POLITECNICO DI TORINO
Repository ISTITUZIONALE

Small community water supplies in the Isiolo County, Kenya

Original
Small community water supplies in the Isiolo County, Kenya / Vezza, P., Arnesano, R., Boano, F., Bessone, A.. - ELETTRONICO. - (2022). (2nd International Join Conference on Water Distribution System Analysis (WDSA) & Computing and Control in the Water Industry (CCWI). Valencia (Spain) July 18-22, 2022) [10.4995/WDSA-CCWI2022.2022.14118].

Availability:
This version is available at: 11583/2995391 since: 2024-12-15T10:44:33Z

Publisher:
Universitat Politècnica de València

Published
DOI:10.4995/WDSA-CCWI2022.2022.14118

Terms of use:

This article is made available under terms and conditions as specified in the corresponding bibliographic description in the repository

Publisher copyright

(Article begins on next page)

15 November 2026

2nd International Joint Conference on Water Distribution Systems Analysis & Computing and Control in the Water Industry
Valencia (Spain), 18-22 July 2022
doi: https://doi.org/10.4995/WDSA-CCWI2022.2022.14118

SMALL COMMUNITY WATER SUPPLIES IN THE ISIOLO COUNTY, KENYA

Paolo Vezza[1], Roberto Arnesano[2], Fulvio Boano[3], Andrea Bessone[4]

[1,2,3] Department of Environment, Land and Infrastructure Engineering, Politecnico di Torino, Italy
[4] LVIA – Associazione Internazionale Volontari Laici, Cuneo, Italy

[1] *paolo.vezza@polito.it,* [2] *roberto.arnesano@outlook.it,* [3] *fulvio.boano@polito.it,* [4] *a.bessone@lvia.it.*

Abstract

Lack of access to drinking water mostly affects the sub-Saharan Africa. In Kenya, since 2000, access to safe drinking water has increased by 12 per cent, whereas access to basic sanitation has fallen by five per cent. The Italian NGO LVIA – Lay Volunteers International Association – has been working in Kenya for more than 50 years to improve living conditions of the beneficiary populations, also with interventions in the water sector that contribute to the achievement of the No.6 Sustainable Development Goals (SDGs) which aims to ensure the availability and sustainable management of water and sanitation. Since 2012, several international cooperation projects have been carried out in collaboration with the pastoral communities of the rural areas of the Isiolo County. Isiolo County, located in Northern Kenya, has been plagued for years by severe droughts and floods that put a strain on water access and the already precarious water infrastructure. In this study, we present the rehabilitation of water supply systems in the villages of Duse, Bulesa/Godha, Sericho, Gafarsa, Oldonyiro, Kipsing, Kinna affected by floods at the end of 2019. In addition, the rehabilitation of Boji village water supply system will be described, as an example of good practise for implementing small community water supplies. In particular, the construction of pipelines, boreholes with solar pumping system, water kiosks, livestock troughs will be presented, as well as, the establishment of a water service pricing system, and the training of the water management committee.

Keywords
Rural areas, water supply systems, Sub-Saharan Africa.

1 INTRODUCTION

According to 2016 UNICEF/WHO Joint Monitoring Programme (JMP), the Kenyan population basic water supply level increased by only 12% in 15 years, between 2000 and 2015, whereas access to basic sanitation has fallen by five per cent. In particular, 46% of the population of Kenya (specifically 88% in urban areas and 36% in rural areas) had adequate access to water in 2000, which slightly increased to 58% in 2015 (specifically 83% in urban areas and 50% in rural areas) [1]. Extrapolating this trend, it can be assumed that this value is not greater than 62 % in 2020, with an annual growth rate of 0.8%. Currently, a big portion of the Kenyan population (about 40 %) continues to have no improved access to drinking water, that is, uses unsafe and discontinuous water supply sources such as rivers, dams, pans and ponds, with high risk to people health [2]. These issues mostly affect rural populations in arid and semi-arid areas (ASAL), where the humanitarian and non-governmental organizations (NGOs) investments are concentrated. Like many sub-Saharan countries, water access and sanitation in Kenya has not achieved the Millennium Development Goals (MDGs) targets set for 2015 [3].

Water availability is still quite irregular throughout the country and rainfall occurrence and intensity implies frequent droughts and severe floods due to climate change effects, worsening the risks associated with changes in the distribution and availability of water resources [4]. The alternation of severe droughts and heavy rainfall with flood occurrence is putting a strain on water distribution systems and the relative operating and maintenance costs.

CC BY NC SA

In the present study, we present the rehabilitation of water supply systems in several villages of the Isiolo County affected by floods at the end of 2019. In addition, we describe the rehabilitation of the water supply system in the Boji village, as an example of good practise for implementing small community water supplies.

