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# ENGINEERING ARTIFICIAL INTELLIGENCE FOR STRATEGIC MANAGEMENT OF EQUITABLE RESOURCE DISTRIBUTION IN NILE BASIN

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**ABSTRACT**

***Uganda, Tanzania, the Sudan, South Sudan, Rwanda, Kenya, Ethiopia, Egypt, DR Congo, and Burundi all make entitlement claims to the ecological system of the Nile Basin. This region is rich in resources, yet prone to interstate conflict, drought, and other vulnerabilities. Water resource conservation systems, alternative purification systems, and rainfall stimulation systems programmed by artificial intelligence can facilitate the establishment of transboundary partnerships that reduce international conflict and serve as a foundation for economic growth and job creation in the Nile Basin region. Water conservation systems using artificial intelligence have been found to increase rainfall capture by an average of 1.5 billion gallons of stormwater per year or enough to provide clean drinking water for 36,000 people per year (O'Neill et. al, 2012). The ecological framework of Nile Basin's various regions will determine the appropriate artificial intelligence systems that can be implemented to promote the equitable distribution the Nile Basin's resources. These systems will lessen political conflict that can negatively impact the agricultural practices of Nile Basin farmers and inhabitants who depend on the Nile Basin's resources for their livelihoods.***

**Keywords:**
*artificial intelligence, strategic management, resource distribution, SME, Nile Basin.*

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## 1. INTRODUCTION

From the high mountains, tropical forests and wetlands in the South, to the savannas and deserts in the north, the Nile Basin is home to a complex ecological system that is inhabited by over 160 million people spread throughout ten riparian countries. The headwaters of the Nile River in the Kagera Basin to its delta in the Egypt River, traverse over 6,695 kilometers, with a drainage basin of 3.2 million square kilometers, covering one-tenth of the land area of Africa. Shared by Uganda, Tanzania, the Sudan, South Sudan, Rwanda, Kenya, Ethiopia, Egypt, DR Congo, and Burundi, the majority of the Nile Basin's inhabitants derive their livelihoods from the Nile River's resources, through agriculture, fishing, trade, and other pursuits contingent upon the ecological health of the region. Agriculture in the Nile Basin sustains tens of millions of people, provides occupations for 75 percent of the labor force and contributes to one-third of the GDP in the region (Karimi, Molden, Notenbaert, and Peden, 2014). Without a stable and equitable distribution of resources, the productive output of the Nile Basin's inhabitants, businesses and governments will cripple the economy and ecology of this region rich in resources.

The application of artificial intelligence for strategic management and equitable distribution of the Nile Basin's resources will empower inhabitants of this region economically, socially and politically. The World Economic Forum has labeled the current economic climate as the "fourth industrial revolution" (Foroohar, 2016). The fourth industrial revolution encompasses emergent technologies that include developments in genetics, biotechnology, machine learning, robotics, nanotechnology, 3-D printing and artificial intelligence. These developments overlap labor production and disrupt the global economy in ways that cannot be easily predicted. A report by the WEF (2016) estimated trends in technological development combined with socioeconomic and demographic changes will lead to net loss of greater than 5 million jobs in 15 major developed and emerging economies by 2020.

SMEs in the Nile Basin can challenge the fourth industrial revolution by investing in clean energy systems that include hydroelectric, photovoltaic, wind and geothermal. These technologies can be strategically managed by artificial intelligence systems that are owned and operated by SMEs in the Nile Basin. The historical antecedent of challenging the industrial revolution was last seen when SMEs in the United States invested heavily in emerging computer and software technology during the 1980s and 1990s. Personal computers soon appeared in the majority of homes and businesses as software companies like Microsoft and Apple Computers began to produce a range of devices and systems that allowed SMEs and individuals to increase productivity. The fourth industrial revolution has introduced the new personal computer in the form of the smartphone and tablet devices. Choudhary and Vithayathil (2013) found that SMEs which leverage digital devices to grow their businesses, quickly increase profits through increased efficiency of transactions. The McKinsey Global Institute (MGI) found that 18% of United States industries have embraced it, with a higher concentration of digital leverage in media, financial services and IT. SMEs that employ artificial intelligence for strategic management of equitable resource distribution are poised to outpace the overall economy in terms of growth.

