

Social Memory of Short-term and Long-term Variability in the Sahelian Climate

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The 170,000 km² interior floodplain of the Middle Niger (Mali) is a tight mosaic of alluvial and desert microenvironments. The interannual to intermillennial climate change profiles of this fluvial anomaly thrust deep into the Sahel and southern Sahara are masterpieces of abrupt phase shifts and unpredictability. Response has been of two kinds. The Office du Niger was France's largest colonial-period development project—and a failure of massive proportions. An older tradition of Social Memory allowed for the integration of increasingly-specialized producers and artisans in a generalized economy. High ethnic and corporate diversity grew into one of the world's most original, purely indigenous urban civilizations.

It all went horribly wrong. And it had such vast potential for Colonial pride and for Metropolitan investment. At the southern fringe of the Sahara, in its colony of l'Afrique Occidentale Française (now the Republic of Mali), France undertook the most ambitious of the development schemes of all her colonies: the Office du Niger. Through massive technical investment and rational economic centralization, a long-dead palaeochannel of the Sahara was to flow once again. This was to be Africa's Green Revolution, three decades before the Asian miracle.

As planned initially in the 1920s, the dam and canal system would annually inundate some 1.9 million hectares. Irrigated cotton would be transported to Mediterranean markets along a railroad of 3,270 km across the world's largest desert. Imperial would forbid the drift of dunes across the tracks! And monocropped Asian paddy rice (*Oryza sativa*) would eliminate the "irrational" cultivation of the local floating rice, *Oryza glaberrima*, whose yearly yields ranged from 4,400 kg/ha to barely subsistence levels. By the early 1930s, the Colonial authorities began to relocate, by brutal military operations, a projected 3.5 million southern peasants to this wasteland—in the process, breaking up traditional land-use and land-tenure—and substituting coercive sharecropping.

And the results? This was just the first of West Africa's long, sad heritage of development debacles, particularly during the Sahel Drought. All such projects were predicated upon large acreage, monocropping, and capital-intensive earth-modification. Rather than 1.9 million

ha put into irrigation, today there are fewer than 50,000 ha, or 2.6 percent of projections. Rather than 3.5 million laborers, today there are less than 37,000, or just 1 percent of projections. The railway was never even begun.

What went wrong? Any reasonably-observant student of historical human ecology might have predicted defeat for the Office du Niger at the hands of a deep-time, local Social Memory. Social Memory is the long-term communal understanding of landscape and biocultural dynamics that creates a filtered perception of environmental variability, which ensures the curated knowledge of pertinent experience, and its intergenerational transmission. Social Memory enables the community to designate those of its members who have authority to act in times of stress. And its principal manifestation amongst the peoples of the Middle Niger is Ecological Resistance.

Ecological Resistance, a concept from historical ecology, is based on the recognizing that rigid, hierarchical decision-making structures are not always best positioned to deal with situations of abrupt, unpredictable climate and environmental change. Heterarchies can show greater resilience, a greater capacity long-term to deal with the attendant economic and social stresses. Under these circumstances, societies may develop persistent mechanisms of resistance to centralizing or coercive tendencies, those leading to hierarchy.

Ecological Resistance is written in the fluid concepts of landscape and ethnicity shared by the mosaic of ethnic and occupation groups of the Middle Niger. Ecological Resistance is inscribed also in the very ancient practice of "niche specialization within a generalized regional economy" that the archaeologist can read in the local response to several dimensions of ecological and palaeoclimatic risk endemic to the Middle Niger. This is risk in a landscape with, nevertheless, vast potential, if managed and massaged with Social Memory's ecological subtlety.

This risk derives from a highly volatile climate—one with variability along several scalar dimensions and, hence, described as "quasi-chaotic" by frustrated development engineers. The Sahel is infamous for high interannual variability of precipitation in: (1) total rainfall; (2) onset of the rainy season; (3) rainfall for each particular month during the short monsoonal wet season, and (4) areal patchiness of the rains. Interannual

variability characterizes the annual flood (1) height, (2) staying power before evacuation, (3) date of arrival from the highlands of southern West Africa, and (4) timing and nature of the seasonal migrations and spawns of its rich fish load. Even variable temperatures over this vast evaporation basin and the deflating northeast trade winds of the dry months conspire to frustrate the considerable predictive skills of the Middle Niger's specialized farmers, fisherfolk, and pastoralists.

The second dimension of variability is mode-shifts: impulsive changes of the central climate tendency, with a threshold beyond a previous normal range of variability to a new set of boundary conditions. In other words, "global" climatic trends may be initiated here by abrupt events and they may be accompanied by periods of high temporal instability. Mode shifts may be interdecadal or multi-decadal in scale—such as the Sahel Drought that began in 1968 and that continues today as a high oscillation episode. Or, modes may last centuries or even a few millennia, as documented in lake-levels.

Our last dimension of variability is the landscape itself. The Middle Niger is a tight mosaic of landforms and floodplain soils of descending bathymetric progression. But, because of the dramatic interannual variation in rains and flood, a Nono (ethnic group) plot of high-yield African rice one year, may the next be used by a separate ethnic group, the Bambara, to grow flood recession sorghum, and during a future year of minimal flood it might be visited only by Fulani herds of cattle and small livestock. That is, the high variability of altitude (bathymetry), inundation-potential, and soil morphology invite a highly fluid concept of landscape. A particular microenvironment might theoretically redirect its seductions among five or six subsistence specialists within a decade—with inevitable potential for conflict when ethnic perceptions collide.

