

# Water and the death of ambition in global health, c.1970-1990

## *A água e o fim da ambição na saúde global, c.1970-1990*

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### Abstract

Economic development and good health depended on access to clean water and sanitation. Therefore, because economic development and good health depended on access to clean water and sanitation, beginning in the early 1970s the World Bank, the World Health Organization (WHO), and others began a period of sustained interest in developing both for the billions without either. During the 1980s, two massive and wildly ambitious projects showed what was possible. The International Drinking Water Supply and Sanitation Decade and the Blue Nile Health Project aimed for nothing less than the total overhaul of the way water was developed. This was, according to the WHO, “development in the spirit of social justice.”

Keywords: water; sanitation; World Bank; World Health Organization (WHO); global health.

### Resumo

*Crescimento econômico e boa saúde dependem de acesso a saneamento e água limpa. Assim, o Banco Mundial, a Organização Mundial da Saúde (OMS) e outros órgãos, a partir do início da década de 1970, inauguraram um período de contínuo interesse no desenvolvimento de ambos para bilhões de pessoas desprovidas de tais necessidades. Durante a década de 1980, dois projetos monumentais e extremamente ambiciosos demonstraram o que era viável fazer. A International Drinking Water Supply and Sanitation Decade e o Blue Nile Health Project visavam à total reestruturação do modelo de desenvolvimento da água. Tratava-se, segundo a OMS, do “desenvolvimento do espírito de justiça social”.*

*Palavras-chave: água; saneamento; Banco Mundial; Organização Mundial da Saúde (OMS); saúde global.*



The 1970s and 1980s were arguably the most important time in the history of water development since the sanitary revolution in the middle of the nineteenth century. The water infrastructure that was put in place in many cities in Europe and America was never built for much of the rest of the world. That began to change during the Second Sanitary Revolution, which reached its apex in the 1970s and 80s. This revolution has its origins in environmental health – a field expanded in the postwar and that drew on the best aspects of nineteenth-sanitary science –, which considered sanitation and clean water as essential for human and economic flourishing. Beginning in the early 1970s, major international organizations like the World Bank, the United Nations Development Programme, and the World Health Organization began to take a sustained interest in water and sanitation. This Second Sanitary Revolution was largely put down by a counter-revolution in the 1990s, during which the ambitions of the 1970s and 1980s were tempered by changes in economics and personnel at places like the World Bank.

During the 1980s, however, before the counter-revolution, two massive and wildly ambitious projects showed what was possible. The International Drinking Water Supply and Sanitation Decade (IDWSSD), from 1981 to 1990, and the Blue Nile Health Project (BNHP) aimed for nothing less than the total overhaul of the way water was developed. The IDWSSD was designed to give more than two billion people access to clean drinking water and sanitation. The WHO considered it a key component of its campaign to achieve health for all, viewing it as “development in the spirit of social justice” (WHO, 1981, p.7). Meanwhile, the architects of the BNHP hoped to foster a rethinking of irrigation projects so that they would not have such adverse effects on health. “The Blue Nile Health Project,” according to one WHO consultant just as it was getting off the ground in the spring of 1980, “must be one of the most comprehensive and ambitious schemes of its kind to be attempted in a developing country” (Jordan, May 1980). For decades many had realized that irrigation projects were incubators of disease, especially in places prone to malaria and schistosomiasis. By the time the BNHP was set to launch, recognition of this fact was well established. As Dr. Ahmed Ayeb El Gaddal (1979), the Sudanese doctor in charge of the BNHP, put it: “Water and its agricultural, domestic, and recreational uses is the major single environmental factor involved in malaria, bilharzia, gastrointestinal diseases, and other vector-borne infections such as onchocerciasis”. As with the IDWSSD, those running the BNHP knew that water and its control were at the heart of sickness and health. Water was also a bedrock of economic development. But when water-related diseases like malaria and schistosomiasis were left to fester on the Gezira Scheme, people simply could not thrive. The BNHP aimed to change that. The director of the Eastern Mediterranean office of the WHO, Dr. A.H. Taba (4 Feb. 1981), wrote that the “Blue Nile Health project is directly oriented towards economic development through improvement of health and restoration of productivity in the population.”

Much of the ambition of the Water Decade and the BNHP faded away as the 1980s came to an end. By the end of the Water Decade and nearing the completion of the BNHP, small-scale thinking took over. At the time, many noticed the change. In the late 1980s, Socrates Litsios, an analyst at the WHO, lamented that thinking about health and development in Africa in the wake of structural adjustment large-scale thinking and ambition had

been replaced by technical concerns. In a blistering critique of a World Bank report called “Beyond adjustment: toward sustainable growth with equity in Africa”, Litsios claimed that the social dimension of such things as AIDS – discussion of which was, he pointed out, entirely absent –, growing inequality, and the deteriorating environment were ignored. In place of such a discussion the report focused on what was and was not measurable. Litsios (1988) wrote: “It is as if the authors decided that because they had no simple measure of these problems, they could neglect them.” By concentrating their analysis on what was measurable, the authors of the report lost sight of the bigger picture. For Litsios (1988) this narrow approach was a “tragic commentary on our times and our lack of vision and hope.”

Others took notice too. Technical solutions aimed at specific diseases had replaced large-scale, interdisciplinary projects like the BNHP and the IDWSSD. In 1992, Johns Hopkins, USAID, and the World Bank organized a conference to discuss the Bank’s forthcoming “World Development Report: investing in health”. The conference, called “Cost effective interventions for child health: technical choices, strategic issues, and priorities,” took as its starting point the following observation:

In the decade of the 1980s there was a major strategic shift in international health strategy from broad-based institutional development and capacity building to a highly focused effort directed toward saving the lives of children by the massive application of selected technical interventions, most prominently, immunizations and oral rehydration therapy (IIP/USAID/World Bank, 1993).

While this shift had had considerable effects on mortality wherever the programs were well run and adequately funded, there were many places where such things as oral rehydration therapy (ORT) and vaccines were barely known. The conference organizers came to the essential, if also unremarkable, conclusion that “ultimately, good health for children requires not only technological fixes but also behavioral and social changes” (IIP/USAID/World Bank, 1993).

The powerful influence of the World Bank’s “Investing in health” and the consequent introduction of cost-effectiveness analysis and the disability-adjusted life year (DALY) into global health is wellknown. The rapid move in the late 1970s and early 1980s from primary health care to selective primary health care – a shift from an attempt at structural change in the way health care is provided to a more limited menu of cost-effective interventions – is a well-established historical narrative (Cueto, 2004; Packard, 2016). The effects of these changes on the way in which the WHO approached diseases like tuberculosis and AIDS, for example, were devastating (McMillen, 2015). Projects like the Water Decade and the BNHP, conceived in the late 1970s and carried out in the 1980s, would find no place in this new world.

I examine this monumental shift in thinking and practice by carefully examining, alongside relevant secondary sources, the archives of the World Health Organization and the World Bank.

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There is a tension between large-scale, interdisciplinary projects and focused, incremental change. The history of water and sanitation development has many examples

of this tension. The shift from the ambitions of the 1970s and 1980s to the more modest goals of the 1990s can be largely, though not entirely, explained by shifts in thinking and personnel at the World Bank. And there are few individuals more associated with the World Bank's water policies than John Briscoe. Briscoe was, among other things, the former chief of water operations at the World Bank, a key player in the privatization of water services, and one of the architects of "willingness to pay" in development economics. He was thus a key player at the Bank, and in development generally, at a period of critical change; indeed, he led much of that change. He was a complicated figure, too. One way of seeing Briscoe would be to note that he was responsible for a way of thinking that led to the narrowing of ambitions in global health and even to increasing inequality. In 1988 he co-authored, with the economist David de Ferranti, *Water for rural communities: helping people help themselves*, which advocated for privatization and cost-recovery mechanisms that would make the poor pay for water (Briscoe, de Ferranti, 1988). Briscoe, along with de Ferranti and others, was instrumental, there is no doubt, in embedding economic thinking into the problems of global health.

