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Water Wars of the Future: Myth or Reality?

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ABSTRACT: This article provides background and context for regional trends and historic agreements focused on the Nile River Basin, offers a comprehensive assessment of security challenges, and presents focus areas for future investment and cooperation. The policy recommendations will serve American interests better and improve agricultural practices in the region. Without a marked alteration of existing aid from Western countries, the water-scarcity situation will continue without producing the required infrastructure improvements.

Keywords: diplomatic history, water management, sub-Saharan Africa, Nile River Basin, Egypt

Over the past decade, analysts and writers have captured public attention with dire predictions and captivating headlines, including “Water Wars: The Next Great Driver of Global Conflict?”¹ Population growth is projected to reach nine billion by 2050 and ominous water scarcity statistics center around ecological change and resource shortfalls such as water and food.² Much of the change will occur in sub-Saharan Africa, which will become the second-most populous region in the world within the next decade, following Asia. This area is also home to the largest concentration of “failed states.”³ While the United Nations Development Program excludes Algeria, Djibouti, Egypt, Libya, Morocco, Somalia, Sudan, and Tunisia from the sub-Saharan Africa label, conflict spreads more easily to surrounding states due to their geographic proximity. Population growth will further challenge an already stressed water supply, while the precarious state of governance could exacerbate conflict in the region. The densely populated area along the Nile

1. Peter Engelke and Russell Sticklor, “Water Wars: The Next Great Driver of Global Conflict?” *National Interest* (website), September 15, 2015, <https://nationalinterest.org/feature/water-wars-the-next-great-driver-global-conflict-13842>; Lauren Risi, “Beyond Water Wars,” *Wilson Quarterly* (Summer, 2019), <https://www.wilsonquarterly.com/quarterly/water-in-a-world-of-conflict/beyond-water-wars/>.

2. Mauro F. Guillén, *2030: How Today's Biggest Trends Will Collide and Reshape the Future of Everything* (New York, St. Martin's Press, 2020), 14.

3. Guillén, *2030*, 25; and Andreas Karlsson, “Water and Conflicts,” Stockholm International Water Institute (website), accessed September 3, 2021, <https://siwi.org/why-water/water-and-conflict/>.

River is home to the majority of Egypt's population of 100 million people—a number that will grow to 128 million by 2030—and particularly vulnerable.⁴

This strategic policy article, with a historical twist, draws on the rich history of the Nile River Basin and synthesizes social science studies and environmental and demographic data to examine past and current approaches to water scarcity in the region. Using data from the World Bank and the United Nations regarding population growth, water scarcity, and other trends to highlight frictions behind water demands, it highlights lessons that can be learned from past water agreements to better inform future policy decisions. For this article, countries in the Nile River Basin are Burundi, the Democratic Republic of the Congo, Egypt, Ethiopia, Kenya, Rwanda, Sudan, South Sudan, Tanzania, and Uganda, and the agreements and policies discussed (that serve as the foundation for successor arrangements) cover these countries. Egypt is the one Nile River Basin country linked to the Middle East that falls outside the designation of sub-Saharan Africa, though it is included.

The analysis is broken into three sections. The first section focuses on the background of the Nile River Basin and regional water challenges, the second section provides context by reviewing historical agreements and present policies, and the third section examines future conflict potential and policy suggestions. Getting all parties as signatories to the 1999 Nile Basin Initiative should minimize intrastate war between countries such as Egypt, Ethiopia, Sudan, South Sudan, and Uganda, particularly regarding water use and the Grand Ethiopian Renaissance Dam. While this coordination has proven challenging to date, the United States, as one of Egypt's largest donors, can encourage Egyptian leaders to come to the table and reexamine water rights claims based on outdated colonial agreements. Most of Egypt's financial resources are directed toward health and nutrition programs rather than improving agricultural initiatives and crop yields that would impact nutrition and health over the long term.⁵

Background

While the Nile River Basin might appear to have ample access to water, many regions along the basin experience water scarcity. Making

4. Omer Karasapan and Sajjad Shah, "Egypt's Population: Boom then Bust?," Brookings Institute (website), May 22, 2018, <https://www.brookings.edu/blog/future-development/2018/05/22/egypts-population-boom-then-bust/>.