2 STUDY AREA

Isiolo County is located in a central part of Kenya where the land is mostly flat (Figure 1). The altitude varies gradually within its area, from about 200 m a.s.l. at Lorian swamp (Habaswein) to 300 m a.s.l. at Merti Plateau and finally to approximately 1100 m a.s.l. at Isiolo town [5]. The capital, Isiolo, is the largest town, which is 285 km north from Nairobi, the capital city of Kenya. The total area covered by Isiolo County is 25,336.7 km^2 [6], which corresponds at 4.26% of the total area of Kenya (580,367 km^2 [7]). The county climate is hot and dry for most of the year. The county receives annual rainfall ranging between 100-750 mm [5] and records mean annual temperatures ranging from 24°C and 30°C [8].

Generally, the warmest period is between February-March, while the coolest is July-August, although seasonal variations in temperature are contained. The temperature and rainfall vary according to the prevailing winds that affect the Country, which determine two seasons: from October to March hot and dry winds from Arabia prevail, while from April to September the coolest and wettest winds from the Indian Ocean prevail. At the beginning of the two seasons, the two rainy periods are determined: the long rain season from March to May with the peak in April, and the less intense short rain season from October to December with the peak in November. The rains are generally showers or thunderstorms occurring mainly in the afternoon or in the evening.

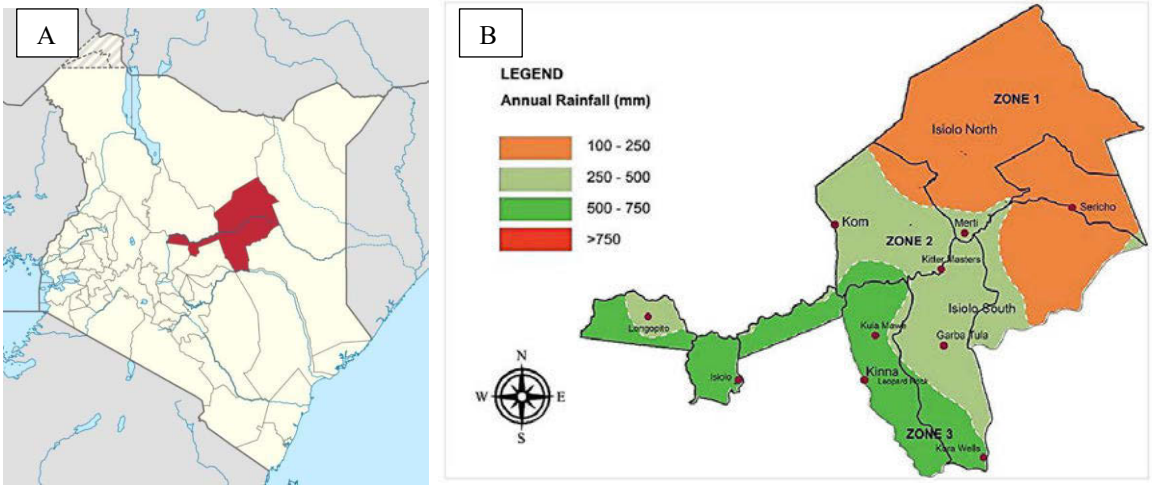


Figure 1: A) Location of the Isiolo County in Kenya. B) Annual rainfall distribution in the Isiolo County

3 PROJECT #1: IMPROVING ACCESS TO SAFE WATER AND HYGIENE PRACTICE

The project "*Improving access to safe water and safe hygiene practice to flood Emergency affected people in Isiolo County*" was funded by United Nations Children's Fund (UNICEF) and implemented in partnership with Lay Volunteers International Association (LVIA). This emergency project aimed to cope with the floods disastrous consequences that had affected many villages in Isiolo County at the end of 2019. As reported by LVIA technicians, after almost a year of drought, starting from the second week of October 2019 torrential rains occurred, exacerbating the water access and water supply issues experienced during the rest of the year.

The worst conditions were found in the Eresaboru and Gafarsa villages where boreholes were submerged and cut off. In Gafarsa, Duse, Bulesa Kipsing, Oldonyiro and Sericho villages, 2.8 km of

CC BY NC SA

the aqueduct pipeline were damaged, disrupting safe water access to people. Water pumping equipments for Oldonyiro and Kipsing villages were also damaged. In total the flood affected a population of about 24,000 people in the study area [9]. The emergency project was aimed to repair and desilt the intakes of boreholes, replace the damaged pipelines and pumping systems, and install other ancillary structures to ensure access to safe water for the affected population. In addition, it was proposed to install inline chlorine dosers for Kipsing, Oldonyiro and Kinna villages which rely on surface water abstraction from sand dams and natural springs (Figure 2).



