Identification and Optimisation of South Africa's Basic Access Road Network

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Abstract : Road authorities are mandated within limited budgets to both deliver improved access to basic services and facilitate economic growth. This responsibility is further complicated if maintenance backlogs and funding shortfalls exist, as evident in many countries including South Africa. These conditions require authorities to make difficult prioritisation decisions, with the effect that Road Asset Management Systems with a one-dimensional focus on traffic volumes may overlook the maintenance of low-volume roads that provide isolated communities with vital access to basic services. Given these challenges, this paper overlays the full South African road network with geo-referenced information for population, primary and secondary schools, and healthcare facilities to identify the network of connective roads between communities and basic service centres. This connective network is then rationalised according to the Gross Value Added and number of jobs per mesozone, administrative and functional road classifications, speed limit, and road length, location, and name to estimate the Basic Access Road Network. A two-step floating catchment area (2SFCA) method, capturing a weighted assessment of drive-time to service centres and the ratio of people within a catchment area to teachers and healthcare workers, is subsequently applied to generate a Multivariate Road Index. This Index is used to assign higher maintenance priority to roads within the Basic Access Road Network that provide more people with better access to services. The relatively limited incidence of Basic Access Roads indicates that authorities could maintain the entire estimated network without exhausting the available road budget before practical economic considerations get any purchase. Despite this fact, a final case study modelling exercise is performed for the Namakwa District Municipality to demonstrate the extent to which optimal relocation of schools and healthcare facilities could minimise the Basic Access Road Network and thereby release budget for investment in roads that best promote GDP growth.

Keywords : basic access roads, multivariate road index, road prioritisation, two-step floating catchment area method