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LA CRISIS DEL AGUA .

WATER CRISIS

Its ecological, social, and political dimensions

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[1] At the onset of the 1900s, the hydraulic horizon of the planet was characterized by optimism. Natural resource exploration forecasted amounts of available springs, running rivers, and bodies of water capable of satisfying the growing needs of the population. A majority of inhabitants remained in the city to find employment within the industry. The supply of potable water and provision of energy collected from large dams should have resulted in enormous storage. Thanks to cautious investment in capital and technology, by both the private sector and government, nourishment necessities tied to demographic growth would be satisfied. The physical availability of resources joined the faith in opportunities opened by technological advancement. In the last stages of the 20th Century, however, different voices of concern began to rise in revolt with the intent on making the world population, specifically opinionated leaders, aware of the imbalance between the availability of hydraulic resources and the increasing necessity for those resources. As we exceed the figure of 6 billion people on the planet, the volume of fresh water recycled in the environment remains relatively stable. Today, many water sources are overexploited and threatened by pollution. Technological advancement continues but is unaccompanied by the same faith and hope in its future outcome. One hopes for a change, not only in the physical availability,

but in the cultural and political focus that designated such availability, its sectorial distribution and access plan, and its use in the arena of opportunity.

[2] We would like to explore three dimensions to of this water crisis. First, there is an uncertainty about the availability and quality of water to meet the needs of a growing population and its diverse utilization for economic expansion. Second, there are new ways to formulate problems and solutions revolving around water management written in emerging cultural trends whose consequences we should decipher. Finally, there exist deep changes in the political relationships derived from uncertainty, from new conceptual models and from the way to practically execute such models. This outline analyzes the water crisis and underlines the techno-environmental dimensions, both politically and culturally, and its interconnection between them.

[3] The uncertainty related to the physical availability of water is a central dimension. This uncertainty can be further highlighted if we look at it from the perspective of our confidence in water abundance some 50 years earlier. In spite of the vast availability of water on the planet, whose surface area is primarily covered by water, human beings vitally depend on fresh water found in the polar ice caps, groundwater, and surface water. To a small but incredibly important extent, we have at our disposal water transported from oceans to land via precipitation of rain and snow, which then drains into channels formed by slopes and river banks, penetrating the soil, where once again the water evaporates and heads towards the sea. In the beginning of the 20th century, these same running rivers appeared abundant and it seemed wasteful that they flowed without being exploited; however, now in the last third of the century, these waters have been collected artificially, often times in an effort to transplant water from regions of

abundance to regions with deficiencies. At some sites, environmentalists try to restore the free flow of water to rivers by dismantling dams. The exploitation of underground water compliments the use of surface water. Paradoxically, this exploitation occurring today results in current and future insufficiencies, and places doubt on the conservation of aquatic resources.

[4] Indications of shortages are diverse and each time extend into more aspects of geography. Occasionally, unexplainable shortages turn into floods and tornadoes, whose destructive and deadly effects are widely reported in the media. This hydraulic instability phenomenon reinforces the dimension of uncertainty.

[5] This uncertainty is not only fostered by environmental indicators; it is imbedded in social norms and technological development and distribution, such as "revolving irrigation" related to the distribution of portable water, the drop in the level of well water, and the contamination of rivers where we deposit trash and run-off water. Additionally, new economic models, which induce higher tariffs and the substitution of public services in the hands of private corporations, repeat this new cultural norm. Culture paradigms and new laws found in the political arena contribute to this conscientiousness of shortage and uncertainty.

[6] Today we have an ambiguous perspective concerning the efficiency of technology to protect and provide for human needs. Some of the first ways water was utilized was by directing water from its channels to irrigate cultivated fields or satisfy domestic need. Other sources included extractions from shallow and deep pools. Small embankments and large concrete dams allow for the distribution and conservation of water throughout cycles of drought and surplus. Twentieth-century

technology has contributed to changing the face of the earth, extending cultivable areas, allowing large settlements of the population to survive in arid regions, and generating electric energy that compliments and alleviates human and animal fatigue from hard work. The ability to exploit natural resources still has an unforeseen horizon for its expansion, but it is also has become clear that towards the second half of the 20th century we are more conscientious as we realize the exhaustion of this precious resource and the destruction of the environment. Today, large reservoirs are subjected to rigorous scrutiny by many special interest groups, and financing for these works needs to satisfy various ecological, social, and technological viability evaluations.

[7] For example, drilling technology designed for the extraction of petroleum has allowed access to aquifers deep in the earth's subsurface. Technological developments in desalination plants and a reduction in the price of production per cubic meter of water could change the balance of distribution of water. Due to economical costs, these two types of technological developments still have limitations for general application. Equally, considerations concerning the social and ecological order in the future could stop or ignite technological development in one direction or the other.