The Nile Basin has been categorized by the U.S. government as one of ten flashpoints of international relations (Starr, 1991). Because the Nile Basin is prone to interstate conflict, drought, famine, and other vulnerabilities, there is a high need for SMEs to provide rapid analysis of complex ecological, social and political conditions which can determine the feasibility of project implementation. SMEs can meet the diverse socio-economic goals that inhabitants of the Nile Basin are concerned with. These issues included water conservation methodology, agricultural development and clean energy production. Through artificial intelligence for strategic management of equitable resource distribution a framework for economic development can be established to guide SMEs in the Nile Basin as they challenge the fourth industrial revolution.

## 2. MATERIALS AND METHODS

The aims of this study include a determination of how SMEs can address the vulnerabilities of the ecological and economic conditions of the Nile Basin through artificial intelligence for strategic management strategies of equitable distribution of resources. The objectives of this study include providing meaningful recommendations for SMEs concerning resource conservation strategies, the application of artificial intelligence to SME functioning and strategic management solutions for the equitable distribution of resources in the Nile Basin. An understanding of the goals, expectations and preferences of inhabitants in the Nile Basin with respect to equitable water distribution, will allow SMEs to introduce artificial intelligence for strategic management of resources with the dual goals of increasing profits and fulfilling social and ecological needs.

This study hypothesizes that public opinion will support SMEs working with states, municipalities and local agencies in the Nile Basin region to develop integrated and multi-sector teams capable of establishing a technical support system for rainfall retention and cloud-seeding through artificial intelligence for strategic management of equitable resource distribution. These integrated and multi-sector teams will be most effective if they utilize public opinion on resource conservation and artificial intelligence to gain constituent approval for planned actions. The practices of these multi-sector teams will be supported by research institutions and membership boards which ensure fidelity with transboundary sustainability goals. The continual dissemination of relevant information to extension staff and participating members will inform the planning and of participants. A majority of public opinion will support the mitigation of negative consequences such as drought, political instability and other unforeseen variables, through efficient water storage and collection, as well as rainfall stimulation and retention systems, which would be strategically managed by artificial intelligence systems that obtain metrics and make autonomous decisions.

The methodology consists of a quantitative analysis of data collected from surveys taken by respondents from a target range of income demographics. The range of income demographic was calculated to reflect a range of income demographics that persist in the Nile Basin, specifically the countries of Uganda, Tanzania, the Sudan, South Sudan, Rwanda, Kenya, Ethiopia, Egypt, DR Congo, and Burundi. The income levels were adjusted based on the mean exchange rate of the aforementioned countries. The purpose of this methodology was to gather data that could be utilized by SMEs which have 500 employees (+/- 75) and $50 million in annual revenues (+/- 15 million). Two-hundred individuals were surveyed for each sample group to obtain data regarding opinions, beliefs, and usage statistics. Surveys were completed by research assistants who randomly selected a predetermined number of individuals from each demographic range.

The secondary data that was used for this study consisted of data published after December 31, 2005, with preference given to peer-reviewed data. Exceptions were made for literature dated before December 31, 2005, that pertained to the subject of this study. Quantitative secondary data used for this study was census records, internal data from SMEs with 500 employees (+/- 75) and $50 million in annual revenues (+/- 15 million), and polls conducted by academic sources that dealt with resource conservation strategies, the application of artificial intelligence for strategic management purposes, and the equitable distribution of resources. Qualitative secondary data included interviews drawn from publications with a focus on strategic management, artificial intelligence, and the equitable distribution of resources.

This study utilized open-ended interviews (Briggs, 1986) and Likert-type questionnaires (Clason & Dormody, 1994). The open-ended interviews utilized prompts with topics relevant to the study so participants could specify their level of agreement or disagreement on a symmetric agree-disagree scale for a series of statements. The open-ended interview structure, as Briggs (1986) emphasizes, allows for the preservation of subjects' authentic voices, rather than for the development of a structured, potentially biased conversation that could, in a worst-case scenario, influence the conclusions and data. Data from the interviews and the surveys was coded and analyzed quantitatively to determine analogous findings which were analyzed in the discussion section. The surveys were structured and identical for all respondents so results could be easily tabulated. Qualitative data was compared with the quantitative data in the development of strategies and solutions to improve strategic management outcomes for SMEs in the Nile Basin with 500 employees (+/- 75) and $50 million in annual revenues (+/- 15 million).