On the other hand, Briscoe could be blistering in his critique of capitalism and the inequalities it could produce. Ten years before he teamed up with de Ferranti, Oxfam hired him to evaluate its work on health care in Bangladesh. He was charged with answering a series of questions: Was Oxfam having an impact? What could they do better? But before getting into the details of his report, Briscoe (1978) led with the following comment:

It is no idle coincidence that the people who eat too little food are the same people who are denied access to adequate health care. All of the immediate causes of the ill health of the majority are manifestations of a single underlying cause, namely an international and national system which exploits and oppresses these people. A program for improving health thus must be a program for changing society.

While finding that Oxfam indeed did some good in the country, he went on to conclude more generally that

foreign voluntary organizations have served as apologists for the continuing exploitation of the Third World by the rich countries. These organizations could play a highly constructive role in their home countries by focusing attention on how the policies of their own governments and corporations contribute to this exploitation (Briscoe, 1978).

Briscoe's orientation from the beginning of his career was clear: because outsiders generally made a mess of things, he wanted to provide countries with the tools they needed to solve their own problems. He recognized that large-scale social transformation was essential, while also advocating for technological changes. He knew that one could not come without the other. He never advocated for ORT "instead" of providing clean water, for instance. But in the ever increasing world of measurement, broad-scale interventions became harder and harder to justify as their measurability, as against precise technical interventions, became more and more challenging. Just as this way of thinking was beginning to take hold, Briscoe argued forcefully against it in the early 1980s. He noted in 1984 that when large-scale water and sanitation programs were compared to specific

interventions, such as ORT, for reducing infant mortality, the former came up wanting. That is, based on a specific, measurable outcome – reduced infant mortality in this case – ORT had a demonstrably greater effect on that “single” metric than more widespread water and sanitation projects (Briscoe, 1984). To Briscoe this was the wrong approach. As he noted, “more systemic non-medical activities in general, and community water supply and sanitation programs in particular, are rejected as being non-cost-effective” (Briscoe, 1984, p.1009). While the Water Decade and the Blue Nile Health Project were launched before ambitions were tempered, by the time they had run their course, the mindset that Briscoe had worried about in 1984 had come to dominate.

More than two and a half decades later, in 2011, and three years before his death, Briscoe lamented the shift away from large-scale infrastructure-level projects. He thought, for example, that the Millennium Development Goals were misguided. By ignoring infrastructure and focusing on discrete problems – however obviously important they are – these goals ironically keep people poor (Briscoe, 2011). This argument is a version of one he made in 1978: if developing countries were not provided with the tools they needed – in this instance, infrastructure – but just discrete technical solutions to particular problems, they would never lose their reliance on outsiders. Of course, this argument is not peculiar to Briscoe; it is simply that Briscoe embodies the complexities of the problems, the contradictions of large- and small-scale thinking, and the compromises that individuals and organizations were forced to make. Briscoe knew that without the essentials all societies require to develop and thrive – water, transportation, and communication, for instance – developing countries would be forever dependent on aid. Decades earlier, the economist A.O. Hirschman called things like water projects – projects essential to economic development – “social overhead capital” (Dietrich, Henderson, 1963, p.18). Briscoe might never have used that term, but what he advocated was the same thing.

The Water Decade and the BNHP came at a time – the late 1970s – when devotion to such things was both at its height and was beginning to be challenged (McMillen, 2020). International Drinking Water Supply and Sanitation Decade and the Blue Nile Health Project were large-scale, comprehensive projects designed to provide sustainable water infrastructure. They were costly and would take a long time to implement; the payoffs might not be immediately clear. They were not designed to provide short-term technical fixes. Both would, if successful, fundamentally change people’s relationship to water and sanitation. Such changes would be the basis for economic and social flourishing.

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The World Bank began the 1970s recognizing that there was “clearly a larger role” for it to play in developing water supply and sewerage. The Bank had been active in developing irrigation projects, but wanted to move beyond them. The 1960s had been spent dabbling in water supply. By 1971, they realized that “investment in this sector would seem to be much more suited to the Bank Group’s development objectives than the limited Bank involvement to date would indicate” (World Bank, 1971a, p.9). Their newfound commitment showed: in 1971 they spent more on water and sewer projects – \$189 million – than in all previous years combined. Even so, this was still “a mere trickle in relation to the unmet need for investment to meet the most modest requirements” (World Bank, 1971b, p.23). That same

year the WHO and the World Bank entered in a formal agreement: they would combine their respective expertise and work together on the problem of water (Shipman, 1974). Within a couple of years the Bank had begun its “phase of experimentation” (WHO/IBRD, 19-21 Mar. 1973). By the middle of the decade more was being done to develop water and sanitation in the developing world than had been done at any other time: UNICEF installed thousands of pumps all over rural India, while the World Bank and the WHO helped to set up local water boards in places like urban Uttar Pradesh, and also began to take the problems of access to water in Africa seriously. Even so, by decade’s end, many believed that not enough was being done to meet the world’s drinking water and sanitation needs.

So it was that in 1977 the UN convened the first global water conference, at Mar del Plata, Argentina. Some of the resolutions agreed to at the meeting were radical, insofar as they contained ideas few had broached, much less agreed to at a global level. For example, in what might be the first mention of such a principle, the participants resolved that “all peoples, whatever their stage of development and their social and economic conditions, ‘have the right’ to have access to drinking water in quantities and of a quality equal to their basic needs” (UN, 1977, p.66; emphasis added). In a section on “Water policies in occupied territories” the participants took a firm stand against those in power who would limit access to water to those without power. In strong language, worth quoting at length to demonstrate the ways in which the conference attendees imagined water to be embedded in social relations, the conference proceedings contained the following:

Noting with great concern the illegitimate exploitation of the water resources of the peoples subject to colonialism, alien domination, racial discrimination and ‘apartheid,’ to the detriment of the indigenous peoples,

1. Affirms the inalienable right of the people of the countries under colonial and alien domination in their struggle to regain effective control over their natural resources, including water resources;
2. Recognizes that the development of water resources in territories subjected to colonialism, alien domination, racial discrimination and ‘apartheid’ should be directed for the beneficial use of the indigenous peoples who are the legitimate beneficiaries of their natural resources, including their water resources;
3. Denounces any policies or actions by the colonizing and/or dominating powers contrary to the provision of paragraph 2 of the present resolution, and particularly in Palestine, Zimbabwe, Namibia and Azania (UN, 1977, p.80; emphasis in original).

Out of that meeting, and based on expertise gained over the preceding half-decade, the Bank, the WHO, UNDP, and delegates from the 116 states present committed themselves to launching, funding, and carrying out the International Drinking Water Supply and Sanitation Decade. The Decade’s goal was ambitious: to provide two billion people with clean water and sanitation. Never had the water needs of the developing world been so vigorously and systematically attacked. When thinking about the importance of the Decade and what it might achieve, a panel of experts at the WHO and the Bank claimed in 1979 that such an undertaking would have an impact like no other. They wrote: “Few development projects have greater potential for directly benefiting the health and social and economic well-being of mankind than water supply and sanitation services” (WHO,

25 June 1979, p.1). Dr. Peter Lowes (1984), the WHO/UNDP coordinator for the Water Decade, was explicit about the ambitions of the Decade. When addressing a group of potential donors he made clear that the Decade sought to accomplish globally what had been accomplished in England 130 years previously.

