MINISTRY OF FOREIGN AFFAIRS
OF DENMARK
Danida

ACCESS TO WATER IN AFRICA
A REVIEW TO FRAME FUTURE DEVELOPMENT ASSISTANCE FOR ACCESS TO WATER IN AFRICA

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BJ-CON

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LIST OF ABBREVIATIONS

ACEN	African Circular Economy Network
BOT	Build transfer Operate
CE	Circular Economy
DBO	Design Build Operate
DSIF	Danida Sustainable Infrastructure Finance
ENRECA	Enhancement of Research Capacity
ESP	Environmental Sector Programme
GWP	Global Water Partnership
ICWE	International Conference on Water and the Environment
IWRM	Integrated Water Resources Management
LNOB	Leaving No-one Behind
MoU	Memorandum of Understanding
NbS	Nature-based Solution
ODA	Official Development Assistance
PASEHA2	Programme d'Appui au Secteur Eau, Hygiène et Assanissement au Niger
PN-AEPA	Programme National d'Approvisionnement en Eau Potable et d'Assainissement
PPP	Public Private Partnership
PROSEHA	Programme Sectoriel Eau, Hygiène et Assainnissement
RUWASA	Rural water and sanitation
SADC	Southern African Development Community

SDG	Sustainable Development Goals
SME	Small and Medium-sized Enterprise
SPS	Sector Programme Support
SSA	Sub Saharan Africa
SSC	Strategic Sector Cooperation
SWAp	Sector-Wide Approach
TEM	Transient Electromagnetic Method
UN	United Nations
WAP	Water Allocation Plan
WASH	Water supply, sanitation and hygiene
WFD	Water Framework Directive
WRM	Water Resources Management
WS	Water supply
WSS	Water supply and sanitation
WSSPSII	Water and Sanitation Sector Programme Support, Phase II
WWT	Wastewater treatment

EXECUTIVE SUMMARY

The Minister for Development Cooperation launched in 2019 a four-year plan for development cooperation with Africa, the purpose of which is that some 6 million more Africans get access to clean water as a result of Danish led funding by 2023. This marks a renewed focus on water in Danish development assistance in Africa, which for decades has received support from Danida either directly as support by the various water programmes over the years or through multilateral development aid through UN organisations, development banks, or through joint arrangements with other donors. The support has been and is still justified by the fact that access to the safe water is essential for improving public health, for poverty alleviation and for growth in general in developing countries.

Because of this long-lasting development aid, Denmark has been able to build a resource base with outstanding competencies and solutions in all aspects of water supply, wastewater treatment, water distribution and integrated water resources management with a strong knowledge base on the challenges, issues and needs in developing countries.

However, it is not clearly defined how this support to water in Africa should be delivered. Therefore, to be able to define and design future concrete activities, a number of previous water projects funded by Danida was reviewed and lessons learned from these projects were extracted and analysed in terms of efficiency and sustainable impact. This analysis was further supplemented with the historic background of the Danish development support for water in Africa, the current trends and drivers within the water sector to be reflected in a forthcoming effort, and an overview of the Danish resource base on water sector competences relevant in an African context.

Despite an impressing Danish effort on many aspects of securing access to clean water during half a century, the review of the previous projects also reveals a picture of an effort characterised to a certain degree by a non-holistic thinking, too much switching of principles and delivery mechanisms governing the aid interventions, problems with long-term sustainability, and lack innovative approaches and cooperation with the research programmes.

Based on the findings from the reviews of the water projects, the study lists a number of selection criteria to be addressed whenever a new support intervention is designed. First and foremost, the development

aid should target areas/countries which are likely to give the maximum impact on poverty alleviation, public health, climate adaptation, and commercial interest and potential of Danish private sector stakeholders. Furthermore, the areas/countries to be targeted should have known and trusted partners, some institutional and human capacity, and an already identified available water source with some knowledge on the quality and quantity of this water source. Also, the interventions should be designed to ensure long-term sustainability (source protection, climate change projections and predictions on water availability, training, robust management set-up for long-term operation and maintenance). And last but not least, the interventions should be designed to link to abatement efforts against COVID 19.

Based on these listed criteria, the following recommendations are given:

- Aim for a focused and prioritised effort. It is better that the projects are few and carefully designed and reaching more people without being too complex than initiating many different projects in many areas.
- Focus on Sahel and secondarily Eastern Africa, Kenya, Tanzania, Ethiopia, and the Cape region in South Africa.
- Target sustainable rural community-based water supply with known available groundwater sources and prioritise projects focusing on construction and installation of mini-grid based water supply schemes, equipped with smart, digitalized state-of-the-art technologies.
- Ensure sustainability by complementing the infrastructure projects with catchment assessments and source protection measures.
- Draw on previous attempts to establish multi-stakeholder system solutions for rural water supply schemes.
- Use the Danish development aid to leverage private financing in scalable blended financing mechanisms.
- Despite challenges to define a sustainable institutional PPP model, seek to secure private sector involvement for operation, service and maintenance of rural water supply schemes based on long-term agreements.

1 INTRODUCTION – WHY STRENGTHENING SUPPORT TO AFRICA ON WATER

Globally, 2.1 billion people lack safely managed drinking water, including 785 million people without basic drinking water services, of whom four out of five live in rural areas[1]. Africa contributes significantly to these negative statistics. While Northern Africa has 92% safe water coverage, Sub-Saharan Africa (SSA) remains at a low 60% of coverage – leaving 40% of the app. 800 million people in this region without access to clean drinking water with severe implication on poverty, public health, hunger and economic growth.

At the same time, Africa's urban population is expected to increase from 345 million in 2014 to 1.3 billion people by 2050[2]. Africa is the only region, where urbanisation likely is not accompanied by an equivalent rate of economic growth. Consequently, there is a large and growing infrastructure and financing gap. Investments will have to be increased significantly to meet the Sustainable Development Goals for poverty reduction and water and sanitation in SSA[3]. Rural Africa also suffers from urbanization, since investments are targeting the urban infrastructure, and rural water supply solutions have difficulties in attract investors to the same extent because of lack of business models and insufficient water pricing options.

Consequently, there is an urgent need for development support to promote access to clean drinking water to SSA, both in urban, peri-urban and rural areas. Denmark has for decades contributed to various SSA countries to fight water scarcity – and the implications thereof – and has through numerous projects provided access to clean drinking water.

Besides these justifications, there are multiple other reasons for allocating development support on water to Africa:

- **Outdated infrastructure.** Evidently, many areas in SSA suffers from over-burdened water systems under increasing stress from fast-growing urban areas, as well as outdated technology and infrastructure and solutions to deal with water scarcity in rural areas – which again is aggravated by climate change effects. Piped water is still the most important source of drinking water (39%) mainly in urban

1 UNICEF/WHO, 2019.

2 World Urbanisation Prospects 2014. United Nations, 2014.

3 Financing water, Investing in sustainable growth. OECD, 2018.

areas, yet boreholes are becoming more and more important (24%) and so are other decentralized smaller off grid installations such as water kiosks and even mini-grid water systems at village level.

- **Climate change.** Climate change accelerates nearly all the adverse effects of water scarcity and seasonality of precipitation causing either to little or too much water. It will have many short- and long-term impacts on water resources, including flooding, droughts, sea level rise, drying up of rivers, deterioration of water quality and ecosystems leading to economic and social impacts on health and food security.
- **Poverty alleviation.** It is still a fact that lack of access to clean water in multiple ways contributes to increased poverty among the most vulnerable part of the population. In rural areas, lack of clean water potentially affects agriculture and kitchen gardening thereby reducing income by small holders and farmers, and in the cities, resources spent to collect water affect the working efficiency by the inhabitants and the overall productivity of the society.
- **Health.** 663 million people globally lack access to safe water supply sources with 350 million people in Africa alone affected every day. The health implications are staggering. 2 million people die every year due to water-borne diarrheal diseases, most of them children under the age of 5. The World Bank estimates that water-related illnesses kill more African children under the age of five than HIV/AIDS, malaria, and measles combined. COVID 19 pandemic has pointed at clean safe water as an indispensable hygienic precondition for fighting such diseases.
- **Gender.** Women and girls are disproportionally burdened by scarcity of clean drinking water. In most African societies, women collect the water for drinking as well as household means such as cooking, washing, and childcare. Because of this traditional gender labour division of roles, women spend around 60% of each day collecting water, which gives an estimate of approximately 110 million collective work hours every day and a decrease in the amount of time available for education, income generating activities, and household. UN WOMEN has estimated that SSA alone loses 40 billion potential work hours per year collecting water[4].

Increased Danish support to water in Africa will be continued in the coming years, and in that context, it is of utmost importance that the development assistance is delivered efficiently and that the access to clean drinking water is provided in such a way that it ensures long-term sustainability of the outcome. It is of equal importance that the support is aligned with the high Danish climate ambitions around

4 https://www.unwomen.org/en/news/stories/2014/3/collecting-and-carrying-water-burdensome-reality-for-women

increased focus on climate change adaptation and in terms of reducing its greenhouse gas emissions by 70% by 2030, which means that the interventions should to the degree possible aim to establish climate proofed technologies and solutions.

Furthermore, the support interventions should be designed without compromising equitable access and pro-poor orientation according to the principle of Leaving No One Behind (LNOB) and at the same time allowing for private sector stakeholders and investors to be involved in the actions to increase access to water. It should also take into account the existing Danish resource base and competencies to achieve the best results on the ground and at the same time seek to optimize commercial potentials within the Danish water sector.

2 OBJECTIVES AND STRUCTURE OF THE REVIEW

The objective of this review is to provide an overview of major lessons learned from previous water projects on providing access to water in Africa. The study focuses on experience from various interventions which have taken place contributing to the SDG 6 targets, especially Target 6.1, mainly resulting from Danish development assistance.

The study is not restricted to a mere description of lessons learned, but will also identify the most relevant, effective and efficient future interventions in the water sector. The review of the previous support should be a basis for recommendations for future interventions in Africa on access to water.

To be able to fulfil these objectives, the study has been structured to give:

1. the historic background, the Danish development support for water in Africa until now,
2. the current trends and drivers within the water sector to be reflected, if relevant, in the future support to Africa,
3. an overview of the Danish resource base on water sector competences relevant in an African context, followed by
4. a review of selected former projects within the previous Danida water portfolio to Africa. The review includes a description of the various aid delivery mechanisms, which have been applied over the years, and country specific project and program reviews, and
5. a list of criteria for how to select the future water projects to achieve the set quantitative goals and to give some overall recommendations for the future action.

3 HISTORICAL BACKGROUND

3.1 Water in Danida

Water has for decades been a prioritised area within the Danida development support for not at least Africa, justified by the fact that access to the safe water is essential for improving public health, for poverty alleviation and for growth in general in developing countries. For this reason, Denmark has been able to build a resource base with outstanding competencies and solutions in all aspects of water supply, wastewater treatment, water distribution and water resources management with a strong knowledge base on the challenges, issues and needs in developing countries.

The long-lasting effort on water in Africa – mainly from a donor perspective and funded by Danida resources – has been followed up by programmes, which also focus on the commercial perspectives and private sector involvement, such as the Strategic Sector Cooperation (SSC) programmes.

This clearly mirror the strategic effort by the Danish government to strengthen water export, launched in 2012 and mainly carried forward by the Ministry of Environment with the slogan "to make water the new wind". This strategy was launched in a close partnership with the Danish water sector. All stakeholders, both public institutions like utilities and research institutions and private sector operators, including water tech companies, contractors and consultants, took part in this effort from 2015 and onwards based on the so-called water vision 2015[5]. The main objectives were – and still are – to be world leading in delivering intelligent, sustainable and efficient water solutions, to double the Danish export by water companies, and to create 4000 new jobs in Denmark by 2025.

Despite these high international ambitions of the Danish government, water as a focus area of the donor support was abandoned by 2017, when Danida launched its new strategy[6]. Apparently, there was not full coherence in the Danish policy on water, but in fact a similar trend to phase out water as a stand-alone priority was seen by other public

5 https://www.vandvision.dk/wp-content/uploads/2017/09/Vandvision_2015_folder-3.pdf

6 The World 2030 - Denmark's strategy for development cooperation and humanitarian action. Danida, January 2017.

institutions both in Denmark and in EU[7]. It reflected the nexus thinking that water should be seen as a cross-cutting issue, which should be main-streamed within other sectors, such as energy, agriculture and health. Unfortunately, as a consequence water was in many cases given low priority in the concrete activities.

