Chapter One

Toward a Provisional Understanding

Framing the Challenges

Over the centuries, the Nile basin has attracted the attention of explorers, geographers, ethnographers, and naturalists, each hoping to unlock its elusive mysteries by pinpointing the precise location of its source and by understanding the flora and fauna of its basin. Empire builders seeking to harness the river's resources to meet the burgeoning needs of modern capitalism soon followed. Indeed, Winston Churchill, anticipating the hydrographic future of the Nile, presciently observed over a century ago that the Nile, if forced into multiple canals of various claimants, "shall perish gloriously and never reach the sea."[1]

Today, environmental analysts, hydrologists, demographers, development economists, theory builders, and policy makers display competing interests in the Nile basin. Their competitive interests follow primarily from concerns that the basin might become one of the weakest links in the regional and international order. Early warning indices support these perceptions: the U.S. intelligence community categorizes the Nile basin as one of the ten flash points in contemporary international relations.[2]

The Nile basin is both geopolitically and ecologically sensitive. It extends from what U.S. policy makers call the "Greater Horn of Africa" to the great lakes region in the heart of the continent. The Nile basin is frequently portrayed as the most vulnerable to recurrent drought and famine, as well as to internal and interstate conflicts. Like many observers, I am deeply interested in the present and potential future sensitivities of the basin in the context of a collapsing hydrology and ecology. It is clear that the Nile basin's regional order, mediated not only by climatic and hydrographic, but also by socioeconomic and political factors, bears close watching.

My research vision entails the explication of the fundamental contradiction between the environmental/hydrological capacity of the basin and the competing national development priorities and objectives of the riparian states. My point of departure differs from existing relevant literature, both in emphasis and orientation. Many analysts have viewed water scarcity as the determinant factor in the presentation of the hydrographic problem. By contrast, I take water scarcity in the Nile basin as an effect, the external expression of the potential collision between the social and natural worlds.

I argue that the source of this potential collision comes from the presentation of the hydrographic problem as rooted in the scarcity problematique, which is further reinforced by the unfettered perspective of nature as an object that humanity may exploit in pursuit of competing social goals. In this conventional view, it is assumed that water, as the essence of nature, is a given, constrained only by supply or quantity. Under this perspective, the uneven distribution of resources and the division of societies into territorially bounded entities go hand in hand, making interstate cooperation difficult, if not impossible, without a central enforcing agency or external imposition of power to condition and control state behavior. By contrast, I argue that, when social goals and needs exceed the supply of water resources or when internal elites seek to cover their incompetence, states begin to externalize the problem; water scarcity becomes both an economic and a political issue. The source of the problem therefore is that the Nile states, as elsewhere, are socialized into the fiction of a sacrosanct state sovereignty that claims exclusive internal autonomy and nonnegotiable external equality with other like actors. In the context of this socialization, it is natural for each riparian state to protect and promote its own hydrographic interest. In advancing state self-interest, decisions are made not only without regard to the interests of other states, but also without regard for the natural integrity of the biotic diversity of the entire basin.

For purposes of preliminary presentation, I thus argue that the problem is not scarcity, but rather the externalization and politicization of the scarcity notion within the context of the prevailing mode of capitalist production in the Nile basin. After all, research in the field of hydrology reports that, while the amount of water on earth today is almost exactly the same as when human civilization began, water resource quality has been substantially altered by anthropogenic-induced pollution and contamination. Caroline Sullivan of the Center for Ecology and Hydrology perceptively notes that "it is not the amounts of water resources available that determine poverty levels in a country, but the effectiveness of how you use those resources."[3]

I hasten to add that distorted priorities and the misuse of resources by human communities are at the root of the problem. Knowledgeable people tell us that with less than $100 billion a year, humanity can:

- Provide safe drinking water and sanitation services to those lacking them
- Reduce poverty

- Halve the number of hungry people worldwide by 2015
- Provide reproductive health care to all needy women
- Prevent soil erosion
- Promote environmental sustainability

Considering that the global military expenditure is $1 trillion annually, and the global crime syndicate grossed $2 trillion in 2003 alone, a $100 billion investment in human necessity is relatively small.[4]

This provisional position suggests that, on the basis of discursive rationality and dialogical communication, the supposed problem of water scarcity can be solved by establishing an equitable and democratic water regime in the Nile basin that takes grassroots democracy, ecological equity, and social justice as the central pillars of a just and sustainable order. Achievement of this task will require the socialization of states and societies away from the belief that the supply and demand of water are quantitatively determined and toward a dialogical understanding of the qualitative dimensions of water resources.

This work makes a normative case for establishing a democratic water resources regime in the Nile basin. This chapter develops the textual foundations of my normative commitment to a dialogical politics of governance in which the focus is more pedagogical than theoretical. Although my normative commitment to a particular outcome will be explicit in this and other chapters, my purpose is not to superimpose a particular vision of the future, but rather to contribute to the ongoing discourse in a positively sustainable direction. The pedagogical narrative developed here advocates for a progressive discourse that contests the prevailing social order and negotiates the outcome based on the following three interrelated theoretical propositions.

First, the discussion of water resources should serve as an entry point for analyzing other facets of development. It is futile to focus on how to divide the available water resources among riparian states without giving proper attention to their contexts. Second, the term "state" in this work is used as a generic agent for change. However, when referring to the state as the negotiating agent, I am not considering the state in its present constitution. Rather, the present use of the term "state" references a politically transformed state, either from within via adaptation or exhaustion, or from without through grassroots contestation, mobilization, and eventual liberation of power from urban kleptocrats and their rural hangers-on. Third, any water resources regime is unsustainable in the long run under the prevailing neoliberal economic order. It is clear by now that a belief in democratic capitalism's potential for self-replication in the Nile basin is self-delusional; the necessary internal conditions and external factors are not present on a pattern analogous to that which prevails in the global north. These three propositions hold throughout this work. In general, I will outline the contextual facets of hydrology in this chapter while deferring the details to subsequent chapters.