Apparatuses used by research assistants included telephones, email, person to person assessments, and review of relevant literature. Participants were asked to speak honestly regarding their experiences and opinions. All participants and the interviewer signed a nondisclosure agreement to ensure confidentiality, either electronically or in-person. The interviewer obscured any potentially identifying information that could be deemed proprietary. Anonymity guided the entire process and after the interviews had been transcribed and evaluated by research management, all recordings were destroyed. Interview participants had the opportunity to review the interview transcripts and request omissions or deletions of any information they deemed questionable.

The purpose of this design was to describe the characteristics of the strategic management approaches that will enable the equitable distribution of water resources through artificial intelligence. Variables that can be observed and measured through interviews and surveys provide qualitative data (Collins & Hussey, 2014). Five questions were formulated for each topic, and each topic was addressed within a span of 15 minutes. This time frame allocated the interviewer five minutes of discussion per topic. The interviews were recorded so that the words of the interviewees could be directly quoted. Interviews were conducted in a one-to-one fashion to ensure each participant felt comfortable expressing his or her honest opinion. The 200 members of the sample population were each 18 years of age or and greater.

Potential assumptions of the study were accounted for by asking respondents questions directly related to the research question. Validity was ensured through an extensive literature review, analysis of survey questions that were used in other peer-reviewed studies, and the review of research and survey questions to academic colleagues who had previously published peer-reviewed studies. Respondents were questioned using informal language that minimized ambiguity and caution was taken to ensure discretion was used in the provision of information.

To avoid ambiguity, no double-barrelled questions were posed in which participants could answer part of the question as yes and another part of the question as no. This study used multiple questions to address the same construct in order clarify any discrepancies.

Qualitatively, this study was limited in that some respondents refused to answer questions and/or provided vague information. Quantitatively, this study is limited by its size, scope, and location of the sample population. Dealing with 200 respondents from one city cannot provide a definite picture of the need for resource conservation strategies and the use of emergent artificial intelligence technologies. Studying the perspectives of potential consumers and producers – via qualitative, open-ended interviews and quantitative, discrete surveys- this study aimed to provide meaningful and empirically grounded recommendations to SMEs seeking to capitalize on the growing economy in the Nile Basin through the supply of artificial intelligence systems for the strategic management and equitable distribution of resources.

## 3. RESULTS AND DISCUSSIONS

The development of SMEs in the Nile Basin that utilize artificial intelligence for strategic management of water resources will be aided by support from local populations, investors, and partnerships with municipal, state, and country-wide governments. This survey question determined the level of support or lack of support for utilizing artificial intelligence for strategic management of water resources.

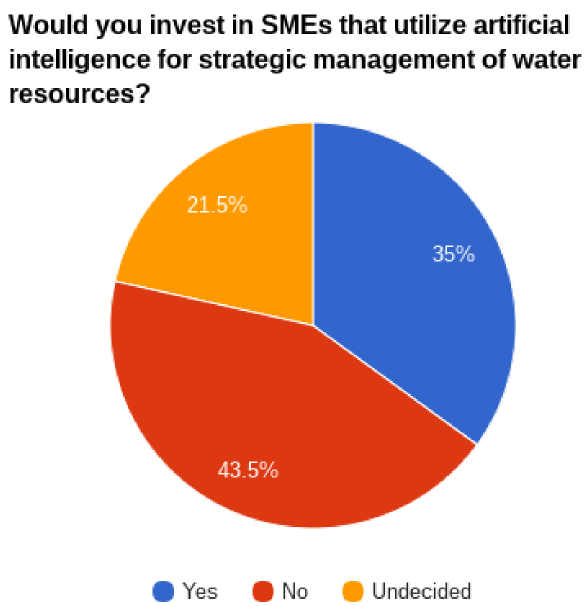


***Figure 1:*** Distribution of responses to the question: Would you invest in SMEs that utilize artificial intelligence for strategic management of water resource?

Seventy respondents (35%) stated they would invest in SMEs that use artificial intelligence for strategic management of water resources, eighty-seven respondents (43.5%) said they would not invest in SMEs that use artificial intelligence for strategic management of water resource, and 43 respondents (21%) stated they were undecided as to whether or not they would invest in the utilization of artificial intelligence for the strategic management of water resources. The research assistant followed the initial question with an opportunity for open-ended response to the subsequent question, “Why did you choose that answer?” Responses included statements such as, “artificial intelligence will cause a labor force reduction” and “artificial intelligence may have unintended and negative consequences”. Based on the quantitative data and qualitative responses, researchers altered the phrasing of the initial question to control for phrasing as a potentially limiting variable.