This was surprising, taking into account that water was acknowledged as one of the most important impacts of climate change on the society. Climate change is commonly understood as an accelerator of problems with too little and too much water, with water scarcity and droughts on the one hand and flooding on the other. Especially in the developing countries with very little climate resilience, climate change induced water issues cause tremendous challenges and mostly affects the most vulnerable parts of the population.

Now the situation has changed again. There is a renewed focus on water in Danish development assistance, at least in Africa.

More specifically, the Minister for Development Cooperation launched in 2019 a four-year plan for development cooperation with Africa[8], the purpose of which is that almost 6 million more Africans get new or improved access to clean water as a result of Danish led funding by 2023. This is part of the implementation of the governmental Memorandum of Understanding with the political partners in relation to establishment of the new Danish Government in 2019. In this MoU, clean water is described as a crucial element of climate adaptation in Africa. In addition, the current COVID-19 pandemic has pointed at the importance of having access to clean water and hygienic sanitation to counteract the spreading of the disease. Therefore, the support to water should also be seen in a broader context, acknowledging the importance of addressing issues on water in relation to both health and climate adaptation.

3.2 Current Danish development support

Although the Danish development support to water was reduced in 2017 with the Danida strategy, the revitalization of the water sector support will not start from scratch. It is estimated that Denmark will through the current engagement contributes with access to clean water, equivalent to 1.8 to 2.4 million people in Africa within the four-year period (2019-2023).

7 See i.e. Horizon 2020 and Horizon Europe.

8 Regeringens udviklingspolitiske prioriteter 2019. Plan for udgiftsrammer for udviklingssamarbejdet 2019-2022.

The renewed focus on water in Africa is a revival of previous development aid priorities on the continent. The change in 2017 was a setback for the support, which had taken place in a number of countries in both Western, Eastern and Southern Africa, notably Uganda, Ghana, Benin, Burkina Faso, Malawi, Zambia, Tanzania, and Kenya, for more than three decades. But despite this change in policy, support for water in Africa did not cease totally, since there has been ongoing support for water, i.e., in Sahel. The Danish government's long-term strategy for global climate action: A Green and Sustainable World from October 2020 mentions specifically the objective of providing improved access to water for people in African as part of the adaptation and resilience objective of the strategy.

3.3 Clarification of the concept of Access to Water

When the Minister for Development Cooperation launched the four-year strategic plan within which access to water was one of three pillars of the support. This statement was inspired by SDG 6.1: "By 2030, achieve universal and equitable access to safe and affordable drinking water for all". It clearly indicates that the goal of the plan is not fulfilled before people on the ground has access to water – either drinking water from the tap or as water that can be collected in a not too far distance from the consumer, that is when the infrastructure of the water supply schemes is in place and provides water.

However, it is not clearly defined how the support to give access to water should be delivered. Is has to be clarified whether the focus should be on urban water supply, or it should address the needs in rural small-town communities. Another question is whether the support should be concentrated in a few countries or should be more regionally distributed. Since the aim is to provide access to clean water to app. 6 million people, the support must at least for some of the projects be in the form of new infrastructure or rehabilitation of existing schemes. In that context the question arises how much funding should be allocated to water source protection and management and to other types of more soft activities in terms of institutional arrangements and capacity building.

As mentioned above, the support on water should be seen in a broader context also addressing issues with relation to health, hygiene and climate adaptation. For this reason, the interventions to get access to clean water should be widened to include activities to assess and secure the quality and the long-term availability of the source water as well as water quality control and monitoring of tap water.

To be able to define and design future concrete activities, the lessons learned from previous types of interventions on what has had the most efficient and sustainable impact in terms of giving access, is analysed (see Annex 1). These lessons learned are then combined with current trends and drivers within the water domain with relevance to Africa. Based on such a combined review the most appropriate and up-to-date interventions can be defined.

4 DRIVERS AND TRENDS IN THE WATER SECTOR RELEVANT FOR AFRICA

To define the type(s) of future projects to be initiated, it is crucial to understand which drivers and trends will govern the water challenges to be met in Africa. These drivers and trends frame the current approaches and features, which are reflected by the development of new technology in the water tech business and by the management approaches and principles currently taken up and applied within public institutions and political organisations.

To respond efficiently to the drivers and trends, and their medium- and long-term implications in a coordinated and coherent way, proactive and effective institutions, onboarding of multidisciplinary skills and expertise, absorption of new and innovative approaches and technologies, and last but not least good and accountable governance structures are required.

The global drivers will govern the thinking of water specialists and water institutions in most developed countries in the coming years. In Africa, however, it is not evident that all these drivers and trends will have the same significant impact on how the water sectors will develop. Some of them, which have materialized within the last decades in the developed countries and to varying degree beyond, are mentioned below and relates to an African context, indicating how significant they are for defining the future development support to Africa on water.

4.1 Main drivers

One major driver above them all will be the imperative to reach the SDG's, which will demand new solutions and technologies to succeed. For achieving access to water, SDG 6.1 is the most relevant goal, although a number of other SDG's are also addressing different challenges with relation to water. A few overall drivers, however, are prevailing:

Climate change

A major driver for development of new water solutions are the impacts of climate change on the water cycle. It is broadly acknowledged that climate change does not change the overall water regime qualitatively but should rather be seen as an accelerator of the already existing challenges in the water sector. In this context, climate change has drastically changed the criteria for sustainability of the interventions.

It is of utmost importance that the supply schemes involve long-term security of a water source of adequate quality and quantity under water stress accelerated by climate change. The definition of sustainability of a water project is indicated as its ability "... to maintain or expand benefits for a long period after project inputs have ceased"[9]. Therefore, there must be much more focus on water resource and catchment assessment with climate change accelerating the effects on the water cycle.

Climate change will have a multitude of short- and long-term impacts on water resources in African countries. These include flooding, droughts, sea level rise, drying up of rivers, and poor water quality in surface and groundwater systems. These effects will together have huge impacts on ecosystems and communities, ranging from economic and social impacts to health and food insecurity, all of which threaten the continued livelihoods of many regions in Africa.

It will not be the same all over Africa. Climate change will increase already existing water stress in some countries, while other countries, that currently do not experience water stress, are likely to become at risk in the future. In some regions, i.e., in Sahel, climate change has accelerated the seasonal differences in precipitation causing flooding in the rainy season and droughts in the dry seasons[10]. Here, a solution could be to ensure that the stormwater is infiltrated to the aquifers to prevent evaporation and flooding from surface runoff and sewer overflows, and to replenish the aquifers for abstraction and use later in the dry season[11]. In such areas the solution is a combination of enhanced use of groundwater for water supply and managing aquifer recharge of stormwater.

Several countries in Africa will exceed the limits of their usable land-based water resources before 2025 even without climate change. It was estimated already 15 years ago that about 25% of Africa's population (about 200 million people) experienced high water stress. The population at risk of increased water stress in Africa was projected to be between 75-250 million and 350-600 million people by the 2020s and 2050s, respectively[12].

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9 Rural water Supply Project in Iringa, Mbeya & Ruvuma Regions, Tanzania. Government of Tanzania & Danida. Completion Report, Phase IV. Volume 1: Main Report. July 2000.

10 C.J. Li, et al. (2016), Spatio-temporal distribution of flood disasters and analysis of influencing factors in Africa, Nat. Hazards, 82(1), 721–731, doi:10.1007/s11069-016-2181-8.

11 K. Villholth et al. (2020) Integrated groundwater management in a semi-arid diverse stakeholder catchment in Limpopo Province, South Africa. Proceedings of the 15th DWF Water research Conference. 4 February 2020.

12 Boko, M. et al (2007). Africa. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, et al (Eds.), Cambridge University Press, Cambridge UK, 433-467.

These figures will be even worse under a climate change regime. In fact, the year 2019 was recorded among the three warmest years for the continent and this trend is expected to continue. Climate change predictions of increased temperatures as well as more fluctuating rainfall patterns are likely to lead to a decrease in recharge, as more water will be lost to transpiration and evaporation.

In Ghana, for example, over 6 million people (20% of the total population) lack access to safe water supply, and climate change is mentioned as one of four factors causing this situation together with rapid urbanisation, poor governance, and payment for services[13].

Other drivers severely influencing African societies are migration and the current COVID 19 pandemic.

The COVID 19 pandemic is causing a paradigm shift in the thinking of citizens and governments worldwide and in Africa as well. It is without doubt a game-changer, which will have significant effects on many donor activities ahead. In the first place there will be focus on the importance of having clean water at hand to deal with this threat and in this context it is obvious to learn from sanitation and hygienic aspects addressed in the WASH approach.

4.2 Trends

Together with the overall global drivers, which have pushed for a sustainable and green agenda, some significant trends have set their mark on how the water sector has developed in recent years under influence by already existing framework conditions and by related drivers:

Circular economy (CE) in the water sector

Globally there is a trend towards implementation of circular economy in the water sector especially in wastewater treatment, where larger Waste Water Treatments (WWTs) are transformed to resource factories, producing energy, recycling phosphate and other materials and in some cases also reusing reclaimed water for various purposes, thereby closing the water cycle.

CE in water supply schemes is not focusing on resources recovery and reuse, but rather on how to reuse drinking water for other purposes after simple treatment, such as irrigation or grey water in toilets and other household activities not requiring drinking water quality.

13 Isaac Asante-Wusu (2020) Why local solutions are best for urban water supply in Ghana. The Conversation. March 2020. https://theconversation.com/why-local-solutions-are-best-for-urban-water-supply-in-ghana-133236

Therefore, water will in the future to a higher degree be treated to a quality 'fit for the purpose', and a number of alternative water sources, such as rainwater, stormwater and reclaimed wastewater, will be introduced in the new water supply schemes.

There is an ongoing debate whether the water sectors of Africa are ready for implementing CE in a larger scale. There is no doubt that given the right conditions in terms of financial instruments, partnerships – i.e., in PPP arrangements – and innovation readiness, there will be a good basis for CE in some countries. The Executive Committee of the African Circular Economy Network (ACEN) has expressed the opinion that "Indeed, we strongly believe Africa is one of the most 'ready-for-circularity' continents, mainly because its ecological footprint is still very low. The chances of moving into a circular business model are easier than in other continents where most infrastructures are already built without their next life cycles in mind. One of the biggest opportunities for Africa is remanufacturing and refurbishment".

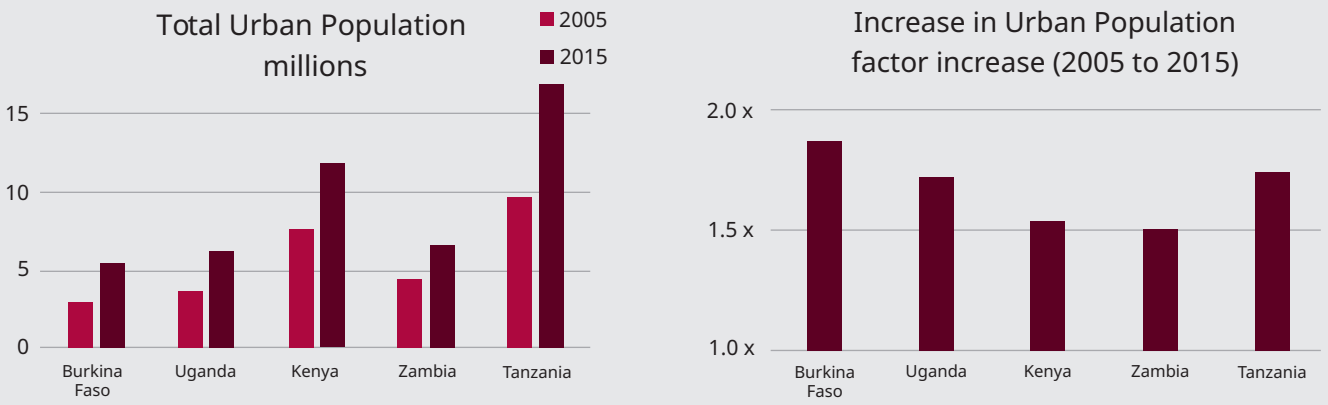
Urbanisation

Urbanisation – because of population growth in general and migration from the rural areas to the cities – has for decades had a huge impact on African societies, and it will also in the future define how the water sector will develop in many countries.