Almost a decade ago, I heard an interesting exchange on National Public Radio. Responding to a media person's questions, a biologist observed that economists generally think in terms of six months and their predictions are often in error. By contrast, biologists think in terms of millennia, since present actions may not manifest their effects until much later. A useful lesson, deduced from the biologist's wisdom, is that understanding the physical and biological structure of our environment is crucial to comprehending the values and limitations of water resources. The broad conceptualization of water resources to include innumerable internal and external influences, along with ecological and climatic determinants, is necessary for any effort to frame viable strategies to cope with the potential conflicts within and among Nile riparian states over the availability and allocation of water resources.

The American economist Lester Thurow borrowed and amalgamated two concepts to make sense of the nature and evolution of the contemporary global economy: plate tectonics from geology and punctuated equilibrium from biology.[5] In Thurow's illustration, the constant motion of earth's plates is unnoticeable to humans until manifested in the form of volcanic eruptions, earthquakes, and tsunamis. Likewise, biotic entities are undergoing incremental changes, continually adapting to new circumstances to ensure survival. However, the cumulative effects of gradual changes sometimes preclude adaptation to sudden and unexpected circumstances in many biotic species; thus, many perish and some survive. Let us consider the evolution of lakes (which is germane to this research project) in order to appreciate the heuristic and pedagogical significance of the preceding insight.

Limnologists tell us that lakes, like all natural and social entities, have beginnings and endings. Lakes begin as oligotrophs with clear and deep waters, little organic matter, and limited biological activity. As organic matter, sediments, and nutrient-rich substances enter the lakes, they begin to age through a natural process known as eutrophication, a condition in which nutrient concentrations in lakes stimulate algae blooms. Left alone, the eutrophication of lakes over millennia precedes their transformation into marshes, wetlands, and finally woodlands.[6] However, the natural aging of lakes is accelerated through anthropogenic eutrophication from the increases of nutrient-rich substances (the result of agricultural and urban runoff, sewage discharge, and other elements from point and nonpoint sources). The nitrogen, phosphorus, and carbon in these substances cause aquatic ecosystems to become swamped by the growth of algae, resulting in the death of plant and animal species from the lack of dissolved oxygen.

Thus, human-induced eutrophication of lakes has serious implications not only for aquatic species, but also for the availability of lake water for human consumption. When speaking of water, we must consider the interaction of water with multiple sources or "plates" (including anthropogenic sources) that will determine the future quantity and quality of water resources available to all species. Only through the comprehension of the nature (characteristics and dynamics) of the "plates" can we fully appreciate the hydrographic complexity, social significance, economic utility, and ecological vulnerability of the Nile river system. In the next sections, the major sources of "plates" are examined.

The Political Challenge

The Nile River is 6,800 km from source to mouth. It crisscrosses 35° latitude and encompasses ten sovereign nations. The Nile drains 2.9 million sq km (one-tenth) of the entire continent of Africa. The swamps of the Nile basin cover 69,720 sq km. Its lake areas cover another 81,500 sq km.[7] Burundi, Egypt, Eritrea, Ethiopia, Kenya, Rwanda, the Sudan, Tanzania, and Uganda all make entitlement claims to this vast ecological system, even though the contributions of the co-basin states vary considerably.

Historically, the nations of the region generally treated water as a low policy priority. Whenever concerns over the water supply arose, they were (usually) understood in hydraulic terms in the sense that supply could be increased through engineering. Today, however, the nexus between the shrinking supply of and rising demand for freshwater has placed water resources at the front and center of national policy priorities, regional competitions, and international concerns. The demographic boom, development imperatives, climatic fluctuations, and poor water management are among the factors responsible for supply-induced concerns over water shortages. For example, two important U.S. allies, Egypt and Ethiopia (pivotal states in the regional subsystem), are each adding one million people every eight months. Such a demographic boom requires not only an increased supply of potable water, but also an acceleration of urban, agricultural, and industrial developments. Necessities of life must be increased in proportion to the rising demands of the expanding population. Well-reasoned estimates suggest that, between 1990 and 2025, the rise in population alone in the Nile countries would reduce the per capita water availability from 1,070 to 620 cu m (cm) for Egypt; from 2,360 to 900 cm for Ethiopia; from 2,780 to 900 cm for Tanzania; from 590 to 190 cm for Kenya; and from 660 to 280 cm for Burundi.[8]

It is in this context that the elevation of water resources to a high policy priority has impelled some states in the region to define water resources in geopolitical terms. Among the early geopoliticians who saw the rising currency of water resources in regional politics was Anwar Sadat of Egypt, who predicted unavoidable conflict in the Nile basin. Following the Camp David Accords that ushered in reconciliation between Egypt and Israel, Sadat cautioned upstream riparian states: "The only matter that could take Egypt to war again is water." Since then, other Egyptian leaders have echoed Sadat's warning. For example, former UN Secretary General Buotros Buotros-Ghali warned: "The next war in our region will be over the waters of the Nile."[9] The warnings are particularly directed at Ethiopia, where 86 percent of Nile water resources originate. Egyptian leaders are not alone in thinking that they can rely on their superior relative military capability to influence the allocation of water resources. Realist scholars subscribe to the somewhat antiquated notion of relative capability as an important factor in influencing outcomes. John Waterbury, for example, notes that "Egypt is capable of imposing a preferred solution."[10] It is against the backdrop of this prevailing conceptual linkage between hydropolitics and geopolitics that the U.S. intelligence community regards the Nile basin as one of the ten flash points in contemporary international relations.