This kind of ambitious thinking was countered by those who argued that water supply and sanitation were too expensive and that other kinds of interventions would do more, at less cost, to improve health, or at least to cure people when their health became poor. Just as the Decade was about to begin, prominent health economics experts made the influential argument that primary health care, as envisioned by the WHO at the Alma-Ata Conference, needed to be replaced with what they called selective primary health care. Primary health care was just too expensive. Water was especially so. But oral rehydration therapy was not. Wasn't simply curing children of diarrhea once they had gotten it a more cost-effective way to address the problem than supplying expensive water and sewerage works? It was certainly more measurable. This kind of thinking was a point of tension throughout the Decade between those who focused on prevention and those who thought it best to cure. When analyzing the IDWSSD's impact on childhood diarrhea – often used as a marker for a community's well-being as well as a sort of proxy for its access to clean water – the Decade's Steering Committee for Cooperative Action reported in 1990 that arguments claiming that water supply and sanitation were too expensive and that the effect of water supply and sanitation on health was too difficult to measure were in fact wrong. As the committee noted, "water and sanitation provision began the IDWSSD in a climate in which major funders saw it as an expensive intervention, in which health impacts could not be estimated." Yet the programs persisted and by the end of the Decade it was clear that providing water and sanitation had a demonstrable, quantifiable benefit when it came to reducing childhood diarrhea (IDWSSD, 1990).

While it did not meet its goal of universal access to water and sanitation – a goal most realized was unreachable – the Decade had a considerable amount of success. Take a look at Africa. While it would be naive and incorrect to say that the Decade solved the continent's water problems, it is nonetheless the case that great gains were made, even at a time when the overall population increased by 36% (79% urban and 23% rural). In urban areas access to a safe, clean drinking water supply, usually though a house connection, increased from 66% to 79% – again, at a time when the urban population boomed (WHO, 1992a). The Decade's bias towards water supply systems meant that sewerage did not receive the same level of attention. Sanitation was of secondary importance – and not only during the Water Decade. When the World Bank began to focus its lending on water supply and sanitation at the beginning of the 1970s, water supply always took precedence. The same was the case during the Decade. Sanitation is a more complicated problem than supplying clean water; it must account for the local environment in ways water supply need not. Additionally, social customs associated with defecation are far more complicated than they are for drinking water. Further, as Decade observers noted, politicians were far more eager to provide their constituents with clean water than with latrines (World Bank, 1992; Cairncross, 1992, p.7). Finally, as Dennis Warner and Louis Lauger, from the WHO's Community Water Supply and Environmental Health Unit, argued in 1991, when reflecting on the achievements of

the Decade, much of the progress that could have been made was stymied by two related things. First, because of the inability to demonstrate quantitatively the relationship between clean water and health, health became less and less of a focus. Second, as cost effectiveness became more and more central in the world of global health, planners began to focus more and more on the quantifiable aspects of water and sanitation development such as hardware. What this meant, according to Warner and Lauger (1991, p.137), was that “considerable efforts were devoted to the development of new hand pumps, excreta disposal systems, and water treatment processes but relatively little effort (and money) was given to understanding complex health linkages or developing health-related design criteria.” The result was a perverse incentive to build more stuff whether it worked to improve health or not.

While there is no doubt that the Water Decade did not achieve all of its goals, the very fact of its ambition, to say nothing of its actual achievements, is remarkable. The Decade brought an extraordinary amount of attention to the poor state of water supply and sanitation in much of the world. Further, research done during the Decade revealed the importance of local conditions: that one size does not fit all, that appropriate technology must be chosen for each locale, and that community participation is critical. These were important lessons for water engineers and others to learn; simply mapping on to the Global South what had worked in the North was not effective (Kalbermatten, 2009; Christmas, de Rooy, 2009). In fact, trying to reproduce the urban “sanitary revolution” of the nineteenth century in the late twentieth century Global South was simply not possible (Gandy, 2006).

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The Blue Nile Health Program was an attempt to think about disease, the environment, economic development, and human behavior all at the same time. As many realized, the irrigation projects in the Gezira region of Sudan had created an entirely new economic and environmental region within the country, where “disease-transmitting mosquitos and snails grow in the canals and wastewaters as prolifically as do cotton, groundnuts, grains and vegetables in the irrigated fields” (Summary..., 3 May 1978). Malaria and schistosomiasis were products, of course, of the natural environment, but it was an environment formed by human action. Before the Sennar Dam was built in the early 1920s, schistosomiasis was barely known, but officials predicted right away that it would become a problem. Indeed, the Sudan Medical Service warned in 1925 that “failure to prevent [schistosomiasis] would be disastrous and probably irreversible” (Amin, Abubaker, 2017, p.87). Observer after observer repeated the same message (Archibald, 1933; Stephenson, 1947; Farley, 1991, p.122-124; Bell, 1999, chap.4). And sure enough, within a few years schistosomiasis could be found in every single one of the newly constructed canals (Humphreys, 1932). In 1952, W.H. Greany (1952, p.265), from Sudan’s Ministry of Health, noted that “this previously waterless area became invaded by schistosomiasis after the introduction of a system of irrigation.” It was clear to the WHO by the end of the 1940s that schistosomiasis had spread across Africa in the wake of irrigation development. A joint working group of the WHO and the Office International d’Hygiene Publique met in Cairo in late 1949 and concluded that “the introduction or development of irrigation schemes, as well as the change from basin to perennial irrigation, has ‘always resulted’ in a considerable increase in the incidence



and intensity of bilharziasis” (OIHP/WHO, 1949, p.14; emphasis added). By the end of the 1950s it was well known that irrigation projects across the world – in Brazil, Venezuela, Rhodesia, Egypt, and elsewhere – were breeding grounds for schistosomiasis (Lanoix, 1958). And schistosomiasis was not the only problem. Malaria, once a seasonal malady, had been slowly turning into a year-round one. “Perennial transmission” of malaria became the norm as irrigation development ramped up in the 1970s, when the Rahad Scheme came on line. The explosion of disease in the Gezira came as the result, after the Second World War, of a massive expansion of irrigation. Fields that were once left fallow were now watered all year. The construction of more and more canals brought water – and malaria and schistosomiasis – to once dry areas. And while the increase in population density put a strain on the water supply, greater numbers of migrants changed the disease landscape (Jobin, 2014, p.328). The project attracted an evergreater number of migrants from malaria-infected regions (Plan..., 1979). As one observer noted, the history of agricultural development was also the history of epidemics of malaria and schistosomiasis in “immigrant non-immune population groups” (Parisi, 9-19 Mar. 1981; see also Fenwick et al., 1982; Amin, Abukaker, 2017). Irrigation development had completely changed the region.

