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James Workman is a Donors' Fellow of the Institute studying the use, misuse, accretion and depletion of fresh-water supplies in southern Africa.

Shattered Nilometers
After 5,200 Years of Top-Down Rule, Can Water Scarcity Re-Democratize?

James G. Workman

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CAIRO, Egypt – A few hours after the White House asserted its right to launch a unilateral preemptive war on Iraq I found myself the sole American sharing a packed auditorium with several hundred nervous Arabs.

All around me sat middle-aged officials. They hailed from Algeria, Jordan, Lebanon, Morocco, Syria, Tunisia, Turkey, West Bank and Gaza, Yemen and, above all, Egypt. Excluding non-Arab Turkey and the markedly absent Israel, these autocracies allowed no opposition parties or welcomed dissent. Glancing about, I estimated the crowd as 95 percent male, Muslim and agitated.

The imam's calls to prayer filtered through the windows. Speakers grew shrill. Driven by modern man's quest to exploit a precious liquid found in this Middle East-North African region, a political crisis loomed. It threatened to unleash instability, violence and refugee waves within and between Arab nations. Yet this same risk united them in solidarity to address their shared predicament. One after another, each took the microphone to vent his opinion about the one indisputable menace that really, truly frightened us.

A future hydro-democrat? *This Egyptian farmer, on a canal off the Nile, will haggle with you endlessly over the price of his own fresh-picked carrots. Soon, he'll haggle with others over the price of water used to irrigate them*

Fresh water. For by their own admissions, Arab governments could no longer supply it.

With parched capitals absorbing less than an inch of rain and hungry millions competing for that scarce resource, this was Africa's most water-stressed and volatile region. I had been invited here by officials to compare political responses to aridity in the continent's dual deserts, Kalahari and Sahara. True, Egypt lay north of my primary ICWA focus. And water 'talk-shops' normally made me snooze.

But this one — boringly titled and run by staid bureaucracies[1] — had the

[1] "Water Demand Management Forum: Decentralisation and Participatory Irrigation Management," hosted by the International Development Research Center, Canadian Internatioanl Development Agency, United Nations Development Programme, Japan Office of Development, International Fund for Agricultural Development in collaboration with the Ministry of Water Resources and Irrigation, Egypt.

opposite affect. It quickened my pulse. It shed light on water politics emerging throughout arid Africa. Its crises spurred me, Walter Mitty archeologist, to dig deeper while interviewing my way up the banks of the Nile, wondering whether something buried so long ago beneath the Sahara might re-emerge, be dusted off and hauled to the surface.

What I sought (with others) was less tangible yet more precious than King Tut's treasure: independent self-governance by irrigation farmers, a revival of hydro-democracy.

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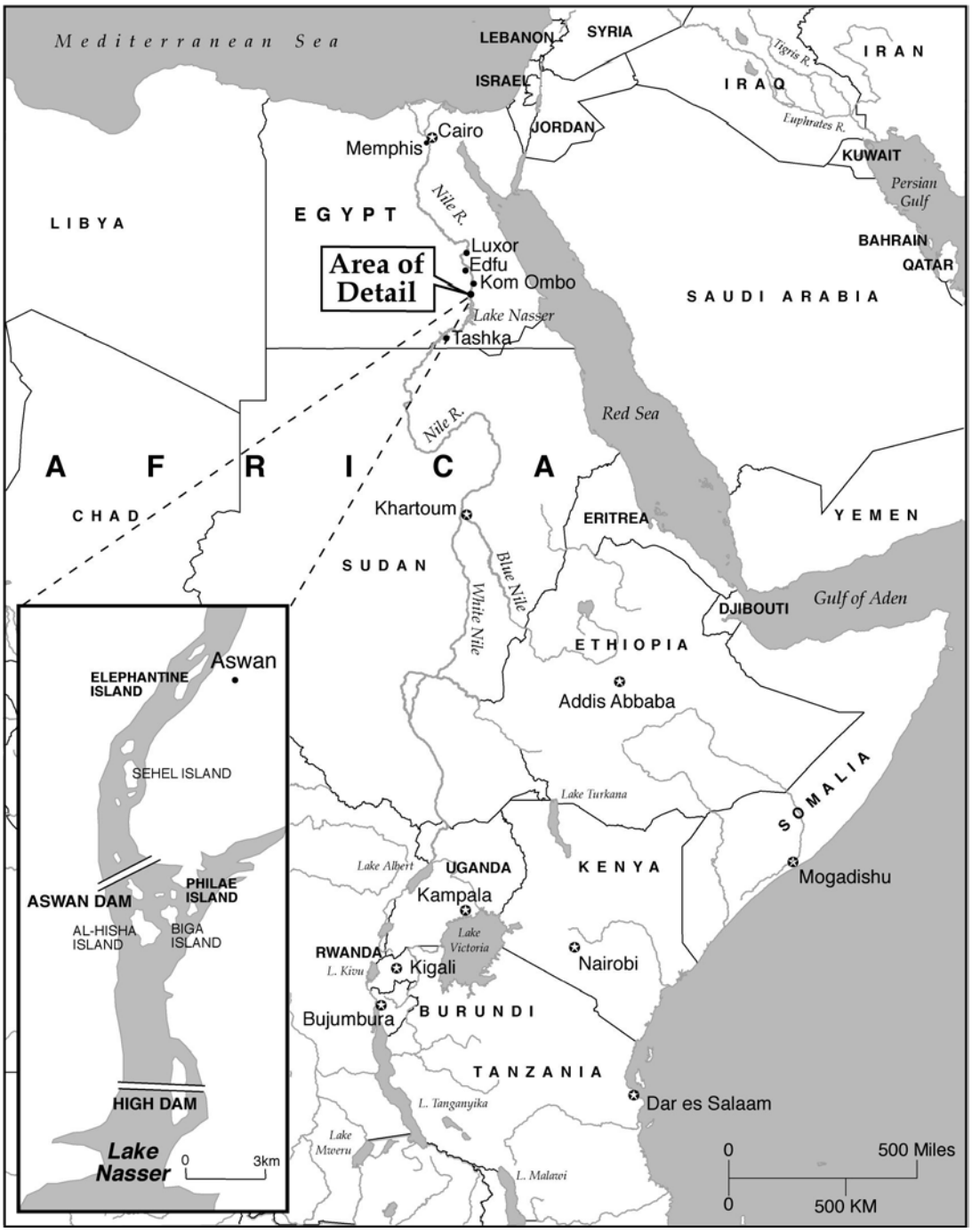
Admittedly, it was a quest worthy of Indiana Jones. For its hypothesis rests on three shaky, un-American assumptions: First, that any democracy ever existed in Africa before it was buried; second, that it could peacefully surface through self-determination without 'help;' and finally, that water, and information about water, may be the decisive variable in this unfolding political process.

