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Water-Energy-Food Nexus assessment of the intended outcomes of the Songwe River Basin Programme in Malawi and Tanzania

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Water, Energy, and Food sectors are interconnected and part of a complex system referred to as the Water-Energy-Food (WEF) nexus. The assessment of WEF interactions through the nexus approach is crucial to illustrate interlinkages, synergies, and minimise trade-offs among these three components when development plans are assessed. Water, energy, and food are at the core of developing countries' goals and strategies where interest in the WEF nexus approach is rapidly growing. However, a lack of empirical evidence, appropriate methods, and quantitative WEF nexus assessment tools has been highlighted. Thus, WEF Nexus Toolkit (WEF-Tools) project aims at supporting policymakers across the water, energy, and food sectors to make evidence-based decisions on environmental, economic, and resource security issues. In this study, we qualitatively and quantitatively assess the WEF nexus in the Songwe River Basin (SRB), located on the border between Malawi and Tanzania. Reducing poverty, improving human health and livelihoods, ensuring water, food, and energy security, mitigating floods, and enhancing sustainable river basin management are the main challenges recognised by the SRB Programme (SRBP) jointly developed by the Governments of both countries. The construction of a multi-purpose dam is a key objective of the SRBP. The dam is intended to supply water for ≈ 180 MW hydropower plant, ≈ 86000 dwellers, ≈ 3000 ha of irrigation schemes in each country, and control floods in the lower part of the basin. WEF-Tools has assessed the SRBP expected outcomes by applying an approach that starts from conceptual mapping of the SRB nexus system and progresses to the development of quantitative tools such as System Dynamics Models (SDMs), and identification of suitable indicators for the assessment of different scenarios, management strategies, subsequently providing decision-makers with feasible development pathways. Ultimately, this work will provide a structured knowledge base, simulation tool, dashboard, and a composite nexus index co-developed, tested, validated, and refined through interactive collaboration with stakeholders and local experts. Thus, it is intended that the toolkit supports the development of short-, medium- and long-term strategies for sustainable integrated resource management and policy development. Outcomes will provide a means for government ministries, NGOs, and development agencies to assess progress towards relevant Sustainable Development Goals (SDGs), particularly SDGs 2, 6, and 7.

Keywords: Water-Energy-Food Nexus, multi-purpose reservoir, decision making, System Dynamics

Model, SDGs, Songwe River Basin