South Africa's water supply areas:

*Development of NFEPA High Water Yield Areas and future refinement needs*

Ashton Maherry, Jeanne Nel, Mark Botha

amaherry@csir.co.za

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NBA2004: 20% of the country produces 70% of the runoff
Mean Annual Precipitation (Lynch 2004)
Equation: WR90 (Midley et al, 1994)

\[ MAR = (MAP-B+3) + \left( \frac{C}{\exp\left(\frac{(MAP-A)}{C}\right)} \right) \]

Where:
- MAR = Mean Annual Runoff (mm per year)
- MAP = Mean Annual Precipitation (mm)
- \( \exp \) = e to the power of
- A = 75 + 45Z
- B = 225 + 135Z
- C = 150 + 90Z
- Z = climate-related zone number, ranging from 1 to 9.
Evaluating the calculation of mean annual runoff at 1 x 1 minute scale
Mean Annual Runoff (mm/year)

- Calculated using MAP grid from Lynch 2004 using DWAF’s WR90 relationships of estimating runoff from rainfall (the one used to calculate quaternary runoff)
- This was cross-checked with totals for each quaternary and it compared well
- This is not the modelled ACRU MAR because the ACRU model assumes the whole country is a grassland biome and the MAR results produced to not coincide as well with DWAF WR90 quaternary estimates
MAR per 1x1’ grid cell divided by Average MAR per primary

- This summarizes the MAR per primary to get an idea where the main runoff is generated for each primary catchment.
- Where the value is over 1 the runoff for that grid cell is above average MAR in the primary, 2 = double average etc.
Translation from GRID to Sub-quaternary Catchments
High water yield areas

- Strategic water supply areas
- Only 18% are formally protected

> 3 x higher than rest of catchment
Application: Mining in high water yield areas, Mpumalanga Province

- Almost 40% of the high water sub-catchments have mining right applications
- These produce 50% of the water yield
Applications

Coal and Water Futures in South Africa
The case for protecting headwaters in the Enkangala grasslands