[8] More than just evaluating the physical availability of water in different countries and regions, and its accessibility which can result in an application of one technology over another, we anthropologists and social scientists are interested in identifying and analyzing all those manifestations of availability and scarcity as a result from social organization, from economic inequality of classes and segments of society, from the competency of groups to exercise their political rights, and from the diffusion of ideas and new cultural representations. One of the new fields of investigation is the

vulnerability experienced by different social sectors as a result of natural disasters such as tornadoes, floods, droughts, etc. Social science fieldwork includes the geopolitics of resources, the forecast of "water wars" between countries or regions within the same nation for flowing and underground water.

[9] The second key aspect in the water crisis occurs in the cultural sphere, in the area of meanings, of ideologies, and of corresponding symbols. The previous section illustrates an example. During the first half of the twentieth century, there was a generalized confidence in the virtues of technology within the reach of humanity; from social development and primary resources, transformation and utilization of technology were extended to the well-being of everyone. Capitalist and communist coalitions, which was what the world had been divided into until recently, had conflicting ideologies, however, both admired technological development and in a way competed against each other through showing-off global advancements. And due to that strategic mentality, they constructed large projects: water reserves held by concrete dams, mechanisms to generate electricity, flooding controls, and derivatives for agricultural irrigation. Some of these monumental works include United States constructions such as the Hoover Dam, located on the Colorado River, or the chain of reservoirs situated in the river basin of the Tennessee River. In the Soviet Union, the Dneprostroi project in the Ukraine represented a vigorous pull for socialist industrialization. Later both countries diffused their sociopolitical models and technological development to their respective areas of influence. Along the Nile River, the Soviet Union displayed its technological capabilities with the construction of the Aswan Dam. With international financing, Mexico's Federal Electric Commission constructed Chicoasen Dam, one of

the largest dams in the world. In the areas surrounding these modern marvels, biologists, public health experts, anthropologists, and sociologists who witnessed the involuntary displacement the basin's citizens, began to come forward with investigations which opposed and criticized the triumphant picture displayed by engineers.

[10] After the Second World War, the threat of famine called for geneticists and agronomists to develop high-yield varieties for crops of corn, wheat, rice, potato, and other grains. The use of these miracle seeds was also accompanied by the modernization and construction of large irrigation zones. The expansion of canal networks, well drilling, and rural electrification were possible for a brief period of time thanks to the concentration of state power in developing countries and the availability of cheap financial resources to meet those objectives. Today, however, the premise of this agricultural and rural boom has changed. Nations that undertook these advancements with external financing did not create adequate models which included the maintenance of irrigation system infrastructure or the cover of operational costs. In the last decades, international institutions have modified their politics of credit and added, as a condition of new funds, structural reforms in developing nations. One of these reforms, relevant to the water crisis analysis, consists of transferring the administration of irrigation systems to the farmers. From the national bureaucrats that allocate farming resources to the foreign farmers who traditionally participate in the decision-making and operations of local irrigation infrastructure, this paradigm change among the world financial elite has created repercussions on different levels.

[11] Underlying the lack of credit is the possibility of a reappearance of epidemics associated with pathogens potentially spread by waterways. Through the concentrated

activities of public health authorities, it appears that we have created a healthy world, free from large epidemics that would have devastated humanity just centuries ago. The world economy and "model" developing nations faced a dramatic crisis at the end of this decade with cholera breakouts in several countries. This epidemic provoked an immediate action to contain the disease. Suddenly, large lines of credit were available for construction of treatment plants and modernization of outdated technology.

[12] At present, we may also observe that before the pressure to demographically increase the availability of hydro resources, there are changes in the social worth of water, which can be reflected in a number of spheres that regulate social interaction, such as normative and legislative systems, public politics, participation plans and citizen representation, a discussion of technological budgets and its consequences, and multiple societal relationships with the environment. All of these transformations are deep-rooted in the mind as a changing sequence in the cultural order.

[13] The third aspect of this three-dimensional model corresponds to the distribution of political power as a function of necessary initiatives that address problems related to the physical availability of water, the equitable distribution of this resource, and conflict resolutions. The concentration of political power was asserted as an intrinsic consequence of political scientists that formulated explanations about the large emerging civilizations in arid zones in Asia and the Middle East. It was also a premise underlying the politics of development. Those nations that aspired for the socialist path or capitalist tract of accelerated economic growth transformed their agrarian economies through an industrial and urban component that required a strong political structure. It was necessary to mobilize human and natural resources from each nation to construct