5. Thomas F. Husted et al., "U.S. Assistance to Sub-Saharan Africa: An Overview," CRS Report R46468 (Washington, DC: Library of Congress/Congressional Research Service, May 20, 2020), <https://purl.fdp.gov/GPO/gpo142314>, 4.

matters worse, these drier regions have large concentrations of people, which means minor weather changes and population growth further stress existing water supplies. Although this problem might suggest conflict over water is common in the basin area, that assumption is not true. Globally, 263 rivers cross international borders, and surprisingly, there were 1,831 conflicts in those regions, though 507 contain secondary drivers related to water access.⁶ While water is vital for life, the economics of water is often overlooked because, as Adam Smith highlighted in 1776 with the diamond-water paradox, water is cheap, and diamonds are expensive.⁷ Climate change adds to the challenges created by erratic rainfall, which can cause floods or droughts with devastating consequences, and has impacted over 300 million people during the past two decades.⁸

According to the UN “International Decade for Action ‘Water for Life’ 2005–2015” website, over 783 million people in sub-Saharan Africa, and 2.2 billion globally, have no access to clean drinking water.⁹ The Nile River, the second longest river in the world and the primary water source for the Nile River Basin, covers over 3.2 million cubic kilometers and 12 countries.¹⁰ The Nile consists of two separate rivers, the White Nile, originating in Lake Victoria, East Africa, and the Blue Nile originating in Lake Tana, Ethiopia, that span a vast area where the people are mostly poor and live in several key regions. According to the Human Development Report, all Nile River Basin countries are classified as low on the human development index, except Egypt which is classified as medium. This means most of the population lives in poverty and is susceptible to water and food shortages, with over 300 million people living on less than \$1 a day.¹¹

Agriculture represents the largest source of income for the rural population. At the same time, most arable land requires rainfall, and only 4 to 5 percent of the region’s agricultural land contains irrigation systems, drastically limiting the ability of the population to mitigate rainfall shortages.¹² An area is considered water-stressed when each person has access to less than 1,500 cubic meters annually, while water scarcity refers to levels less than 1,000 cubic meters. Regions with

6. Terje Oestigaard, *Water Scarcity and Food Security along the Nile: Politics, Population Increase and Climate Change* (Uppsala, Sweden, Nordiska Afrikainstitutet, 2012), 74.

7. Richard Damania et al., *Unchartered Waters: The New Economics of Water Scarcity and Variability* (Washington, DC: World Bank, 2017), 9.

8. Damania, et al., *Unchartered Waters*, 1.

9. “International Decade for Action ‘Water for Life’ 2005–2015,” United Nations Department of Economic and Social Affairs, accessed March 20, 2021, <https://www.un.org/waterforlifedecade/africa.shtml>; and Risi, “Beyond Water Wars.”

10. “Waternet: On the Geopolitics of Water Scarcity,” accessed February 10, 2020, <https://www.waternet.be/nile>.

11. Oestigaard, *Water Scarcity and Food Security along the Nile*, 33.

12. Damania, et al., *Unchartered Waters*, 37.

less than 500 cubic meters would be designated areas of absolute water scarcity.¹³ The NRB population is highly concentrated and most of the people depend on agriculture for their livelihood. Some areas of the basin experience higher levels of precipitation but storage and transmission infrastructure are lacking to collect and distribute the water. Furthermore, low rainfall levels, some as low as 10 millimeters per year in Egypt, and the lack of irrigation systems force most of the population to depend on rainfall for their water needs. Figure 1 illustrates regions experiencing water scarcity.

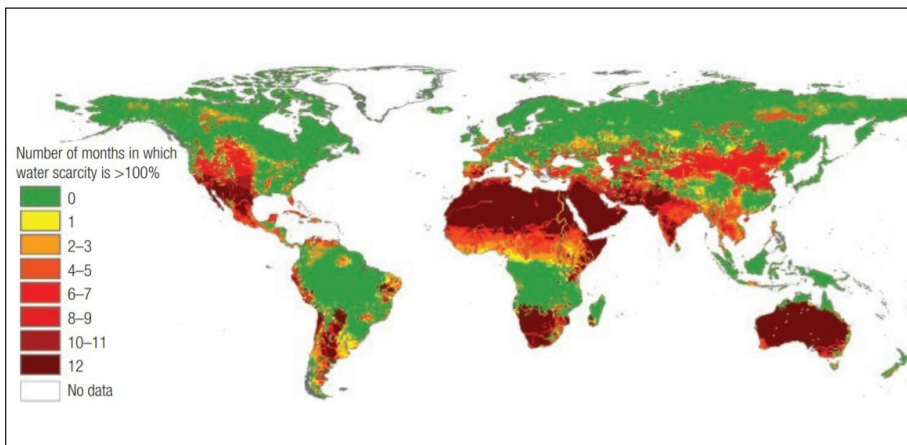


Figure 1. Regions experiencing severe water scarcity

(Note: Water scarcity <100 percent reflects a situation where net surface and groundwater withdrawals plus environmental flow requirements are greater than the available supply. Source: Richard Damania et al., *Uncharted Waters: The New Economics of Water Scarcity and Variability* (Washington, DC: World Bank, 2017), ©World Bank. <https://openknowledge.worldbank.org/handle/10986/28096> License: CC BY 3.0 IGO)