Although Egypt's repeated warnings may indicate the seriousness of the hydrographic problem, the posturing in favor of the utility of force is dangerous and hollow as well. In the nineteenth century, Egypt's leaders made several military attempts to control the source of the Nile, but to no avail. I don't believe that Egypt is any better prepared today to influence the status of the Nile by military means; claims of modern Egypt's superior relative capability are grounded in illusion. The country is dependent on unsustainable American economic largesse and military protection to the tune of $2.1 billion a year. With such foreign dependency, Egypt hardly enjoys relative capability vis-à-vis its immediate rival, Ethiopia. Aside from nightmarish logistical problems (troop deployment and prepositioning of war material over an extended geographic space), Egypt's position is complicated by Ethiopian nationalism and pan-African sentiment.

Furthermore, even assuming relative capability in the short run, Egypt lacks the means to establish long-term colonial occupation of Ethiopia and the east African states in order to ensure a permanent flow of Nile waters. More important, defining water resources in merely geopolitical terms is self-defeating because the definition rests on the faulty presumption that water resources are only a matter of interstate relations. The factors that influence the supply of water are manifold. Indeed, innumerable internal factors (such as complicated interethnic relationships and the vulnerability of local ecosystems to degradation) are complicated further by other factors having the dimensions of law, institution, and policy that could compete with each other in the absence of a regional consensus. The maintenance and proper management of water resources are contingent on the integrity of the Nile ecology as a whole. Recognition of this reality in part requires the establishment of broader legal, political, and institutional frameworks that might prevent interstate conflict over the ownership of water resources or the nature of the jurisprudence governing the Nile water regime. In fact, in implicit recognition of these limits of power, Egypt has lately tempered its geopolitical posturing by invoking customary international law to justify its priority claims on Nile waters.

Egypt is put in a quandary by the hardening of upper riparian states' positions on the principle of equitable utilization of Nile waters. Ethiopia and the east African states appear committed to dam construction to meet the urgent necessities of their peoples, regardless of Egyptian consent. Pressure from international institutions and donor countries is also affecting Egypt. Since the end of the cold war, various UN agencies have been actively seeking to facilitate a water sharing arrangement from which the ten Nile states could benefit. The negotiations, with the World Bank, UNDP, and FAO playing active roles, have intensified since 1999 under an interim water regime dubbed the Nile Basin Initiative (NBI).

As confidence-building measures, twenty-two feasibility studies and projects were launched in 2001 with $140 million in grants from donors. In the hope of enticing both sides into a permanent and viable water regime, donor countries have attached $3 billion in promissory notes for projects in the Nile basin to this preferred outcome.[11] Noting the significance of the NBI, James Wolfeson, president of the World Bank, characterized the initiative as "a remarkable and fragile first step. It may be the first time in history that we are able to have the scientific and technical resources, the capacity, the knowledge, and the expertise to come together."[12]

The co-basin states' formal acceptance of the NBI by no means signals the resolution of the legal, political, and economic aspects of the Nile question. Yet, despite the potential for the protagonists' legal presentations to crystallize into dogmatic positions, the fact that riparian actors have adopted the language of law offers some rhetorical promise. Overcoming the juridical obstacle to the sustainable use of the Nile water resources will obviously be the first major step forward, but it is not an end in itself. Actors will ultimately have to face the challenges of regional poverty, underdevelopment, and other aspects of ecology, social justice, and political freedom. Although I do not minimize the tentative steps taken by the riparian states to deal with the quantitative determinants of water sharing under the Nile Basin Initiative, I question whether the NBI's objectives can be achieved within the prevailing structures; these limiting structures will be identified and evaluated in later chapters in the context of the scramble for security and poverty alleviation in each riparian state.

The Demographic Challenge

Ever since Thomas Robert Malthus wrote his controversial essay on the principles of population in 1798, the relationship between people and the carrying capacity of their environment has preoccupied population biologists. Current estimations of the earth's carrying capacity still range wildly, from two to several hundred billion people. Although the UN guesses that the global population will eventually stabilize at 11 billion, the emerging consensus among ecologists is that the earth can only support between 1.5 and 2 billion people at a reasonably acceptable living standard.[13] Neo-Malthusian analysts suggest that the production and supply of food and water are unlikely to keep pace with population growth in developing countries, including those states in the Nile basin, and with prevailing consumption patterns in the global north. Paul and Anne Ehrlich find that overpopulation in the global south and overconsumption in the global north, leading to finite resource depletion, are mutually reinforcing causes of human poverty, ecological degradation, and atmospheric deterioration.[14] In their view, until and unless these two fundamental problems are resolved, the very survival of humanity is at stake. Brown and Kane echo this concern, warning that the earth's carrying capacity is fast approaching its limits, owing to unsustainable exploitation of fish, rapid urbanization, dirty industrialization, and expansion of global water demand despite hydrological limits.[15]

The empirical evidence is overwhelming. Over the past thirty years alone, the general health of ecosystems has declined by 33 percent, while the general human demand for ecological resources has increased by 50 percent.[16] The average number of hectares (ha) of cultivable land per human fell from .23 ha in 1950 to .13 ha (moderately or highly degraded) in the mid-1990s. The human being had 0.23 ha of farmland to grow food, which fell to 0.13 ha by the mid-1990s, mostly moderately or highly degraded.[17] The steady diminution of cultivable acreage is complicated by the shrinkage of water resources, resulting from simultaneous rises in human population and consumption levels that, taken together, act to accentuate demand for water resources. For instance, in the year 1900, the world as a whole used 400 bcm of water. Forty years later, this figure had jumped to 800 bcm, and the world population had increased by 40 percent.[18] By the mid-1970s, countries of the world were annually withdrawing 2,838 bcm of water for industrial, agricultural, and municipal usages.[19] The U.S. Council on Environmental Quality, in its 1980 report to the president, assessed that demands for water withdrawals would rise between 200 and 300 percent by the year 2000. By the mid-1990s, the United States alone was withdrawing 584 bcm of water annually to maintain its prosperity.[20]