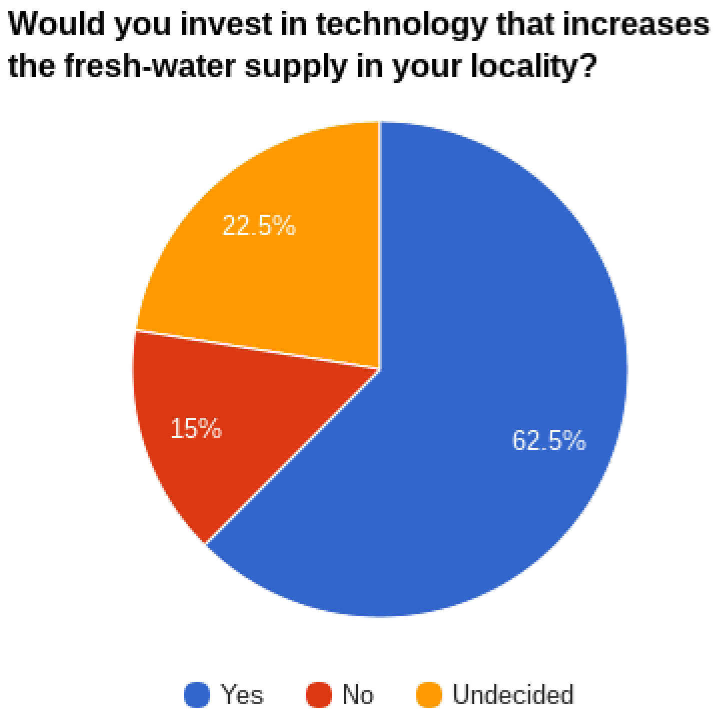


***Figure 2:*** Distribution of responses to the question: Would you invest in technology that increases the fresh-water supply in your locality?

Fig. 2 demonstrates how semantic alteration can alter the majority consensus on the utilization of artificial intelligence for strategic management of water resources. When asked, “Would you invest in technology that increases the fresh-water supply in your locality?”, 125 respondents (62.5%) stated they would invest in technology that increased the fresh-water supply in their locality. Questions in Fig. 1 and Fig. 2 yielded similar results from respondents who stated “undecided”. In Fig. 1, 43 respondents (21.5%) stated “undecided” and in Fig. 2, 45 respondents (22%) stated “undecided”. This uniformity of “undecided” responses indicated a significant portion of the general population is not informed about the utilization of artificial intelligence for strategic management of water resources or has not been convinced of its functionality or lack of functionality. Education regarding the practical application of artificial intelligence for water resource management and an analysis of semantic structure when discussing artificial intelligence may contribute to positive outcomes for SMEs in the Nile Basin.