Figure 2. A) New installed HDPE pipes in the Bulesa village B) New pipeline in the Kipsing village. C) Borehole in the Kipsing Village with added solar panels for the new pumping system. D) Women fetching water at a community water point in Sericho village. E) Inline chlorine dosing equipment installed for Kinna village water supply system. F) The director of the water service during the launch of the new water kiosk in the Gafarsa village

LVIA coordinated the project activities in collaboration with the Isiolo County Departments of Water Services and Public Health and other local agencies and stakeholders. Community groups

CC BY NC SA

and beneficiaries actively participated in the implementation of the project. The programme was implemented in the wake of the COVID-19 pandemic. Therefore, some of the activities were aligned to the COVID-19 response, mainly to support prevention and control awareness through hygiene promotion activities.

The results of the project are listed below, partially redefined due to the COVID-19 pandemic:

Result 1: by 30th April 2020, 17,384 persons (8,969 male, 8,415 females of which 6,954 children) had permanent access to safe water at 7.5 to 15 litres/person/day from repaired water sources and water supply systems in the following villages: Duse, Gafarsa and Seiche in Garbatulla subcounty, Bulesa in Merti Sub-County and Oldonyiro and Kipsing in Isiolo Sub-County.

Result 2: by 30th April 2020, 1,354 school children (730 girls and 624 boys) had access to safe water at 1-2 litres/child/day from repaired water supply systems in Oldonyiro and Kipsing Primary and secondary schools.

4 PROJECT #2: REHABILITATION OF BOJI VILLAGE WATER SUPPLY SYSTEM

The project "*Rehabilitation of Boji Village Water Supply System*" was funded by Italian Government and United Nations Children's Fund (UNICEF) and implemented by Lay Volunteers International Association (LVIA) in partnership with National Drought Management Authority (NDMA) and in collaboration with the Isiolo County Departments of Water Services and Livestock.

This activity was part of a larger project – "*Improving access to water and the resilience of pastoral communities in Isiolo County, Kenya*", funded by Italian International Cooperation Programme – that had the general aim of improving the living conditions of pastoral communities of Isiolo County. The specific purpose was to develop climate change resilience and mitigation mechanisms through water supply protection and rehabilitation and, at the same time, through increasing capacity building of the local community.

The water supply protection and rehabilitation were completed within 18 months. The project achieved 100% of the targets set at the baseline which were measured through key indicators. This implies that the project improved the availability of safe water, through the rehabilitation of two boreholes and the construction of new pipelines and four water kiosks (Figure 3). This allowed to separate water for human use and livestock use, to provide water allocation also to schools, health dispensaries and mosques. Solar pumping systems, coupled with a diesel generator backup system, were installed to reduce water pumping operational costs.

The project was implemented using a participatory approach with active community engagement throughout the project lifetime. In addition, a proper water management structure was put in place to insure the sustainability of the system. This implied to create a water management committee in charge or insuring public access to water, collect water fees and manage funds for the system maintenance and management.

The direct beneficiaries reached through the project implementation were 2,175 people (1,110 males, 1,065 females), out of which 236 were school students. Indirect beneficiaries (i.e. people living within the zone of influence of the project that may have access to water) were 4,544 (2,113 males, 2,431 females). Livestock population, benefiting of watering system, were 15,000 shoats, 2,600 cattle and 4,500 camels.