The prediction is credible, since world water consumption has doubled every twenty years during the twentieth century.[21] In fact, 180 million tonnes of world grain are said to be produced with nonreplenishable waters. Such rapid depletion of freshwater is occurring despite predictions that 2,000 additional cu km of water will be needed by 2025 to feed the world population.[22] Moreover, in the second half of the twentieth century, the gap between the supply of and the demand for water resources widened alarmingly; this gap continues to grow. In 1982, the WHO reported that only 29 percent of rural populations in underdeveloped countries were provided safe drinking water.[23]

It does not seem that chronic water resource shortages will be ameliorated any time soon. If the present projection holds, fifty-two countries, housing 3.5 billion people, will experience acute water shortages by 2025. Presently, 450 million Africans cannot access potable water, and 3 million die each year from waterborne and sanitation-related diseases. The average African uses just 10 to 20 liters of water a day, while the average American consumes 600 liters per day; the United Nations estimates the absolute minimum of daily water need for cooking, drinking, bathing, and sanitation at 50 liters.[24] These figures do not include water used by agriculture and industry; in terms of total usage, the average American consumes 5,200 liters daily, the global daily average is 1,750 liters.[25]

A number of irreversible ecological changes can also be observed. Over the last half-century, Africa has lost 75 percent of its water resources and is projected to lose another 13 percent by 2025.[26] To give tangible expression to this data, it is useful to note that, since the 1960s, Lake Chad (once the sixth largest lake in the world) has shrunk from its original size of over 350,000 sq km to 2,000 sq km.[27] The predictable implication of this scenario is not only a shortage of potable water but also of consumable food supplies, given the FAO's projection that the 2025 world food requirement will represent a 50 percent increase over the currently available supply.[28]

We should bear in mind that, today, 2 billion people worldwide suffer from various levels of nutritional deficiencies. We should also keep in mind that Africa's malnourished population is expected to rise from 315 million in 1995 to 404 million in 2015, representing a full 32 percent of the continent's people.[29] The data released in August 2005 by the International Food Policy Research Institute also do not inspire optimism. According to this study, the proportion of Africans suffering from malnutrition has remained constant at 35 percent since 1970, meaning that there were 200 million malnourished Africans in 2001, including 38.6 million children. The authors took pains to point out that at least $303 billion in new investments in agriculture, water management, and other facets of development would be required just to halve the number of hungry Africans by 2015.[30]

The consequences of this scenario inevitably include the recurrence of acute food and water shortages, degradation of ecosystem services, massive internal and interregional migrations, social convulsions, and political instabilities. The UN seemed to endorse this line of argument when it gave to its 1994 Cairo conference the title: "Population and Development"; this emphasized the presumed existence of crucial linkages between population size and the imperatives of economic development as determinants of the expected pace of progress. Thus, increased rates of population growth and economic development presuppose relative abundance and regular provision of water resources; the present 360 million people in the ten Nile riparian states are projected to reach 812 million by 2040.

However, cornucopian commentators, who belong to a class of optimists, openly challenge the glum neo-Malthusian assessment that overpopulation causes underdevelopment, poverty, or critical resource shortages. They find that overpopulation, if it exists, inevitably results from a lack of development. In 2003, for example, the ten Nile riparian states, with a total population of 358 million, and a total land area of 8.9 million sq km, had a combined gross domestic product (GDP) of $146 billion. By comparison, the three small Benelux countries, with a total population of 27.6 million, and a total land area of 74,632 sq km, had a combined GDP of $889.9 billion.[31] Therefore, the optimists contend that there is more to development than the quantitative determinants of growth seem to suggest: temporal and spatial factors and the interplay of natural and anthropogenic processes are crucial. But, while optimists may be right in that overpopulation, like poverty, is much less a factor than a consequence of underdevelopment,[32] their argument cannot erase the fact that the Nile states must cope first with their immediate problem: their inability to provide potable water and adequate food to their present peoples, on the one hand, and the imperatives of building internal capital accumulation to spur development, on the other.

At the moment, it doesn't seem feasible to pursue both social goals simultaneously within the prevailing socioeconomic and political structures. After all, according to the water poverty index that ranked 147 countries in 2002 in terms of their water resources and capacity to access and use those resources, the bottom ten countries included Ethiopia, Eritrea, Rwanda, and Burundi.[33] Moreover, Ethiopia's 1981 food production declined by 30 percent from the 1961 level, even as its population doubled.[34] In light of this, the demographic factor is likely to greatly influence water policies and interstate behavior in the basin. In the early 1990s, six of the co-basin states (Egypt, Sudan, Ethiopia, Kenya, Uganda, and Tanzania) planned to irrigate a combined area of 3,152,000 ha of agricultural land.[35] It does not appear that the search for more irrigable land will stop here. With the rising demand for food, the co-basin states will increasingly come under pressure to bring more land, including marginal land, under irrigation.

Such moves by co-basin states to boost food production in tandem are likely to put much stress on the hydrological and ecological determinants of the Nile system. Noting the enormity of the hydrological problem, Abu Zeid, Egypt's minister of water resources, projected that the Nile countries would face serious demands from growing populations in the coming decades, since worldwide demands on water resources were rising at three times the rate of the global population.[36] Moreover, on average, 48 percent of the population in the ten Nile states is under the age of fourteen; feeding, housing, and educating such young populations is enormously expensive. Over the long range, overpopulation may not become problematic when, and if, the Nile countries achieve the sort of development presently enjoyed by the Benelux countries. In the short to medium term, though, overpopulation is bound to contribute to the dire state of underdevelopment, mass poverty, social disintegration, ecological deterioration, and political instability throughout the basin—the kinds of stagnant turmoil we are witnessing today.