Before launching my upstream expedition to test it, I had to update childhood lessons. As kids we learned how the fertile, fluctuating, life-giving Nile spawned the first great civilization [although we bypassed exactly *how* water did this, and at what or whose expense]. Later we learned liberal democracy was a Western 'invention,' born in slaveholding Athens, perfected in slaveholding America and thereafter 'exported' by us everywhere from post-royal France to post-WWII Japan to, presumably, post-war Iraq. Democracy thus resembled a catalytic converter, waiting to be installed by skilled U.S. mechanics, clearing the air with unfettered trade, uncensored Internet and, say, unrestrained Emenem rap. Lastly, the historic modern incentive driving all policy was to expand the flow of and access to crude oil.

What about other depollution? These lessons ignored If, How, Why and Where *water* provided an evolutionary force in political history. Specifically, in arid Africa: Did rivers foster democracy? Had human control of water smothered it? And could the pressure of aridity, rather than petroleum or even water, help revive it once again?

I found just enough tantalizing hints that it did, it had, and it could. Water's role depended on who reined the river. After digging through the historical sand, I un-



covered this: Egypt before the pyramids was in fact a landscape filled with scattered, independent, self-governing farm communities that eked out livelihoods from the flood and ebb of the Nile. While not rich and powerful, they were, by necessity, egalitarian.

"Throughout history, aridity has in most cases led to democratic decision-making on use of water, water allocation and conservation," said Paul Van Hovwegen, a water-management expert who has spent decades in Arabic countries. "Traditional social entities were often fully run on such democratic principles."

Digging deeper, I discovered how and why those principles got buried. Riparian farmers began to grow enough grain to store. A few opportunists used surplus grain to arm mercenary thugs. With thugs, they took over neighboring lands and controlled sections of the river. More grain led to more hired hooligans and priests who duly assured "Da boss" (and everyone else) of direct descent from the gods, until, presto! Civilization.

Water-Breathing Powers That Be: *This recurring hieroglyph, here found at Luxor, depicts Upper (left) and Lower Egypt united by the Nile, looped and knotted in the shape of the pharaoh's lungs.* Rulers' political fates were indeed intertwined with the river's flow.

In this Hobbesian world water was no longer the benign democratic force it began as a river; water monopoly allowed rulers to crystallize their status quo. Anyone wanting land or water was beholden to The Man. This primitive trickle-down economic policy, of course, had no patience for self-rule and collective responsibility. By commanding and controlling water, any arid state could grow (and tax) enough to feed its people and still keep the armed, water-controlling bureaucracy prosperous and in control. This formula for irrigated-food security helped the world's first nation-state unite upper and lower Egypt along the Nile. Water control enabled an unbroken chain of pharaohs (and later imperial usurpers) to grasp and cling to power, right up to Egypt's one-party rulers of today.

Western development banks and agencies were ostensibly set up to grow democracy. But by funding government water schemes, they often retarded it. "The donor-aid system worsened the situation," Van Hovwegen warned me, "because it focused on assistance through these central agencies, creating new perverse interest in top-down water-management changes. As long as this last system is prevalent, the democratization of water management will be difficult."

