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Foresight in Agriculture, Food and Nutrition for Planning Freshwater in the Course of Climate Change in Africa

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ABSTRACT

Integrated Water Resources Management (IWRM) has been designed as a foresight process for world leaders to solve communities' issues dealing with water uncertainty in agriculture, food and nutrition as well as other related industries. That is why a Global Water Partnership (GWP) was initiated in 1992 by the United Nations to develop water and place it to the center of the political and economic concerns of the member States with an aim to mobilize resources that are necessary to manage water rationally. A focus was put on more than two billion poor people living without access to adequate potable drinking water, among whom more than three-quarters (¾) of the African populations living in poor areas and unurbanized cities. Predictions show that by the 2050, most of this population will be living in African megacities. This will be amplifying the "3As" of water issues: Water Availability, Accessibility and Affordability. Solving this major crisis in prospect requires foresight, both as a process and an analytical tool to address these key issues in the course of climate change. As a process, foresight involves consultation among stakeholders to ensure socio-political, economic, agro-natural and engineering technological solutions to "Develop and Avail Water to All! ". This process, would later require an evaluation of the feedbacks to and from these proposed solutions and their tools. These may include among other strategies and legislations for water policies; innovative techniques for irrigation (production, storage, transport and distribution of water) and hydro-power generation; Payments for water ecosystems services (PWES); and various management operating systems for risk control and mitigation at the watershed and community levels. However, the uncoordinated efforts of scientists working the climate adaptation, mitigation and amelioration spheres have generated another threat, that of climate intervention in the form of solar Geoengineering. African leaders, thus need foresight to check closely opportunities and dangers arising from these technologies. They require a neutral organization having to conduct rigorous socio-economic and environmental impacts assessments prior to embracing these technologies. That is the only way they may ensure a climatic justice to peasants and farmers so that they can leave a legacy in the agriculture, food and nutrition niche for the next generations.

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Introduction

Integrated Water Resource Management (IWRM) has not only become a necessity but a public duty for the leaders of all the nations and their communities. That is the very reason why the United Nations initiated the Global Water Partnership (GWP) in 1992 to value water and put it to the center of political and economic discussions of its member states. This has helped mobilizing the required resources for managing rationally water and its related resources, to enable more than two billion people living under water poverty line to get adequate and potable freshwater [1]. This is a concern for more than a three-quarters (¾) of the African population that live in scatters and shantytowns, within poor unurbanized areas, who do seldomly have access to potable freshwater and decent sanitation services. Besides, the United Nations projects that by 2050 this population will double in megacities [2]. That will be a serious «3As » crisis: « A » as water «Availability»; « A » as water «Accessibility»; and « A » as water «Affordability». These issues are being escalated by the changing patterns of the global climate, demographic growth and urbanization, as well as some of the human interventions on the environment [3].

In its central theme "Valuing freshwater resources", the World Water Day (WWD 2021) reminds us perspective major water crises so as to take action now. Solving this major crisis in prospect requires foresight in freshwater planning, both as a process and an analytical tool to address these key issues in the course of climate change. As a process, foresight involves consultation among stakeholders to ensure socio-political, economic, agro-natural and engineering technological solutions to "Develop and Avail Water to All! [4]. The usefulness of foresight for freshwater planning in the agriculture, food and nutrition niche is to ensure climate justice to peasants and farmers so that they can leave a legacy to the future generations. The 2021 UNCTAD Report on Technology and Innovation notes that technology assessments (TA) and foresight studies "can catalyze social, political, and inter-institutional debates on the pros, cons, and associated uncertainties across alternative directions". Foresight exercises can be used to

bring together key agents of change and sources of knowledge, to explore possible scenarios and develop strategic visions and intelligence to enable countries to identify and explore the potential of frontier technologies to shape the future and help achieving sustainable development [5]. Hence, the foresight process in freshwater planning shall partly emanate from the political will of the leaders and the involvement of local stakeholders to the planning to enable them buy-in the resulting outcomes of the process. It would later require further evaluation of the feedbacks to and from the proposed solutions and their tools. The evaluation will be based on scenarios of many possible futures and scientists use predictions to systematically explore these alternative futures through the forecasts that are generated [6].