In an OECD survey including five African countries, Tanzania faced the largest challenge, with 7.2 million more urban people served over the period 2005 to 2015 compared to Kenya with 4.1 million and Burkina Faso, Uganda and Zambia with 2.2 - 2.6 million more people (Figure 1)[14].

14 Access to Water and Sanitation in Sub-Saharan Africa. Review of Sector Reforms and Investments, Key Findings to Inform Future Support to Sector Development. Part I – Synthesis Report. GIZ, January 2019.

FIGURE 1. URBANISATION IN 5 AFRICAN COUNTRIES



Source: Country case studies

Urban population grew by a factor of between 1.5 and 1.87 in the five countries, with Burkina Faso facing the largest challenges in proportional terms (+87%). Uganda's extent of urbanisation, 16% in 2015, was lower than the other countries with the proportion of the population living in urban areas in the other countries ranging between 25% (Kenya) and 40% (Zambia). High rates of urban population growth are expected to continue in all five countries.

It is obvious that this trend will have a huge impact for provision of water in the urban domain. However, it will not reduce the challenges in the rural areas, since it might lead to a situation with less investments in local rural communities, even though it is often in such areas where water scarcity has relatively higher impacts, since the rural population is dependent on access to water not only for domestic purposes, but also for agriculture.

Digitalization

Digitalization is the innovation trend introduced to give water technologies and solutions more efficiency and functionality by linking digitally services to customers, and better link utilities and consumers.

It has been claimed that Africa is very well geared to absorb digital water solutions. In many African countries, digital services have been widely applied based on the coverage of mobile phones, which are used for numerous purposes including data transmission, telecommunication, banking, insurance, retail payment, etc. Digitalization is taking place in the water sector as well, mostly in rather simple applications with digital payment devices – mostly for cellphone payment – connected to drinking water dispensers or water kiosks. For low-income customers, it is easier to pay with smartphone applications for what they consume

in smaller amounts rather than a lump sum at the end of a billing cycle. Using mobile-enabled payment methods also saves customers time and money by providing a secure channel to pay for water at a fair and set price without the need to travel to a local utility office. Furthermore, digital payment has been shown to mitigate petty corruption[15].

African water supply operators are, however, ready to move to the next level with more integrated and digitalized water supply installations in small waterworks with mini-grids to serve more users instead of a large number of separate wells and taps, which are more difficult to manage and operate in terms of technical maintenance, water quality control and customer services.

Decentralization

There is a trend towards decentralization of public services provided by i.e. utilities, both geographically or digitally and in terms of administration. Management should be located or perceived near the users of the services to enable them to encode and respond quickly to the needs of the users and to communicate with the users.

It seems like a good idea to promote a development towards involvement of local communities in water supply schemes in rural Africa, which has been the case in numerous water supply projects across Africa – although applying different organisational set-up. However, it is widely recognised that decentralization reforms through local governments only are effective if certain conditions are met[16], including aspects of local government accountability. But it has also been shown that decentralization trends enhanced accountability and efficient and effective service delivery[17]. Some experiences with decentralization have shown that central authorities are sometimes reluctant to delegate responsibility to local communities or districts both for financial and administrative reasons[18].

The nature context

Nature as the fundament for life is seen as an upcoming driver for human activities. Nature must be protected and managed sustainable

15 Aaron Krolikowski. Can Mobile-Enabled Payment Methods Reduce Petty Corruption in Urban Water Provision? Water Alternatives, 2014, 7(1): 235-255.

16 Jesper Steffensen. Draft Note on Water Sector Decentralization. Danida. 2010.

17 Nyika Joan Mwihaki (2018). Decentralization as a tool in improving water governance in Kenya. Water Policy, 20 (2), 252-265. https://doi.org/10.2166/wp.2018.102.

18 See i.e., Review-cum-Appraisal of Water Sector Programme Support, Phase I, 2006 – 2011 & Water Sector Programme Support, Phase II, 201-2013 in Zambia. Danida, July 2011.

to ensure the wellbeing of future generations, and all humanactivities must be subordinated the consideration for the nature as such. This trend is reflected by the focus on biodiversity and nature-based solutions (NbS), which means actions which at the same time restore and protect nature and use nature to solve problems caused by adverse effects of antropogenous stress, such as pollution or climate change. NbS have gained increasing interest also in an African context.

In the water domain, a number of NbS have been developed, some of them in large scale such as the one funded by the Upper-Tana Nairobi Fund, which addresses the challenge of severe erosion and nutrient runoff into Nairobi's water supplies by helping upstream farmers implement practices, that both reduce erosion and increase agricultural yields[19].

Others apply rather simple and site-specific technologies, which require a minimum of expertise to operate and maintain using natural ecosystems to work for the benefit of the communities. See Box 1 on page 23 for examples of such simple NbS within the water sector.

NbS are very promising as solutions to combat climate change effects particularly when it comes to managing the water cycle. Yet it remains to be adopted at the scale required to have meaningful impact.

NbS have gained a lot of support by water specialists worldwide, but more investigations are needed, if such solutions shall overcome the scepticism of investors and decision-makers concerning their reliability and cost-effectiveness compared to engineered solutions.

Co-creation

Stakeholder participation has been in focus in donor support for many years, especially in projects targeting local communities. When it comes to larger infrastructure projects in the cities and involving decision-makers at governmental level, it has not dominated the thinking to the same degree. However, there is a new sense of a design co-creation approach that brings people together to collectively produce a mutually valued outcome, using a participatory process that assumes some degree of shared power and decision-making. The idea is that such an approach enhances local ownership of the programming and lower the programmatic risk[20].

Co-creation practices also pave the way for a switch towards a new approach in water management. Water supply management concepts until recently have been dominated by a supply driven practice, meaning

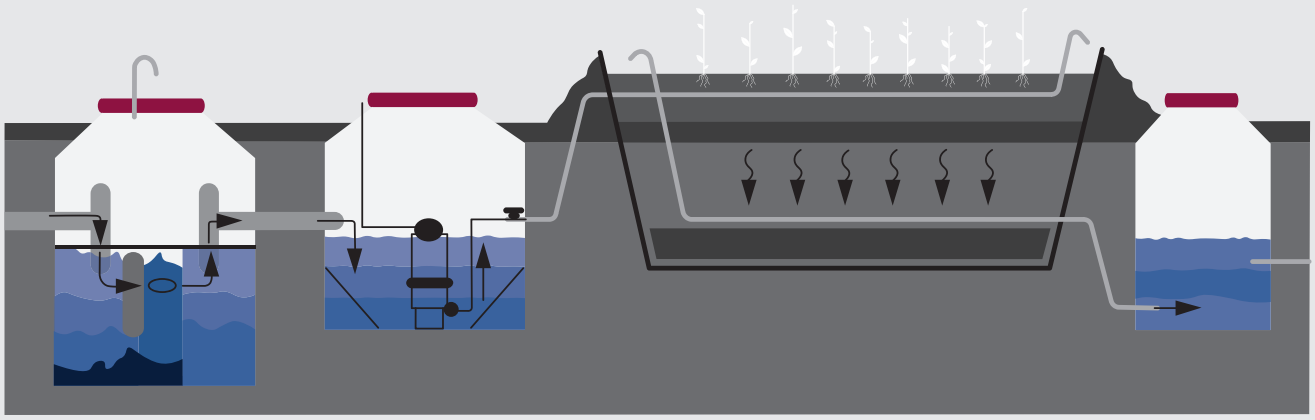
19 F. Miralles-Wilhelm and T. Iseman (2021). Nature-based solutions in agriculture. The case and pathway for adoption. FAO and the Nature Conservancy.

20 Discussion Note: Co-Creation Additional Help. USAID, 2017.

that all responsibility was placed on the water supplier and the public authorities responsible for the water supply. Now – facilitated by a new sense of co-creation, which links supplier and user together – the perception is in favour of a more demand driven water supply. This trend influences the design of new technologies, and the increased digitalization is a driver for this new way of thinking.

BOX 1: EXAMPLES OF NATURE-BASED SOLUTIONS (NBS) IN THE WATER SECTOR

Rootzone system



Biological degradation takes place in the rootzone and is enhanced by diffusion of air down in the soil along the plants, which are selected based on their ability to facilitate the air transport. Flow may be either vertical or horizontal. The plants can be harvested for different purposes.

Managed Aquifer Recharge

Surface water, stormwater, reclaimed wastewater and other slightly polluted water sources are artificially infiltrated to the groundwater in specially equipped infiltration pitches, trenches or wells thereby at the same time cleaning the water by the soil during passage through the soil layers and recharging depleted groundwater aquifers.

This is also in line with more focus on user and consumer behaviour as a strong tool to obtain more sustainability in water management. While it used to be the responsibility of the public institutions, including the utilities, to ensure sustainable production and use of the available water, there is now a shared responsibility with the users to ensure enough water for the future. The users themselves have to show and exert awareness towards sustainable use of the water resources in terms of water saving and water protection. Such a shared responsibility requires a much more focused effort on education and awareness raising from central and local authorities and decision-makers.

Private sector participation, commercialisation and entrepreneurship.

It will take huge investments in drinking water supply and wastewater treatment and in other water management services (water efficiency, mitigation, protection, reuse, saving, monitoring, etc.) to meet SDG 6. World Bank estimates a tripling of global investments to more than USD 300 billion a year. Climate change and urbanisation lead to adverse effects on the water quality and water availability in some of the most densely populated areas in the developing countries. Neither public sector finances nor ODA budgets can meet the financial requirements of the SDG targets. Focus is therefore increasingly on how private finance can be mobilized.

The main challenge is that water is seen as a public good and cannot be sold on commercial terms as large part of populations would not be able or willing to pay for the water. In many countries, the water sector is organised with utilities based on full cost recovery or loss coverage that do not allow for profit-based pricing system. However, it is a dogma that there is little willingness to pay among domestic consumers. On the contrary, if the drinking water delivered has the expected quality, many consumers are willing to pay, if the alternative is to spend hours and valuable time to collect and transport water – primarily by women – from distant sources[21] [22]. In cases with consumers who are not able to pay, a solution could be cross-subsidy schemes with distribution system connecting to both billed and non-payable consumers. This could at least allow for local private sector organisations to operate small schemes with some profit. For larger schemes, which require private investors at a larger scale, some countries have made use of blended finance mechanisms (PPPs) with private ownership stake in public facilities and assets such as asset divestiture, DBOs, BOTs, and different types of utility services (leases, concessions, operating contracts, etc.).

The attempts to introduce blended finance mechanisms as part of the development support folio has within the last decades led to a change in mindset in the developing countries favouring commercialisation and entrepreneurship as a means to solve some of the challenges in the water sector. Previously there has been a push in many water supply projects to leave the operation and maintenance of water supply schemes to local private stakeholders. This has proven successful in some cases but has also failed to be a long-term solution in other cases18. This renewed entrepreneurial mindset has fostered the development of incubator environments also in Africa, i.e., in Nairobi, Kenya competing for the next technological breakthrough for solving water challenges, often linked to the effects of climate change.

21 Rural water Supply Project in Iringa, Mbeya & Ruvuma Regions, Tanzania. Government of Tanzania & Danida. Completion Report, Phase IV. Volume 1: Main Report, July 2000.

22 Evaluation to Danish support to water supply and sanitation. Danida, May 2007.

5 THE DANISH RESOURCE BASE – DANISH STRONGHOLDS WITH RELEVANCE FOR PROVIDING ACCESS TO WATER IN AFRICA

The Danish resource base is well fit for a future development support to Africa on water. First, because of a long tradition of supporting African countries especially in SSA, Danish water experts are familiar with the conditions on the continent, including the prevailing societal issues to be reflected when designing the development aid activities (economical, political, behavioural aspects). Second, when focusing on the professional expertise and the technical and management solutions, a number of Danish strongholds can be brought in place. Below, some of these strongholds are listed.

5.1 Areas of expertise

Groundwater

Danish drinking water supply derives 100 % from groundwater for all purposes, and it is distributed after abstraction and very simple treatment – and without addition of chlorine – to all users, including domestic consumers, industry and agriculture. Therefore, it has for many years been an imperative for Danish authorities to manage groundwater properly to ensure safe drinking water for all. For the same reason, reliable and up-to-date technologies and solutions have been developed over the years to give Danish companies a leading position worldwide on groundwater expertise, know-how and technologies. Many of these competencies have been put in place in Danish development support by Danish consultants, water tech companies and contractors.