What happened in Sudan was a version of a global phenomenon seen in many places that manifested in myriad ways: the total environmental transformation of a landscape after the introduction and rapid spread of capital-intensive agriculture geared toward commodity production. Large irrigation projects like the Gezira scheme often lead to a new disease environment. Another widespread change was mass soil erosion. One of the most well-known examples of this is the dust bowl that swept across America’s Great Plains in the 1930s as grasslands gave way to plowed fields. While it is certainly true that the dust bowl of the 1930s could not have existed just anywhere – the ecological pre-conditions of the American Great Plains were unique – most scholars argue convincingly that what made the Great Plains blow away in great clouds of sand in the 1930s was human manipulation of the environment in the form of capital-intensive agriculture (Worster, 1979). But this was not an American problem. In the 1930s, across the colonial world and elsewhere – really, wherever intensive agriculture combined with the right environment – dust bowls appeared. In their extraordinary 1939 study of the problem, *The rape of the earth: a world survey of soil erosion*, Graham Vernon Jacks and Robert Orr Whyte wrote that the “main economic cause of recent accelerated erosion has been the transfer of capital across regional or political boundaries and its repayment with soil fertility” in order to grow commodity crops for export (cited in Holleman, 2018, p.51). The same kind of wholesale transformation of the landscape also happened on the Gezira: as A.H.S. Omer, of the Institute for Tropical Medicine in Khartoum, wrote in 1975 (p.122), when irrigation agriculture arrived the “environment completely changed.” Indeed, without the development of massive irrigation schemes, the region would not have become the diseased place the BNHP attempted to cure as of the late 1970s.<sup>1</sup>

That capital-intensive agriculture is transformative is of course not a novel point historiographically; environmental historians have been making similar arguments for decades. Indeed, one of the foundations upon which the field of environmental history was built was its interrogation of the consequences of commodity production. What I want

to make clear is that the architects of the BNHP took it as their starting point: the natural environment of the Gezira province had been so altered that a region that had barely known water-associated disease had been made into an environment where water-associated diseases had become endemic and occasionally epidemic. The BNHP was committed to mitigating the effects of what its designers knew was a human-created problem associated with economic development. That is, they acknowledged that with the imperative of economic development came responsibility. The World Bank – a key partner in financing portions of the project through its simultaneously run Gezira Rehabilitation and Modernization Project – proposed that there was in fact a moral component to irrigation development:

Interventions which are known to increase substantially the spread of serious disease cannot be undertaken lightly. If they are embarked upon lenders would seem to be morally obligated not only to institute effective counter measures to offset these dangers but to reduce the remarkable increase in waterborne diseases that for example the irrigation schemes in Sudan have produced (Messenger, 14 Dec. 1981).

In fact, so seriously did the World Bank appear to take the health implications of irrigation development at the time that Sudan's Minister of Health worked on the assumption that health considerations were built into any Bank-funded project in Sudan (Abbas, 30 Mar. 1980).

The moral component of economic development, especially when it came to health, was also on the mind of Halfdan Mahler, the Director General of the WHO. Mahler, the principle champion of primary health care and Health for All by 2000 – WHO initiatives designed to fundamentally reorient health care in the developing world – considered the BNHP the embodiment of his core principles: it was a project that aimed to develop primary health care and deliver it to everyone; it linked health care to economic development; and it involved community participation (also a pillar of the Water Decade). Mahler was deeply committed to the BNHP; it embraced all of his priorities. At a donors' meeting in Khartoum in February 1980, Mahler (24 Feb. 1980) said: "The role of health as a bridge between the elements necessary for developing the New International Economic Order has been recognized; the goal of health for all at a level which will permit people to lead socially and economically productive lives must be achieved if international and social justice is to prevail." That Mahler embraced the New International Economic Order (NIEO) – a 1974 UN proposal designed to rebalance the inequitable global economy to more properly favor the Global South through vigorous development and more equal trade – is no surprise. The NIEO aligned nicely, though not precisely, with Mahler's goals for global health (Chorev, 2012, p.6-7, chap.3). And the Blue Nile Health Project had it all: it connected economic development and health in a way that would not hinder growth, while at the same time addressing social justice.

But Mahler was not naive. A little more than a week later he gave another speech on the Blue Nile Health Project in which he was much more sharp-tongued. He worried that health concerns would be subordinated to economic ones – and he was right to be concerned. He was alarmed by the inequality he saw building around him. His optimism had been strained:

Surely, when you are looking at the dilatory tactics, the frustrating negotiations, if they can be called negotiations at all, that now for several years have been surrounding the introduction in this world of the minimally decent economic and social order, you cannot be very optimistic about this divorce between the North and the South being remedied in the near future (Mahler, 24 Feb. 1980).

He was particularly worried about the ways economists thought about health and development:

Most economists are utterly and totally cynical about the contribution of health for socio-economic development. Even if famous economists like Myrdal, who [said to me] 'My dear Mahler, please: you don't have to prove the case of health; it is a moral imperative,' but I am sorry to say Mr. Myrdal, although you have said it is a moral imperative, we are still struggling very hard indeed to make most economists understand that health is not just a consumption sector but a truly contributing sector in overall development. We have to convince the hard-nosed economist that health is a worthwhile kind of development (Mahler, 24 Feb. 1980).

He went on:

Is the world for the habitants of space ship earth so that each and every one of them gets the chance to realise their social and economic potential or, is it made for the few individuals of a few countries to play havoc with the world's resources whether they are human or physical? In my humble opinion, we are indeed watching a build up of history's most explosive time bomb if we permit things to continue as they are today (Mahler, 24 Feb. 1980).

For Mahler, the BNHP was a hopeful sign. It was ambitious and compassionate; it embodied his goals for primary health care; and it was, he felt, on the verge of actually taking off. As he said, "nothing stands in its way except for human lethargy, cynicism, lack of political will and social imagination" (Mahler, 24 Feb. 1980).

Mahler was right to be worried: such a project could be a hard sell. It would come online at the same time as the Water Decade and face much of the same scrutiny. Indeed, while some at the Bank believed there was a moral component to development and that health needed to be taken into consideration when designing projects that they knew would alter the environment in ways that produce disease, others wondered if investing in health was worth it. Doubts of this sort needed to be overcome before the Bank would consider financing a health component of their work in the Gezira.

The Bank's Gezira Rehabilitation and Modernization Project (GRMP) had three goals: sustained increase in exports; increased income for 1.5 million people, all of whom depended on the Gezira Project for livelihood; and strengthening the "fiscal base of the country." The GRMP had to figure out how to achieve these goals in the most cost-effective way. While most agreed that the project had created an environment conducive to disease, and of course no one argued that that was acceptable, Bank staff nonetheless debated whether or not investing in health would help them achieve their goals or if it was an unnecessary expense (Sudan..., 13 June 1982). The most pressing question when it came to health was the health of labor. As a senior financial analyst at the Bank put it in

1982: “health considerations impose a binding constraint on the availability of labor for productive operations and this constraint imposes a heavy economic cost” (Shivakumar, 22 June 1982). While true, Bank officials wondered if it also still might be true that the health component of the project might simply be too much to bear. As one Bank official put it, when trying to boil the project down to its essence: “The only elements which might be reduced or eliminated with minimal effect on the balance of the project are the health and water supply components” (Jordan, 9 July 1982).

Given the weakness of Sudan’s health infrastructure, Bank officials wondered if it was worth investing in health if there was the possibility that the investment would be squandered. Emmerich M. Schebeck (11 June 1982), from the Bank’s Population, Health, Nutrition (PHN) Division, put it this way:

Thus, one is confronted with the difficult choice of either doing nothing in the way of health components even when the parent irrigation project may actually give rise to or exacerbate health problems in a project area or to include funds for a component recognizing that the activities intended are likely to be less than fully effective because of the organization and administrative shortcomings of the Ministry of Health in Sudan.