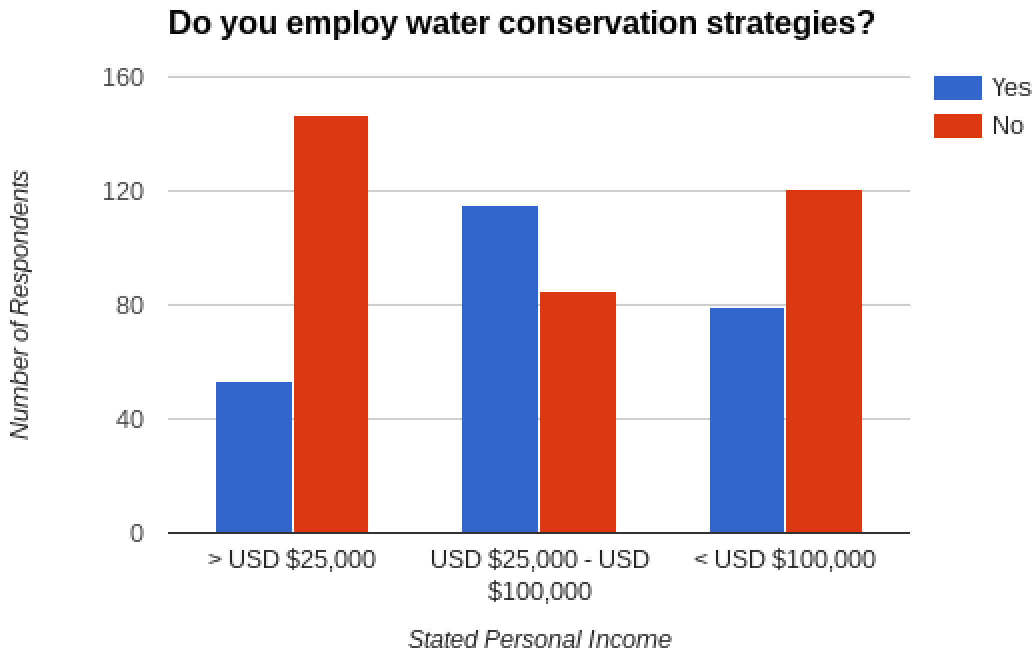


***Figure 3:*** Distribution of responses to the question: do you employ any water conservation strategies?

For respondents who stated their annual personal income was less than USD $25,000, when asked "Do you employ any water conservation strategies?", 53 respondents (26.5%) stated they employed water conservation strategies and 147 respondents (73.5%) stated they did not employ water conservation strategies. For respondents who stated their annual personal income was between USD $25,000 and USD $100,000, 115 respondents (57.5%) stated they employed water conservation strategies and 85 respondents (42.5%) stated they did not employ water conservation strategies. For respondents who stated their annual personal income was above USD $100,000, 79 respondents (39.5%) stated they employed water conservation strategies and 121 respondents (60.5%) stated they did not employ water conservation strategies. The middle-income demographic had the greatest number of respondents state they utilized water conservation strategies, indicating a unique characteristic to this segment of the population that increases their tendency to conserve water. A segment of the population that engages in water conservation is more likely to utilize artificial intelligence for increased conservation capacity granted they are educated on the means by which this aim can be accomplished.

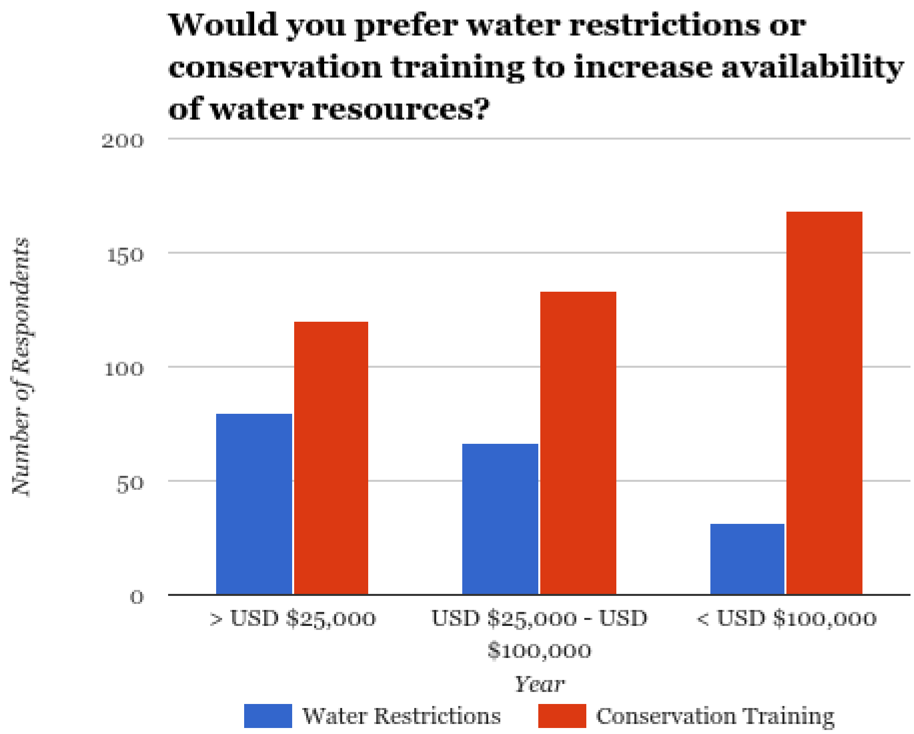


***Figure 4:*** Respondent data from various income brackets when asked, "Would you prefer water restrictions or conservation training to increase availability of water resources?"