The groundwater management areas of expertise include the following:

- **Groundwater mapping.** While practitioners often have had to rely on often out-dated and misleading hydrology maps for identification of suitable groundwater aquifers, a Danish technology based on geophysics has been developed as part of the Danish national mapping program which took place 2002-2019. This technology using airborne TEM technology is now world leading.
- **Groundwater monitoring.** A groundwater monitoring programme has been in place since 1987 as a consequence of the National Water Environment Plan II, long before the launch of the EU WFD from 2000. All data from the groundwater monitoring programme have been placed in an openly accessible database called Jupiter, which in

terms of transparency and data-based groundwater management is an example for many countries round the world.

- **Groundwater quantity assessment.** The Danish management approach is based on a total water cycle concept, and water quantity predictions at local and regional scale as a result of climate change effects and groundwater abstraction can be carried out by using a Danish national hydrological model, called the DK–model, which is a unique tool in an international context.
- **Groundwater quality assessment.** For water abstraction permits, water quality assessments have been carried based on state-of-the-art sampling and analytical techniques for decades. Lately new online sensor technologies for both organic contaminants and microorganisms have been developed by Danish companies.
- **Groundwater protection and pollution control.** Denmark has a long tradition for groundwater protection by various measures to control contamination from contaminated sites, agricultural practices (pesticides and nitrate), and waste, including source mapping, regulatory restrictions, and groundwater remediation.
- **Groundwater-based drinking water production and supply.** Danish municipalities and rural towns have operated both small groundwater-based waterworks and larger utilities for years and have achieved world leading experience in utility operation and management, groundwater treatment, smart water distribution (pumps, valves, NRW/leakage detection), and smart metering.

Water savings and water efficiency

Even though there is not water scarcity in Denmark – except for some very restricted areas – Denmark and Danish stakeholders have advocated for and implemented water savings for years. As a remarkable result, Copenhagen and other cities in in Denmark have managed to reduce drinking water consumption from around 170 liter/capita/day in the 70es to 103 liters/capita/day in 2019. A number of tools have been launched to secure this result, including, educational and awareness campaigns at all societal levels, introduction of water reuse options, development of water saving technology in households and agriculture, etc.

Climate change adaptation and flood management

As a result of allocation of huge funds for climate adaptation by the municipalities in recent years, Danish institutions, utilities and private companies have developed state-of-the-art solutions and technologies on how to prevent and/or combat urban flooding and other effects of climate change. In Copenhagen alone, some 2 billion EUR have been allocated for this purpose.

Integrated water resources management (IWRM)

The concept was introduced by the international water community with Danish water experts as very engaged participants at the International Conference on Water and the Environment (ICWE), in Dublin in 1992, which introduced the so-called Dublin Principles. The concept was defined by the Technical Committee of the Global Water Partnership (GWP) as "a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems." It is based on three principles: social equity, economic efficiency and environmental sustainability. Danish consultants have from early on dedicated themselves to these principles and have carried out several studies on IWRM across the African continent and beyond. Therefore, there is broad knowledge and expertise on IWRM in the Danish resource base.

Digitalization of water technology and services

Digitalization is one of the vectors of modern water technology, and Danish companies – driven by the demand of Danish utilities and authorities and the international market competition – are in the forefront when it comes to digitization and digitalization. Good examples are within operational control systems for water works, which have been introduced internationally, i.e., China, and smart water metering connecting water companies and users digitally.

5.2 Consortia and partnerships

One other feature of the Danish approach is that water specialists across the sector work together in all stages of water projects in crosscutting multi-stakeholder consortia delivering so-called system solutions. Such arrangements are especially relevant when delivering tailormade solutions, such as small waterworks, where all components should be communicating digitally both inside the works for process control and regulation and outside the works with the end users ensuring the optimal service in terms of quantity and quality of the water.

Not all services need such multi-stakeholder arrangements, but most projects at least require good communication between the different service and technology providers and with the customers to reach the objectives. The Danish resource base has such cooperative and communication skills, which have proven competitive in international markets – especially in times where co-creation is a trend for successful project planning, design and implementation.

6 REVIEW OF PREVIOUS DANIDA SUPPORT TO AFRICA

6.1 Methodology

The review of previous Danida support should provide a basis for decisions on the type of projects and interventions to be initiated to achieve the goals of creating access to clean water to 2.3-2.9 million people and at the same time addressing the health and climate change issues related to water. To provide a basis for such a decision, the review consists of three steps:

- An outline of a best practice on a holistic and systematic water supply management approach to give access to water, on what steps to be included in the implementation of water supply projects to obtain impact and sustainability. The projects can then be reviewed using this exemplary approach as a reference to analyse whether they have taken into account the different aspects in the way they have been implemented.
- A review of selected concrete projects and programs previously carried out across Africa with an emphasis on sustainability of the interventions and some considerations on why the projected have succeeded or failed (Annex 1).
- A summary of the findings and conclusions of the review of the projects in terms of relevance, efficiency and applicability for a future support to give access to clean water in the coming years – taking into account the importance of long-term sustainability of the interventions and the relevant trends and drivers described in Section 4.1.

Based on these findings, a way forward to select project modalities to be initiated for the coming years is described, and some recommendations on the future support are given.

6.2 Water supply as part of a holistic water cycle management

The suggestions on the way forward and the recommendations should be given bearing in mind that the effort both should target a concrete and quantitative goal of delivering access to certain number of people by 2023 and at the same time fulfil criteria of the interventions on sustainability and on improvement of hygiene, health and adaptation to climate change. The previous projects should be reviewed based on an

understanding of a holistic view on the process on providing access to water.

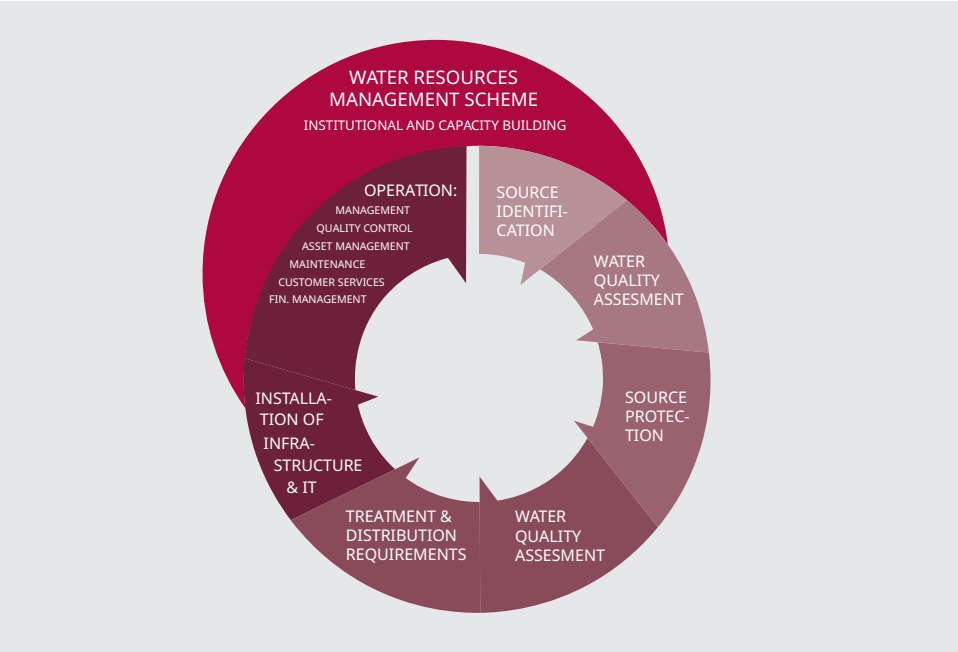
Denmark is a good example on how such a holistic approach is structured and implemented. This is because Denmark has a long tradition for provision of drinking water for the society, including all aspects from institutional, policy and regulatory framework, management schemes, to infrastructure on drinking water protection, abstraction, treatment, and distribution. The Danish water supply and water resources management schemes are to some degree framed by the EU Water Framework Directive (WFD) and the Drinking water Directive, which applies such a holistic view on water catchment management which takes into consideration the whole water cycle. Whether the thinking behind WFD is suitable in a context of i.e., IWRM and catchment management in the developing countries is being debated[23].

Ideally, A holistic and systematic water cycle management, which is governing all activities eventually leading to increased access to water on the ground in a certain area to both domestic, agricultural and industrial users, has to involve a sequence of steps – which can be illustrated as by the figure below:

- To establish proper institutions with skilled staff and adequate resources and build a management framework.
- To find a suitable raw water source for the production of drinking water, to assess the quality and the quantity of the water source under different climate scenarios and to avoid overexploitation and source depletion, and to define measures to protect the water source to ensure long-term water availability and establish monitoring programme.
- To design the water supply schemes taking into account the quality of the source water and the needs of the users to be served, including water treatment, distribution, metering etc.
- To establish procedures for management, production, operation, control, maintenance, etc. to ensure operational and financial sustainability.

23 Sonja Heldt et al. (2017) Is the EU WFD suitable to support IWRM planning in non-European countries? Lessons learnt from the introduction of IWRM and River Basin Management in Mongolia. Environmental Science and Policy, 75, 28-37.

FIGURE 2. SCHEMATIC ILLUSTRATION OF THE STEPS INVOLVED TO ESTABLISH A WATER SUPPLY SCHEME



To close the loop of the water cycle, the above-mentioned steps to ensure access to drinking water should be followed by proper waste-water treatment to protect the water source and to avoid contamination of the water source used for the water supply.

At village and small-town level, complex and advanced wastewater treatment plants should not be installed, and the communities should rely on other simpler types of treatment, i.e., root zone plants or managed aquifer recharge. Such technologies might also enable the reclaimed wastewater to be reused for other purposes than drinking water, i.e., irrigation.

This approach is also relevant in an African context, but the focus should here be 1) to ensure the quality and quantity of the source water in a long-term perspective including relevant source protection measures and 2) to establish robust water supply infrastructure and a manage-ment and financial scheme which will ensure long-term operation of the scheme.

An observation is that it seems as if the Danish water resources management approaches applied in Africa and other Third World countries by Danida and experts working with Danida projects do not reflect or refer to the WFD thinking and vocabulary. The development community has instead developed its own theoretical basis and practice inspired by the UN and likeminded organisations – despite the fact that many elements are very much comparable. This is partly justified by the fact that conditions in the developing countries are quite different from condition in Europe.

6.3 Lessons learned from Danida projects

A number of different project areas with relevance in a context of providing access to clean water have been implemented over the years within the different aid delivery mechanism and programmes. These include in the first place water supply (WS), water supply and sanitation (WSS) and water supply, sanitation and hygiene (WASH) projects. Many of these projects which have included building of physical infrastructure and installation of management schemes, have been complemented with integrated water resources management (IWRM)[24] or catchment management projects and with different types of capacity building and policy and management support. Only projects in relation to these categories are reviewed in this study in terms of their impact to deliver access to water[25].

In some cases, water in treated in a broader context as part of Environmental Sector Programmes (ESP). Although such interventions in Tanzania, Ethiopia and Egypt are relevant in a water context, they are not taken into account in this review.

The last category of relevant interventions is the water research projects. They are funded through by DFC as specific PhD projects or through programmes like ENRECA or SSC (Window 1 & 2) or as part of sector support programmes, i.e., in Zambia. They are not reviewed here either since they are not considered per se to deliver access to water.

It should also be emphasized that a significant part of the support for water is delivered through multilateral interventions, either through specific multidonor arrangements or through the multilateral organisation and development banks.

Although this support has contributed significantly to the overall effort to give access to clean water across Africa, it is only partly covered by this review.

Besides the different types of areas covered by the projects, project implementation has taken place through a number of different project modalities, which changed with time and by the influence of the current thinking in the development aid community at the time of design and implementation of the projects.

24 A note on IWRM is prepared as Annex 2, since an IWRM component is often carried out in connection with WS and WSS studies, often claiming to involve a water resources assessment component.

25 Annex 1.

Starting already in the early 70'ties, water was prioritised, although the geographical focus changed over time and different aid delivery mechanisms and approaches governed the interventions. However, there is not a very strict time limit as to which the different project modalities have been implemented.