How would they decide? Was it possible to determine if the health component of the project would have a reasonable chance of success? As was asked about the Water Decade: can health be measured? To try and answer these questions the Bank sent Dr. Graham Clarkson, from the PHN Division, to investigate. Clarkson spent several weeks evaluating control strategies in early 1983 and determined that the BHNP’s goals were reasonable and its capacity sound. He offered a word of caution to the finance team at the Bank: don’t get too fixated on quantification. “In Sudan, lack of documented evidence of the actual amount of morbidity and death caused by schistosomiasis in the Gezira makes it impossible to quantify in precise terms the extent of the problem but does not, unfortunately, diminish the hazard” (Clarkson, 14 Apr. 1983). His thorough assessment of the program and its possibilities came to the not unsurprising conclusion that quantifying the benefits of schistosomiasis control was neither possible nor necessary. That is, the harm the disease was doing to workers and others in Gezira was self-evident; improvement in health would lead to economic improvement (Schistosomiasis..., 23 June 1983). With the Bank’s concerns now allayed they were prepared to offer funding. And it paid off: in 1995, when the Bank appraised the project, the schistosomiasis component was considered to be one its greatest successes. One of the key lessons learned was that “the results achieved so far confirm that the reduction in the prevalence of the disease is a direct consequence of the duration of the disease control program” (World Bank AEOD, 2 Mar. 1995).

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The Gezira Irrigation Scheme, in service since the 1920s when the British ran Sudan, was by the 1970s the largest irrigation project on the planet, covering more than two million acres (Ertsen, 2015). It was also, due to increased irrigation, the scene of the most intense transmission of *Schistosoma mansoni* anywhere in the world (El Gaddal, 1979). The cotton grown here and on the Managil and Rahad schemes was Sudan’s major export and thus the

key to its economic success – or failure. The labor of growing cotton and maintaining the irrigation works, to say nothing of all the economic activities associated with servicing an enormous population, attracted perhaps half a million migrant workers each year (Bella et al., 1980), bringing the population in the area to approximately 2.5 million. The architects of the BNHP, recognizing that “Sudan’s agricultural productivity is, at times, held hostage to disease,” knew only looking at malaria or diarrhea or schistosomiasis would be inadequate (Orozio, 1981). They needed to combine their efforts into one integrated approach. In an early appeal to potential donors the lead investigators explained why they needed a new approach. The old way of doing things – focusing on malaria, bilharzia, and diarrhea as isolated diseases – was ineffective. The Blue Nile Health Project would be different: “The overall objective of this project is to control and prevent the major water-associated diseases, primarily malaria, schistosomiasis and diarrhoea through a comprehensive approach, and to assess the health and socio-economic impacts” (Summary..., June 1982). It might seem remarkable now – or perhaps not – but it was a novel realization at the end of the 1970s that water, in this unique environment, linked malaria, diarrhea, and schistosomiasis and that rethinking water control might in turn lead to better health outcomes. As a 1980 WHO press release trumpeted, “the multi-faceted plan is key to a new strategy of disease control that is being put into effect on a large scale for the first time. Designed to tackle all of the area’s health problems, it is comprehensive rather than piecemeal in scope, and represents a major shift away from a project-by-project approach” (Orozio, 1981). Indeed, were the project not comprehensive and not integrated into the embryonic primary health care system developing in Sudan it would, the WHO worried, simply be another “vertical project” (Arfaa, June 1980).

At the BNHP this translated into, for example, making domestic water supplies more accessible so that people would not bathe in or get drinking water from irrigation canals. Focusing on single diseases, the BNHP planners realized, was inefficient; what might work to control schistosomiasis might also work to control diarrhea. Further, thinking more broadly could lead to cost savings; that is, if changes in water use had positive effects on several diseases at once that would of course be cheaper than the demonstrably more expensive focus on one disease at a time. The cost of controlling malaria kept rising as new drugs were required because of resistance to the old ones. In 1975, a devastating malaria epidemic sent disease rates skyrocketing, all because the local mosquito, *A. arabiensis*, had become resistant to DDT. Drug resistance was thus something many involved in the Gezira project were concerned about (Messenger, 14 Dec. 1981; El Gaddal et al., 1985). The architects of the BNHP wanted to rethink the single disease, single intervention approach.

The costs of the present single purpose control programmes are prohibitively high. The current strategy relies mainly on repetitive chemical control which has resulted in the development of multiple resistance in the malaria mosquito thus newer and more expensive insecticides have to be used. Environmental and biological control of mosquitoes and snails, improvements in basic health services, changes in human behaviour and permanent modification in agricultural and domestic water use will be developed as alternative to large-scale use of pesticides and drugs (First..., 31 July 1979).

They knew they needed to learn about more than disease. Because more than half a million people migrated in and out of the area each year they needed to understand the relationship between this mass movement and disease. For instance, Dr. Mutamid Amin wanted to know what effect providing clean water to those living in formal villages would ultimately have if “squatters” and seasonal laborers were living in informal settlements outside the confines of control (Minutes..., 18 Apr. 1979). Also, understanding human migration meant not only learning how migration and vector-borne diseases interacted, though that was critically important; it meant understanding the economics of migration, the push and pull factors that drove people to migrate. They needed to understand the history of the Gezira Scheme. Had the three principle diseases been in place before large-scale irrigation or were they the result of irrigation? Early on they recognized that not only did they need to know how long the diseases had been in place and what role irrigation development might have had in their arrival and dispersal; they knew they would have to study the past to learn what had and had not worked to control disease (Summary..., 3 May 1978). The project was an ideal laboratory for looking into the social aspects of disease. When visiting in February 1980, Dr. P. Rosenfield, of the Bank's and WHO's jointly run Special Programme for Research and Training in Tropical Diseases, made this abundantly clear when she noted the interest of the Ford Foundation in studying the social aspects of irrigation and reported on the University of Gezira Medical School's emphasis on “interdisciplinary studies.” Students, in fact, were required to do a unit in community health for their medical degree. She was excited about the possibilities for doing research that went beyond biomedical concerns: “This visit confirmed previous impressions that the social and economic research potential related to tropical disease transmission and control is great in the Sudan” (Rosenfield, 22-29 Feb. 1980).

The architects of the BNHP wanted the project to be valuable beyond Sudan. While the program was designed to solve the problems of the Gezira, it was also a research enterprise. The planners imagined that their project would be a model for other tropical countries faced with the disease environment created when water resources were developed for food, energy, and commodity production (Summary..., June 1982). Indeed, because the World Bank had created dozens of irrigation projects in Africa and the Middle East in recent years there was growing concern about their ill effects. To that end, the Bank set aside \$60 million to mitigate the effects of irrigation development on health (Orozio, 1981). The BNHP was part of a broader set of research efforts, such as the Special Programme for Research and Training in Tropical Diseases, that aimed to better understand common diseases across a broad swath of the planet. The Special Programme began, in fact, as a response to the “frightening increases in prevalence and severity” of malaria and schistosomiasis due to water development schemes (Baum, Boskey, 12 Nov. 1976).