In light of the arguments made in the previous paragraphs, the debate between the neo-Malthusians and the cornucopians is abstract, unhelpful, and reductionist. A meaningful and useful population discourse cannot be understood apart from spatial, temporal, and contextual dimensions. I tend to agree with Athanasiou that "Overpopulation is a real threat, a multiplier of stress and tension, a variable in the equation of a crisis. But it is, as well, a heavily warped political category. Malthusians see overpopulation as a cause of a biological crisis, not as one of its key biosocial factors."[37]

To present overpopulation as one of the many factors retarding progress in the Nile basin is not to suggest that it is a cause of underdevelopment in the region. That said, a radically new population policy is urgently needed in the Nile basin. If the ten Nile states are presently helpless to provide safe drinking water and adequate food to their combined peoples of 360 million, it is difficult to imagine how they will be able to supply those necessities of life to 812 million people some forty years hence. At the moment, I believe that achieving demographic stability, along with a substantial reduction in human numbers throughout the region, ought to be among the immediate goals of all riparian states. This requires synchronized population policies: a regional bureau of population control must be established for purposes of coordinating efforts to promote the education of women, family planning, and reproductive health, and to combat pathogenic sources of diseases. The Nile states have valuable lessons to learn from the experiences of the Indian states of Kerela and Tamil Nadu. Led by progressive and enlightened groups of political cadres, these two states challenged the all-embracing capitalist order in favor of a progressive socioeconomic system that made the people in general, and women in particular, central to their policies. The leaderships introduced a series of policies that included agrarian land reform, universal health care, literacy, training, nutritional support, and distribution of free condoms. As a result, these Indian states managed to regulate their population sizes, as both fertility and mortality rates sharply declined.[38] In the same way, the Nile states can, and should, manage their population sizes primarily by encouraging delayed marriages and pursuing active policies to promote universal female education, female social emancipation, and economic empowerment.

The Economic Challenge

The ten sovereign states that share the Nile basin are all developing nations. Indeed, Eritrea, Ethiopia, Rwanda, and Burundi, with per capita income of between $100 and $200, are among the ten poorest countries in the world, where degradation of ecosystem services, rapid population growth, instability, and stark poverty are all defining features of their existence.[39] It thus goes without saying that the ten co-riparian states have to initiate comprehensive development programs in the form of both rapid industrialization and accelerated agricultural modernization if they are to meet the basic necessities of their growing populations and, by extension, buttress their own legitimacy.

The first priority for all states is to achieve food security, a phrase featured in virtually every public utterance today. Of course, if the experiences of advanced countries are a useful guide, the idea of food security presupposes industrialization of agriculture, ranging from cultivation to production, from processing to marketing, under technologically advanced conditions. That is how the advanced countries have not only achieved food security, but also squeezed substantial transferable surpluses from agriculture to fuel the industrialization of the manufacturing sector. Supported by modern means of production, the average American farmer, who barely fed himself two centuries ago, today feeds seventy-eight other persons and himself. Even though the proportion of land devoted to food production remained relatively stable between 1920 and 1978, food production in the US doubled during this period, due to agricultural industrialization.[40]

Modern activities revolving around agriculture perform a number of functions, in addition to producing food. Indeed, the whole range of tasks associated with cultivating, harvesting, processing, and selling food products are major sources of national employment. It is rarely emphasized that, for example, the biggest employer in the United States is not the manufacturing sector, but rather the agricultural sector. In 1986, U.S. agriculture employed 27 million Americans, representing one out of every five jobs, who were engaged in various phases of growing, producing, and marketing agricultural products; actual farmwork involved only 3.4 million workers.[41]

Attaining food security thus entails the agricultural industrialization. But here is the rub: industrializing agriculture requires a number of important aspects, including deployment of sizable capital, modern farm machinery, heavy uses of fertilizers and pesticides, substantial amounts of energy, and construction of dams to continuously supply irrigation water. For example, a full 27 percent of American crops are grown on just 12 percent of the country's total cropland of 169 million ha, supported by 2.5 million dams.[42] Moreover, of the 1,600 billion liters of water the US withdrew daily in the 1980s for various purposes, excluding hydroelectric use, 600 billion liters per day (or 38 percent of the total daily withdrawals) was for agriculture, with 99 percent used for irrigation.[43]

Central to American agricultural prosperity has thus been the heavy use of water from its 2.5 million dams and bountiful groundwater endowment, as exemplified by the great Ogallala aquifers. In the 1980s, the US withdrew 29.1 trillion liters per year from its groundwater reserves.[44] The Ogallala aquifers, central to America's hydrological wealth, cover half a million sq km, hold four trillion tonnes of water, and support over 200,000 modern wells that supply water to 3.3 million ha of farmlands.[45] There is an interesting parallel between irrigation-based American agricultural prosperity and its water endowment and water use. For example, in 1950, total U.S. withdrawals from its surface and groundwater reserves, excluding hydroelectric uses, were 250 bcm a year; this rose to 500 bcm a year in 1980.[46]

Irrigation-based agriculture is key for the United States, as for humanity as a whole. Today, 40 percent of global food crops are grown on irrigated fields.[47] Although Nile states may separately find independent sources of capital, they cannot find an independent source of water or a separate ecology. By compulsion of nature, they have to share the waters of the Nile and the various streams and lakes that make up the Nile system.