- **Area-based project support.** In the 80'ties the development support took place through area-based project interventions, and such projects were also implemented later, but then often as part of more comprehensive package. These projects, i.e., RUWASA I programme in Uganda[26], the Community Water Supply and Sanitation component[27] under the Water sector programme Support package, and the groundwater supply project in Malawi[28] were often demand-driven, decentralized, often long-term interventions, carried out at community or district level, in a specific area and through specific projects on the ground.

  A number of these water projects aimed at building water supply schemes in villages. The projects were implementation on the ground merely to establish infrastructure, i.e., abstraction wells or small-town waterworks.

  Many of the projects seem to have had a rather narrow focus, i.e., they were carried out without a prior assessment of the water source – aquifer or fresh-water body – to be used as raw water, and in some cases how to ensure pro-tection of this water source onwards by establishing groundwater monitoring programmes and water quality control procedures. This was the case for the District Based Water and sanitation Component of WSSPSII in Ghana[29].

  In many of these studies, the governance structure designed for the action did not ensure sustainability. The institutions involved, the level of leadership, and the management set up were in many cases not convincing in terms of being able to deliver the expected outcome of the interventions.

26 Evaluation of Water, Sanitation and Environment Programmes in Uganda (1990-2017). Danida, February 2019.

27 First joint technical Review of the Community Water Supply and sanitation Components in Greater Accra and Eastern Regions. Final report. Danida and Ministry of Works and Housing, Community Water & sanitation Agency, January 2001.

28 Evaluation of four supply projects, and appraisal of Karonga Lakeshore integrated rural ground-water supply project. Volume 1: Main report. Danida, April 1985.

29 Final AIDE MEMOIRE from a Joint Ghanaia-Danish Review of the Water and sanitation Sector Programme Support, Phase II. Danida, October 2005.

- **Sector Programme support.** In the mid 90'ties Danida to a certain degree abandoned the project support as the primary intervention modality to favor Sector Programme Support (SPS) which a broader focus to include policy and management components within whole sectors in selected countries, i.e., RUWASA II in Uganda22. The sector programmes were agreed at ministerial level but could still be community or district based.

- **Sector Wide Approach (SWAp).** Later in the 90'ties, this change from project support to public sector support was gradually channelled into a new approach, the Sector Wide Approach (SWAp) at least at the political level. This was characterized by a coordinated programme support to an entire sector.

  This approach was introduced in response to the observation that the fragmented donor-sponsored projects did not deliver the outcomes as expected. They were intended to provide a more coherent way to encompass government-led sectoral policies and expenditure frameworks and build local institutional capacity as well as offer a means to more effective relationships between governments and donor agencies.

  In SWAps all the support delivered was channelled into a sector to support a specific programme, strategy or policy under government control. SWAps should enable more integration with national programs and should also to a higher degree allow for coordination with other donors. The support was often pooled, either by multilateral agreements with other active donors in the same sector and country, or even with a multitude of donors coordinating their efforts.

  Such Joint Sector Programs, i.e., the PN-AEPA in Burkina Faso[30] and the JWSSP in Uganda[31] were implemented and continued during the next decades. These projects often resulted in a rather complicated set-up with very high transaction and coordination costs. Furthermore, SWAps and other similar approaches have the tendency to exclude innovative technologies and solutions, since many different stakeholders have to agree and take stocks in the decision-making. This is potentially a serious weakness especially on a continent where digitalized innovative solutions have shown viable and might mean short cuts to save time and resources.

30 Revue conjointe 2008 de la Mise an Oeuvre du Programme National d'Approvisionnement en Eau Potable et d'Assainissement a l'Horizon 2015 (PN-AEPA). Aide Memoire. Ministère de l'Agriculture, de l'Hydraulique et des Ressources Halieutiques, Avril 2008.

31 Evaluation of Water, Sanitation and Environment Programmes in Uganda (1990-2017). Danida, February 2019.

SPS and SWAp could materialize by various types of funding modalities. It could be through sector programs, basket funding[32], budget support[33], technical assistance or even as traditional projects. Although these new modalities with more sector focus on the one hand are a good basis for alignment, coordination and harmonization of the support, they are on the other hand largely based on the assumption that the recipient countries were ready for an increased ownership, transparency, and accountability which was not proven in all cases.

In reality, much of the support, also after the focus has changed to a more pro-grammatic focus, was still allocated as projects. The sector focus was maintained through the turn of the century, and during the period there was a tendency towards more donor coordination at least at an intentional level. It also took place in some countries, but was complicated for several reasons, i.e., different views on the importance of ownership by local counterparts, different project cycle procedures by different countries, and because many donors stick to projects as the main aid delivery mechanism.

- **Strategic Sector Cooperation (SSC).** In 2018, a new instrument was launched which targeted both low-income countries and middle income countries namely, the Strategic Sector Cooperation (SSC), which aims at mobilizing the competencies of Danish public authorities directly in long-term strategic cooperation with counterpart authorities in selected sectors in selected countries both in developing and growth economies. The objectives of the SSC are to contribute to the SDGs, to mobilise partnership cooperation in sectors where Denmark has a strong expertise and technology, and to engage the Danish private sector in delivering solutions to the SDG challenges in partner countries.

  Thus, it is underlined that Danish companies, including Danish tech companies, are supposed to participate directly in the SSC actions, and the expectation is that this programme can serve as a door-opener for delivering Danish solutions and technology on a commercial basis[34]. Therefore, it is crucial that the selection of programmes takes departure in those sectors, where Denmark has a competitive

32 Defined by donor contributions to funds to an autonomous account, managed jointly with other donors and/or the recipient. The account will have specific purposes, modes of disbursement and accountability mechanisms, and a limited time frame.

33 Such aid is allocated directly to a recipient country government. It is a method of financing a recipient country's budget – sometimes to a specific sector – through a transfer of resources to the recipient government's national treasury. The funds thus transferred are managed in accordance with the recipient's budgetary procedures.

34 Evaluation of the Danish Strategic Sector Cooperation. Danida, 2020.

advantage and a reputation which makes the Danish private sector an attractive partner for cooperation. Some African countries have been selected for this programme within water, namely Ghana and South Africa currently under implementation and Ethiopia and Morocco to start implementation later this year.

Also, for this sector it has proven a challenge to find the right formula to obtain the potentials, and it is recommended to improve programme guidance through dissemination of good practices. The programme is thought to be a good complementarity to Danida beneficiary countries, and countries transitioning from Danida support would be a good target for this programme, and the SSC could then build on the results from the Danida support. Both South Africa and Ghana are outliers in that sense, since the first had not been a Danida beneficiary for a long time and the second is still receiving aid from Danida on water. Despite this there seem to be good start in both countries, South Africa also being a good target because of its huge water scarcity problems deriving from climate change, and Ghana being in the forefront to absorb new innovative technologies developed by Danish companies.

6.4 General findings from the project reviews

This study has collected and extracted lessons learned from selected reviews and evaluations of previous water projects and programmes with a water supply component in Africa, see Annex 1. It should, however, be noted that most of the reviews are carried out just after or during the implementation of the schemes, and therefore cannot be used for an analysis of long-term sustainability of the interventions.

In general, the selected and reviewed water projects can be characterized by a dogmatic and somewhat reductionistic approach, although the broader holistic view was sometimes reflected in the design stages of the projects. In the reviewed projects, the focus was on procurement, construction and installation of infrastructure (hand pumps, dug shallow water wells, deep boreholes, village water piped supply schemes), capacity building, allocations of funds, decentralization of responsibilities of tasks, etc.

Only in some cases, an integrated, systematic suite of projects to ensure long-term sustainability including identification and assessment of the water resources to be used as source water, source protection activities, educational and awareness activities on the relation between water quality and health, was unfolded. In some of the reviewed projects, the lack of catchment assessment as a prerequisite for long-

term sustainability, was emphasised as a matter of major concern[35] [36]. Even in some joint programmes, such as PN-AEPA, the identification and exploration of suitable aquifers were not part of the programme strategy initially, which was notified by the joint review taking place two years after the start of the programme[37]. In other cases, this element was indeed part of the program design and implementation, i.e., the water resource management component of the RUWASA program in Uganda, which included a construction of a fully equipped laboratory, a database and training of staff for monitoring and analysis of the most relevant water quality parameters[38].

In a majority of the projects reviewed, problems with funding of operation (salaries, day-to-day expenses) and maintenance (spare parts) were observed. The financial sustainability was in most cases foreseen in the project design and set to take place through cofunding from the beneficiaries or through revenues to a local – often private – operator, but very seldomly materialised to the extent expected. In some cases, it was also due to an unclear division of roles and responsibilities of the involved institutions at different levels, and even to changes in these administrative and political arrangements occurring during implementation of the project.

It is an observation that there in the last decades, generally spoken, seem to have been an overweight of activities and components addressing – sometimes rather theoretically – administrative, management, institutional and policy issues on the expense of actual delivery and installation of infrastructure and securing long-term sustainability of operation and maintenance of the schemes, customer relations and services, and long-term availability and quality of raw water.

Another striking observation is the absence of innovative thinking in the project designs. Very little technical innovation has taken place, both in terms of selection of solutions and technologies (with a few exceptions, i.e., Grundfos Lifelink) and with respect to organisations and stakeholders involved in the development aid programmes. The need for innovative thinking and potential involvement of research

35 Rural water Supply Project in Iringa, Mbeya & Ruvuma Regions, Tanzania. Government of Tanzania & Danida. Completion Report, Phase IV. Volume 1: Main Report. July 2000.

36 Evaluation of village water supply schemes in Cameroon. Report by Hoff & Overgaard for Danida. 1983.

37 Revue conjointe 2008 de la Mise an Oeuvre du Programme National d'Approvisionnement en Eau Potable et d'Assainisse-ment a l'Horizon 2015 (PN-AEPA). Aide Memoire. Ministère de l'Agriculture, de l'Hydraulique et des Ressources Halieutiques, Avril 2008.

38 Evaluation of Water, Sanitation and Environment Programmes in Uganda (199-2017). Danida, February 2019.

institutions was pointed out by Danida in 2007[39]. It is surprising that i.e., the Danish utilities and SMEs – and even research institutions – have not been involved in the development support actions, despite the fact that most solutions at the public home marked often are delivered by multi-stakeholder consortia. Such joint solutions are a real stronghold of the Danish water sector, and the development aid could benefit from mirroring this approach – of course taking into account the specific context in the beneficiary countries.

A relatively new RDI Danida programme, the Strategic Sector Cooperation (SSC), in South Africa and Ghana, has launched a cooperation model, where such organisations are taken on board in the projects, but these projects are still mainly research and demonstration projects, which makes it more obvious to do so.

When looking at the Danida portfolio over the years as a whole – and not only the specifically reviewed projects – it seems as if there is a lack of a long-term strategy. Different principles and aid delivery mechanisms for the support have governed the concrete development aid interventions and programs over the years. Despite Danish companies and donor agencies having a very skilled and experienced resource base on water supply and sanitation and on water resources, changing political agendas have hampered a long term holistic and coherent strategy for support on water supply in Africa.

There has been too much switching from one aid delivery mechanism to the next, from one basic principle governing the support to the next, inspired by the international development aid organisations. This is perhaps inevitable, and there may be very good reasons, but the development community seems to have been rather impatient to wait for the outcome from one programme type before changing approach, and to a certain degree rather dogmatic in their thinking. This gives a picture of a time wise somewhat fragmented development support rather than a support defined by a long-term strategy.

Continued promotion of the SDG's, however, may change this stochastic thinking, since they create a unique opportunity for a long-term direction and consensus of the development aid efforts on water.

Another observation is the lack of real cooperation with the research programmes in Danida or attempts to learn from both networks and expertise obtained within these projects. This fact was pointed out by the so-called Hernes report, which back in 2001 recommended closer links

39 Evaluation of Danish support to water supply and sanitation. Danida, May 2007.

between research and development assistance[40] and this point of view is confirmed by a recent evaluation of Danida support for development research, published in 2020. Here it was concluded that a lack of an overall research strategy hampered synergies between the research and development aid, which could have supported the aid interventions[41].

There have been promising attempts to link research program to development support interventions within programme countries, i.e., in Zambia[42], but it has been more an exception than a mechanism which was taken up on a broader scale. The most significant attempts were the research components of the Water SPS pro-grammes[43] in four African countries which aimed at two different aspects, namely assisting in solving specific problems for the sector programme, and research capacity building.

