



Supporting better decisions across the nexus of water-energy-food challenges: Case of the Zambezi Basin

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The water energy food (WEF) nexus has been promoted in recent years to improve decision making across the three sectors. Water, energy and food production are inextricably linked and rely on the same land resource. The nexus perspective seeks to highlight interlinkages, the synergies and trade-offs between these sectors to aid better decision making for development in the three sectors. However, data and a lack of complete knowledge and observability make the WEF approach a challenging task, especially in transboundary river basins where there is a diversity of scales at which the nexus can be observed and studied.

Land use changes have a profound influence on hydrological and agricultural provisioning and regulating ecosystem services and energy provision. Future policy decisions in the water, energy and food sectors could have profound effects, with different demands for land and water resources, intensifying competition for these resources in the future (Smith et al., 2010). Previous studies focus on monitoring land cover and land use changes, but failed to utilize earth observation techniques to understand the spatial nexus interlinkages, and in turn use it to inform decision making in the sectors concerned. Earth observation and spatial computing approaches can highlight issues within the nexus, putting major issues on the map. They can also identify resource use hotspots and chokepoints for targeted solutions before major crises occurs and they show spatial interactions of the WEF systems and other systems such as climate, population and how they relate and how they impact each other (Eftelioglu et al., 2016). This study uses Google Earth Engine (GEE) to understand historical land cover and land use changes in the Zambezi basin and examine the spatial relationships of water, energy and food, how much land is required for water, energy and agricultural development to meet existing and growing demands in the Zambezi and the trade-offs between land for WEF development vs. nature and/or and other uses. GEE is a web based catalogue of Landsat satellite imagery and geospatial datasets with planetary-scale analysis capabilities. The use of GEE provides ready to use geospatial data, which can be used for natural resource management applications. In this case, GEE will be used to analyse the land cover/use changes in the Zambezi river basin from 1972 to date. This will contribute to understanding the spatial and temporal interlinkages of water, energy and food can be used to address data gaps and overcome issues of observability in the nexus in transboundary basin across a diversity of scales, from a small local to basin-wide and regional scales. In addition, this research will aid decision and policy makers to make informed development decisions for the achievement of sustainable development goals in the water, energy and food sectors.