With over a dozen subsistence-defined ethnic groups in the Middle Niger, some conflicts are inevitable. But why has the floodplain historically not been a morass of bloodshed and conquest? What is the Social Memory of landscape that positively encouraged ethnic differentiation, elaborate niche specialization, and a shared commitment to a regional economy of reciprocity? Not only are fisherfolk divided ethnically into hand-net, shallow swamp fishermen, or deep-channel collective-net fishermen, or into the hunters of aquatic fauna such as crocodile, hippos, and giant Nile perch; not only can the fisherfolk absolutely count on the labor of rice farming Nono, Marka, and Rimaibe during the season of fish migrations; but also, the critical rituals of appeasement of the water spirits that obligatorily begin the deep-swamp fishing calendar of the Bozo can only be initiated by their Nono farmer neighbors.

Over deep time, there has developed an ethos of Ecological Resistance to a monolithic perception of landscape. This deep-time ethos encourages both niche specialization and a highly contractual web of surplus and labor exchange obligations. If diversification (broadening the subsistence system) and exchange (playing off temporal variability against spatial variability) are classic tools of risk-buffering, the peoples of the Middle Niger have gone beyond mere buffering to create a massive web of mutual aid obligations underlain by four the foundation stones of their Social Memory:

1. Critical Catalyst: The subsistence calendar of group "X" can only be activated by the scheduled ritual intervention of group "Y." To try to short-circuit this tradition simply invites disaster.
2. Bonds of Fictive Kinship: Legends of common origin and rules of obligatory common labor (including an elaborate web of joking relations).
The template for these myths is an account, most likely fictive, of the sequential colonization of the floodplain, in which ethnic groups contracted with a hierarchy of occult guardians of prominent topographic features.
3. Undischargable Debt: Lore of extraordinary sacrifice by one group for another, under conditions of ecological stress, wrapping everyone in a fabric of expectations for future behavior.
4. Equation of Ecological Resilience with Resistance to any form of Centralization or Authority Monopoly: Locally, it is not considered to be at all remarkable that the 1,500 year archaeological record of urbanism, to date, shows no evidence of state formation, political or social hierarchy, or elites of any stripe.

What is impossible, of course, is to know how deep in time run any of these specific rules of ethnic accommodation. However, there is good proxy evidence that highly elaborated corporate identity and niche specialization are ancient institutions. We turn first to the best understood region of the Middle Niger, the vicinity of modern Jenne and its ancestral community, Jenne-jeno, where excavation and survey has gone on for some twenty years. Jenne-jeno is a six-meter high tell covering 33 ha, with evidence throughout a continuous sequence lasting from c. 300 B.C. to A.D. 1400. The Jenne-jeno sequence is a record of ever increasing numbers of specialists.

But more interesting is what we can say about the scores of satellite tells clustered near Jenne-jeno. Within a four-kilometer radius of Jenne, there are 69 such satellites, most if not all occupied simultaneously for up to a millennium. A complete surface recording of all 69 sites and preliminary excavations at 10 demonstrate some degree of corporate exclusivity at different mounds and of specialization in subsistence and craft activities.

Beginning some 2,000 years ago, we have an emerging urbanism based upon clustering—that is, a segmented community of specialists who voluntarily come together to take advantage of the services of others and of a larger market for their products, but who maintain physical separation in order to reinforce their separate identities. Clustering—physical separation with proximity—facilitated the reciprocal relations with other specialists that bind together the Middle Niger ethnic mosaic to this day.

So, clustering appears to have been a stable solution to the complementary ecological problems of the Middle Niger—specifically, a rich environment, but one highly variable in its rain and flood regimes. Elsewhere, environmental unpredictability disperses people, but here, many specialized artisan and subsistence producers link into a generalized economy. Clustering does not substitute, however, for other “extensive” strategies: (1) sowing more land (and more heterogeneous plots) than the farmer has labor to harvest (2.5 ha/person at 400 mm., compared to 1 ha/person at 1,000 mm.) in order to anticipate spatial variations in rainfall or flood; and (2) mixing a variety of crops and grain varieties (42 of *Oryza glaberrima*) over a variety of micro-environments and along the bathymetric progression.

Settlement clustering is widespread over the 55,000 km² Middle Niger River Valley. Just how old are niche specialization and the values of horizontal

complexity associated with it? Here we return to the senescent basin of the Office du Niger. Along the dry channels and distributaries of this “dead delta” are clustered early iron age communities of the mid-first millennium B.C. These are proto-towns of up to 33 components built atop Late Stone Age, clustered settlements going back into the second millennium B.C. Excavation at these sites is in its infancy. Yet, at Late Stone Age sites throughout the Middle Niger for which we can make an argument for contemporaneity, evidence suggests that specialist fisherfolk, pastoralists, and perhaps grain gatherers/early horticulturalists were purposefully living in separate hamlets, next to one another, at least seasonally. Pastoralists exchanged surplus meat for fish, and certain ritual items also passed hands.

Whatever the ultimate age of clustering and specialization in the Middle Niger, the values of Social Memory (especially Ecological Resistance) are arguably of considerable antiquity. An extremely fluid concept of landscape helped to turn endemic climatic stress into a culture of ethnic accommodation. These values were directly opposed to the Office du Niger bureaucratic belief in massive capital injection, monocropping of exotic crops, and homogenization of the landscape and the peasantry. The Office du Niger had no option but to fail. And in its place, the traditional Middle Niger remains, even thirty years into the Sahel Drought, the granary of West Africa.