Another recent exception is the above-mentioned SSC program, which aims to involve different stakeholders in the programme, including research organisations, utilities and private sector stakeholders.

40 Partnership at the Leading Edge: A Danish Vision for Knowledge, Research and Development. Report of the Commission on Development-Related Research Funded by Danida. Ministry of Foreign Affairs, Copenhagen 2001.

41 Evaluation of Danida Support to Development Research (2008-2018). Danida, March 2020.

42 Research in Water Sector Programmes. Danish Water Forum, October 2004.

43 Identification and Preparation Study of Water and Sanitation Sector Programme Support. Government of the Republic of Zambia, Ministry of Foreign Affairs, 2004.

7 CRITERIA AND RECOMMENDATIONS FOR SELECTION OF FUTURE DEVELOPMENT ASSISTANCE ON WATER IN AFRICA

The new development goal for water in Africa has the objective to increase the access to water defined partly by quantitative indicators in combination with some long-term goals to combat climate change effects and hygienic problems derived from extreme climate conditions. An important factor is the time perspective, and a quantitative goal to be reached by 2023 is already somewhat overdue. The question is how to design the engagement the coming years in order to balance the short-term goal of providing access to a defined number of people before 2023 and at the same time ensure long-term sustainability of the interventions. This is the challenge. There is a lesson learned from Uganda, where some DKK 2 billion was spent during three decades, and many of the installations are now falling apart and institutional capacity and human skills provided seem to vanish.

If future support interventions to provide access to water should avoid the risk of failure and waste of resources, the projects have to take into consideration a number of elements to ensure long-term sustainability of the effort.

To get faster results, the interventions should be built on previous efforts. Even though rehabilitation and updating of old infrastructure would not contribute as such to the quantitative goal, it would in many cases be a shortcut to improve the situation. Also, some schemes could be much more well-functioning if a few digital add-ons are installed.

Furthermore, it is crucial that the projects to be initiated are not too complex in terms of institutional arrangements, donor participation, and project cycle management.

7.1 Selection criteria based on project reviews

Based on the findings from the review of selected water projects in Annex 1, a number of selection criteria should be addressed whenever a new support intervention is designed:

- Country/ies with already existing networks and institutions – local and/or governmental – known and trusted by Danida and/or implementing partners.

- Target area of support should be selected based on the following criteria:

  a. Area or community with some institutional and human capacity in place to serve as basis for selecting the counterpart on the ground.

  b. Area with potential adverse climate change effects on water cycle, i.e., characterized by water scarcity to be accelerated by droughts and/or with seasonal precipitation patterns.

  c. Area with already identified available water source and with some knowledge on the quality and quantity of this water source.

  d. Area based on commercial interest and competencies of Danish private sector stakeholders.

- Project modality that is likely to produce some short term results in terms of increased access to water within the given timeframe (ideally by the end of 2023).
- Scoping of feasibilities study/ies to give the maximum impact on poverty alleviation, public health, climate adaptation, and commercial interest and potential of Danish private sector stakeholders.
- Identification of long-term interventions to ensure sustainability (source protection, climate change projections and predictions on water availability, training, robust management set-up for long-term operation and maintenance).
- Identification of interventions to link abatement of COVID 19 to the effort (hygiene awareness campaigns).

7.2 Recommendations for future water projects

Going through the different criteria to define and design the type of development water projects to be selected and funded by Danida to reach the quantitative goals set for 2023, the following recommendations are proposed:

- **The effort should be prioritised and focused**, both in terms of number of projects and number of locations and countries involved. It is better that the projects are few, but reaching more people without being too complex, and that the interventions are designed to achieve sustainability in terms of water resource assessment, operational management scheme, technology selection, financial set-up, and availability of necessary skills and resources.

- **Selection of countries or areas with a significant challenge related to climate change.** The project(s) should target areas/countries in the arid or semi-arid part with water scarcity – or at least water stress – in combination with significant seasonality in precipitation in Sub-Saharan Africa (SSA), which points primarily at Western African Sahel countries such as Burkina Faso, areas of Ghana, Mali and Niger, and to a certain degree at Eastern Africa, Kenya, Tanzania, Ethiopia, and the Cape region in South Africa[44] [45]. These are also countries with previous Danida projects on water supply. In the first hand,two to three countries should be selected in order to obtain visibility and cross-applicability of networks and contacts in the beneficiary country.

- **Use a project approach** as the one applied in the Water and Sanitation Sector Programme Support Phase I and II[46] in Ghana based on a decentralized, district-based modality combining a component of infrastructure installations with components on water resource assessment/IWRM, educational and awareness, and capacity building where needed.

- **The projects should primarily target areas with groundwater** as the primary raw water source and schemes for rural small-town communities to match the Danish resource base and competencies.

- **The projects should at best target construction and installation of small, mini-grid based waterworks, equipped with smart, digitalized state-of-the-art technologies**, i.e., for water quality control (sensors), treatment, distribution, payment, customer services, and operational procedures, which in fact have proven more robust that traditional hands-on technologies. Such small waterworks will be matching the need in both rural villages and in peri-urban settlements with no water infrastructure in place. The schemes could gain from experience with mini-grid systems in the energy sector, like the KOPA Solar concept in Kenya[47], which is applying a smart-phone-based pay per amount technology platform. The concept has shown a remarkable and surprising willingness to pay among underprivileged users, thereby proving a business model for private investors to enter. Another advantage of focusing on grid systems is they can integrate customers with an ability to pay with customers who do not

44 S.E. Nicholson (2016a), An analysis of recent rainfall conditions in eastern Africa, Int. J. Climatol., 36(1), 526-532, doi:10.1002/joc.4358.

45 C.J. Li, et al. (2016), Spatio-temporal distribution of flood disasters and analysis of influencing factors in Africa, Nat. Hazards, 82(1), 721-731, doi:10.1007/s11069-016-2181-8.

46 Aide memoire of Joint Ghanaian-Danish Review of the water and sanitation Sector Programme support, Phase II, October 2005.

47 https://m-kopa.com/

have the ability in cross-subsidy arrangements, thereby still securing a business model for private investors in a PPP arrangement.

- **The type of projects could be tendered as multi-stakeholder system solutions** as defined during the launch of the water vision from 2010 and onwards. Such a system solution, i.e., for a small-town waterworks applying state-of-the-art hardware and software, was described as a component in a demonstration project within the China Europe water Platform for inspiration. A system solution is an integrated solution with all the tech providers together with designers and service providers with expertise on operational aspects on board in one consortium.
- **Danida aid interventions should cover feasibility, design and implementation of water supply schemes.** If the intervention is thought to be upscaled by private capital, it is a challenge that the Danish water sector does not have an integrator as i.e., the energy sector, where Vestas has played that role, which can be acting on behalf of a consortium to mature projects. The integrator is the lead contractor of the consortium delivering the whole package of services and to make a financial arrangement for replicating/scaling the system solution, i.e., by loans from DSIF or investments from the SDG Fund or similar facilities.
- **Use the Danish development aid to leverage private financing in scalable blended financing mechanisms** to achieve scale. To attract private capital, a business model for the water supply schemes must be available. It could be either by selling the water in cross-subsidy arrangements to secure revenues as mentioned above or by establishing the schemes and infrastructure and generate earnings by replicability of the system solutions.
- **To ensure sustainability, the infrastructure projects should be preceded by or complemented with catchment assessments**, i.e., including hydrological climate modelling studies[48], to predict the long-term availability and quality of the source water. Complementary projects targeting plans for source protection – groundwater monitoring, well protection, area use restrictions, awareness programs, etc. – should be implemented as well. Further to achieve sustainability, it must be ensured that the schemes are established with a transparent and accountable management set-up, which have been agreed upfront with the local partners and responsible authorities, and a socially responsible leadership with focus on equitable

48 See i.e. Millicent Obeng Addai et al. (2021) Holistic groundwater resource characterisation and assessment model for the Nasia Basin, Northern Ghana. Proceeding of the 15th Annual DWF Water Research Conference, 4 February 2021.

supply of water for all users taking into account the specific social context.

- **Despite challenges to define a sustainable institutional PPP model, seek to secure private sector involvement for operation, service and maintenance of rural water supply schemes based on long-term agreements.** The water supply schemes should be designed such that it allows for operators to generate revenues to cover maintenance and operational costs for a reasonable timeframe, and for involved private companies or investors to give an upside. It could be by establishing PPP arrangements with the public part and Danida to cover the first years of operation and leaving the long-term operation to a specifically established private project company.

ANNEX 1

Short reviews of selected water supply projects

Ten water supply projects were selected for review of performance in terms of technology, water source, rural/urban setting, operational aspects and sustainability according to the criteria listed in Section 5.2.

Village Water Supply Schemes, Cameroon

This programme included the installation of village water supply schemes including waterworks and piped distribution systems in 42 villages[49]. The programme was established under the responsibility of the Directorate of Rural Engineering (GR) and was the first to include a piped rural water scheme in Cameroon. Before that all the rural water schemes were either shallow wells or deep boreholes.

It was shown that the village rural water supply schemes were only utilized 12 % of its maximum at the time of the review. To be able to enhance its utilization rate, the distribution system should be extended significantly.

The quality of the drinking water served by the system was sub-standard, since measurements of bacterial contents showed too high counts. The reason was that the groundwater used was mixed with surface water, for which the treatment filters were not adequate for obtaining the necessary water quality. For this reason, the treated water was dependent on chlorination, but chlorine contents were found to be too low in 14 water works. It was not indicated whether any health studies were carried out in relation to the operation of the village water supply schemes due to the poor water quality.

In terms of sustainability, nothing is indicated on operational drawbacks due to failing supply chain procedures or downtime of the drinking water production. Only minor problems with blockage of or breakdown of technical installations were reported, except for problems with chlorine dosage pumps. It is concluded that the quality of the equipment was high comparable to technology used in Danish waterworks. The criteria for selection of the sites for the waterworks reveal, that due to

49 Evaluation of village water supply schemes in Cameroon. Report by Hoff & Overgaard for Danida, 1983.

lack of hydrogeological information this was done by asking people about availability of water sources in the vicinity of the villages also during the dry season. No assessment of the water quality of the selected water source seems to have taken place. It is also noted that nothing is done to ensure proper source protection from pollution from antropogenous activities, and the wells were not protected from human activity or polluted surface water seeping into the well from the surface.

Four water Supply Projects, Malawi[50]

The programme consisted of two parts, one being the Namitambo and Kawinga piped rural water supply using untreated surface water from a mountain stream/-river to distributed taps each serving about 150 users, and the other the dispersed National Borehole Programme. The first part was functioning well at the time of the review, while the second part faced a number of problems due to high transportation costs and use of low standard drilling and pump technology.

There was a high degree of community involvement through community committees in the piped rural water supply in both planning, construction, and implementation of the rural supply schemes.

The long-term sustainability of both parts of the programme is considered to be low. The poorly performing boreholes and pumps are not restored, and the maintenance of the piped rural water supply suffers from lack of spare parts and resources for operational costs, and confusing procurement procedures. It is unclear whether there have been any water quality or water quantity assessments carried out prior to the actual project. However, health and sanitation programmes are introduced building on a good understanding of the relation between water, sanitation and health. Water quantity seemed to be secured, since it is indicated that the hydrogeological conditions are favourable for further groundwater exploitation. The staff and equipment resources allocated for groundwater rural water supply services of the Groundwater Section of the Water Division is considered insufficient to fulfil the ambition of reaching 75 % of the rural population with groundwater supply.

Rural Water Supply Project in Iringa, Mbeya and Ruvuma Regions, Tanzania[51]

This project started in 1979 and lasted until early nineties. The current report concerns the last phase, after the aid for water has ended by

50 Evaluation of four supply projects, and appraisal of Karonga Lakeshore integrated rural ground-water supply project. Volume 1: Main report. Danida, April 1985.

51 Rural Water Supply Project in Iringa, Mbeya and Ruvuma Regions, Tanzania. Completion Report, Phase IV. Volume 1: Main Report. Government of Tanzania & Danida, July 2000.

the introduction of the sector approach, which did not target the water sector, which then had to fade out. This last phase was focused on activities to ensure sustainability of the previous interventions. The objective of the programme was to provide drinking water to priority villages in the three regions. It was designed as a community-based programme from the beginning with the water users to be responsible for operation and maintenance of the schemes.