It is here where a dialogical discourse becomes useful to negotiate the nature of a democratic water regime. Dialogical discourse is also critical to avoid or overcome the downsides of industrialized agriculture. As is the case with most negotiations over natural resources under the prevailing mode of production, national and transnational actors are more often preoccupied with sharing than with resource conservation, protection, and management. As Poincelot perceptively notes, "Resources are threatened in two ways: by depletion and by contamination such that the resources become unusable. Both problems have an impact far beyond agriculture in that the resulting loss of food production and environmental damage threaten and diminish our quality of life."[48]

Depletion of Nile water resources can result from the riparian states' race to construct dams in order to modernize their agriculture, whereby they create permissive conditions for evaporation from a widespread network of reservoirs. It is instructive to bear in mind that 170 cu km of water annually evaporate from the world's dams.[49] Degradation of Nile water resources can also result from the growing use of the Nile system for navigation, as has been the trend worldwide. For instance, there were fewer than 9,000 waterways in the world in 1900; today there are more than 500,000.[50] Contamination of Nile waters can also result from problems associated with agricultural modernization: heavy pesticide and fertilizer usage, saltwater intrusion, salinization, sedimentation, and soil erosion. Water quality degradation and contamination associated with agriculture, for example, annually costs the United States between $6 and $9 billion.[51]

Other consequences are associated with the industrialization of agriculture. The first involves the risk of centralizing agrarian production in few hands. The agricultural sector in the Nile countries, from which 80 percent of the populations earn their living, is highly fragmented. In order to achieve scale efficiency in terms of both inputs and outputs, aggregation of farmlands would seem natural. The experience of advanced countries supplies evidence for the necessity of the concentration of agricultural capital and centralization of farmlands. In the United States, for example, the number of farms fell from 6.1 million in 1940 to 2 million in 2000.[52] The concomitant social consequence of the concentration of agriculture in fewer hands is urbanization, as more and more persons displaced by mechanized agriculture flock to the city in search of livelihoods. Urban growth, of course, requires simultaneous provision of jobs and water. When one talks about the city, it is important to keep in mind Odum's words: "The city is the parasite of the rural environment. It produces little or no food or other organic materials, purifies no air, and recycles little or no water or inorganic materials."[53]

Industrialization of agriculture signifies a distinct stage of development in a country. The gap between countryside and city narrows, and income levels between the regions tend to grow closer. Labor composition also changes as more and more workers are employed in manufacturing and service sectors. In this situation, industrial and municipal water usage intensifies. In addition to intensification of water consumption, industrialization and congregation of people in ever larger cities have important effects on resource utilization and environmental quality. The veritable lesson that should not be lost on Nile actors is the fact that modernization of agriculture and industry, on the one hand, and growing urbanization, on the other, readily lend themselves to simultaneous intensification of resource use and resource quality degradation. Contaminant inputs to the ecology are proportional to the level of industrialization. In the underdeveloped world, where environmental regulations are weak to nonexistent, industries and cities are major sources of pollution and water contamination. By some estimates, 90 percent of wastewater generated in the underdeveloped world is dumped untreated into rivers and lakes. Millions of tonnes of raw sewage from east African cities are annually discharged untreated into Lake Victoria, the source of the White Nile.[54]

One side effect of industrialization, equally worrisome to developing and advanced countries, is the growing acidification of rivers, lakes, and streams. Not only does acidification affect water quality, but it also undermines the food source. For example, studies found 200,000 lakes in Norway to be sensitive to acidification; 78 percent of the lakes in southern Norway have become completely barren of fish. It is alarming that the number of barren lakes in Norway has doubled since the early 1970s.[55] In the early 1990s, Sweden also saw 95,000 km of streams becoming acidified; by then half of its 90,000 acid-sensitive lakes were showing considerable levels of acidification.[56] In the early 1990s, 350,000 lakes in eastern Canada were found to be acid-sensitive, of which 14,000 had become acidified and another 150,000 were demonstrating considerable effects. In the Canadian province of Ontario, 48,000 lakes were showing serious ecological effects from acid deposition.[57] Acidification of lakes, by undermining the physiology and reproduction of aquatic species, undermines human food security. Acid precipitation also has a serious impact on watershed vegetation. In 1990, it was estimated that Europe as a whole lost $30 billion from timber production because of acid rain.[58]

The cautionary value of the advanced countries' experiences for the riparian states in the Nile basin is apparent. The lesson is twofold. First, industrialization under the prevailing mode of production inevitably entails negative externalities such as air pollution, contamination of water resources, acidification of rivers and lakes, and soil deterioration. Second, despite multiple layers of regulatory agencies and environmental groups, coupled with relatively ample resources earmarked for environmental protection, even the advanced countries have not been able to effectively mitigate or manage the effects of industrialization. Destitute both in resources and regulatory machinery, the Nile states are ill-equipped to deal with the harmful effects of industrialization. Therefore, the challenge for the Nile states is to fashion an economic order that is ecology-friendly and efficient in terms of resource use.

One of the major difficulties in the Nile basin is the fact that the actors are multiple, distinct, and sovereign. Most of the demographic increases are likely to occur in urban areas, not necessarily due to only natural urban birth rate, but largely because of rural to urban migration following the classic trajectory of modernization. Impounding water in gigantic dams or artificial lakes will become unavoidable; diversion of a sizable quantity of water to irrigate ever-expanding agricultural areas will be required to ensure national food security. These competitive programs will certainly accentuate the demand for water throughout the basin. The conventional wisdom is that instrumentalist national policy priorities will be competitive, setting the stage for inter-riparian conflicts. The impact of the divergent programs on regional hydrology will be severe, bringing land reclamation imperatives and sustainability principles into collision. Short of policy coordination at the regional, national, and subnational levels, the development imperatives of the riparian states can generate severe stress on the environment, undermining the hydrological sustainability of the Nile basin, and weakening the integrity and buffering capacity of local ecosystems.