Every year, over 100,000 cubic meters of rain falls back to earth. If this water were collected, it could potentially support every person on the planet with 15,000 cubic meters of water per year.¹⁴ The average amount of water required to grow one calorie of food is one liter. Hence, a healthy diet of 2,000 calories a day translates to 2,000 liters of water per person per day. Drought and water stress are of particular concern in the Nile River Basin. While countries along the Nile have access to water, people who live within walking distance of the river can struggle to get enough water to survive. For example, in Ethiopia, water infrastructure is so poor people have less than 50 cubic meters of water per person.¹⁵ Rainfall across the region varies. Egypt, for example, only averages 10 millimeters annually.¹⁶ Thus, drought, water stress, and water scarcity are

13. Carlos Pavon, "Water Scarce Countries: Present and Future," World Data Lab (website), October 15, 2019, <https://worlddata.io/blog/water-scarce-countries-present-and-future>.

14. Frank R. Rijsberman, "Every Last Drop: Managing Our Way Out of the Water Crisis," *Boston Review* 33 (2008): 7–12, https://www.researchgate.net/publication/303736864_Every_Last_Drop_Managing_our_way_out_of_the_water_crisis.

15. Rijsberman, "Every Last Drop."

16. *Africa Water Atlas*, United Nations Environment Programme (Malta: Progress Press Limited, 2010), 74.

acute in the Nile River Basin. World leaders might be quick to disregard the issue, without realizing there are numerous bilateral and multilateral agreements over water, clear evidence the water narrative is cooperative rather than combative.¹⁷

Historic Agreements

The 1925, 1929, and 1959 historical water agreements remain a governing element in the basin countries and leaders often cite them. Recently, John Mukum Mbaku, a nonresident senior fellow for global economy and development with the Africa Growth Initiative at the Brookings Institution, wrote, “Over the years, Egypt has used its extensive diplomatic connections and the colonial-era 1929 and 1959 agreements to successfully prevent the construction of any major infrastructure projects on the tributaries of the Nile.”¹⁸ The factors involved in the original water agreements need to be placed into a contemporary context that demonstrates the agreements are no longer relevant. Properly understood, Egypt’s claim of natural, historical rights must be discarded as an anachronistic legacy.

The British took direct control of Egypt in 1882, and cotton already represented over 80 percent of the region’s exports to the robust English textile market, incentivizing active British control of the waterways.¹⁹ The Aswan Low Dam (also the Old Aswan Dam), was completed in 1902 to maximize cotton production and supply the London mills. Lord Allenby subsequently issued his dictate that Sudan would increase the farming region in Gezira, invoking the ire of Egypt and leading to the creation of the Nile Waters Agreement of 1929 stipulating no project would take water from the Nile to “prejudice” the interests or reduce the quantity of water arriving in Egypt. While the agreement did not guarantee a specific amount of water, the river’s entire flow was designated for Egypt during the dry season.

Several agreements were developed between colonial powers and various basin states. For many years, England tried to secure a contract to build a dam at Lake Tana. The Ethiopians, however, never conceded, nor were they part of the Nile Waters Agreement of 1929. When Sudan gained independence in 1956, the country’s leaders, concerned about the impact of the Aswan High Dam, declared the country would not abide by the agreement. Tensions between Egypt and Sudan escalated until 1959 when the strife was resolved with the signing of the Full Utilization of the Nile Waters (FUNW) agreement, specifying Egypt would receive 55.5 billion cubic meters and Sudan 18.5 billion cubic meters (billion cubic

17. Karin R. Bencala and Geoffrey D. Dabelko, “Water Wars: Obscuring Opportunities,” *Journal of International Affairs* 61, no. 2 (2008): 21, <http://www.jstor.org.ez-salve.idm.oclc.org/stable/24358109>.