Since sustainability was the primary objective of the Phase IV, components on strengthening of management institutions, technical rectification of the schemes, and enhancement of supply of spare parts and repair services by private sector suppliers. Since not all preconditions for sustainability depend on the involved water users, the focus of the phase IV was on those elements which was in the hands of the users, such as:

- Adequate scheme management of the water users/scheme managers
- Technical scheme maintenance and repair
- Training of staff
- Selection of technology

Besides, the following preconditions was indicated as key for obtaining sustainability:

- **Proper scheme management systems.** Even though substantial resources for this component were allocated, it did not prove to have a long-term consistency. At the time of the project finalization, it was a concern whether it would be possible to keep the trained staff in the organisation.
- **Involvement of private sector** to carry out technical work for the schemes and service providers to assist with management tasks were basically a good approach for ensuring sustainability. However, the work to be done by private sector stakeholders was not enough to maintain a local business, which affected the supply of some spare parts for restoration.
- **Continuous catchment area management** is key for ensuring source water availability under future water stress, and this component was not given sufficient attention. Because of the population growth it is crucial that preventive measures are put in place for source protection.

Regarding the whole programme, a number of additional conclusions can be drawn with relation to the long-term function of the schemes. The community-based set-up and the participatory approach were proven useful for the purpose, and the user payment system installed had positive effects on dedication and commitment of the users and on

the scheme management. This was again a prerequisite for providing a financial basis for continuous operation and maintenance of the scheme.

The Community Water Supply and sanitation Components in Greater Accra and Eastern Regions, Ghana[52]

In a review, the progress of the component on the support to Community Water Supply and sanitation Programme in Greater Accra and Eastern Regions was described. The programme was delayed, and a number of observations and recommendations were put forward to speed up the progress.

It was foreseen that decentralization should be a key element of the programme. District assemblies should be responsible for construction of hand-dug wells and of facilitation of operation and maintenance for all works. However, this delegation of responsibility has not proceeded as expected. Although the district sub-committees on water and sanitation were adequately staffed, the progress was not up to standards due to lack of capacity and motivation. The reasons for the failure were indicated to be a too optimistic time schedule for the implementation of the delivery and to the fact that new actors were taken on board.

In terms of sustainability, a water resources study was carried out, but the assessment of the groundwater pollution risk was very theoretical and not useful for practical purposes. An assessment of the hydrogeological regime of the area showed that it was quite difficult to identify groundwater aquifers with a good water quality, and at the time of the review it was still a concern whether it would be possible to find groundwater of a suitable quality and yield in the Eastern Region. For that reason, it was indicated that it should be considered to install pipes systems like in Greater Accra Region instead of single village boreholes.

Under another programme component, Danida has allocated resources for spare parts for a three-year period, which is considered to ensure some operational robustness at least during the initial operational phases.

52 First joint technical Review of the Community Water Supply and sanitation Components in Greater Accra and Eastern Regions. Final report. Danida and Ministry of Works and Housing, Community Water & sanitation Agency, January 2001.

District Based Water and Sanitation Component of Water and sanitation Sector Programme Support, Phase II, Ghana[53]

At the time of the review, 235 boreholes, 143 rehabilitations of boreholes, 41 hand dug wells and 20 small town water supply schemes were approved, but after two years only 15 boreholes had been handed over. There were more reasons for that delay, i.e., confusion about a new procurement act, low capacity at district level and bad planning at regional level.

The selection of district sites was demand-driven based on poverty maps to ensure targeting the poorest communities. However, in reality, the main criterium for selection of sites was prevalence of Guinea worm, but to obtain long-term sustainability, a number of other criteria should have been put in place, including availability of water sources with a proper water quality – or in areas equipped with treatment facilities – of a quality which could be upgraded by simple technology.

Further to obtain sustainability, source protection activities should be established (raw water quality monitoring, awareness and education on how to avoid pollution, proper sanitation, etc.) and financial resources for operation and maintenance ensured, including procurement procedures. Funding for salaries, allowances and operational costs were provided for by District assemblies in many – but not all – districts, which is very promising.

There is an IWRM component linked to the Water and Sanitation Sector Programme Support, but it cannot be seen from the current document, whether it will contain any groundwater quality and quantity assessment in the areas of the selected district water supply sites. But since there is a strategic environmental assessment to be included, it can be assumed that some environmental sustainability principles will be part of such a study.

Water Sector Programme Support (WSPS), Phase I, Zambia

The programme included two components on water supply, namely Component 1: Support to Rural Water Supply and Sanitation RWS, and Component 2, Support to water supply and sanitation in Peri-urban/ low-cost housing Areas[54].

For the whole programme, decentralization was supposed to ensure allocation of human resources and funds for successful implementation

53 Aide memoire of Joint Ghanaian-Danish Review of the water and sanitation Sector Programme support, Phase II, October 2005.

54 Review-cum-Appraisal of Water Sector Programme Support, Phase I, 2006-2011 & Water Sector Programme Support, Phase II, 2011-2013 in Zambia. Danida, July 2011.

of WSPS at district level, but it has failed to do so. Also, the Government of Zambia should ensure staffing of RWS, but it did not happen. These two aspects evidently influenced the outcome.

RWS consisted of rehabilitation of 1745 water points and installation of 1952 new water points. At the time of the review only 30 % of the rehabilitations and 40 % of the new water points were completed. This was due to unrealistic planning at district level and probably also lack of staff, qualifications of this staff and a heavy workload as well. But it was also a result of the reversion of the responsibility of procurement from districts to the central level in the midst of the process. The procurement at central level also proved unsuccessful, since they were not able to handle the large number of new boreholes, and by beginning of 2011 there were serious challenges to keep the time plan.

Very few funds were available for operation and maintenance, which is a serious drawback for the sustainability of the support.

For the Component 2, there is observed good progress in implementing the various activities to deliver the support to the water and sewerage companies. However, the Luapula Water and Sewerage Company has not been able to generate income matching the operational cost of the company, and only a part of the fund to secure viability has been secured. For this reason, it is doubtful whether the company can survive without the injection of extra funds.

To complement the water supply components, an IWRM Centre has been funded within the School of Mining. The centre was supposed to give geology and hydro-geology courses, which is a good basis for predicting and assessing the availability and quality of the water resources to be used for water supply.

Programme d'Appui au secteur Eau, Hygiene et Assainissement (PASEHA2) au Niger.

Within this programme there is a component on provision of drinking water[55], which at the time of the review is well underway. The contracts for the work have been awaiting the result of the study on the rehabilitation of the drinking water in two regions, region Zinder and region Diffa.

It consists of a number of deep wells, low water table wells, village water systems. The quality of the work carried out has been acceptable, although there have been problems with the sequence of the different activities, i.e., the contracts for the waterworks have been finalised

55 Approvisionnement en Eau Potable, see Aide Memoire, Revue a mi-Parcours du programme d'appui au secteur Eau, Hygiene et Assainissement (PASEHA2) au Niger. Danida, Décembre 2014.

before the drillings have been carried out. Within the project, rehabilitation of 60 hand pumps was also foreseen. But they were not initiated, since it was realised that it would be better to replace these hand pumps with solar-driven pumps.

The priorisation of the villages for new interventions on water systems were prepared by the national water supply and sanitation unit using a database for the purpose. However, the unit has refused to include new proposals for site interventions put forward by the villages, which might hamper a correct priorisation of interventions and might influence the motivation for taking part in decentralization attempt, which is the intention of the programme.

As part of the programme, a component on promotion of hygiene and sanitation (latrines) measures has been launched, which is also supported by the Luxembourg Foreign Aid Agency. However, this component suffers from the lack of technical personnel on the ground to assist in deployment of services. Another component addresses the IWRM to be put in place on a national basis, and a good progress is observed for this component.

Whether these components include activities which could ensure long-term availability of the water resources and water quality assessments for the water supply services is unclear, but the fact that they have been included in the programme indicates a broader view on what is necessary for succeeding with the water supply projects in terms of securing improved access to safe and clean water.

Danish-Ugandan Rural Water and Sanitation (RUWASA) project – Rural Water supply, Uganda[56]

The objective of this component of the programme was to provide better access to improved and sustainable water and sanitation services to people, especially poor people, in rural areas. This objective was fulfilled, since the rural coverage went from 20% in 1991 to 70 % by 2017, and the largest percentage coverage of improved rural water supply (86%) was in the Eastern Region with the highest percentage of poor people (81%) and an estimation of 1,548,000 poor rural people benefitted of improved water supply in this region. The main improvement of coverage took place during the first part of the programme, which was the area-based project period, which ended around the turn of the century.

In the same period, Danida changes strategy to focus on institutional and management aspects in the sector as a whole by a sector wide approach (SWAp) with a national rather than a local level.

56 Evaluation of Water, Sanitation and Environment Programmes in Uganda (1990-2017). Danida, February 2019.

By 2017, some 86 % of the improved water supply was still functioning, however only 45 % of water samples taken at the water collection site lived up to water quality standards. Thus, in terms of sustainability of the operational performance, the RUWASA Water Supply has to this point in time to a high degree succeeded due to solid capacity building carried out and robust infrastructure put in place. In terms of long-term source protection, the project has not proven as successful.

RUWASA evidently introduced good practice within a number of areas of Rural Water Supply, which is mentioned in the evaluation report[57].

In terms of sustainability, the project seems to have failed, since a gradual deterioration of the various physical installations can be observed in recent years. It is not because of the quality of the physical installations put in place or the professional skills of the water professionals involved, but because these installations have now been in operation for many years and needs repair and rehabilitation. The problem is that the operational and institutional arrangements as well as the regulatory and tariff policy decision have proven insufficient for long-term operationability and maintenance of water supplies.

In particular, it has been a challenge to move from a community based approach to a system which should rely on revenues to manage the schemes, including funding of maintenance and repair.

The relation between water resources assessment to secure long-term availability of good water quality of the raw water for drinking water production was implemented through a parallel program on water resources management, which was defines through the development of a Water Action Plan (WAP). The objective of the WAP was to provide a framework for protection of Uganda's water resources. It was materialised in a special WRM directorate to monitor the water resources in terms of quality and quantity and carry out water resource assessments. It also included the establishment of a water laboratory with analytical equipment for sampling and analyses and with a database to harbour the analytical parameters. This project was implemented 1996-2000 and developed a good technical and administrative expertise, which is intact at the time of the evaluation. It is not clear whether the staff of wthe laboratory will be able to carry out projections of raw water availability as a consequence of climate change effects on the catchments.

57 See above, page 50.

ANNEX 2

A note on IWRM

In a context of providing access to water, it is important whether components on water resources assessment or catchment assessment, as it is also termed, are part of the water supply programmes to secure sustainability to the water supply projects. First, it is important to include water quality and quantity assessment of the water source for the water supply to define treatment needs to ensure safe water delivery and to predict future water availability in a climate change scenario with increased pressure on the water source. Secondly, such a component should also aim to ensure long-term source protection of the water source by relevant measures such as monitoring programmes, pollution source regulations, etc. In some areas, i.e., by the Rural Water Supply Network in Uganda, introduction of Water Source Protection plans, are suggested inspired by the common concept of water safety plans, which are aiming at delivering safe water by utilities[58].

IWMI is often a component of the Water Sector Programmes and as such a complementary intervention to the Water Supply (and Sanitation) components, and it is often considered to be an important for the success of water supply projects on the ground. However, IWRM – even though it is defined by the Global Water Partnership as "a process which promotes the coordinated development and management of water, land and related resources in order to maximise economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems"– does not necessarily involve water resource assessment and protection.

IWRM is in many cases implemented parallel to water supply and sanitation and capacity building components. This was partly implemented in the Water Sector Programme Support (WSPS I) in Ghana[59] and in the Water and sanitation Sector Programme Support,

58 See i.e. https://www.pseau.org/outils/ouvrages/rwsn_water_source_protection_2015.pdf

59 First Joint Technical Review of the Community Water Supply and sanitation Components in Greater Accra and Eastern Regions. Danida, January 2001. Joint Technical review of the sector Capacity Building Component Community water and sanitation Agency. Danida, December 2000.