According to the World Bank, the UNDP, and other international agencies, the solution is the creation of a regional water regime modeled after the Mekong River. As the story goes, Vietnam, Laos, Cambodia, and Thailand have hammered out their differences by creating a regional water regime to promote economic development in the Mekong river basin. The reported positive outcome is the Nam Ngum hydroelectricity plant in Laos, which supplies 80 percent of Thailand's and 100 percent of Laos's energy needs. Thus, the Mekong River has become an engine of regional integration rather than one of inter-riparian conflict.[59]

The lessons of the Mekong River were not lost on the 400 Nile state delegates to the eighth NBI session, held in July 2000. At the conference, proponents of inter-riparian cooperation proposed that the Nile states could benefit from a comprehensive, transboundary integrated management system, as well as from the promotion of economic development in the Nile basin by allocating internationally supported development projects throughout the basin under an equitable water utilization regime. To showcase this orientation, as noted earlier, the World Bank, UNDP, and FAO began funding twenty-two projects with $140 million. The World Bank also pledged to raise $3 billion to accelerate economic development in the basin as the necessary precondition toward regional integration.

Despite the NBI's positive superficial appearance, it is nonetheless flawed. A base focus on sharing Nile waters and initiating projects throughout the basin evades fundamental issues of democratic governance, social justice, and ecological equity. Dividing Nile water resources among the ten riparian states and impounding their respective shares for purposes of irrigation and hydropower generation does not guarantee them food security. On the contrary, impounding water resources throughout the basin can have huge ecological and economic costs, unless accompanied by a radical transformation of existing political structures and an open contestation of the prevailing mode of production. For example, FAO studies show that 30 million ha of the world's 240 million ha under irrigation are severely salinated, and another 80 million ha suffer from waterlogging and salinization.[60]

The Hydrological and Ecological Challenge

Various studies indicate that water availability is a function of both natural supply and human demand. There is an inexorable relationship between human actions and the laws of hydrology.[61] The availability of water resources to humans is thus determined as much by the hydrologic cycle as by human effects on the ecological determinants of civilization. Understanding this complex interaction between human needs and nature's capacity to meet them becomes crucial. In this sense, the hydrologic cycle is as much a function of geomorphology as of anthropogenic participation. It is repeatedly stated that over 97 percent of all water on earth is found in the form of seawater and therefore unusable by humans. Theoretically, only 2.7 percent of the earth's water is freshwater and thus accessible to humans; in reality, though, only a small proportion of this freshwater is readily available to humans: 77 percent of the freshwater is trapped in ice caps and glaciers; another 22 percent is detained in the ground.[62] Equally important to acknowledge is the fact that the hydrologic cycle is greatly influenced by the exchange between the earth's energy cycle and solar energy fluxes. It is estimated that some 500,000 cu km of water annually is evaporated from surface water bodies, surface land, and vegetation into the atmosphere by solar radiation; this returns to the earth in the form of rain and snow. Of the gross returning water, the share of the land surface is 110,300 cu km, even though the contribution of the land surface to the evapotranspiration regime is only 72,900 cu km.[63]

The vexing paradox posed by the hydrologic cycle is that the seasonal and annual distribution of rain and snow is geographically uneven. For example, the annual per capita runoff in Egypt is less than 1,000 cu m compared to 100,000 cu m yearly per capita runoff in Canada. The annual runoff in two-thirds of the African continent is one-third less than the global annual average.[64] This suggests that the thermodynamic relationship between solar energy fluxes, geographic configurations, types of vegetation, evapotranspiration, and precipitation regimes is unmistakable. Conversely, the human role in the thermodynamic relationship is seldom recognized as critical to the hydrologic cycle.

A continual rebalancing process, heating up and cooling off the earth, results from the interaction between incoming solar radiation and outgoing energy from earth. As Berner and Berner coherently note, ocean currents transport warm water from the equator to the cold polar regions of the earth; winds circulate warm air through the atmosphere; and the water vapors in the atmosphere carry latent heat.[65] These three modes of energy transmission are sensitive to human actions. Burning more fossils can easily influence the circulation of heat, in the process warming the earth's atmosphere. In the absence of the right counteraction between the outgoing and incoming energy fluxes, the relationship between the evaporation and precipitation regimes can be significantly altered. A small rise in the earth's surface temperature due to greenhouse gases can substantially change the hydrologic cycle, resulting in uneven distribution of precipitation. Some regions become wetter, while others become drier.

As paleoclimatologic data suggest, the African continent has seen dramatic shifts in the hydrologic cycle over the past 14,000 years. Prior to the dramatic hydrological shifts pounding the continent, for example, the Sahara Desert was once endowed with lush landscapes, expansive shallow lakes, and vast groundwater resources. Today, the Sahara Desert is moving southward, placing the Sahel region extending from Niger to Ethiopia under its powerful influence. It is worth noting that the hydrological circulation on the African continent is a function of the interaction between solar radiation and the highly seasonal African and Indian monsoon. The alternating wet and dry seasons and the interannual rainfall fluctuations in the Nile basin are determined by the monsoonal circulation in interaction with the solar energy in the atmosphere, in the oceans, and on land.[66] Perhaps a useful way to look at the hydrological determinants germane to the Nile system is to conceive of the regional water budget as a function of the global water budget. The conditions that generally affect the composition of the atmosphere will have a direct bearing on the region's climate, temperature, and precipitation. For example, climatologists warn that carbon dioxide buildup in the atmosphere and consequent warming can radically alter the global cycling of water; some places are likely to become wetter and other areas drier. The resulting unusual events (severe storms, floods, heat waves, droughts, the spread of pathogens and diseases, sea level rise, and acidification of water) will gravely affect human health, water supply, agricultural productivity, and ecosystem services, as well as internal and regional microclimates.[67]

Interannual fluctuations of the Nile during the last century are suggestive of the radical shifts in precipitations that can arise with variegated implications. For example, the years 1913, 1984, and 1987 were periods of extremely low Nile flows. By contrast, the years 1946, 1954, 1961–1964, and 1998 were the wettest of the twentieth century. The 1961–1964 flood years were particularly costly in economic, social, and human terms.