18. John Mukum Mbaku, “The Controversy over the Grand Ethiopian Renaissance Dam,” Brookings Institution (website), August 5, 2020. <https://www.brookings.edu/blog/africa-in-focus/2020/08/05/the-controversy-over-the-grand-ethiopian-renaissance-dam/>.

19. Oestigaard, *Water Scarcity and Food Security along the Nile*, 34.

meters based on average water levels of 84 billion cubic meters at Aswan) of water from the dam, though no other countries were included in the agreement.

Egyptian references to the agreement with countries that fall outside the colonial legacy raise the hackles of their neighbors. The historical 1929 and 1959 Nile Waters Agreements arose from British rule to support cotton production in Egypt and farming in Sudan, none of which are relevant today. Tensions over control of the Nile grew heated in 1997, prompting Egypt to cite historical rights based upon the colonial agreements, suggesting all modern states are bound to abide by these documents. Consequently, Sudan refused to follow them, and Ethiopia reminded all parties it never signed the Nile Waters Agreement or the Full Utilization of the Nile Waters agreement; Tanzania, Uganda, and Kenya had already adopted a position that current states were not obligated to follow legacy treaties that do not serve current state interests.²⁰

These frictions generated the 1999 Nile Basin Initiative (NBI) for all riparian states and established a cooperative framework for the use of the Nile, sustainable water practices, and trust and transparency over water use for everyone in the basin. Egypt and Sudan never signed the agreement (South Sudan is not a member, and Eritrea is an observer) designed to promote constructive dialogue, training, and collaborative development of sustainable water practices in the Nile River Basin. Some friction exists with countries located downstream, specifically Egypt and Sudan that want other members to request permission before engaging in activities impacting the basin. The two controversies applicable today are Egypt's insistence on following a framework based upon colonial agreements and Egypt and Sudan wanting NBI decisions to be based on consensus rather than a majority. This method would ensure Egypt and Sudan are not marginalized since they believe their colonial history grants them special water access status.²¹

On March 30, 2011, Ethiopia announced construction of the Grand Ethiopian Renaissance Dam on the Blue Nile to provide much-needed electricity for its population, once again raising the specter of water cooperation and questions about access to the Nile. Egypt strongly opposed the construction of the dam, however, the Arab Spring and the fall of Egyptian President Hosni Mubarak in April 2011 facilitated Ethiopia's seamless inception of the project. Strangely, Essam Sharaf, a former Egyptian prime minister, mentioned the dam as a benefit for the region. Like Egypt, Sudan was too distracted by the secession of South Sudan to engage over Ethiopia's plans for a dam. Rather, the Sudanese were more concerned about jurisdiction over petroleum and other natural resources

20. Oestigaard, *Water Scarcity and Food Security along the Nile*, 35, 36, 37.

21. Bencala and Dabelko, "Water Wars," 25.

than water-related agreements, undoubtedly because, heavy rains during negotiations satisfied agricultural requirements. Beginning in July 2011 through the middle of 2012, the entire East African region suffered a drought that was one of the worst in the past century. The drought also caused a food crisis in the Sudan region, forcing the Sudanese to focus on water rather than fossil fuels. Subsequently, South Sudan applied for membership in the Nile Basin Initiative and was admitted in 2012.²²

Grand Ethiopian Renaissance Dam

The construction of the dam began while the region was struggling through a drought and most political leaders were working to provide food and water for populations on the brink of starvation. Ethiopian leaders focused on building the dam to improve the lives of their people. More importantly, Ethiopia and other riparian states insist on an equitable distribution of water. Many of the NRB states refuse to acknowledge the 1959 agreement which focuses on the use of the Nile for Egypt and Sudan exclusively, though allowing for 10 billion cubic meters for seepage and evaporation, while ignoring the water needs of other countries.²³

Neighboring countries demanded a more equitable agreement. Although Egypt used its influence to block funding for Ethiopia's dam project, Ethiopians were willing to finance the project with additional loans secured from China, much to the dismay of Egyptian leaders. The \$4.6 billion dam project was completed on July 22, 2020, and Ethiopia began the lengthy process of filling the dam's reservoir, which will reach total capacity in 2023.²⁴ The dam's construction without any disagreements is not an indicator that all the riparian states (Burundi, the Democratic Republic of Congo, Kenya, Rwanda, Tanzania, Uganda, Egypt, Sudan, and South Sudan) are supportive. The apparent peace is due to environmental factors having not significantly strained existing water supplies.

