

Decentralized Energy-Water- Food systems in Africa: Space Analysis, Least-cost modeling of sack farming and establishment of renewable energy technologies in the Diepsloot slums of Johannesburg, South Africa

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Abstract

UNICEF projects South Africa to have a staggering 80% of the population living in urban areas by 2050. Poor urban planning and unavailability of affordable low cost housing will force the underprivileged population to overcrowded slums. Thus, creating a sustainable solution incorporating energy-water-food nexus to aid these sectors of population will become a defining impetus of modern societies.

Analysis of past rainfall and climate trends in Diepsloot show that it is an ideal location for urban farming. Due to lack of land, sack farming, in which farmers plant crops into the sides and tops of large sacks filled with soil, bears potential for such agricultural practice.

Apart from the aforementioned, rainwater harvesting, a passive cooling system for vegetables shall be introduced, which uses natural evaporative cooling instead of electricity compared to a

fridge. In addition , a community center marketplace will be established. Powered by solar energy mainly for lightning. Furthermore, it is envisaged to be a place of inspiration and demonstration for decentralized solar systems. Respective trainings on this subject and subsequent realization can be conducted in cooperation with on-site NGOs like Dell Learning Lab.

Through crowd funding, partnerships with governmental agencies and the city of Johannesburg and a monthly subscription fee of 60 ZAR, we plan to provide two sacks per household, ad hoc training and support, and access to a nursery within the marketplace. The project hopes to run a pilot cycle in any accessible section of informal Diepsloot, with initially 100 families as participants. Pessimistic cost analysis of the 2-year pilot cycle results in a return on investment of \$800, which can be used in subsequent cycles. The long term goal of the project is to create a marketplace of social interaction and a feeling of community belonging for an otherwise disregarded faction of society.

Keywords: Urban Farming, Renewable Energy, WEF Nexus, Diepsloot, Local Entrepreneurship.

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