Yet the trickle-down system required a monopoly over water. Without it, cracks appeared, and the edifice weakened. Against water-rule's powerful *status quo* came an equally potent force, aridity. Speakers lamented how, for the first time since the pharaoh Menes united Upper and Lower Egypt in 3100 BC, they were losing to the latter. There was no longer enough water for the Arab State to use as compelling political, economic or spiritual leverage over its urbanizing, industrializing and expanding populations.[2] Speakers from Yemen, Jordan and the Palestinian territories acknowledged that their peoples "hit the wall" years ago, consuming more water than nature supplies. Those from Egypt, Sudan, Morocco, Tunisia and Syria confessed they too are hitting the bottom of a dry well. After 50 centuries of central rule, knowledgable forecasters said Egypt was being forced to shift back toward something resembling its earlier water-democratic self.

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Why now? Day after day I watched the timeless Nile flow through Cairo, just outside the window and across the street. It seemed strong, but slow. So much water got siphoned off or evaporated upstream, that here I saw only 18 percent of what entered Egypt above. Later I visited Alexandria on the coast. Skirting the Delta's edge, I witnessed huge pipes disgorging vast quantities of Nile water into open canals that fed green fields, bordered by desert. I reached the sea, but in dry years, the Nile never does. It may be the world's longest river, but it was also, as it turns out, maxxed out. Finite.

Pushed and pulled in 61 million directions, the nation's water autocracy could no longer absorb the strain of water's innate centrifugal forces. Water falls apart; the center cannot hold.

"Government has played the role of a helpful big brother for irrigated agriculture for a long time," said an Egyptian hydrocrat (perhaps unfamiliar with George Orwell's novel). "But today we can't count on big brother alone [to provide water] anymore but rather only as one small partner." Later, all participants agreed when a keynote speaker[3] cited "a *tacit recognition* of the inability of the public sector to provide the requisite financial resources and institutional capability" to allocate water as it always had.

Tacit or no, any admission of the problem — that governments were failing to command-and-control their finite water — was a first step toward recovery. The Arab single-party state still possessed the will to dictate irri-

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[2] Conspicuously missing from the Forum were certain Arab autocracies like Libya, Saudi Arabia, or Kuwait. These of course don't feel obliged to manage demand of water. Abundant oil lets them build exorbitant desalination plants, or mine finite ancient aquifers, then water the desert to export wheat.

[3] Abdelmajid Slama, IFAD's MENA Regional Director.

High Dam, Huge Lake

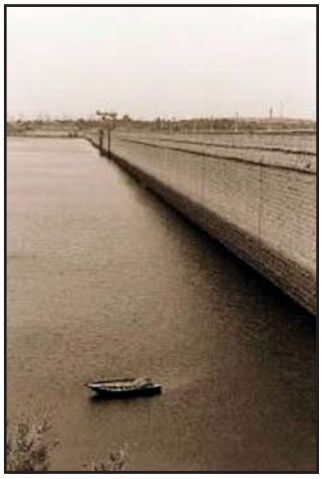
IN TAMING NATURE, SIZE ISN'T EVERYTHING

Today, Mubarak's National Democratic Party harnesses more volumes of raw bulk-water supply than any previous Egyptian ruler — Pharaonic, Greek, Roman, Islamic, Mamluk, Ottoman, Napoleonic, British colonist or puppet king — before it. In theory, that should ensure peace of mind at long last. Instead, the ruling party is still losing sleep.

Rulers have always been subject to whims of the Nile. History indicates how their political fortunes coincided almost unswervingly with fluctuations in the level of that river. Low waters left fields dry and barren; floods damaged irrigation systems; silting cut hydroelectric production; salting cut crop yields States rose and fell at its mercy. So sovereigns and their elite prayed for steady flows to Sobek, Aten, Isis, Zeus, Apollo, Jaweh, God or Allah.

Alas, their prayers often fell on deaf sandstone. To keep their grip, rulers hedged their bets and put faith in technology. They developed tools, pumps, ditches. More recently they built an intricate system of barrages, locks, pumping stations, canals. A century ago they built the first Aswan Dam.

In the 1960s Nasser's newly independent nation decided to construct its modern Wonder, a piece de resistance. The 'High Dam' used 18 times the building material of Cheops' pyramid and created the world's largest artificial lake. I could not come to Egypt without seeing it, and arranged an official tour, complete with propaganda tape showing Khruschev and Nasser expressing Egypt-Soviet alliance, and the muddy water channeling a new force. It was an awesome thing to witness.



Aswan Dam, Facing Upstream Side

The dam's force relies on rockfill mass over concrete curvature. It's scale is difficult to take in, though. Atop the dam, it is so long (3 km) across, that it doesn't seem "high" at all. Lake Nasser stretches so far, across borders, that its stark purity of mass can't be absorbed. The distant hydroelectric power station doubled the nation's power supply.

Today, thanks to the High Dam, Egypt commands 55 cubic kilometers — or 809 cubic meters per person — of water from the Nile. That's obscenely more than any nation on the continent, let alone arid regions. By comparison, Botswana commands .11 cubic kilometers, Namibia, .25.