The process of filling the dam is taking place without significant objections from the Nile River Basin community. The dam, however, is likely to incite disagreement. One way to head off potential conflict is to reach an agreement on the discharge of water downstream during water shortages. Currently, no specific agreement on water sharing and the impact of water diversion exists between Egypt and Ethiopia. Furthermore, data are lacking on how the Grand Ethiopian Renaissance Dam will change downstream water flow in both predictable and

22. Oestigaard, *Water Scarcity and Food Security along the Nile*, 42, 48.

23. Mbaku, "The Controversy over the Grand Ethiopian Renaissance Dam."

24. Elias Mesert, "Ethiopians Celebrate Progress in Building Dam on Nile River," *Washington Post* (website), August 2, 2020, https://www.washingtonpost.com/world/africa/ethiopians-celebrate-progress-in-building-dam-on-nile-river/2020/08/02/77041354-d4e8-11ea-a788-2ce86ce81129_story.html.

unpredictable ways. It will take years to determine the dam's repercussions from variables such as rainfall, how well Ethiopia adjusts to environmental changes during the filling process, the consequences of filling the dam, and Sudan's use of the Nile.²⁵ Another important consideration is the amount of water utilized for irrigation in Sudan and Ethiopia. Noticeable impacts on the Nile might automatically be attributed to Ethiopia and the dam and exaggerated or distorted by public opinion and social media, which could transform into widespread protests that could turn violent.

The Nile River Basin, a region with dense communities, poor water infrastructure, and some rain flow averages as low as 10 millimeters annually, has seen riots over food insecurity in the past. Water has the potential to drive conflict and impact food production. A severe drought might tip the scales. Many Nile River Basin countries have limited military capabilities. Egypt, however, has the most significant military assets and the means to engage in conflict if one erupted. When a population lives on the edge between survival and death, seemingly minor changes can spark large-scale protests and violence. For example, the spread of protests around the Middle East during the 2011 Arab Spring was fueled by a spike in food prices, specifically rising bread prices in Tunisia, culminating with demonstrators in Cairo shouting, "Bread and freedom."²⁶ Egypt remains a major importer of wheat, providing generous subsidies to ensure bread is affordable for the masses of people who live in poverty.

The Nile River is also a source of revenue and sustenance for communities of fisherman who have lived off the river for generations. It is possible the Grand Ethiopian Renaissance Dam will further degrade the dwindling supply of fish and eliminate the livelihoods for entire communities. Ethiopia did not conduct studies to examine the dam's impact to downstream fishing villages. While violence has not erupted along the Nile over fishing rights, it has in other areas. For example, in 2009, conflict erupted between Kenyan and Ugandan troops over ownership—and the attendant fishing rights—of Migingo Island in Lake Victoria. Fortunately, the incident did not turn violent. Lakes are drying up in the region, however, and altering traditional livelihoods. Thriving fishing communities around Lake Haramaya have disappeared, while other places such as the Lake Chad area in Central Africa have lost 90 percent of their water due to irresponsible practices, climate change, deforestation, and changes in the lake, with many Nigerians migrating to Cameroon. Their settlement prompted a war between the two countries in the 1990s. The International Court of Justice eventually ruled in Cameroon's favor in 2002. There are multiple factors involved

25. Kevin G. Wheeler et al., "Understanding and Managing New Risks on the Nile with the Grand Ethiopian Renaissance Dam," *Nature Communications* 11, 5222 (2020): <https://doi.org/10.1038/s41467-020-19089-x>.

26. Oestigaard, *Water Scarcity and Food Security along the Nile*, 78.

in the depletion of African freshwater sources, but the trend is clear. Satellite images show many of the continent's large 677 lakes are shrinking noticeably, which must cause concern and drive more sustainable practices and awareness to utilize freshwater sources better.²⁷

Water and food shortages can easily promote riots, and the violence can quickly spin out of control and turn deadly. The infamous 2007–08 African food riots were driven by food prices doubling, sometimes in a matter of months, spreading from Egypt and Ethiopia to Senegal and even further south into Mozambique. In the future, it is likely irregular periods of dry weather will intensify competition over scarce water resources and cause riots. Evidence suggests the average riot in the in sub-Saharan Africa between 1990 and 2012 led to 66 deaths.²⁸ A few notable examples took place in 2001. Two groups fought over access to the river and 130 people were killed. In Kenya in 2012, over 100 people were killed when violence erupted between Pokomo farmers and Orma nomadic cattle herders over access rights to the Tana River.

