

Dodoma: Climate Resilience Through Nexus Interventions



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Food Water Energy Nexus in Dodoma

Dodoma is the capital of Tanzania and had remained a small city of less than 400,000 people for much of the last few decades. However, in 2018 Tanzania's President operationalized Dodoma's role as Capital and began the movement of ministries from Dar es Salaam, Tanzania's largest city, to the Dodoma. This has resulted in Dodoma becoming the fastest growing urban area in the country, requiring rapid development of new ministerial buildings, commercial property and housing to anticipate this growth. With this rapid growth, new infrastructures are needed to assure widespread delivery of water, energy and other infrastructure services, as well as provision of food. This also provides opportunity for use of integrated and nature-based solutions to ensure that Dodoma's surrounding hinterland remains intact, functional and providing valuable ecosystem services.

Dodoma is located in a dry-land environment with limited water to support agricultural cultivation. The water is also unreliable in terms of quantity and predictability of rain. Nevertheless, much of the city's surrounding agriculture includes grapes and pomegranates. Indeed Dodoma has a burgeoning wine industry that is celebrated at an annual festival. There is interest in using food and agriculture to boost its economy. The region is also well known for its cattle industry that feeds much of Tanzania.



Facts & Figures

Population

414,918 [1]

Annual Population growth rate

3.3%

Average Income per Capita

177.32 USD

Population Density

149,844 persons/km²

Dodoma is entirely reliant on ground water supply from the Makutupora basin, which is abstracted by 24 boreholes about 35 kilometres from the city [2]. The city council has noted that a number of water springs that provide additional water are under threat from unplanned residential expansion [3].

For energy Dodoma is reliant on the national grid energy mix which is split roughly in thirds generated by hydropower, oil and natural gas [4]. However, only about 18% of Tanzanians have access to electricity, and household energy is still highly dependent on biomass in the form of charcoal [3], [4]. This represents risks to the surrounding area in which trees are scarce, so in addition to local environmental degradation, there is another impact in that charcoal is transported long distances from other regions in Tanzania.

Key environmental challenges have been identified by residents in Dodoma as *drought*, accompanied by changing rain patterns and a destabilization of cropping and harvesting seasons, *deforestation*, resulting in land degradation, reduced fuel wood and increased burden on women who source it, *flooding*, exacerbating *erosion*, *human and livestock disease*, and *limited groundwater recharge* [5].

Story of the Innovation

The innovation in this case takes place in Chololo Village, home to about 5000 residents, within the Dodoma jurisdiction about 40 minutes' drive from the Capitol. Identifying a need to improve climate resilience, this project was developed in partnership with the Institute of Rural Development Planning, Agricultural Research Institute Hombolo, Dodoma Environmental Network, Dodoma Municipal Council, Majin a Maendelo Dodoma and Tanzania Organic Agriculture Movement, and funded by the European Union. It aimed to improve the adaptive capacity of residents in Chololo, and took a holistic approach to reframe the village as an eco-village, constructing a number of technological facilities to could improve resource access and efficiency across the village and to undertake a number of trainings to support residents with improving their livelihood opportunities in relation to these technologies and processes.

The entry point for this nexus innovation was climate-safe and productive agriculture, in which 'improved, early-maturing, high-yielding

seed' was provided to farmers and 400 farmers were also upskilled in a number of agricultural practices, including: ox-drawn tillage, soil water conservation measures, use of farmyard manure to improve soil fertility, plant spacing techniques, community seed production and intercropping and crop rotation [5]. Improved species of goats, chicken and cattle, which are more productive, were introduced, as well as beehives and small-scale tilapia ponds. Rainwater harvest technologies were installed on the school rooftop, collecting 60 000 litres of water to feed into an underground water storage facility. This, in addition to subsurface and sand dams, is capturing seasonal precipitation and ensuring water availability across the year.

Solar panels were installed to provide energy to support the pumping of water through the system as well as lighting in the village. It had co benefits including the ability to charge electronics and support the powering of weather monitoring and computer equipment, which was installed as part of wider climate awareness initiatives and efforts to track how climate change was affecting the area. These weather tracking tools contributed to a simple innovation of providing evidence of changed weather patterns. The continuous use of these tools will be quite valuable for creating a culture of consistent inquiry and knowledge support. For example, with this knowledge, farmers felt more confident to plant, when the weather was uncertain. The project has shown success in improving the productivity of cultivated land: over two years, crop yields for maize, sorghum, pearl millet, sunflower seeds and groundnuts effectively doubled [5].

Biogas digesters and energy-efficient cooking stoves were installed to further change the energy mix and reduce reliance on wood fuels, that have caused deforestation. In addition, a tree nursery was developed to support tree-planting of productive and indigenous trees across the village.

The project has also providing new livelihood opportunities, such as through leather tanneries and making leather-goods, sales through the tree nursery, beekeeping, fish farming, and maintaining the water and energy equipment. Through provision of new technologies and trainings, the basis was established to support collective community land-use planning. The efforts included educating community members on land policy, mapping the village boundaries, training a district and village participatory

land-use planning team, and facilitating the registration, at district level, of the village land-use plan once it was complete [5]. The plan was deemed necessary by the village community, particularly to ensure demarcation of agriculture, livestock, settlements, forest, roads and playing areas.