High Dam, looking toward power station

So, why isn't it enough? First, evaporation increases. Second, sediment is rising behind the dam. Third, many claim the dam system now buries as much fertile cultivable land as it has newly irrigated. Third, it has also trapped the rich black silt that farmers relied on, forcing a turn to artificial fertilizers and increasing salinity. A predictable current stops floods, but also slows flows, leading to a rise in infection in canals with *bilharzias* parasite.

But the main reason is less technical than political. Perhaps because here, more than anywhere, water is power, and power by its nature, corrupts. Providing water ensures loyalty to the state that provides it. But allocating free state water, like allocating free state money, not only breeds corruption. It breeds waste.

Water evaporates, leaks, or runs to the wrong places at the wrong time. Seepage and evaporation account for a loss of about 12-14 percent of the annual input into Aswan's Lake Nasser, with three times that again lost from open irrigation canals and channels downstream.

What's more, the state's technological, supply-side options have run out; there's no place left to dam, no space to raise barrages higher. There's also no money. State-sponsored engineering solutions like dams, pipelines and canals, so prohibitively expensive already, prove even more costly as new supplies grow scarcer and cities must reach father away for new sources.

In short, the supply of water from the Nile has maxxed out. This has not stopped the state from proposing to divert some of the Nile into a "Toshka Spillway" northwest off Lake Nasser. But most observers see that as delaying and worsening the situation; the water it wants to divert belongs to upstream countries. In short, there's nothing extra to "spill."

Lake Nasser, looking up from High Dam

gation and use. It just lacked the water.

Such hydro-impotence was not hypothetical. It became real as I narrowed the scope and focus of my excavation. The dominant player of these Arab nations was Egypt. The dominant element of Egypt was irrigation, The dominant instrument of irrigation was water, which sucks up 85 percent of the Nile. Now water is vanishing under unprecedented stress.

One stress-point is population. Growing from six to sixty million thirsty and hungry people in a century puts a hell of a strain on any water source, even the mighty Nile, which slakes 96 percent of Egypt's thirst (the rest comes from fossil groundwater and desalination). A second stress is booming cities and industry. These consume 4.6 and 7.9 billion cubic meters (bcm) per year, respectively, and bite into irrigation's lion's share (61 bcm) of the water pie. A third is waste, which has ballooned in direct proportion to the age and complexity of the hydraulic irrigation system, losing 23.3 bcm. Then there's evaporation: the sun god, Ra, still devours as his due 4 bcm a year from the irrigation network. Finally, there's the Nile itself, which stubbornly resists attempts to tame it.

All this stress might seem wonk-ish were it not for the disturbing math. The average amount of water in the Nile as it enters Egypt is 84 bcm per year; international treaties mean Egypt's annual share of water from the Nile drops to 55.5 bcm. The balance sheet (55.5 minus 76.13) reveals that Egypt is burdened by a negative 20.63 bcm annual water deficit, amounting to one-fourth of the Nile.

Water Falls Apart, The Center Cannot Hold: *The Egyptian government will still operate these irrigation pumps, but increasingly at the command of those below, not above, as responsibility for water shifts, democratically, away from the bureaucracy toward independent water users.*

That figure becomes even more frightening when you include the legitimate needs of navigation, fisheries, or nature, or the fact that current demand is projected to increase by 30 percent in the decades ahead. It ignores how Ethiopia, Sudan, Kenya, Uganda, *et al* have begun to use 'their share' of the Nile. Unless Egypt was prepared to engage in an aggressive, even hostile, nine-way conflict with its upstream neighbors and water rivals, something had to give.

* * *

Perhaps something has already given. After a bit more digging, I found that Egyptian conflicts were boiling up and down the Nile, albeit not the variety I'd assumed. Every visitor knows how as late as 1997, Muslim fanatics firebombed and machine-gunned dozens of foreigners to cripple what had been a booming tourist economy. Post 9/11, that industry still reels. To restore confidence, Egypt claims to have "utterly crushed" Islamic terrorism with a heavy hand, and the police state remains omnipresent. In one week traveling up the Nile, I crossed several dozen well-armed checkpoints, and was required to join four scheduled military convoys.

Nubian Washerwoman: *Displaced by the dam upstream of Aswan, she competes with 61 million others for her share to use of the precious finite waters of the Nile.*

Disaffected Islamism is one destabilizing force. But it's minor, compared

Fightin' Words
EGYPT AND ITS "WATER WARS," REAL OR IMAGINED

At the height of the Cold War, when the anti-communist West withdrew funds to build the High Dam across the Nile, Egypt seized the Suez Canal, thus leveraging one water-related conflict with another. Such disputes have been seen in the region for 5,000 years, and it may be too much to expect them to disappear soon. Yet despite all the bellicose rhetoric, there has never been a 'war' fought strictly over water. Then again, there was never a war fought over oil before the late 19th century; no nation had depended on it so intensely before it grew so scarce.