Over the course of the 1970s, then, it became more and more clear that irrigation development led to the creation of new disease environments; it was also increasingly obvious that a comprehensive approach could be far more successful than a piecemeal one. Just as those who planned the Water Decade thought about water in an all-encompassing and ambitious way, so, too, did the designers of the Blue Nile Health Project. To achieve their goals they initially set up a study area to learn what worked and what did not. They tried

everything in tandem. Village health committees were formed and volunteers were trained in malaria and schistosomiasis diagnosis; mothers learned how to use oral rehydration salts to combat diarrhea. The Bank's GRMP funded the construction of community water supplies and more efficient drainage canals to reduce standing water. Centrally operated mass chemotherapy programs treated schistosomiasis. The Chinese grass carp was introduced to reduce aquatic weeds, mosquito larvae, and snails (Jobin, 2014, p.321-360). Did the Blue Nile Health Program work? In many respects, yes – and in a remarkably short period of time. In 1981, Dr. Graham Clarkson's (31 Jan. 1981) assessment was dire: "The magnitude of the problem," he wrote, "cannot be underestimated." Four years later, Dr. A.A. El Gaddal (1985), the BNHP's project manager, reported that schistosomiasis had been reduced from a prevalence rate of more than 50% to less than 10%; malaria and diarrhea rates fell considerably as well. And success was sustained for the ten-year lifespan of the BHNP: schistosomiasis was kept at bay throughout the 1980s, and malaria prevalence dropped to below 1% from a high of over 30% in the early 1970s (Jobin, 2014, p.341-342).

But it all came to an end. The coup that toppled the regime in 1985 and installed Omar Bashir as president led to political instability in Sudan. Many on the staff were jailed; others fled. And the BHNP relied more and more on outside expertise. Still, year after year, as long as funding was available, success was the norm. Until 1990. That year, torrential rain overwhelmed the drainage systems and malaria swept the Gezira. By then, too, as planned, foreign financial support had come to an end and the Sudanese government was unable to pick up the slack. Many of the remaining staff and doctors left Sudan to seek opportunity elsewhere. While the BNHP had provided ten years of good health – malaria and schistosomiasis were largely under control – and the Bank had financed the construction of clean water and sanitation works, many of the gains were ephemeral. There had not been enough time to develop biological methods of snail control; the provision of free chemical biocides was too good to pass up. Bed nets for malaria control had not been widely adopted. Meanwhile, because they relied on infrastructural changes – new water pipes, latrines, and so forth – the gains made in providing clean water and sanitation would, theoretically, last longer (Jobin, 2014, p.350-357). Once the BHNP shut down, schistosomiasis was no longer a priority – for anyone. Halfway through the first decade of the twenty-first century, prevalence rates on the Gezira had climbed to more than 70% in males and 60% in females. While the BHNP was operative, rates were below 10% (Amin, Abubaker, 2017). And malaria has gone from being under control to becoming, once again, a regular feature of the year to, at regular intervals, becoming quite intense (Hussien, 2019).

## **Final considerations**

Too often we write stories of failure. This is not one of them. The Blue Nile Health Project worked, and the Water Decade was an example of extraordinary cooperation and coordination. In urban Africa, the gains in access to drinking water made during the Water Decade – a rise in direct house connections from 29% to 49% – were greater than those made in the twenty-five years between 1990 and 2015, when access to drinking water actually dropped from 43% to 33%, coinciding with the period when the Millennium

Development Goals set access to clean drinking water as one its it pillars (WHO, 1992b; UNICEF, WHO, 2015, p.10). The Water Decade marked the beginning of the global effort to provide clean drinking water and adequate sanitation for all. The BNHP demonstrated that when adequate financing, staffing, interdisciplinary cooperation, and community buy-in are present extraordinary results can be achieved. This is, of course, an obvious point. But what the story of the BNHP does is provide a real-world example of a series of lessons the WHO, for one, seems to still be learning. In spring 2015, when the WHO released a statement reflecting on its response to the Ebola pandemic, it learned several lessons about the importance of community, capacity, the failure of the market, and the fragility of poorly resourced health systems (WHO, 16 Apr. 2015). Of course, the BNHP made all of this clear decades ago.

#### NOTE

<sup>1</sup> It should be noted that the World Bank had decided to engage in rehabilitating the entirety of the Gezira scheme after realizing it was in a dire mess (siltation, poor health, terrible roads etc.). See: Sudan... (5 July 1979) and Gezira... (1980-1982).

#### REFERENCES

- ABBAS, Khalid Hassan.  
Unofficial translation of a letter to Sudan.  
Sayed Nasr El Din Mustafa, Minister of National Planning. Comprehensive approach to the prevention and control of water-associated diseases in irrigated schemes, Gezira province, Sudan; SUD/VBC/001, jacket 4 (Archives of the World Health Organization, Geneva). 30 Mar. 1980.
- AMIN, Mutamat; ABUBAKER, Hwiada.  
Control of schistosomiasis in the Gezira Irrigation Scheme, Sudan. *Journal of Biosocial Sciences*, v.49, n.1, p.83-98. 2017.
- ARCHIBALD, Robert George.  
The endemiology and epidemiology of schistosomiasis in the Sudan. *Journal of Tropical Medicine and Hygiene*. v.36, n.22, p.345-348. 1933.
- ARFAA, F.  
Visit to Blue Nile Health Project, 14 March-18 April 1980: comprehensive approach to the prevention and control of water-associated diseases in irrigated schemes, Gezira province, Sudan, assignment report; EM/VBC/26, EM/PHC/12 EM/SCHIS/79 EM/SUD/VBC/001/RB-VA RESTRICTED, SUD/VBC/001, jacket 5 (Archives of the World Health Organization, Geneva). June 1980.
- BAUM, Warren; BOSKEY, Shirley.  
Special Programme for Research and Training in Tropical Diseases: background materials for Bank participation in tropical diseases research-set; memo to Robert McNamara; R1992-049, folder 1103166 (World Bank Group Archives, Washington, DC). 12 Nov. 1976.
- BELL, Heather.  
*Frontiers of medicine in Anglo-Egyptian Sudan, 1899-1940*. Oxford: Clarendon Press. 1999.
- BELLA, H. et al.  
Migrant workers and schistosomiasis in the Gezira, Sudan. *Transactions of Royal Society Tropical Medicine and Hygiene*, v.74, n.1, p.36-39. 1980.
- BRISCOE, John.  
Invited opinion interview: two decades at the center of world water policy. *Water Policy*, v.13, n.2, p.147-160. 2011.
- BRISCOE, John.  
Water supply and health in developing countries: selective primary health care revisited. *American Journal of Public Health*, v.74, n.9, p.1009-1013. 1984.
- BRISCOE, John.  
*Improving health care where health is underdeveloped: do foreign voluntary agencies (particularly OXFAM) help in Bangladesh?* Oxfam Archives, MS Oxfam; PRFBGD 88, box 45 (Bodleian Library, Oxford University, Oxford). 1978.
- BRISCOE, John; DE FERRANTI, David.  
*Water for rural communities: helping people help themselves*. Washington, DC: World Bank. 1988.
- CAIRNCROSS, Sandy.  
*Sanitation and water supply: practical lessons from the decade*. Washington, DC: The International Bank for Reconstruction and Development/World Bank. 1992.