CC BY NC SA

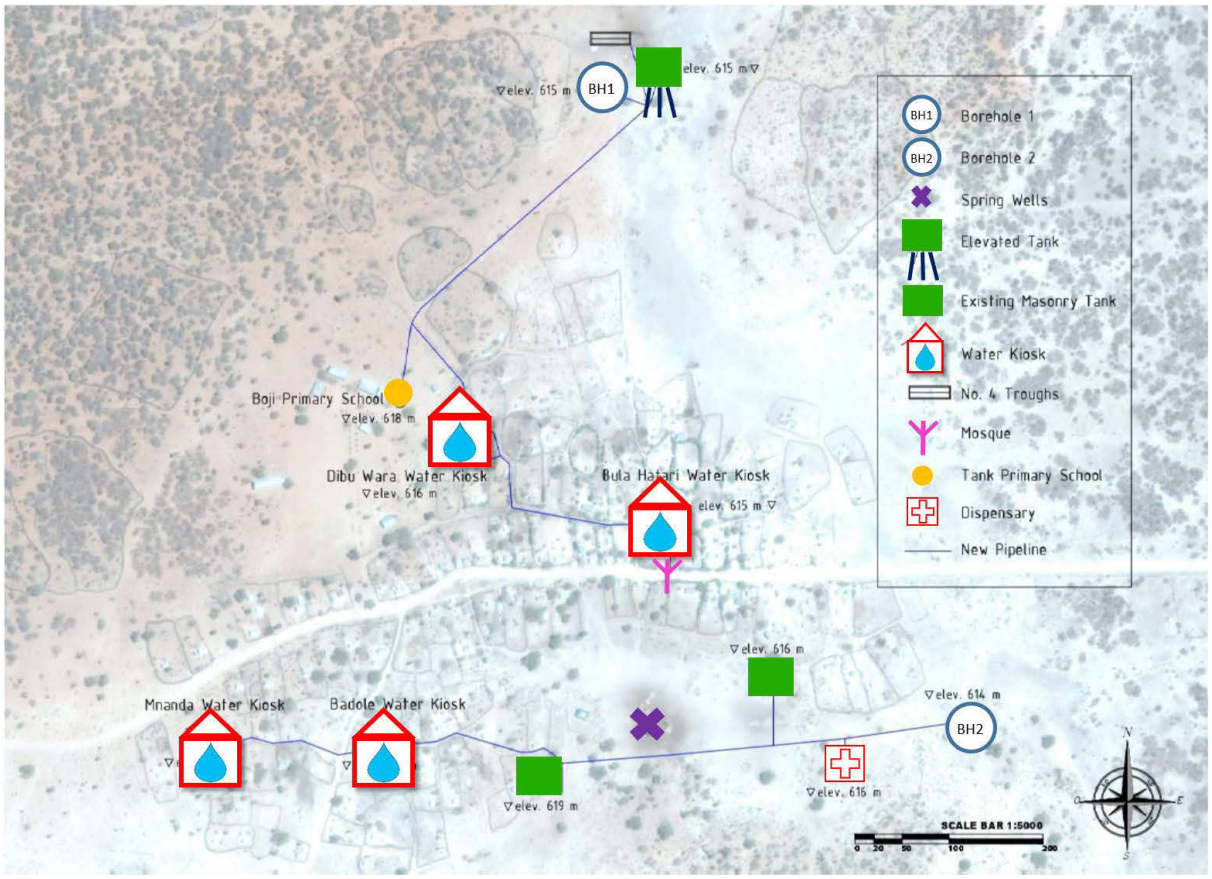


Figure 3: New water supply system at the Boji village.

5 DISCUSSION

Although technical notions and technologies for water distribution and allocation are roughly the same in all circumstances, their implementation is strongly affected by the social context. From a project management point of view, the construction or rehabilitation of water supply systems in rural areas of Kenya may consider a strong involvement of beneficiaries in the project activities. A management committee should be put in place to ensure the maintenance of the water supply system. The water management committee should be trained with technical and business skills, and it is important that committee members are salaried. Each water committee should develop a business plan in order to anticipate future investments, equipment replacement and maintenance. In addition, water committees should report revenue, costs and activities to communities for transparency.

From a technical point of view, pumping water from boreholes can be carried out using solar energy. The implementation of this technology is feasible in rural areas of Kenya and can be considered convenient both from an economic and management point of view. To insure continuous water distribution a backup system (e.g. diesel generator set) should be considered. Safe water access can be insured by the installation of water kiosks in strategic places, supported by appropriate water storage facilities that guarantee water availability in case of power failure or interruptions of pumping systems.

CC BY NC SA

6 REFERENCES

[1] M. Mwangi, B. Gichangi, B. Kinuthia, J. Samo-Project Manager, and I. Githu-Project Director, "Evaluation of the Sustainability of Solar Powered Water Supply Systems in Kenya" 2018. [Online]. Available at: www.solarzzy.comwww.eedadvisory.com

[2] WHO and UNICEF, "Progress on Drinking Water, Sanitation and Hygiene - Joint Monitoring Programme 2017 Update and SDG Baselines," 2017. doi: 10.1111 / tmi.12329.

[3] USAID, "USAID water and development country plan for Haiti," 2016. [Online]. Available at: https://dec.usaid.gov/dec/content/Detail.aspx?vID=47&ctID=ODVhZjk4NWQtM2YyMi00YjRmLTkxNjktZTcxMjM2NDBmY2Uy&rID=MjM1MTM5

[4] R. Connor, The United Nations World Water Development Report 2015: Water for a Sustainable World, vol. 4, no. 2. 2016.

[5] R. of Kenya and I. C. Government, "Isiolo County Integrated Development Plan, CIDP, 2018-2022," 2018.

[6] I. C. Government, "County Government of Isiolo," 2020. https://isiolo.go.ke/.

[7] United Nations Statistics Division, "Demographic Yearbook—Table 3: Population by sex, rate of population increase, surface area and density" pp. 1–13, [Online]. Available at: https://unstats.un.org/unsd/demographic/products/dyb/dyb2005.htm.

[8] B. Mati, J. Muchiri, K. Njenga, F. P. de Vries, and D. J. Merrey, "Assessing water availability under pastoral livestock systems in drought-prone Isiolo District, Kenya," in Water Management, 2006, p. 13.

[9] National Drought Management Authority, "Isiolo Flood Risk Assessment Report Dec 2019" 2019.

CC BY NC SA