Phase II (WSSPS II)[60], the latter without a capacity building component but including an educational component and a policy, monitoring and management support component. The focus was on training either to teach and provide local stakeholders with an understanding of the concept and or to enable them to implement IWRM.

A project carried out in the SADC countries on the Integrated Water Resources Management Strategy and Implementation Plan for the Zambezi River Basin summarises well the thinking during the period[61]. In this project, the strategic objectives were to:

- Develop and manage water resources so as to serve social and economic development in the Basin.
- Mainstream environment in the development and management of water resources in the Basin.
- Adapt water resources management to current and future climate variability and change.
- Operationalize the institutional frameworks in support of basin-wide water resources development and management.

The IWRM Strategy for the Zambezi Basin was supported by a number of sub-visions, i.e., equitable access to water of an acceptable quantity and quality. However, these strategic subvisions seem to be absent in the concrete activities of the above project, which does not directly address water use and access to water.

This IWRM Strategy project and action plan – as were many other IWRM projects – was in its own right an interesting and comprehensive study on the framework to be installed for the more concrete actions to give the society access to water. But opposite to the Ghana case, it was not seen as a complement to a water supply component. Thus, IWRM is not in itself automatically ensuring the water resource assessment, and there are several studies discussing how water resources assessment can be addressed in a IWRM context[62] [63]. Some IRWM schemes did incorporate conservation, protection, and monitoring and control of the water

60 Final AIDE MEMOIRE from a Joint Ghanaian-Danish Review of the Water and sanitation Sector Programme Support, Phase II. Danida, October 2005.

61 Integrated Water Resources Management Strategy and Implementation Plan for the Zambezi River Basin. SADC-WD, Zambezi River Authority, SIDA, DANIDA & Norwegian Embassy Lusaka. April 2008.

62 Daniel Karthe (2013) Assessing water availability and its drivers in the context of an integrated water resources management (IWRM): a case study from the Kharaa River Basin. Mongolia. GEOÖKO Vol XXXIV, -26.

63 Jacques Ganoulis (2008) Modelling Water Quality for Integrated Water Resources Management At The Basin Scale. Dangerous Pollutants (Xenobiotics) in Urban Water Cycle, 89-99.

source, i.e., as defined by the National Water Policy (2002) in Tanzania[64]. However, in a context of a plan to secure access to water, the Local level IWRM approach which was demonstrated through a number of pilot projects in five SADC countries within the framework of SADC Regional Water Sector Programme[65] seems to offer a good way to move forward with a coupled approach of IWRM and Water Supply. Local level IWRM links water demand, water supply and water resources management.

Another very useful approach to ensure safe and enough water from the start of the establishment of a water supply and under future climate change scenarios was as it was done in the RUWASA project[66]. Although it did not include all the elements to obtain such a goal, the water resource assessment component of this programme fulfilled the sustainability criterium of long-term monitoring of the water resources. This approach is discussed further at page 33. A number of other studies also included components on groundwater monitoring and source protection[67], i.e., the PROSEHA in Niger.

64 Project document on Rural Community Management of Water and Sanitation in Kilosa District. Danida, December 2007.

65 Guidelines for Local-Level Integrated Water Resource Management. IWMI and Danida.

66 Evaluation of Water, Sanitation and Environment Programmes in Uganda (199-2017). Danida, February 2019.

67 Appui à l'évaluation à mi-parcours de la phase 1 du Programme Sectoriel Eau, Hygiène et Assainnissement (PROSEHA) (2016-2020). Ministère de l'Hydraulique et de l'Assainnissement & Agence Luxembourgeoise pour la Cooperation au Développement, Septembre 2019.

ANNEX 3

Terms of Reference

Study on Access to Water in Africa

Background

Accelerating impacts of climate change and reduced access to water is a challenge globally, but with distinctive effects in developing countries. They are often located in already harsh climate zones, having low capacity to manage water resources, to build resilience and to adapt to climate impacts. If the current tendency continues, it is likely that additional 70-200 million people in Africa will have impaired access to water in 2030.

Due to the crucial importance of water for human health and food production, water is on top of the agenda of the international community. This is especially true for Africa, which suffers from water scarcity, health problems from water pollution and accelerating problems for the water cycle. The consequences of water scarcity are multiple, ranging from severe negative economic and socio-economic impacts, deterioration of human health to fueling conflicts and human displacements. Water supply, sanitation and hygiene (WASH), given their direct impact on infectious disease, especially diarrhea, are also important for preventing malnutrition. Both malnutrition and inadequate water supply and sanitation are linked to poverty.

There is still a long way to go to fulfill the SDG 6 targets for clean water and sanitation, although some progress has been realized in recent years. Still future support to improve access to water in Africa is highly justified, but it is still not evident which aspects such a support should target, and which types of programs need to be deployed to get the highest value and impact of investments.

There is a long tradition in Danida to provide support to water and sanitation in Africa. The rationale for the support has been – and still is – that investments in this sector have evident tangible benefits in terms of poverty alleviation, improved social welfare through a significant reduction in water-related diseases improved nutrition status which the recent Covid19 pandemic demonstrated. Further, higher productivity in a number of sectors, including agriculture, and that water resources management and development is closely linked to climate change adaptation.

Former Danida programs have covered the whole water cycle, but rarely at the same time. Support has ranged from technical support to the water supply and sanitation infrastructure (such as construction of wastewater treatment plants and groundwater wells), more soft institutional interventions on capacity building, training and general consultancy services for integrated water resources management, water quality and health assessments, and support for legislative frameworks and sector policies. In some cases, research programmes have also been implemented as part of a country programme, i.e., in Zambia.

Over time, the Danida interventions have changed from region to region, but there have been water programmes in most low-income countries targeted by Danida and suffering from lack of safe and clean water and water-related hygiene problems through WASH programmes. Denmark therefore has a high standing within water communities in many developing countries, including several African countries. Good examples are Burkina Faso, Ghana, Mali, Niger, Kenya, Uganda and Zambia where Denmark has spent more than one billion DDK in each country since the beginning of the 1990'ties, targeting various kinds of activities within the water sector.

The Danish activities on water in the early days were mainly in the form of development cooperation applying a traditional donor approach with direct support to various projects carried out to a large degree by Danish companies. In recent years, it has become important to ensure empowerment of local stakeholders and accountability and ownership by the beneficiary countries. This has been facilitated by different financial modalities such as sector-wide approaches (SWAps), basket funding or budget support. Through these sector-wide approaches there has also been an attempt to build local competences and skills and strengthen the local private sector (consultancy, construction and drilling, supply management, etc.) to fill all the niches in water value chain. Thus, contributing directly to economic growth and job creation. In recent years, there has been a tendency to increase support for middle-income countries like Ghana and South Africa with a clearer commercial angle to focus on Danish trade and investments. Examples are the Strategic Sector Cooperation (SSC) program in selected countries and projects financed by IFU/Danida Sustainable Infrastructure Fund (DSIF) and Climate Investor II.

Danida programs have targeted both urban/peri-urban areas and the rural communities. In the urban areas, the institutional and financial challenges are often complex and may be hampered by severe donor competition, considerations for proper private sector involvement and technical and financial sustainability. The urban infrastructure projects tend to get bigger and bigger, dominated by the big foreign companies often financed by blended finance instruments within Public-Private-Partnership (PPP) arrangements. In rural areas there has been a shift in

focus from hand pumps to smaller town/township piped water supplies systems that combines public stands with private connections. There has also been an increasing focus on management and protection of water resources in a context increased scarcity and competing uses.

Despite these efforts, Africa is still facing a number of challenges related to provision of clean water. Despite some success to provide access to safe water in some areas, water scarcity and hygiene, insufficient drainage, sanitation and hygienic problems are prevailing in many regions. In recent years, it has become clear that climate change increasingly impacts the water cycle, affecting water scarcity and thus the availability of water both for domestic urban consumption (Cape Town is the well-known example) and for food production in rural areas. Climate change influences the crop patterns in many regions because of changing temperature regimes and droughts caused by less or more fluctuating, and less predictable, precipitation patterns. In other cases, the opposite problem – too much water – results in floods affecting health and welfare as well as the infrastructure in both rural and urban areas. Thus, the major challenge is the "new normal" with a higher degree of unpredictability in rainfall and accessibility to water resources.

Water is life, also in Africa. The question is how to develop strategies, innovative business models and interventions, which ensure provision of safe and climate resilient water to sustain local livelihoods. Multiple factors have to be considered in this respect, not only the sustainable use of water resources (managing the source), but also the effectiveness of water use, the ability to build resilience to manage water crises, the in-built conflicts with rights of access to water, and the seasonal, emergency or more permanent migration patterns associated to water access. There is also a strong link between water and mitigation. Water supply consumes energy, and wastewater treatment can be significant source emissions. Should future interventions mainly target the rural population or the growing urban population, and what types of interventions will have the highest impacts on poverty alleviation, climate change, health etc.? (e.g., infrastructure projects on water supply and wastewater treatment, awareness raising to change the behaviour of people, water resource management, institutional strengthening, capacity development, climate adaptation) Since it is evident, that neither public sector finances nor ODA budgets can meet the financial requirements for realizing the SDG 6 targets in Africa, it should also be considered how alternative and private finance can be mobilized for this purpose.

Objective of the study

The objective of the study is to make available:

- An overview of major lessons learned on providing access to water in Africa

The study will focus on documenting experiences from development assistance contribution to achieve the SDG6 targets in Africa, including experiences obtained from Danish development assistance.

The study is expected to inform further considerations for evaluative work on Danish effort to provide access to water in Africa.

Outputs of the study

The study will have the following outputs:

- A short inception note outlining in more details the focus and content of the study.
- A study report (max. 30 pages) plus annexes, in English and with a short executive summary.
- An internal meeting in Danida to discuss outcomes of the study with relevant departments and selected embassies.

Scope of work, approach and activities

To identify the most relevant, effective and efficient future interventions in the water sector in Africa, it is important to get an idea of the success of previous programmes and policies.

The study will look into existing documentation (evaluations, relevant synthesis papers etc.) and will have special focus on the experiences and lessons learned from Danish interventions and the involvement of the Danish knowledge base.

The study will document the major lessons learned with respect to effectiveness and sustainability, and with considerations around efficiency.

Special attention will be given to the poverty and health focus of interventions and rural water supply and water resource management, including nature based solutions (NbS) and new technology.

Looking into recommendations for future interventions the study is expected to look into, but not necessarily limited to, the following aspects:

- The relative potential impact of the selected interventions on poverty alleviation, public health and wellbeing, malnutrition, climate change, migration, commercial potential.

- Which areas within the water sector to be targeted? Should future programs target the more "classical" areas such as construction of wastewater treatment plants, rural drinking water supply, IRWM or should it be considered to introduce new areas – in an African context – such as protection of water resources, water savings, water reuse, digitalisation of services, water efficiency (NRW) and Nature based Solutions?
- Should there be more focus on sanitation and hygiene? And what is the best approach to address what has been termed the "sanitation gap"?
- Should the interventions follow the nexus thinking and rely more on demand management by involving major users in the programs?
- The ability of the selected intervention to involve local expertise and stakeholders at different levels, including strengthening local eco-system of water related businesses, to achieve long term sustainability and ownership in terms of institutional capacity, WASH behaviour change knowledge and practice, maintenance of knowledge and infrastructure/technology, and create decent, green and skilled jobs,
- What are the advantages and disadvantages of ihe interventions focusing on local, decentralized off-grid systemsvs interventions focusing on centralized systems imbedded in existing institutional framework with a maintenance organisation in place?
- How will climate change impact water access and management in Africa? How can Denmark support building climate resilient water management, investment and green/grey infrastructure?
- How to address barriers in terms of governance, gender and equity issues related to the selected options,
- The competitiveness of Danish resource base within the markets' segments of the considered areas of interventions,
- The commercial interest and potential of Danish companies, both service providers, tech companies and contractors, within the selected options to be considered,
- The institutional arrangements, funding mechanisms – including blended finance instruments – and financial partnership models foreseen for the selected options.

Organisation, resources and time frame

The study will be conducted by: Mr. Bjørn Kaare Jensen, water specialist and external consultant to Danida.

The study will be carried out as a desk study in the period 1 September to 31 December with a budget of maximum 200 man hours.

The contact person in Danida will be Henning Nøhr (hennoh@um.dk), Department for Evaluation, Learning and Quality (ELQ).

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