the basic infrastructure of roads and electricity generation, to expand and foment the production of raw materials, and to channel economic surplus towards the urban and economic sectors. The aforementioned transformation affected the world with underdevelopment and authoritarian order, which resulted in social revolutions and other fruits through challenging authorities and their use of power. In the last few decades we have witnessed the failure of this accelerated growth model associated with the concentration of power. This political failure gave way to an appearance and consolidation of new political actors, such as branches of organized society as producer associations, NGOs, strengthening of municipal and regional institutions, political party independence and candidate options, and more interference by multinational institutions in the economic order, but also in the political and cultural domains. So therefore, the initiatives of a new hydraulic order in countries whose government had already concentrated legal faculties and executive authority concerning water became case-studies for new patterns for distribution of power. In this transitory state, ordinary existing laws result in obsolescence, and yet still have not been replaced by new ones. One runs an additional risk when not recognizing the customary rights of social groups that have peacefully enjoyed water resources for centuries.

[14] Looking at the world context, Mexico occupies a unique role. Mexican territory can be characterized by its geography and diverse ecology, with areas of extreme arid lands and other areas of abundant humidity, like the Baja Californian peninsula and the deltas of the Grijalva and Usumacinta rivers in the state of Tabasco. Throughout its history, this territory, our territory, has been simultaneously populated by societies marked by distinct sociocultural levels and technologies, such as simple hunters-

gatherers living alongside sophisticated empires which gave central power to a number of collective urban and agricultural communities. In the course of history, governments substituted certain systems for others, introducing new legal frameworks and cultural trajectories, some more appropriate than others in terms of valuable geography and also joint markets and politics. However, these judicial traditions and centralized government march down a common path: one that generically defines water as a public good whose private usage has been almost always supervised by community values. We could postulate the existence of a moral economic belief of water administration, prevailing in the long term, and celebrating short and long durations of political vicissitude. Because of this historic reason, the neoliberal agenda present in the last decades provokes a disconcerting interrogation. In brief, Mexico is running along a new global current of neoliberal navigation, against local history.

[15] By the middle of the 20th century, Mexico was the subject of an audacious and unique experiment. Its administration and political control were placed in the hands of the secretary of state. Never before had a western country placed such emphasis in water management. Except during the hydroelectric generation, all governed duties were centralized in the Secretary of Water Resources (SRH), from the end of World War II until the beginning of 1976, when then-president Jose Lopez Portillo dismantled the bureau and united it with Agriculture and Livestock. We could say that the politics of water privatization (that today expand throughout the planet due to the influence of the financial axes of the world economy) could not have been so easily adopted by Mexico if it wasn't for the water bureaucracy forged in the preceding decades. The consequences of this transformation, this 180 degree turn with respect to water

management from public to private hands, has still not been undertaken. As scientists we have an important task in this research endeavor.

[16] Despite the constant history of public interest in water management, the country is formed by particular paradoxes and ambiguities. This can be analyzed with observational instruments appropriate for social phenomena on diverse scales. Thus, while irrigation water in large districts was administered by governmental authorities, small irrigation units dispersed in small valleys and plateaus enjoyed relatively autonomous management and administration. The supply of fresh water flowing to cities has reoccurred in different administrative modes: private, municipal, and mixed; contaminated water management, however, has been documented in various Mexican cities as being more *laissez faire*. Long ago, this water was considered useless and burdensome; today, however, it is considered to be very valuable and irreplaceable. From the perspective of public health, we can identify a single paradox: while bureaucracy has been capable of organizing medical attention for millions of patients, water sanitation of run-off water remained completely ignored, exposing the general population to waterborne illnesses. These variations and ambiguities in the Mexican political and administrative system related to water enclose terrible paradoxes and enigmas, two issues that we citizens, politicians, and scientists should contribute to confronting and resolving.

[17] Reflections concerning the sociocultural implications of our water crisis are a must. This paper introduces ample possibilities for practical exercise. Technological innovations of the 21st century should go hand in hand with social participation. The agendas of political parties, with control of regions and cities, in opposition with each

other, should conceptualize methods for making this resource more accessible and efficiently distributed. In universities and learning centers, water management is a major field of study just as Engineering, Sociology, Economics or Anthropology. Research related to the intelligent use of water should cover diverse geographical scenarios and complex social scales, arid and humid climates, forms of advance technology and apparently primitive and simple plans. Documentation of pluviometer measurements, water volume extracts from pools, provision of water for domestic use, leaks or inefficiencies throughout the urban network, funding for agricultural irrigation, and energetic use constitute an unavoidable public duty overlooked by the state still under the liberal banner delegated by bureaucracy. Legislators should proportion legal frameworks for the state that normalize not only public administrative functions but the conduct of private parties caught in the everlasting conflict of water scarcity. Without social and political participation, education and integral research on water matters, various statistical documentation, and effective legislation to administer collective and private water rights, the water crisis will expand deep into the next century.

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