For respondents who stated their annual personal income was less than USD $25,000, when asked "Would you prefer water restrictions or conservation training to increase availability of water resources?" 120 respondents (60%) stated they preferred "conservation training" and 80 respondents (40%) stated they preferred "water restrictions". For respondents who stated their annual personal income was between USD $25,000 and USD $100,000, 133 respondents (66.5%) stated they employed stated they preferred "conservation training" and 67 respondents (33.5%) stated they preferred "water restrictions". For respondents who stated their annual personal income was above USD $100,000, 168 respondents (84%) stated they employed stated they preferred "conservation training" and 32 respondents (16%) stated they preferred "water restrictions". The linear trend demonstrated a correlation between increased income and preference for "conservation training" as opposed to "water restrictions".

Rainfall that is strategically produced will be collected by runoff capture sites managed by SMEs contracted by local municipalities with the aim of increasing water availability for agriculture, public, and private uses. Cloud-seeding systems will be operated via ground dispensaries or airplane dispersion to release trillions of microscopic particles known as condensation nuclei (Fig. 5). Free-floating water vapor in the clouds latch onto the condensation nuclei and when enough particles coalesce around the condensation nuclei, the aggregation becomes too heavy to remain airborne and releases rain or snow depending on the external temperature. Based on the findings of an external consultant hired to check the reliability of the this artificial intelligence system, cloud-seeding in the San Gabriel mountains outside of Los Angeles is predicted to produce a 10 to 15 percent increase in average rainfall production.

Groundwater recharge facilities, reservoirs, and dams can be strategically placed to increase the capture of runoff water. These systems have been found to increase rainfall capture by an average of 1.5 billion gallons of stormwater per year or enough to provide clean drinking water for 36,000 people per year. The high demand in the Nile Basin for potable drinking water can be addressed by SMEs which use cloud-seeding systems integrated with runoff sites. Key factors to evaluate when establishing a cloud-seeding system are average temperatures in a region, wind direction, and potential method of dispersion (ground or air). Clouds in the 10,000-foot level should be minus 5 Celsius (23 degree Fahrenheit) for ground-based seeding.

Seeding clouds through airplane dispersion in regions where clouds approach from large bodies of water will be more effective because this method can more accurately target the portion of a cloud which requires silver iodide aggregates to produce rain particles. Key factors include ensuring yearly rainfall conditions are adequate, as well as the establishment of proper establishment of runoff sites to capture rainfall. Cloud-seeding near urban areas must consider whether water delivery systems that dispose of fecal matter would contaminate the efficacy of the runoff dispersion. Seeding cannot occur if above average rainfall is expected unless reservoirs are designed to handle potential overfill. Without overfill precautions there may be a resultant flood. Private farmers must be consulted to ensure they receive a proper allocation of rain and runoff water. Cloud-seeding alters the natural cycle and may leave farms outside the target area drier than expected. SMEs could be liable for rainfall changes based on existing law in areas. Cloud-seeding will help reduce the negative effects of drought and aid riparian countries store extra water to continue agricultural production in the instance that political instability or climate change prevents a country from equitable water distribution.

Ethiopia's Grand Renaissance Dam may affect water availability for riparian countries in the Nile Basin region. SMEs can enable communities and countries to strategically manage water resources to reduce dependency on the fluctuating release of water determined by Ethiopia's environmental regulations agency. Cloud-seeding will be beneficial in topographic regions such as the Ingessana Mountains and areas surrounding Dinder National Park in Sudan because of the convergence of cloud formations with elevated mountain ranges. Groundwater recharge facilities, reservoirs, and dams can be strategically placed to increase the capture of runoff water. In the Nile Basin, SMEs that can develop cloud-seeding systems for municipalities and governments to increase the presence of water that can be used for agriculture and domestic purposes. Cloud-seeding is the most cost efficient form of water transportation. The current plan used by the Los Angeles County cost $122 per acre foot of water captured by cloud-seeding. Los Angeles County pays the Metropolitan Water District $714 per acre foot for water brought from elsewhere. These savings of $592 per acre foot of water can be redistributed into R&D for further advancements in the use of artificial intelligence for strategic management of resources.

