the pith of the trunk, known as sago or sago.



From ENSO to climate change, is adaptation enough?

- Climate change may present extreme versions of familiar “shocks”, e.g. extended droughts, more frequent floods, coping mechanisms may be adjusted (innovative adaptation)
- Repeated shocks, at short intervals, can lead to societal collapse (need more than just local knowledge)
- Adaptive capacity may be higher for societies subject to El Niño/La Niña events, or other interannual oscillations (e.g., NAO, Hurricanes)

What if...

- El Niño events don't just appear more frequently and more severely, but instead we move into a permanent El Niño state? (Meir and Grace 2005)
 - Tree mortality is at 10% or higher for an extended period?
 - Wild fires become annual events?
 - Forest phenology is disrupted, and animal and fish populations crash?
- Other surprises?
 - ...is local ethnoecological knowledge capable of providing solutions for adaptation to these kinds of problems??

4. Banking knowledge: what if there is a shift in climate?

- Current ethnoecological knowledge may only be relevant to those living elsewhere (to the north?)
- Knowledge banks and networks: tools for those subject to unfamiliar conditions, but must have access
 - IPR issues: benefit sharing
- Problem of documenting local knowledge and performance of actual activities/contingencies
 - Nature of knowledge: need Participant observation, use video

IPCC WGII Report April 6th 2007

- 'While most technologies and strategies are known and developed in some countries, the assessed literature does not indicate how effective various options are to fully reduce risks, particularly at higher levels of warming and related impacts, and for vulnerable groups.'
- 'However, adaptation alone is not expected to cope with all the projected effects of climate change, and especially not over the long run as most impacts increase in magnitude...' (p. 18)

Conclusion: Future research

- Long term monitoring needed; never know when shocks and surprises will arise!
- Fine grain ethnographic analysis needed to understand variation in responses
- Focus on local people's applications, extensions and syntheses of ethnoecological knowledge with other kinds of knowledge, such as weather forecasts, in enacting social, economic and political changes to cope with both shocks and surprises caused by climate change

Thank you!