Still, Thomas Homer-Dixon, a pioneer in environmental security, has maintained that for any war to erupt over a river's fresh water in the future, four conditions must apply: the downstream state must be entirely dependent on that source; that downstream state must be stronger than its upstream neighbors; upstream neighbors must have the capacity and need to cut off that water supply for themselves; and the states cannot be democratic. Of 150 transboundary rivers around the world, only one place meets these criteria.

Egypt on the Nile.

Depending on the source you believe, there already have been some close calls:

1. Consider the Bible. A little known side-incident from Exodus occurred when Moses dammed a tributary of the Nile to the Egyptian Plains to prevent the Egyptians from reaching the Jews as they retreated through the Sinai in approximately 1200 BC.

2. Military conflict nearly erupted between Britain and France in 1898 when a French expedition attempted to gain control of the headwaters of the White Nile. While the parties ultimately negotiated a settlement,, the incident has been characterized by Homer-Dixon as having "dramatized Egypt's vulnerable dependence on the Nile, and fixed the attitude of Egyptian policy makers ever since."

3. In 1958, Egypt sent an unsuccessful military expedition into disputed territory in the Anglo-Egyptian Sudan amid pending negotiations over Nile water, Sudanese general elections, and an Egyptian vote on Sudan-Egypt unification; the Nile Water Treaty was signed when a pro-Egyptian government was elected in Sudan.

4. On paper, the Sudan has a vast amount of water available on average, but it is compelled by treaty to pass on much of the water it receives, from upstream nations. In recent years, internal turmoil and civil war have prevented the Sudan from using even its legal share form the Nile Water Treaty.

5. In 1978 Ethiopia's proposed construction of dams on the headwaters of the Blue Nile led Egypt to repeatedly declare the vital importance of water. "The only matter that could take Egypt to war again is water," said President Anwar Sadat, in 1979. His words set off a chain reaction of predictions:

"The next war in our region will be over the waters of the Nile, not politics," said Egypt's Foreign Minister (later UN Director-General) Boutros Boutros-Ghali in 1988.

In the 1990s, another Egyptian, now director of the Alexandria Library, then World-Bank VP Ismail Serageldin, proclaimed, "The wars of the next century will be fought over water, not oil, unless we take preventative action today."

to aridity. Aridity leads to quiet eruptions crackling among eternally-loyal-to-the-state irrigation farmers, as well as between those farmers and other state-supporting sectors. The anger belongs to no party, no agenda, no creed, no organization. Yet scattered water disputes have been mounting, building, consolidating along the water diversions. In contrast to Egypt's bellicose water rhetoric with its neighbors abroad — which can be negotiated diplomatically through interstate treaties — real fissures were appearing between locals inside Egypt's own borders. This required a fresh, subtle and light-handed approach. Neither Egypt's military nor police can 'utterly crush' water-use by force.

Granted, conflicts were neither new nor unique here. People argue over water, as people always will. In the past, government delivered *'its'* Nile through *'its'* canal system to *'its'* farmers, but left others to sort out the messy bickering that arose. Three traditional systems tried. The 'Munawaba' organizational unit, led by a respected landowner, allocated the water flowing in the 'mesqa,' or service area where the canal fans out to farms. At a smaller level, organization orbited the animal-powered water lift, or 'Saqia,' where a dozen families shared the same system, taking turns according to acreage. As a fallback, Egyptians turned to *'Haq ul Arab,'* an old, informal system of local law based on Islamic principles of fairness in the use of scarce collective resources, like water.

To work, these systems needed small, manageable disputes. They also depended on top-down hierarchy—getting directives, signals and authority from on high, backed by the ability to grant or withhold water. No longer. Water sources are finite. Competition grows. Egypt has reached the limits of technology. Unemployed farmers depart for cities. Irrigators retain their political clout, but their economic value is waning, dipping below a fifth of gross domestic income. Traditional systems alone have proven too few, weak, marginal and simple to resolve the mounting water pressure. "Although Egypt's Ministry of Water Resources and Irrigation (MWRI) is responsible for water management," said Yehya Abdel-Aziz, Director of the country's Water Boards Project, "linkage and coordination

Overhauling Tradition: *Feluccas were once used to haul stone and farm produce; now their lucrative payload is tourism. They adapt to the Nile, and adapt the Nile to their needs, but tradition is not enough to meet modern water demands.*

with other stakeholders are not strong enough to eliminate conflicts."

* * *

After millennia of large-scale, centralized water management, Egypt found itself up to its neck in water debt. Hydro-bankrupt. The government began foundering. But misery loves company, and necessity breeds invention. Judging from the texts of speakers here, aquatic insolvency was forcing bold experiments across a half-dozen arid landscapes. From the Strait of Gibraltar to the Strait of Bab al Mandab, the water-indebted Arab State was finding little alternative but to re-allocate its water, and thus re-allocate its authority. No, not to opposition parties, but to self-regulating, autonomous entities, called "Water Boards (WB's)," and "Water User Associations (WUA's)."