Enabling Environments & Capabilities

The key enablers of this project are a large financial investment which allowed a holistic implementation of a project through proven technologies, while also paying attention to the need for developing soft skills to ensure that the system could be maintained. Further training supported residents in leveraging these technologies for increased incomes and more employment opportunities across the village. The project took a gender inclusive approach by targeting initiatives to reduce the burden of energy and water sourcing on women and focusing on training women. The wide collaboration of National Ministries as well as the Dodoma Municipal Council and implementing partners gives the project legitimacy and has also meant the project is an inspiration for future development possibilities in Dodoma, with the Mayor confirming that's his vision would

be for much of Dodoma to take on integrated approaches such as those initiated in Chololo eco-village. The success of the project has also resulted in a follow up project under the banner of Chololo 2.0 [6], which aims to expand on the facilities already installed. This project fits a familiar approach in which nexus projects are externally funded. And it would be interesting to understand how integrated projects could be mainstreamed in future development planning approaches. This is also an example in which a holistic approach has shown success in most areas. It is also notable for a strong monitoring and reporting process in which data supports a number of the outcomes. The project, while supported by strong research institutes, has paid deference to traditional knowledge and allowed farmers to make their own inferences about which systems work for their business. Enabling factors for implementing this project are outlined in Table 1. They reference factors of knowledge, institutions, social, ecological, technological and economic considerations. Of most note in this case is the focus on improving knowledge and skills to ensure that any physical infrastructure is understood and can be maintained by those operating it. The focus on championing and extending existing practices and knowledge is expected to support enthusiastic participation and sense of ownership in the project process.



Figure 1 – Successful goat rearers: Jerry Masianga (left) from Chololo Village and Deborah Mahenga (right) from Kikombo village exhibit their blended goats at the 2017 Nane Nane Agriculture exhibition in Dodoma
Photo credit: [Chololo Eco Village](#)



Figure 2 – Members of the Kikombe youth solar group pose for a photo in Chololo Village, Kikombo
Photo credit: [Chololo Eco Village](#)



Table 1 – Enablers and Capabilities for Implementation of the Chololo Ecovillage Project

Knowledge	Institutional	Social	Ecological	Technological	Economic
<p>Training carried out by implementation partners</p> <p>Acknowledgment of traditional practices</p> <p>400 farmers trained in various agricultural approaches</p> <p>“133 community members and village leaders were trained on afforestation, nursery management and tree planting,” as well as leather tanning</p> <p>Training in the use of weather forecasting technology, water storage and solar energy technology</p>	<p>Funded by EU - Global Climate Change Alliance</p> <p>Academic partner - Institute of Rural Development Planning</p> <p>Implementing Partners:</p> <p>Hombolo Agricultural Research Institute (National Extension Service), Dodoma Municipal Council, Dodoma Environment Network - DONET (NGO), Maji na Maendeleo Dodoma - MAMADO (NGO), Tanzania Organic Agriculture Movement - TOAM (NGO - Membership organization promoting organic farming)</p>	<p>Participatory approach is cited for identifying local capacities to accentuate</p> <p>Beneficiaries involved in reporting their challenges, productivity and how that changed over the project duration</p> <p>Participatory land-use planning to identify and allocate clear spaces for crops and livestock production, forestry and living area</p>	<p>Areas included the eco-village (6 sub-villages)</p> <p>Land available for expansion - made more manageable by land-use planning</p> <p>Water scarcity that required a solution (water storage intervention implemented)</p>	<p>Minimal Research & Development - used proven technologies to deliver service</p> <p>Technology well utilised for strong outcomes of increased productivity, improved water collection, storage and access, and improved energy efficiency</p> <p>Farmers provided with drought-resistant, high-yielding and early-maturing seeds</p> <p>Weather monitoring station to provide information to farmers about when is best to plant - unclear how effective the information sharing may be.</p> <p>Tillage instruments: 24 ox-drawn tillage for magoye ripper, ox-weeder, ridger plough</p>	<p>Training how to make businesses or increase productivity to improve economic gain</p> <p>Using what you have to improve your income</p> <p>External funding by EU - Global Climate Change Alliance</p> <p>Allocation to product and processes</p> <p>Economic sustainability of beneficiaries potentially quite strong - sustainability of technology, potentially not - unclear allocations to maintenance (eg. parts), but the training of beneficiaries should help keep the systems in good condition</p>

Synthesis

This case serves as a powerful demonstration of how a project can be implemented holistically with indicators of success shown across each intervention that was undertaken. Further, the involvement of the community in implementing the project and evaluating it is laudable. In a reflection with the community, the various innovations that were installed were ranked by the community based on the innovation's effectiveness, degree to which it benefited women, and affordability. The top innovations were cited as: 'livestock disease management, improved seeds, intercropping, good agricultural practices, use of farmyard manure, tree planting, soil moisture conservation, ox-tillage, fuel-efficient stoves and improved chickens'[5]. This reinforces agriculture and food as a vital entry point for nexus work, exemplified by a female participant's reflection that 'when there is food, there is peace' [5].

Nevertheless, this project also reinforces a recognition that many nexus projects tend to be donor driven, requiring large external funding and causes a question of whether integrated projects such as this can be

internally driven and implemented and make use of own revenue. The success of this case and the interest in expanding the facilities and trainings suggests that there is good ownership of the ideas and opportunities represented in this case by the residents of Chololo. Many have expressed the potential for sharing the ideas further, which has been done through the second iteration of the project delivery from 2016 through 2018 (visits to neighboring project villages, recognition in international ecovillage networks and participation in virtual conferences). However, as part of reorienting Dodoma as the Capital, certain areas of arable land used by Chololo residents has been claimed for development of a military base, jeopardizing some of the investment in agriculture and livelihoods of the village. This represents a disconnect between national strategy and local action, which is present in many contexts. While the continued growth of Chololo is uncertain, there is interest in expanding its ideas to influence the development plans for Dodoma Municipal Council, as it grows.

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