The national cost for freshwater contamination outweighs the cost for implementing safe and effective systems which utilizing artificial intelligence of for the strategic management of water resources. One cost-effective approach is the nanofiltration system. Michael Pritchard invented a non-chemical nanofiltration hollow fiber membrane with 15-nanometer pores capable of transforming swamp water into potable water in seconds. Pritchard named his invention the Lifesaver bottle. The Lifesaver bottle is capable of cleaning 6,000 liters of water with a single filter. Instead of the high social cost of shipping water to areas lacking potable water, Lifesaver bottles can be sent to protect vulnerable populations until artificial intelligence systems are fully implemented. The contaminant, tuberculosis bacteria is sized at 200 nanometers. The poliovirus is sized at 25 nanometers. Lifesaver pores are 15 nanometers and thus, neither the tuberculosis bacteria or the poliovirus can enter the Lifesavers nanopores.

Rainwater harvesting can be used to accumulate and store rainwater before it reaches the aquifer. Rainwater harvesting has been successfully used to provide drinking water, water for irrigation, and water for livestock. SMEs can instill rainwater collection systems on houses, businesses, and local institutions. In exchange for using these private locations to collect rainwater, an SME managing these accounts can provide a predetermined amount of freshwater to these locations. The SME can harvest the surplus rainwater and sell it to the government, private businesses, and farmers. Rainwater harvesting can supplement the subsoil water level and increase urban greenery, increasing the value of the land and real estate. Private homes, businesses, and local institutions can be equipped with greywater harvesting systems. Greywater is any wastewater that is generated from dishwashing, laundry, and bathing, which should be on-site recycled and used for landscape irrigation and constructed wetlands.

The creation of a business coalition in the Nile Basin region that mirrors the South African Green Industries Council (SAGIC) would integrate the aims of increased conservation and SME development. Xeriscaping is landscaping that reduces or eliminates the need for supplemental water from irrigation and will increase the efficiency of agricultural endeavors for the 75% of the working force in the Nile Basin which relies on agriculture to subsist. The selection of plants that reduce water-runoff conserves water and will strengthen the economies of riparian countries. Xeriscaping reduces water consumption, increases water availability for community and domestic uses, reduces maintenance time in comparison to traditional landscaping methods, takes advantage of rainfall retention, has low maintenance costs, and reduces waste and pollution as there is no need for heavy fertilizers. After implementing xeriscaping measures districts saved between 16 percent and 40 percent on average water costs. Xeriscaping can be self-implemented, but requires adult education centers to provide education, training, and workshops. The evidence collected in Fig. 4 demonstrates people prefer conservation training in contrast to water restrictions.

Water loss can be mitigated by increasing the number and capacity of ground reservoirs and terraces that capture flood runoff. An SME that can develop ground reservoirs and terraces can be strengthened by presenting scientific evidence through a quantitative analysis of the water lost during a flood and how this water can be reappropriated to benefit regional partners. Projected sites for strategic management systems to be implemented include Lake Nasser/Nubia in Egypt; the Jamma, Reb, and Gumara sub-basins, as well as watershed management in Tana-Beles as part of the Tana-Beles Integrated Water Resources Development Project in Ethiopia; and the lower Atbara, Ingessena Mountains and areas around Dinder National Park in Sudan.

Stephenson (1999) found that "long-term education of consumers is seen as a necessity." If water-users are educated to become advocates for water efficiency and taught to use water-saving devices, they can contribute to significant water savings (Dolnicar & Hurlimann 2010). SMEs in the Nile Basin can address issues of land degradation, excessive silting of lakes and rivers, loss of wetlands from clay extraction for brick making, loss of unique animal and plant species, lack of control monitoring human settlements, deteriorating water quality, the toxic and hazardous wastes by industrial companies, the need for revitalization of lands that have been decimated by livestock grazing and the uncontrolled clearing of vegetation cover, and soil erosion that has polluted the rivers and lakeshores along these riparian countries.

## 4. CONCLUSIONS & RECOMMENDATIONS

SMEs can stimulate local and regional economies of the Nile Basin by utilizing artificial intelligence for the strategic management and equitable distribution of resources. Energy sources derived from the hydroelectric potential of the Nile River can be used to employ rural populations and facilitate transboundary partnerships. In the Blue Nile basin of Western Ethiopia and Sudan, 80 percent of the rural population depends on wood from forest clearings. In regions that participate in the mining and burning of large tracts of land, environmental degradation can be repaired through the methods of xeriscaping, cloud-seeding and rainfall collection. Nanofiltration can be utilized to provide safe drinking in regions affected by pollution. SMEs can repopulate mining sites with trees and perennial plants that reduce soil erosion and stimulate layers of topsoil that contribute to healthy crop development.