Defining one of these entities is seldom easy. Professional Egyptologists decipher history by reading 'between the hieroglyphics.' As an amateur, I employed this method to decode bureaucratic water-jargon such as "participatory irrigation management (PIM)" or "fee-based structural mechanism for water allocation services." As it happens, both clunkers obscured a linked pair of revolutionary notions.

Water Boards (WB's) meant that lowly farmers, rather than rulers, would drive policies on how to develop and use scarce water supplies, dredging up decisions from below rather than swallowing them from above. How they do so leads to Water Users Associations (WUA's): farmers' new, decentralized and autonomous assemblies. Cobbling together some of the *Saqia, Munawaba* and *Haq ul Arab* systems described above would essentially soak up some water authority. WUA's would water-tax themselves through elected representatives rather than receive unlimited free water from the baksheesh-hungry bureaucracy that had been making paternalistic decisions 'on their behalf.' In bottom-line practice, this meant that WUA's would absorb from the State at least half of the operation and maintenance of their irrigation systems. In return, they would no longer pay land tax.

These steps mark radical departures from the past. It grew evident, to me anyway, that a fresh "hydro-social contract" was quietly being written within Arab states. As my weeklong workshop demonstrated, drafting such a contract is slow and clumsy and messy and a complex process. But so far it has been a peaceful one. As each speaker talked about his nation's needs you could almost see the outcome — representative democracy — seeping up through the floors even as state taxes leaked away.

No wonder water bureaucrats seemed nervous. No wonder, as discussions heated up, more than one speaker rose from the floor to insist, "This process, this sharing of power over water, really cannot, and should not, be confused with democracy." Hours later another echoed such claims, adamant in the position that "Decentralization of decision-making has nothing to do with democracy!"

No? Methinks they doth protest too much. Later, asking *sotto voce* questions at a Canadian-embassy reception, I found the opposing view from several participants and

Camel Men (Left): *One of the issues being debated is, which water users might have a stake in a Water User Assocation? (Below) Not Too Thirsty:* Can you lead a camel to water? Yeah, but you can't make it drink much, or often.

speakers. "It has *everything* to do with democracy," confided Van Hovwegen, the regional water expert. "Of course, they just can't say that here. But it's true."

* * *

In 450 BC, the Greek historian Herodotus first linked the fate of a nation with the flow of its river. "Egypt is the gift of the Nile," he famously wrote. Less eloquently, Egypt is also the gift of information about the Nile. If water is power, water-knowledge is omnipotent.

To remain economically solvent and politically legitimate, the government (like those of other Arab states) must do more with less water, shrinking budgets and looser control of information. It must eliminate waste and increase efficiency; squeeze more crops per drops. It can't do so by force. So the bureaucracy is being forced to concede ground — literally — to those historically most adept at watering it. As it happens, that means farming communities, who haven't been independent since before the pyramids. Now it would have to share both water and information with WUA's, turning Herodotus on his head: The Nile would be the gift of Egypt.

Only by increasing farmers' water-knowledge can the new bubble-up hydro-democracy arise from trickle-down civilization. There's one sticky issue, though. After 5,000 years of water dependence, farmers have grown rusty at management.

This became painfully obvious at the workshops. I expected the one-party bureaucrats of Egypt (and other Arab states) to be despondent about surrendering their grip on the Nile to farmers. Sure enough, they dragged their heels; most convinced themselves that all farmers must be led like oxen, by the nose. As one put it, "We tell farmers what to do with our water, and they do it. Otherwise there would be chaos."

What surprised me was how some farmers felt reluctant to embrace their newfound clout. Rather than seize control, I heard them complain, voice doubts and hesitate. Perhaps they don't trust the State. Or perhaps their wavering reflects the insecurity that accompanies any democratic reform. They never have had real responsibility, and many did not appear to want it. Well, too bad, farmer Ahmed. The Nile has run out. Free water is over. Because it is finite, key decisions over its precious flow will now be foisted upon your reluctant but competent shoulders.

Through new Water User Associations, farmers are suddenly expected to determine quantities and qualities of water: what crops they will use it for, when they need it, how they will distribute it, why they can manage it, and who they will choose to represent their needs. Critically, they will decide how much to pay as fees in exchange for the precious water.

This last brings the most anxiety to Egyptians I met, and their paralysis amuses me. They live and breathe a market culture where men and women eagerly haggle for hours or days over prices of: water-dependent camels and sheep; water-taxis and felucca tours; water-irrigated carrots and alfalfa; water-laundered clothes; water boiled for Arabic coffee or tea; water-grown papyrus or lotus; water bubbling in hooka-like *sheeshas*. Haggling is the Arab trademark, a cliché. Yet facing the prospect of negotiating the price of water itself, they fall silent. Then apoplectic. They don't know where to start. It has always been free. "We don't want to pay for the Aswan High Dam!" wailed irrigators from one nascent WUA.

How on earth, they asked, *can we set the price, and taxes, and volumes for something no one knows the value of?* Their seemingly simple question was first asked by those early Egyptian opportunists, 5,000 years ago. They developed a very, very old answer. I wanted to see it.

* * *

So I set my compass south, upstream, via water-taxi,

Promoting water user associations

WHY DEMOCRATIZE WATER?