- CHOREV, Nitsan.  
*The World Health Organization between North and South*. Ithaca: Cornell University Press. 2012.
- CHRISTMAS, Joseph; DEROOV, Carel.  
The decade and beyond: at a glance. *Water International*, v.16, n.3, p.121-126. 2009.
- CLARKSON, Graham.  
GRP Project n.4218-SU; Chapter on schistosomiasis component for implementation volume, March 22, 1983. Gezira Rehabilitation Project, Sudan; memo to Emmerich M. Schebeck; file 811823, credit 1388, correspondence, v.8, 3 Jan. 1983-16 June 1983; P002587 (World Bank Group Archives, Washington, DC). 14 Apr. 1983.
- CLARKSON, Graham.  
Statement on the conclusion of PHN reconnaissance mission to Sudan at a meeting with the minister of Health, H.E. Kalid Hassim Abbas and senior members of the Ministry of Health, Dr. Khan, WHO representative and Messrs. Blinkhorn and Farag of the World Bank. Gezira Rehabilitation Project, Sudan; credit 1388, P002587, correspondence, v.3, 1 Oct. 1980-28 Jan. 1982, folder 811818 (World Bank Group Archives, Washington, DC). 31 Jan. 1981.
- CUETO, Marcos.  
The origins of primary health care and selective health care. *American Journal of Public Health*, v.94, n.11, p.1864-1874. 2004.
- DIETRICH, Bernd H.; HENDERSON, John M.  
*Urban water supply conditions and needs in seventy-five developing countries*. Geneva: World Health Organization. 1963.
- EL GADDAL, Ahmed Ayub.  
Proposal for projects on health restraints to rural development in Sudan: comprehensive approach to the prevention and control of water-associated diseases in irrigated schemes, Gezira province, Sudan; SUD/VBC/001, jacket 1 (Archives of the World Health Organization, Geneva). 1979.
- EL GADDAL, Ahmed Ayub et al.  
The Blue Nile Health Project: a comprehensive approach to the prevention and control of water-associated diseases in irrigated schemes of the Sudan. *Journal of Tropical Medicine and Hygiene*, v.88, n.2, p.47-56. 1985.
- ERTSEN, Maurits.  
Improvising planned development on the Gezira Plain, Sudan, 1900-1980. London: Palgrave-MacMillan. 2015.
- FARLEY, John.  
*Bilharzia: a history of Tropical Medicine*. Cambridge: Cambridge University Press. 1991.
- FENWICK, A. et al.  
Schistosomiasis among labouring communities in the Gezira irrigated area, Sudan. *Journal of Tropical Medicine and Hygiene*, v.85, n.1, p.3-11. 1982.
- FIRST...  
First draft document prepared for donors' meeting: comprehensive approach to the prevention and control of water-associated diseases in irrigated schemes, Gezira province, Sudan; SUD/VBC/001, jacket 1 (Archives of the World Health Organization, Geneva). 31 July 1979.
- GANDY, Matthew.  
The bacteriological city and its discontents. *Historical Geography*, v.34, p.14-25. 2006.
- GEZIRA...  
Gezira Rehabilitation Project, Sudan; credit 1388; P002587; correspondence, volume 2, Oct. 1, 1980-Jan. 28, 1982; folder 811817 (World Bank Group Archives, Washington, DC). 1980-1982.
- GREANY, W.H.  
Schistosomiasis in the Gezira irrigated area of the Anglo-Egyptian Sudan, I: public health and field aspects. *Annals of Tropical Medicine and Parasitology*, v.46, n.3, p.250-267. 1952.
- HOLLEMAN, Hannah.  
*Dust Bowls of Empire: imperialism, environmental politics, and the injustice of "green" capitalism*. New Haven: Yale University Press. 2018.
- HUMPHREYS, R.M.  
Vesical schistosomiasis in the Gezira irrigated area of the Sudan. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, v.26, n.3, p.241-252. 1932.
- HUSSIEN, H.H.  
Malaria's association with climatic variables and an epidemic early warning system using historical data from Gezira State, Sudan. *Heliyon*, v.5, n.3, p.1-15. 2019.
- IDWSSD.  
International Drinking Water Supply and Sanitation Decade; Steering Committee for Cooperative Action. *Report on IDWSS impact on diarrheal disease*. [s.l.]: [s.n.]. 1990.
- IIP/USAID/WORLD BANK.  
Johns Hopkins Institute for International Programs; US Agency for International Development; The World Bank. Cost effective interventions for child health: technical choices, strategic issues, and priorities proposal for a consultation. World Development Report 1993: investing in health. Jacket 4, N55-418-2

(Archives of the World Health Organization, Geneva). 1993.

JOBIN, William.

*Dams and disease: ecological design and health impacts of large dams, canals and irrigation systems.* New York: E. & F.N. Spon; Taylor and Francis. 2014.

JORDAN, Deane.

Sudan-Proposed Gezira Rehabilitation Project. Gezira Rehabilitation Project, Sudan; memo to files; EA2DB, file 811820, credit 1388, P002587, correspondence, v.5, 1 June 1982-30 July 1982 (World Bank Group Archives, Washington, DC). 9 July 1982.

JORDAN, Peter.

Report on a visit to the Sudan to review schistosomiasis aspects of the Blue Nile Health Project, February-March 1980. Comprehensive approach to the prevention and control of water-associated diseases in irrigated schemes, Gezira province, Sudan; Regional Office for the Eastern Mediterranean; EM/SCHIS/78 EM/SUD/VBC/001/RB-VA, SUD/VBC/001, jacket 5 (Archives of the World Health Organization, Geneva). May 1980.

KALBERMATTEN, John M.

Water and sanitation for all: will it become reality or remain a dream? *Water International*, v.16, n.3, p.121-126. 2009.

LANOIX, Joseph N.

Relation between irrigation engineering and bilharziasis. *Bulletin of the World Health Organization*, v.18, n.5-6, p.1011-1035. 1958.

LITSIOS, Socrates.

Review of the World Bank documents "Beyond adjustment: toward sustainable growth with equity in Sub-Saharan Africa" and "UNDP/World Bank/African Development Bank: assessment of social dimension of structural adjustment in Sub-Saharan Africa" (including meetings). RAF/86/037, jacket 2, C17-372-3, RAF (9) (Archives of the World Health Organization, Geneva). 1988.

LOWES, Peter D.

The water challenge in developing countries. International University Foundation Conference, 29 June 1984-1 July 1984; (INT/81/048), W 8/372/5 (6), jacket 2 (Archives of the World Health Organization, Geneva). 1984.

MAHLER, Halfdan.

Address at the Donors' Meeting in Khartoum, Sudan: comprehensive approach to the prevention and control of water-associated diseases in irrigated schemes, Gezira province, Sudan. Prevention and control of water-

associated diseases in irrigated schemes; SUD/VBC/001, jacket 5 (Archives of the World Health Organization, Geneva). 24 Feb. 1980.

MCMILLEN, Christian W.

"These findings confirm conclusions many have arrived at by intuition or common sense": water, quantification, and cost effectiveness at the World Bank, ca.1960 to 1995. *Social History of Medicine*, hkaa006. Available at: <<https://doi.org/10.1093/shm/hkaa006>>. Access on: 24 Apr. 2020.

MCMILLEN, Christian W.

*Discovering tuberculosis: a global history, 1900 to present.* New Haven: Yale University Press. 2015.

MESSENGER, Harold.

Assessment of waterborne and related diseases in relationship to the Gezira Rehabilitation and Modernization Project 1. Gezira Rehabilitation Project, Sudan; credit 1388, P002587, correspondence, v.3, 1 Oct. 1980-28 Jan. 1982, folder 811818 (World Bank Group Archives, Washington, DC). 14 Dec. 1981.

MINUTES...

Minutes of a meeting held 18 April 1979 with government official: comprehensive approach to the prevention and control of water-associated diseases in irrigated schemes, Gezira province, Sudan; SUD/VBC/001, jacket 1 (Archives of the World Health Organization, Geneva). 18 Apr. 1979.

OIHP/WHO.