Water Sustainability Perspectives in Africa: A Multifaceted Question

Water does not only have an economic value but also an ecological, cultural, social, political and spiritual value, and this shall be recognized in all its perspectives and valuations for sustainable investments. Terje Oestigaard illustrates this fact by evoking a mythical invisible spirit that blocked for close to a decade the construction of a billion dam in Bujagali, Uganda! This because the dam was being erected in a valley where was residing one of the most important river divinities of the Busoga Kingdom [7]. So, the point is: to ensure water sustainability and solve water crisis in Africa, cultural, social and spiritual values of water resources shall not be neglected during water assessments and investment evaluations. Hence, we do have to understand the value of water in its diverse perspectives: academic, scientific, professional, political, community wise, gender wise and specific groups wise [8].

To remedy to the pressing water deficit in Africa, researchers have conducted various studies on integrated systems for managing hydrological basins (by local communities and the government), potable drinking water supply and sanitation schemes as well as innovative irrigation techniques in the Sahel, other arid and semi-arid lands (ASALs) (including water production, stocking, transport and distribution), hydroelectric power generation in major river basins, payments for water ecosystem services (PWES), notably in Burkina-Faso, Ethiopia, Ghana, Kenya, Mali, Senegal… as well as water politics, diplomacy and diverse strategies and legislations for solving conflicts within and across water boundaries [9].

Projects on water sedimentation dams, irrigation and hydroelectric power generation are such examples of sustainability for developing the water sector and its related fields (like agriculture, energy, sanitation, etc.). These devices are designed in such a way that water is stored during a period and the remainder is given a leeway to get back to the river to balance water flows and deficits during the rainy and dry seasons. This allows agriculturalists and other water users to be autonomous instead of depending solely on rainwater in their work. The subsequent water development and storage helps meeting the growing water demands due to the increasing urbanization, food production (through irrigation) and energy generation, to name but a few issues [10].

Irrigation and the Future of Food Security in Africa

Beyene and Luwesi (2018) report, the irrigation scheme of Koga dam in Ethiopia, with its 7,000 hectares total surface allows about 10,000 households (that is a total of 50,000 people) to benefit from water ecosystem services of that dam and thus improve on their life. This substantial improvement can be seen in the way people eat, groom and build their houses since that irrigation came to life. There is a lot of cash circulating therein simply because of the existence of an upstream big dam that supplies water to primary and secondary canals that are downstream and closer to the users, to enable business development [11]. Nonetheless, it shall be noted that irrigation consumes more water than does hydropower generation. Important water losses possibly have major repercussions downstream, leading to water crises. That is not the case for hydropower generation, which may at any time allow water drain into the river. Hence, with irrigation, we may in the long run see the whole water basin ecosystem change, especially if water is freed during the dry season instead of the rainy season [12].

Therefore, development has its effects, both positive and negative. It cannot be achieved without incurring a cost, both internal and external. The question is: how can we reduce these side effects and make development sustainable? When a dam is built, what will be the negative effects that shall be mitigated downstream and allow some tradeoffs between different water users, be it in agriculture, hydropower generation, potable drinking water supply and sanitation, and other water ecosystem services? It is not a matter of rebuking development strategies and questioning investments in water infrastructure but there is a critical need of understanding the side effects, outcomes and impacts of such strategies and investments, whether positive or negative, within their economic, ecological, political, cultural, social and spiritual contexts [13].

By the year 2050, almost 50% of the African population will live in urban areas. We are bound to develop our water resources so as to fill the needs of all these people. To that effect, we shall develop systems that are sustainable to enable not only households but also other industries, including agriculture, manufacturing industries and other enterprises to access and utilize water. Agriculture being the mother of human civilization, it remains the most indispensable activity of mankind and requires supply and demand systems that are sustainable for the future of our dear continent. Irrigation development shall thus not be solely linked to the construction of big dams and canals but also to its natural support ecosystems on which depend sustainable irrigation systems that supply water to the users [14].