Further studies should examine the hydrologic, meteorological, climatic, socio-economic, and analytic data that will assist riparian countries in unique water infrastructure development. Surveys of sample population indicate favorable responses to education and training rather than enforced water conservation mandates. Water conservation strategies should aim to provide education and training, while utilizing the emergent technologies that promote the equitable distribution of resources in the Nile Basin. SMEs can provide successful education and training programs that conserve the plentiful natural resources available in the Nile Basin's riparian countries, while economically developing to expand regional power trade opportunities manage my artificial intelligence metrics. By empowering people to manage their water use, the Nile Basin and its citizens will develop economically.

SMEs that seek to address resource management in the Nile Basin should establish a framework for social justice, ecological equity, and integration with cultural practices in selected region of development. Furthermore, a comprehensive understanding of the biological framework of Nile Basin's various regions will determine the appropriate artificial intelligence systems that can be implemented using the Nile Basin's water resources. These systems should not be contingent on the annual release of water from the Grand Renaissance Dam, but rather strive to be independent of political conflict that can cripple the agricultural practices of Nile Basin farmers.

Hydrology research has found the amount of water on earth today has not altered greatly, however the water resource quality has severely diminished due to pollution. The Nile Basin economies and populations will benefit from the effective management of water resources through artificial intelligence. Addressing the need for increased availability of drinking water, sanitation services that improve the quality of life for residents of the Nile Basin and rainfall capture for agricultural purposes, SMEs can assist stakeholders in the Nile Basin while improving the business and ecology climate of this region. Leadership in SMEs should form transboundary partnerships with governments and municipalities through the fulfillment of goals initiated by the NBI. SMEs can be aware of and help shape the regulations that protect the waters and tributaries of the Nile and stimulate continued economic growth for the betterment of humanity.

The equitable utilization and distribution of water in the Nile Basin has been a politically divisive topic. This crisis is an opportunity for governments in the Nile Basin to competitively invest in SMEs that provide clean energy alternatives and water conservation systems. SMEs in the Nile Basin can create jobs through domestic manufacturing, community revitalization, and clean energy technology development and engineering. The utilization of strategic management systems that promote the equitable allocation and distribution of water resources through artificial intelligence mechanisms capable of delivering metrics, analytics, and decisions is a revolutionary opportunity for SMEs in the Nile Basin.

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## APPENDIX A

***Table 1:*** Respondents opinions on artificial intelligence for strategic management of water resources

| Particulars | Strongly Disagree (1) | Disagree (2) | Neutral (3) | Agree (4) | Strongly Agree (5) |
|---|---|---|---|---|---|
| I have heard about water conservation in the media | 8 | 20 | 22 | 90 | 60 |
| I would participate in a water conservation incentive program | 23 | 18 | 30 | 55 | 74 |
| Would you prefer mandated conservation strategies? | 40 | 76 | 18 | 40 | 26 |
| SMEs should address resource conservation issues | 9 | 14 | 4 | 78 | 95 |
| Artificial Intelligence technology should be | 14 | 9 | 12 | 51 | 114 |

| | | | | | |
|---|---|---|---|---|---|
| utilized to conserve water | | | | | |
| There is a need for efficient management of water resources through artificial intelligence | 4 | 16 | 32 | 67 | 81 |

For the initial question, “I have heard about water conservation in the media,” 8 respondents (4%) stated they had not heard of water conservation strategies, compared to 150 respondents (75%) that stated they “agreed” or “strongly agreed” they had heard of water conservation strategies. Fig. 3 shows a greater percentage of middle and high-income respondents indicating the use of water conservation strategies. Strauss (2011) found that increased levels of education are linked to higher personal income, which may also correlate to increased application of water conservation methodology. The majority of respondents (40.5%) “strongly agreed” when asked to evaluate the statement, “there is a need for efficient management of water resources through artificial intelligence.” When the semantic nature of this questions was changed to “artificial intelligence should be utilized to conserve water,” 114 respondents (57%) “strongly agreed” with the statement. When asked to evaluate the question, “SMEs should address resource conservation issues,” 173 respondents (86.5%) stated “agree” or “strongly agree”, indicating there is strong support for the development of businesses that address resource conservation issues.

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