Although the Grand Ethiopian Renaissance Dam appears to be ramping up for full use with very little vocal opposition, a drought in the coming years could quickly alter the amiable mood of the Nile River Basin states. Christian Almer et al. have demonstrated water scarcity in agricultural communities will generate social tensions when there is cultural diversity or multiple ethnic groups.²⁹ To foster peace and social stability and avoid conflict and the loss of lives, regional leaders must address these challenges and demand policy changes and updated agreements.

Future Regional Strategic Implications

Regional leaders need to address three key areas to promote better development in the Nile River Basin, the second-most populated continent on the planet. The first area is better agricultural practices. The second area is the effective use of dams to control water during floods, provide electricity, and serve as an insurance policy against drought. The last area is improved stewardship, policies, and water-irrigation infrastructure to manage water as a resource. Along with these changes, the United States can encourage Egypt, Ethiopia, Sudan, South Sudan, and Uganda to reach an agreement regarding water use and the

27. Ernest Waititu. "Diminishing Water Resources Threaten Peace." *Washington Times* (website), May 26, 2009, <https://www.washingtontimes.com/news/2009/may/26/diminishing-water-resources-threaten-peace/>

28. Christian Almer, Jeremy Laurent-Lucchetti, and Manuel Oechslin, "Water Scarcity and Rioting: Disaggregated Evidence from Sub-Saharan Africa," *Journal of Environmental Economics and Management* 86 (August 2015): 24, <https://mpira.ub.uni-muenchen.de/34487/>.

29. Almer, Laurent-Lucchetti, and Oechslin, "Water Scarcity and Rioting," 2, 193–209; and Risi, "Beyond Water Wars."

role of the Grand Ethiopian Renaissance Dam in regulating the waterways of the Nile before a drought impacts the region and tensions escalate.

Some agricultural practices need to be revised to achieve better crop yields. Education programs can assist farmers and demonstrate the benefits of crops that can tolerate frequent dry spells, which are becoming more common crops in the basin. A few more easily implemented solutions include efficient crop rotations to balance soil nutrients and minimize the need for mineral fertilizers, which are not practical for local farmers. Additionally, educational programs can be developed to promote phosphate application, implement manure as fertilizer, and utilize disease-resistant varieties and species of plants that mature more quickly and help local farmers improve yields.

Promoting the use of hybrid seed might be counterproductive. These seeds create a dependency on chemicals and fertilizers that are unaffordable for most farmers. Furthermore, conservation farming can save ground preparation and make better use of rainfall, maximize moisture retention by maintaining open soil surface conditions, promote deep rooting zones, and help navigate intermittent rainfall patterns. Education programs on easier-to-grow crops should be introduced to heighten awareness of alternative food sources. For example, cassava is a naturally pest-resistant and resilient tuber that grows well in arid regions. It takes less water to grow than wheat and is naturally gluten free and an excellent source of carbohydrates with a lower sugar load than wheat.³⁰ The Portuguese introduced cassava to Africa in the sixteenth century, though it is currently cultivated on small farms only and is not widely known in the region.³¹ Exploring agricultural solutions that can provide better crop yields while educating local farmers about sustainable growing practices is crucial in raising awareness, improving farming methods, and scaling solutions to larger farms to maximize production.

Africa has the potential to become the world leader in hydroelectric power, and aid from the United States could help expedite the process. Dams can provide energy and water security for people in Nile River Basin communities. The region contained over 257 million people in 2016—or more than 20 percent of the total population of Africa.³² Many of these people live without electricity, and the number of people without electricity will likely continue to

30. Guillén, 2030, 27.

31. Dunstan Spencer and Associates, "Cassava in Africa: Past, Present, and Future," Food and Agriculture Organization of the United Nations (website), accessed December 14, 2020, <http://www.fao.org/3/a0154e/A0154E04.HTM>.