The hydrologic cycle is not solely determined by geomorphologic processes, but is also significantly influenced by human actions. Even if the riparian states are able to reach agreements on the basic questions of law and policy, they still must face the science of the environment. National hydrological security cannot be separated from the environmental security of the region as a whole. The environmental security of the Nile basin can be threatened by factors from within and from without. Ecological degradation, deforestation, desertification, atmospheric degradation, migrations of the intertropical convergence zone, changes in oceanic temperature, and a radical shift in global climatic conditions can easily weaken the requisite conditions of sustainability of the water regime. Human-induced or naturally occurring processes can affect the hydroclimatology of the basin, the precipitation regime, and the discharges of the Nile in unpredictable ways. The recognition of negative environmental implications should be a sufficient basis for proposing changes to state behavior and policy priorities.

Of course, formidable impediments exist to realizing such a vision. Significantly, an insufficient understanding of the intrinsic relationship between hydrology and ecology may be compounded by the dominant view of policy makers and their economic advisers. The call for a sustainable water regime must be embedded in regional unitary decisions undertaken to fashion, develop, and promote integrated ecological policy. This involves the total negation of positivist dichotomies between high and low politics, sovereignty and anarchy, economy and ecology, order and justice, equity and efficiency, equality and liberty, and between society and nature as terms in opposition to one another.

For example, politicians seeking legitimacy and economists seeking efficiency often speak of a necessary trade-off between such oppositional terms as equity and efficiency on the faulty presupposition that the values of the terms in presumed opposition cannot be realized without the subordination of one to the other. In truth, they are not. On the contrary, they function as harmonious and holistic complements, in organically complex and interdependent relationships. An economy that does not nurture the ethics of conservation, preservation, and protection of ecological resources will in the long run undermine the foundations of its operations. The logic of efficiency, which does not celebrate equity as the ethical foundation of human civilization or promote the ethics of doing with less in order to share ecological resources in the present and the future, will in the long range erode the basis of orderliness, human solidarity, and the co-evolution of human societies with the living ecology.

A society that objectifies nature will hasten its own demise. The ethics of nature thus demand the complete repudiation of the hitherto dominant anthropocentric practices, which put human interests and needs above those of other living things that share the ecology with humans. The point to be emphasized here is that the living ecology can continue its evolutionary course without the presence of man, but man cannot survive unless the integrity of the living ecology is preserved. To appreciate this point, a brief discussion on ecological imperatives is in order.

Ecology is not only a living entity where "organisms, animals, plants, and microbes interact with the natural world," but also a science by which we study these complex interactions among living entities in the context of their environment.[68] Biological transformations in ecosystems cannot be understood apart from the physical compositions of the ecology and the chemical reactions that take place within it. The ecology is a synergistic system in which energy fluxes and nutrient cycling continually occur as a result of the mutual dependence and interdependence of all living things on and with their nonliving environment, in the process modifying the conditions of their evolution and co-evolution. The positive or negative effects of co-dependence, of living things on one another and on the physical environment, arise from the very unity of the ecology itself. This ecological reality is strengthened or weakened by the magnitude of such physical phenomena as water movements, wind currents, and solar radiation. To capture the full range of the complex interdependencies of biological entities and physical forces, the British scientist Charles Elton once used the notion of thermodynamics as key to understanding ecology. In fact, he aptly defined the earth as a "giant thermodynamic machine driven by the solar radiation."[69]

This is exemplified by the ecology of the Nile watershed where all living organisms are affected in various ways by such natural events as drought or the spread of disease vectors, and by such human actions as deforestation or dam construction at various points in the catchment. Extensive deforestation, for example, can expose denuded landscapes to rapid evaporation rates, decrease the amount of rainfall, or alter the patterns of heating and cooling and the character of microclimatic zones. Likewise, removal of topsoil from exposed landscapes can encourage the transportation and deposition of sediments in waterways.

The cumulative effects of ecological deterioration can thus erode the basis of human survival. The report of the Millennium Ecosystem Assessment, prepared by 2,000 world scientists and other experts representing a variety of fields, presents an alarming scenario. According to the report, 60 percent of ecosystem services that support life on earth in fundamental ways have been degraded or exploited unsustainably. "Any progress achieved in addressing the goals of poverty and hunger eradication, improved health, and environmental protection is unlikely to be sustained if most of the ecosystem services on which humanity relies continue to be degraded."[70] The report adds that the hyperacceleration of human exploitation of ecosystem services in response to ever-expanding demands for fresh water, food, fiber, timber, and fuel could irreversibly impact supplies.

Biologists warn that the principle of punctuated equilibrium could be at work here. Small and incremental changes may go on unnoticed for a while, but these cumulative changes can produce abrupt, sudden, and enormous effects such as sudden shifts in local, regional, and global climates, the emergence and spreading of new human pathogens and diseases, sudden changes in the properties of water, the collapse of fisheries, and an unprecedented loss of biodiversity. The spread of malaria in the Nile basin and beyond exemplifies the effects of ecosystem service degradation. For instance, had only malaria been eradicated some thirty years ago, Africa's GDP would have grown to $100 billion today.[71]

On the microlevel, Rwanda typifies the dangers of climate change and the associated spread of malaria. Since the 1960s, average temperatures in Rwanda have increased by almost 1° Celsius; incidents of malaria doubled as the malaria-carrying anopheline mosquito continually climbed to high altitudes.[72]

One major cause of degradation in ecosystem services is the alarming rate of vegetation removal. When vegetation cover is removed, fragmented, or destroyed, valuable soil nutrients and chemicals are exposed to erosion by wind and water. In consequence, soil erosion starves farmlands of important minerals, nutrients, and chemicals. According to some stud-