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Small dams dynamics as a proxy measurement for hydrological drought

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The Limpopo river basin covers an area of about 415,000 Km2, across four countries in Southern Africa, namely Botswana, Mozambique, South Africa, and Zimbabwe. The normal rainy season is from October to March, though the basin is characterised by semi-arid and highly variable rainfall conditions. As a consequence, hydrological droughts often occur. To sustain rural livelihoods in the basin, an important number of small reservoirs have been developed. However, some of the small reservoirs dry up, because of severe meteorological conditions that arise.

This study therefore takes the perspective that the characterisation of small reservoirs' levels can assist in providing an insight on the aridity that is likely to prevail from the end of a rainy period. To achieve this, Landsat TM 4-5 images were processed in a Geographical Information System (GIS) for selected study sites, namely Gwanda and Matobo districts (in Zimbabwe), Lotsane catchment (in Botswana), and Mabalane district (in Mozambique). The acquisition periods of the images characterised respectively a rainy and a dry period. Small reservoirs were identified through GIS processing of the images. Surface areas of the small reservoirs were extracted and comparisons were made between periods of the images for each study site. A total of 256 small reservoirs were identified in Gwanda district in February 2009, of which 46 % that had volumes below 24,533 m3 were dry by May 2009. A total of 162 small reservoirs were identified in Matobo district in April 2010, of which 54% that had surface areas below 24,496 m2 were dry in November 2009. A total of 106 small reservoirs were identified in Lotsane catchment in Februrary 2010, of which 43% that had surface areas below 33,780 m2 were dry in May 2011. A total of 195 reservoirs were identified in Mabalane district in March 2009, of which only one was having water in September 2008. The advantage of this approach is to use identified thresholds of reservoirs sizes to assist in early warning in such a data-scarce basin. Consequently, appropriate coping mechanisms can be adopted as a result of these findings.