Joint Office International d'Hygiène Publique/World Health Organization study group on bilharziasis. *Report on the first session, Cairo, 24-27 Oct. 1949* (WHO Technical Report Series, n.17). Geneva: WHO. 1949.

OMER, Abdel Hamid Sayed.

Schistosomiasis in the Sudan: historical background and the present magnitude of the problem. In: International Conference on Schistosomiasis, 1975, Cairo. *Proceedings...* Cairo: Ministry of Health and Population. p.121-132. 1975.

OROZIO, Peter.

\$155 million programme in Blue Nile area of Sudan tackles diseases linked to irrigation. Gezira Rehabilitation Project, Sudan; Donors conference set for Khartoum 24-26 February; credit 1388, P002587, correspondence v.2, 1 Oct. 1980-28 Jan. 1982, folder n.811817 (World Bank Group Archives, Washington, DC). 1981.

PACKARD, Randall.

The rise and fall of primary health care. In: Packard, Randall. *A history of global health: interventions into the lives of other people.* Baltimore: Johns Hopkins University Press. p.227-266. 2016.

PARISI, Vincenzo.

Report on a visit to Sudan. Comprehensive approach to the prevention and control of water-associated diseases in irrigated schemes, Gezira province, Sudan; SUD/VBC/001, jacket 6 (Archives of the World Health Organization, Geneva). 9-19 Mar. 1981.

PLAN...

Plan of operations. Comprehensive approach to the prevention and control of water-associated diseases in irrigated schemes, Gezira province, Sudan; SUD/VBC/001, jacket 2 (Archives of the World Health Organization, Geneva). 1979.

ROSENFELD, Patricia L.

Special programme for research and training in Tropical Medicine. Comprehensive approach to the prevention and control of water-associated diseases in irrigated schemes, Gezira province, Sudan; Duty travel report; SUD/VBC/001, jacket 6 (Archives of the World Health Organization, Geneva). 22-29 Feb. 1980.

SCHEBECK, Emmerich M.

*Sudan*: GRMPI-Appraisal and comments on consultants preparation report for proposed health intervention. Gezira Rehabilitation Project, Sudan; Office memo to Christopher H. Walton; file 811820, credit 1388, P002587, correspondence, v.5, 1 June 1982-30 July 1982 (World Bank Group Archives, Washington, DC). 11 June 1982.

SCHISTOSOMIASIS...

*Schistosomiasis component*. Sudan Gezira Rehabilitation Project; annex 3E, implementation volume, volume I/annexes I-IV (World Bank Group Archives, Washington, DC). 23 June 1983.

SHIPMAN, Harold R.

*The WHO/IBRD cooperative program on water supply and wastes*. Public Utilities Department guidelines series. Washington, DC: World Bank. 1974.

SHIVAKUMAR, Jayasankar.

Subject: Sudan-Gezira Rehabilitation and Modernization Project 1; Proposed discussion with health and water supply bank staff. Gezira Rehabilitation Project, Sudan; Office memo to R. Nooter, Sr. Loan Officer; AS2DB, file 811820, credit 1388, P002587, correspondence, v.5, 1 June 1982-30 July 1982 (World Bank Group Archives, Washington, DC). 22 June 1982.

STEPHENSON, Ralph W.

Bilharziasis in the Gezira irrigated area of the Sudan. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, v.40, n.4, p.479-494. 1947.

SUDAN...

Sudan: Gezira Rehabilitation and Modernization Project; Aide memoire of IDA appraisal mission. Gezira Rehabilitation Project, Sudan; file 811820, credit 1388, P002587, correspondence, v.5, 1 June 1982-30 July 1982 (World Bank Group Archives, Washington, DC). 13 June 1982.

SUDAN...

Sudan: Gezira rehabilitation project brief; Project officer J. Shivakumar (World Bank Group Archives, Washington, DC). 5 July 1979.

SUMMARY...

Summary of the Blue Nile Health Project in Sudan. Comprehensive approach to the prevention and control of water-associated diseases in irrigated schemes, Gezira province, Sudan, enclosed within report of negotiations with the World Bank Mission on Gezira Rehabilitation and Modernization Project; SUD/VBC/001, jacket 7 (Archives of World Health Organization, Geneva). June 1982.

SUMMARY...

Summary project proposal for a comprehensive approach to the prevention and control of vector borne disease in water resources development projects. Comprehensive approach to the prevention and control of water-associated diseases in irrigated scheme, Gezira province, Sudan; SUD/VBC/001, jacket 1 (Archives of the World Health Organization, Geneva). 3 May 1978.

TABA, A.H.

Letter to A. Wapenhuis. Gezira Rehabilitation Project, Sudan; credit 1388, P002587, correspondence, v.3, 1 Oct. 1980-28 Jan. 1982, folder n.81.1818 (World Bank Group Archives, Washington, DC). 4 Feb. 1981.

UN.

United Nations. *Report of the United Nations Water Conference, Mar del Plata, Argentina, 14-25 Mar. 1977*. New York: UN. 1977.

UNICEF; WHO.

United Nations Children's Fund; World Health Organization. Figure 13, Rural-urban gap in coverage of piped water on premises by region (%), 1990-2015. In: United Nations Children's Fund; World Health Organization. *Progress on sanitation and drinking water*: 2015 update and MDG assessment. p.10. 2015.

WARNER, Dennis; LAUGERI, Louis.

Health for all: the legacy of the Water Decade. *Water International*, v.16, n.3, p.135-141. 1991.

WHO.

World Health Organization. *WHO leadership statement on the Ebola response and WHO reforms*.

Geneva: World Health Organization. 16 Apr. 2015.

WHO.

World Health Organization. In: WHO. *The International Drinking Water Supply and Sanitation Decade*: final report. Geneva: WHO. 1992a.

WHO.

World Health Organization. Table A.3.2: global percentage coverage in 1970, 1975, 1980, 1983, 1985, and 1990. In: WHO. *The International Drinking Water Supply and Sanitation Decade*. Geneva: WHO. 1992b.

WHO.

World Health Organization. *Drinking water and sanitation, 1981-1990: a way to health*. Geneva: WHO. 1981.

WHO.

World Health Organization. Strategies for extending and improving potable water supply and excretal disposal services during the decade of the 80's: possible strategies for the International Drinking Water and Sanitation Decade; Provisional agenda: item 20; CD26/DT/2(WHO Archives, Geneva). 25 June 1979.

WHO/IBRD.

World Health Organization; International Bank for Reconstruction and Development

Cooperative Program: African region. Review of the WHO/IBRD Cooperative Programme: possible assistance in EH in the African region. Meeting minutes; P 20/372/2 AF (WHO Archives, Geneva). 19-21 Mar. 1973.

WORLD BANK.

World Bank Operations Development Department. *Water supply and sanitation projects: the Bank's experience, 1967-1989* (Report n.10.789). Washington, DC: World Bank. 1992.

WORLD BANK.

*Water supply and sewerage* (sector working paper). Washington, DC: World Bank. 1971a.

WORLD BANK.

*International Development Association annual report 1971*. Washington, DC: World Bank. 1971b.

WORLD BANK AEOD.

Agriculture and Environment Operations Division; Eastern Africa Department; African Region. Implementation completion report. Report n.14024-SU; Sudan Gezira Rehabilitation Project; credit 1388-SU (World Bank Group Archives, Washington, DC). 2 Mar. 1995.

WORSTER, Donald.

*Dust Bowl: the Southern Plains in the 1930s*. New York: Oxford University Press. 1979.