It has sunk in that the region must now produce more with less water. Desperate water times lead to desperate water measures.

"With water scarcity, the hardest hit will likely be irrigated agriculture," said Abdelmajid Slama, IFAD's MENA Regional Director. "In contrast to top-down allocations, experiments with farmer-managed irrigation systems demonstrated the potential for substantial improvements in system efficiency through active participation of users in water distribution and in system operation and maintenance-related decisions."

Why and how do WUA's do that? By decentralizing authority and empowering local decision-making, they:

- Reduce financial and institutional burdens on the government;
- Promote economic use of water and increase in productivity by giving water users the opportunity to appreciate first hand the true scarcity and cost of delivering water to the farm gate;
- Develop a sense of ownership and responsibility over the irrigation system, which supplies that scarce resource;
- Promote system sustainability by enabling water users to adapt to requirements of cropping patterns
- Provide a basis for fair allocation of a scarce resource through the collective effort of a group with common interest, operating on the basis of mutually agreed and binding rules.

A Time To Sail: *Among other water uses, navigation on the Nile depended on information about when the river would ebb or flood. But where did that information come from?*

bus, train, ferry and (my favorite) felucca. Any well-adjusted visitor to Egypt would stand agape at the Pyramids, mesmerized by the Sphinx, awestruck at Abu Simbel. Not your waterlogged correspondent. No, rather than race toward the gargantuan Wonders of the Ancient World, he trundled away from tour buses toward an inspirational… hole in the ground.

Not just any hole. Various remnant incarnations of this stone-hole structure still exist up and down the river, from Geziret el-Rhoda in Cairo, to Memphis, Edfu, Kom Ombo, Philae Island and Elephantine Island. It's a well-like gauge called a 'Nilometer.'

Nilometers varied in size and shape; three steps or ninety, round or square. They may have been open, flanked by walls, or covered by a roof. They typically appeared on the upstream side of an island or promontory, often as part of a temple structure. Each was essentially a cistern connected to the Nile; the water level in the nilometer was the same as that in the river. Such direct equivalency appears droll, plain, even boring.

Simplicity concealed power. As the name implies, a Nilometer measured the height or depth of the Nile as it rose up and down the cistern. As a combined predictive and political tool, each Nilometer became the cornerstone upon which Egypt's various rich and enduring civilizations rose, or fell.

Consider location. On the East bank of the Nile, luxurious temples rose to honor immortal gods, with gold-tipped obelisks igniting each dawn with the sunrise. On the West bank, pyramids and tombs ushered dead pharaohs and their families into the afterlife as the goddess Nut swallowed the sunset. Smack dab in the middle sat your average Nilometer. It cared less about the afterlife; it was concerned with today. It disregarded the east-west trajectory of the sun except as a calendar to record what really mattered: the south-north trajectory of moving water.

It is a truism that water is life. But in a dry land political life — of the *Guns, Germs and Steel* variety, in which states organize and tax a society's excess food in exchange for military protection — could exist only with accurate *data* about water. To know when to plant, when to harvest, what to grow, how often, and how much seed to use, they had to know when the seasonal floods would most likely arrive, and just how high or low those floods might be.

Wet countries like Russia, New Zealand or Canada get such information directly: Step outside; check the clouds; get wet; act accordingly. Uniquely, Egypt relied on water falling 2,000 miles away, well beyond its political reach.

A mighty egotist like Pharaoh Ramses II could crush the Nubians and Hittites, keep Upper and Lower Egypt united along the Nile from the delta to the 4th Cataract in modern Sudan, and erect hundreds of colossal statues to honor his exploits and warn rival kingdoms. But Ozymandias was a wimp compared to that river. He hadn't a clue whether it was raining in the highlands of Ethiopia or Burundi, whether the Nile would rise or fall. To indicate upstream weather, he had only the Nilometers, and paid his elite officials to study past and present readings of flows and fluctuations as if their lives depended on it.

Their lives did. Access to the Nilometer's secrets, as revealed on its wet walls, was guarded, restricted to the literate and elite. Special officials kept a regular watch, trudging up and down Nilometer stairways hour by hour, collecting data, calculating in an exact metric of cubits, and writing down figures on papyrus that they would later compare across the weeks, months, years, centuries.

As such, Nilometers became the world's oldest continuous weather record.[4] But they calibrated far more than

Location, location, location: *Smack dab between left and right banks, oblivious to the east-west rise and fall of the sun, the Nilometer at Kom Ombo measured the only trajectory that really mattered: the up-down level of the river.*

[4] Scientists today are taking a second close look at these records to compare modern and ancient patterns of El Niño. Apparently El Nino behaved then as it does today, lasting one or two years and returning every four to seven years. The Nilometer may also indicate signs of climate change.

More elegant and effective than a 1040 IRS form: *Nilometers were power.*

that. Nilometers were early-warning systems for floods. They were crop-determinants. They told how much grain to store, how much to plant. Architects and astronomers studied readings before placing temples, installing irrigation systems and establishing effective transportation schedules for stones and obelisks.

