

TECHNICAL ABSTRACT

Solar Radiation in Southern Africa*

by Gladius Lewis

Dept. of Mechanical Engineering, The Univ. of Alabama in Huntsville, Huntsville, AL 35899, USA.

An examination of data for a number of locations in Southern Africa obtained from The Meteorological Office, Harare, Zimbabwe (1984), The Meteorological Office, Lusaka, Zambia (1983) and the Council for Scientific and Industrial Research, Pretoria, South Africa (1984) has provided the following information on the general levels of solar radiation in the region. Table 1 gives the annual mean daily global solar radiation at the seven stations shown in Fig. 1, and Table 2 gives the monthly mean daily global solar radiation and duration of sunshine at Harare.

Table 1.
Annual mean global solar radiation

Station	MJ/m ² per day
Bloemfontain	21.0
Buloways	21.3
Cape Town	19.4
Harare	20.3
Livingstone	21.4
Mansa	20.5
Windhoek	22.8

Table 2.
Monthly mean daily global solar radiation and duration of sunshine at Harare

Month	MJ/m ²	Sunshine hours
January	20.8	6.4
February	20.6	6.4
March	21.5	7.0
April	20.4	8.0
May	18.7	8.6
June	16.4	8.7
July	17.9	9.1
August	20.0	9.6
September	22.6	9.7
October	23.6	8.7
November	21.0	7.0
December	20.3	6.2

*Abstracted by R.H.B. Exell, Div. of Energy Technology, Asian Institute of Technology.

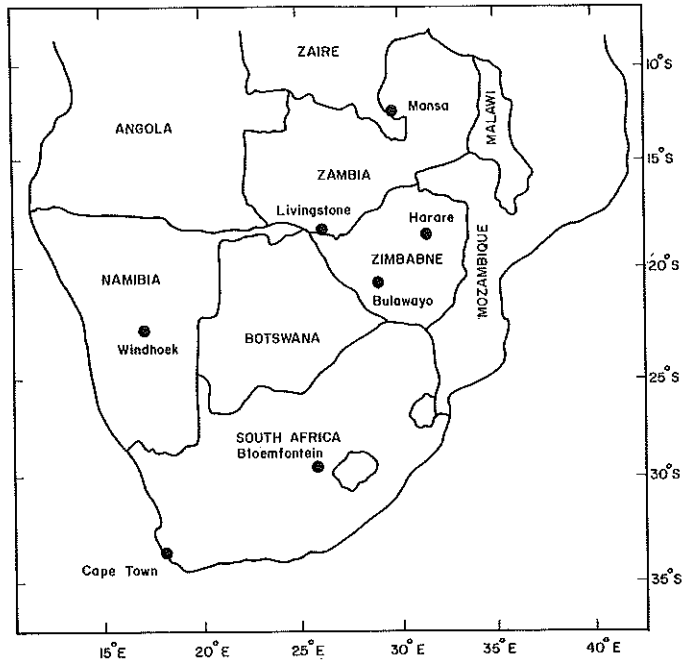


Fig. 1 The 7 Southern African locations.

Calculations suggest that the optimum tilt angle in degrees for solar collectors in southern Africa should be given by the expression $4 + 0.8 \phi$, where ϕ is latitude, between 10° S and 35° S. The mean daily solar radiation is insensitive to variations in the tilt angle: departures from the optimum angle of up to 10° reduce the mean solar radiation falling on the tilted surface by an amount not exceeding 2%.