32. Stephan Deconinck, "The Nile River Basin – An Introduction," Waternet: On the Geopolitics of Water Scarcity (website), April 12, 2021, <https://www.waternet.be/nile>.

grow. By 2030, there will be over 650 million people without electricity on the continent and 90 percent of them will live in sub-Saharan Africa.³³

Africa could be the leader in hydropower as a renewable energy source, though it currently only produces 80,000 megawatts.³⁴ Power Africa is a US Agency for International Development (USAID) program created to add 30,000 megawatts of clean energy to sub-Saharan Africa. The program funds small uncoordinated projects around the region but none focused on the Nile River Basin.³⁵ China, widely considered a leader in global dam construction, has invested heavily in Africa (including backing the Grand Ethiopian Renaissance Dam); meanwhile the United States has many programs in place through USAID. If the United States and China were to cooperate, they could create and execute a comprehensive development plan that would provide much-needed resources and stabilize local governments and economies.³⁶

The construction of effective irrigation systems can provide higher crop yields and increase farming production through technology that prevents water-transmission losses. Most Nile River Basin farmers lack irrigation, though there are a few exceptions. World Bank estimates the cost at between \$13,000 and \$18,000 (US) per hectare.³⁷ Sudan is the exception with 20,000 kilometers of irrigation, but its very old system loses significant amounts of water.³⁸ While Sudan has some existing infrastructure to maximize the agricultural yields, it would require significant investment to irrigate its 48,000 kilometers of arable land that depends exclusively on rainfall. Although 20,000 kilometers of arable land are covered with legacy systems, the systems lose significant amounts of water.³⁹ Even in areas of the Nile River Basin with sufficient access to water, infrastructure is a problem. One official in South Sudan's water authority remarked they had enough water to serve the 10 million residents, but they cannot build comprehensive water infrastructure to facilitate distribution.⁴⁰

The money is available, but US assistance is directed at a broad array of projects in sub-Saharan Africa and must be better coordinated by the State

33. Megan Rowling, "650 Million People Will Still Have No Access to Electricity by 2030, According to a New Report," World Economic Forum (website), May 23, 2019, <https://www.weforum.org/agenda/2019/05/patchy-progress-on-electricity-access-casts-shadow-on-global-goal>.

34. Anita Marangoly George, "Done Right, Hydropower Can Help Fight Energy and Water Poverty," *World Bank Blogs*, September 2, 2014, <https://blogs.worldbank.org/voices/hydropower-s-role-energy-water-poverty-nexus>.

35. Power Africa, "About Us," USAID (website), n.d., accessed May 3, 2021, <https://www.usaid.gov/powerafrica/aboutus>.

36. Philip Andrews-Speed, "China's International Energy Engagement," *Handbook on the International Political Economy of China*, ed. Ka Zeng (Northampton, MA: Edward Elgar Publishing, 2019), 139.

37. Oestigaard, *Water Scarcity and Food Security along the Nile*, 81.

38. *Africa Water Atlas*, 80.

39. "Development Aid at a Glance: Statistics by Region, Africa, 2018 Edition," Organisation for Economic Co-operation and Development (website), <https://www.oecd.org/dac/financing-sustainable-development/development-finance-data/Africa-Development-Aid-at-a-Glance-2018.pdf>.

40. Risi, "Beyond Water Wars."

Department and USAID. As depicted below in figure 2, agriculture and economic initiatives only received 8 percent of program funding in 2019. While there are many humanitarian issues in Africa, South Africa and Nigeria top the list of aid recipients. Egypt does not appear at all. The only Nile River Basin countries listed are Ethiopia, Uganda, Kenya, and the Democratic Republic of Congo. Rather than scattering US aid dollars around a vast region, localized concentration in regions might produce better, longer-lasting results. Granted, in some countries, armed terrorist groups greatly exacerbate the humanitarian crisis, though eliminating militants has proven more complex in countries such as Nigeria and Mali.

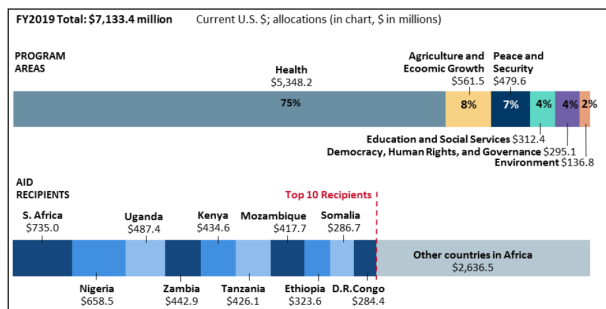


Figure 2. US assistance to Africa by program area

(Notes: Funding allocated from global or functional programs, including emergency humanitarian assistance is not included. International food assistance, provided under Title II of the Food for Peace Act (P.L. 480), is also excluded, whether for humanitarian or development purposes. Source: CRS calculation based on FY2019 sectoral data provided by USAID, February 2020.)

Prioritizing regions such as the Nile River Basin could improve water practices and crop yields, ensure dams provide water during droughts, and increase crop yields, which would better the nutrition and health of the population and reduce the long-term humanitarian requirements and costs referenced in figure 2.