There was, of course, a reverse and sinister flip side: Nilometers propped up Big Brother. They gave central-authoritarian rulers the god-like power to tax, control and destroy.

They did this in part through religion. The only crocodiles I saw along the banks of the Nile were 3,000 years old, mummified. The crocodile, hunted-out today, was for millennia the sacred animal of Sobek, god of water and fertility. The most important cult for Sobek was at Kom Ombo, where the ancient Egyptians raised and venerated crocs. They were kept in a pool dug in the precinct of the temple, right next to the Nilometer. Located alongside temples, like this, the Nilometer was also used by priests to gauge the god's favor, or the pharaoh's performance as god-like intermediary. Tombs and temples measured him for eternity; Nilometers measured him alive.

But Nilometers were grimmest at their most pragmatic: they alone determined the scale of taxation. If the level rose high, it meant the river would deposit more water and more rich and fertile silt, cover vast areas along the banks, and subside slowly for a long growing season. That meant a good harvest. It also meant the state would exact high taxes. Conversely, if the Nilometer gauge stayed low, so would be the predicted harvest and taxes from it. If you grew more than expected, great. If less, too bad. In any case, it was infinitely simpler than an IRS 1040.

* * *

Nilometers range from 1,300 to 4,000 years old, but, given their dual predictive and political role, remained in use continuously through Greek, Roman, Ottoman and Arab-Islamic states. Time shattered, humans rebuilt.

Returning to Cairo, I spent one late afternoon wandering in, down and around the famous and elaborate Rhoda Island Nilometer, with no one else around. Built in 861, the Mikyas al-Nil is the oldest Islamic structure in Egypt, taking the form of an octagonal column within a stone-stair-lined pit connected to the Nile by three tunnels. It toppled shortly after construction in a flood, and was rebuilt. It crumbled again in 1092 and was rebuilt. In 1798, as a makeshift fort for Mamluk officers, it was bombarded by Napoleon's troops, and rebuilt. In 1825, following an explosion in a nearby pow-

Shatter-Proof? *The functional concept behind the Nilometer — measuring and using information about the Nile for governance — may endure in WUA's long after their structural use has become obsolete.*

der factory, it was repaired once again. The most recent repairs and additions came in the late 1870s, two decades before construction of the first Aswan Dam made all Nilometers downstream apparently obsolete. A century later, construction of the 1970 High Dam inundated upstream Nilometers beneath the wide, calm surface of Lake Nasser.

Net Losses on the Nile: *Food grown from water diverted for upstream irrigation subtracts protein from downstream fishermen in the delta.*

Replacing Nilometers with the High Aswan Dam was like replacing barometers and thermometers with one central thermostat-linked air conditioning. The old tool helped measure and adapt to unseen heat and water pressure, the new one adapted climate to us. There's nothing wrong with that progression, in theory. But comfort requires infinitely more energy, money, work and repairs. Comfort varies from room to room, person to person. You have to turn it off when not using it, then later flip it on again. You have to adjust the dial to taste, which changes with the mood. With 61 million people sharing the same Aswan "thermostat," and energy prices rising, the conflict over 'who controls the remote' has grown ugly on a national and international scale.

So in one sense, these emerging, democratic Water User Associations were taking both a revolutionary step forward and a reactionary step back. The independent farmers' groups appeared to be shattering, then reconstructing hundreds of their own durable Nilometer/WUAs, not of stone, but of paper and computer. They were adapting water-use to their local needs and limits and conditions. To adapt, they could not hoard critical water information among a secretive elite; they had to share it with others in the open arena of debate.

No one can predict how the ripples from such decentralization of decisions may make waves in the form of a broader, nation-wide democracy. But if control of water indeed influences control of power here, the concept may not be all that far-fetched.

In any case, based on what I could tell during my Nile expedition, the centripetal shift that democratized water allocation appeared as inevitable as it was gradual, subtle, and nonviolent. This was illustrated during a workshop where we tried to hammer out the "institutional parameters of a Water User Association."

Our moderator asked us to contribute suggestions—ideas like planks in a party platform—and said she would then write them on a wall sheet. Standard workshop operating procedure, to me. But others voiced objections. Right off the bat, a gruff Egyptian hydrocrat announced, "Okay. And whichever idea gets the most votes, all others must be erased." His friends nodded.

"No," replied the facilitator, a soft-spoken and rather attractive Egyptian female, one of the few I have seen who did not cover her head.

"But why? It wins. The others lose."

"Because," she gently answered, "What we're trying to do is encourage tolerance. If there is a minority view, we cannot throw it out."

Confusion. "Why not?"

"It's called a liberal democracy," she continued, "where every view counts. If clarification is needed, we don't disqualify one opinion."

In the dumbstruck silence that followed, I smiled into my jacket lapel. And wafting up through the open window, from a hundred yards away, I distinctly heard the Nile gurgle. ❑

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Phone: (603) 643-5548
E-Mail: ICWA@valley.net
Fax: (603) 643-9599
Web Site: www.icwa.org

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