Governing Water Crisis in the Anthropocene: A Contemporary Issue of Climate Intervention

Rockefeller Foundation (2021) reports on the future scenarios of technology and international development : "for decades, technology has been dramatically changing not just the lives of individuals in developed countries, but increasingly the lives and livelihoods of people throughout the developing world (…) While there is little doubt that technology will continue to be a driver of change across the developing world in the future, the precise trajectory along which technological innovation will travel is highly uncertain [15]. This excerpt of the Rockefeller Foundation report can be illustrated by technological issues arising from the construction of dams and the deployment of climate engineering technologies in the water sector. The construction of all dams is subject to several controversial issues but its major concern is water availability (=A =) in the African continent, which natural quantities have drastically been reduced. The other two issues facing Africans and which are related to water availability are its accessibility and affordability (thus making the "3As"). These issues are being escalated by the changing patterns of the global climate, demographic growth and urbanization, as well as some of the human interventions on the environment. It is therefore crucial for African governments to design sustainable ways of water

resources development and storage in order to meet the growing water demands due to increasing urbanization, food production through irrigation and energy generation, to name but a few issues. Irrigation development is a climate adaptation response to the ever-increasing climate uncertainties and the shrinking water endowment under the changing global climate [16]. It is dearly needed because of the farming water vulnerability to climate change and the unsustainable use of water in agriculture, which have resulted in enormous inefficiencies and massive losses of agricultural production in Sub-Saharan Africa. But the challenge is its governance.

Beyond multi-purpose water dams, flexible irrigation canals and other infrastructure, irrigation development needs a participatory governance system, which is essential for mitigating the socio-cultural and ecological impacts of intensive cultivation on local communities, other actors and institutions therein involved. Like irrigation, the recent development of climate adaptation and mitigation solutions as well as amelioration strategies in the 20th century has also seen governance challenges. Various agronomic and engineering methods were developed for the mitigation of climate impacts on our warming macroclimate, which often results in the escalation of natural disasters, water and energy crises, food insecurity and poverty pressures. It was also notable to see regulatory approaches that have changed consumer behavior towards water value and adaptation to the changing natural environment [17]. Unfortunately, the uncoordinated efforts of various stakeholders developing these climate interventions present a threat to the future of freshwater and irrigation in Africa.

For instance, in the 21st century, scientists have gone ahead with researches on climate engineering, also known as geoengineering, to develop a stratospheric shield made of a mass of gases that would reflect back sunlight into the atmosphere to cool the planet earth. Some of these climate interventions resulting from the research works of the late Professor Paul J. Crutzen, who won a Nobel Prize in 1995, are associated with Carbon Dioxide Removal (CDR) from the atmosphere to reinforce the existing climate mitigation measures, while those that simply reflect sunlight back are associated to Solar Radiation Management (SRM) strategies. Hence, Geoengineering has so far proposed schemes ranging from less dangerous but expensive to highly lethal but cheap technologies, which present a high risk for the survival of life supporting systems [18]. They might easily exacerbate the on-going climate adaptation and mitigation efforts, in case they fail, thus resulting in three categories of water stress and shock, namely: (i) Too little (ii) Too much and/or (iii) Too dirty water

Conclusion and Recommendations

African population and urbanization in Africa are growing faster than predicted. By 2050, the number of poor people living without access to adequate potable drinking water will double in poor areas and unurbanized cities. There is thus need for foresight in freshwater planning to curb undernutrition, food insecurity and water related diseases. This process will enable the development of adequate socio-political, economic, agro-natural and engineering technological solutions to "Develop and Avail Water to All! " in consultation with the public. Unfortunately, the uncoordinated efforts of scientists working the climate adaptation, mitigation and amelioration spheres have generated another threat, that of climate intervention in the form of solar Geoengineering. African leaders, thus need foresight to check closely opportunities and dangers arising from these technologies.

Mike Childs, head of science, policy and research at Friends of the Earth-UK urges us as follows: "We are going to have to look at new technologies which could suck CO2 out of the air. But we don't need to do this by investing in hare-brained schemes that reflect sunlight into space when we have no idea at all what impact this may have on weather systems around the globe [19]. Hence, a frank conversation on geoengineering governance is needed to pave the way to a neutral global body to mitigate serious technological risks and water governance issues arising from these schemes. There is a net preference for a UN body to ensure climate justice to poor peasants and farmers living in rural Africa. This independent global technical body will assess the feasibility and vulnerability associated to the deployment of largescale geoengineering schemes prior to considering their actual deployment. Water and climate technology developers are therefore warned to conduct rigorous socio-political, economic and environmental impact assessments that take into consideration the limits of the bearing capacity of our ecological systems and the socio-cultural, political and economic contexts in which African communities live. This may prevent a premature failure of any water technology development plan to Secure Water for Food and Nutrition (W4FN).

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