Health programs represent a short-term need, while distributing a more significant percentage of aid to agriculture would strengthen agricultural value chains and enhance crop yields that would pay dividends in the future, thereby reducing the programmatic need for health and nutrition services. In addition to reallocating funding to achieve these goals, the United States must leverage its existing relationships in the region.

In May 2021, the United States and Egypt worked together to reinforce a ceasefire between Israel and Palestinian militants. This action underscores the importance of Egypt’s role in a region that continues to loom large for American policy interests and shows President Abdel Fattah al-Sisi can be an effective partner in ending violence. Egypt continues to be the largest recipient of US assistance, averaging between \$7 and \$8 billion annually between the Obama and Trump administrations. The United States can leverage Egyptian

aid to encourage Egypt's leaders to collaborate with regional partners to sign water-sharing agreements that would address the long-term needs of many countries in the region.

Conclusion

The US Congress must divert some of the aid earmarked for Egypt to other countries to develop better water-irrigation methods, increase stewardship over precious water supplies, and assess and improve water use for agricultural purposes, including more sustainable practices and metered programs for high-volume users to guard against waste. Agricultural studies highlight poor farming practices, poor soil structure, loss of organic material, insufficient crop rotation or diversification, and impediments to plant root structure, which drastically reduces the effectiveness of crop yields.⁴¹ A more holistic approach—to include tracking water withdrawn, applied, consumed, and lost—will provide more meaningful numbers and must be considered for a complete picture of water conservation in arid regions.

In addition, better coordination among agencies and other countries in the Nile River Basin can produce stronger policies and promote long-term solutions that will improve the lives of the people and reduce the likelihood of conflict due to growing populations, water shortages, droughts, and other environmental stressors exacerbated by climate change. This action would require the United States to engage China on the continent and synchronize efforts to promote better agricultural practices, build dams, and create irrigation infrastructure to help farmers better steward the available water. The United States would also need to share short- and long-term plans for aid to sub-Saharan Africa. While regional tensions are currently low, environmental instability can lead to drought and place water at the forefront of tensions between states in the region.

Along with policy changes, the United States must take the lead in the development of water-sharing agreements for all riparian states that foster an inclusive Nile Basin Initiative. This action will dictate influencing Egypt and Sudan to abandon old colonial agreements and create dialogue all states in the region would embrace. The time to broaden signatories to the initiative is urgent—before passions become inflamed. All regional communities must sign the 1999 Nile Basin Initiative to include Egypt, Eritrea, Sudan, and South Sudan, and the rest of the world (and donor countries) should use aid to facilitate the process. In the basin, both private and public use of agricultural water resources must focus on more efficient transmission methods, given the results of single-factor studies, to maximize crop yields. The design and potential

41. *Africa Water Atlas*, 159.

application of irrigation systems must consider the sustainability of groundwater and the larger hydrologic cycle overlooked when focusing on single-factor productivity studies used for purchasing and fielding equipment for large-scale agricultural uses.⁴²

Strategists can learn from past water agreements to inform contemporary challenges, and agreements involving all stakeholders can establish a foundation to minimize future conflict. Investment and aid will flow into the continent, and American leadership can provide an overarching plan to improve the lives of the people. Unless changes are made to existing US policies and strategy, violent extremist groups can easily spread as they exploit the failures of the states and destabilize the region. While the US military and United Nations have missions in the Sahel to combat terrorism, not addressing the issues surrounding water scarcity and usage could fuel conflict and violence, creating another region on the continent that requires a large peacekeeping force and more humanitarian aid.

The threat of water wars, while not dire (yet), should draw attention to policy changes and water-sharing agreements in the Nile River Basin to ensure the next environmental crisis does not incite violence in the region. America can lead these efforts to provide long-term solutions to the people's food insecurity and electrical needs, which will make the population more resilient during droughts and other environmental challenges. Egypt is the keystone in the Nile River Basin. American policy needs to influence al-Sisi to negotiate a water distribution agreement with the Grand Ethiopian Renaissance Dam before the next drought can cause conflict and further destabilize the basin. Furthermore, improving dam infrastructure can provide energy and water security and make a difference between life and death for populations living on the brink of existence.

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42. *Beyond Scarcity: Water Security in the Middle East and North Africa*, MENA Development Report (Washington, DC: International Bank for Reconstruction and Development/World Bank, 2018), xxxvii.

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