

INTRODUCTION TO PASSIVE CLIMATIC DESIGN

Passive climatic design entails the study of a particular sites climate, and deriving from this study a series of design principles that should be applied in order to achieve a building that is heated and cooled naturally thereby creating a comfortable indoor and outdoor environment for living.

The designs illustrated are but one example of the application of each climatic zones design principles, and are published as a means to begin a discussion around appropriate and sustainable passive climatic design. Comments, criticism and suggestions are welcome at www.greenbrick.co.za.

Each design is an interpretation of a specific zones climate and cannot therefore be applied to a different climatic zone without revision and adaptation to that new climate. In fact, some designs would be wholly unsuitable for other climatic regions; especially those designed for the more extreme climates i.e. designs for hot humid regions would create uncomfortable living conditions if transplanted, without adaptation into a hot dry climate.

Further, an attempt has been made to design a range of different size and typology homes, from a starter home or cottage to a large home that can be subdivided into two dwellings. Climatic appropriate design is applicable to all buildings of every size and type, and contributes to minimizing a buildings reliance on scarce and costly energy and water resources.

Note that apart from analysing the climatic data of the region within which the site is located, analysis of the site specific conditions is also required. Specific solar orientation, wind direction and speed, the effect of overshadowing from neighbouring buildings, vegetation and geographic features, all need to be taken into account, and might override a regions climatic design principles. The designs published do not take any site specific conditions into account, only regional conditions, and therefore need to be adapted to suit a specific site.

So why should one bother with site or regional specific climatic design? By addressing the climatic design principles of each region, the potential for a comfortable environment increases and the costs of heating and cooling decrease. "Additional expenditure utilised for heating due to wrong orientation in housing is up to 48% of household expenditure" Irurah 2000 This study shows how badly designed houses have a detrimental effect not only on comfort and wellbeing but also on household budgets.

References: Two invaluable books on South African climatic design were referenced,

- Manual for Energy Conscious Design Dieter Holm, 1996 (Unfortunately this manual is out of print, but the author has confirmed that he is working on an updated edition to be published soon)

- Enviro-friendly Methods in Small Building Design for South Africa Alaric Napier, 2000 (An excellent reference book published and available directly from the author - alaricjill@vodamail.co.za or tim@mindscope.co.za)

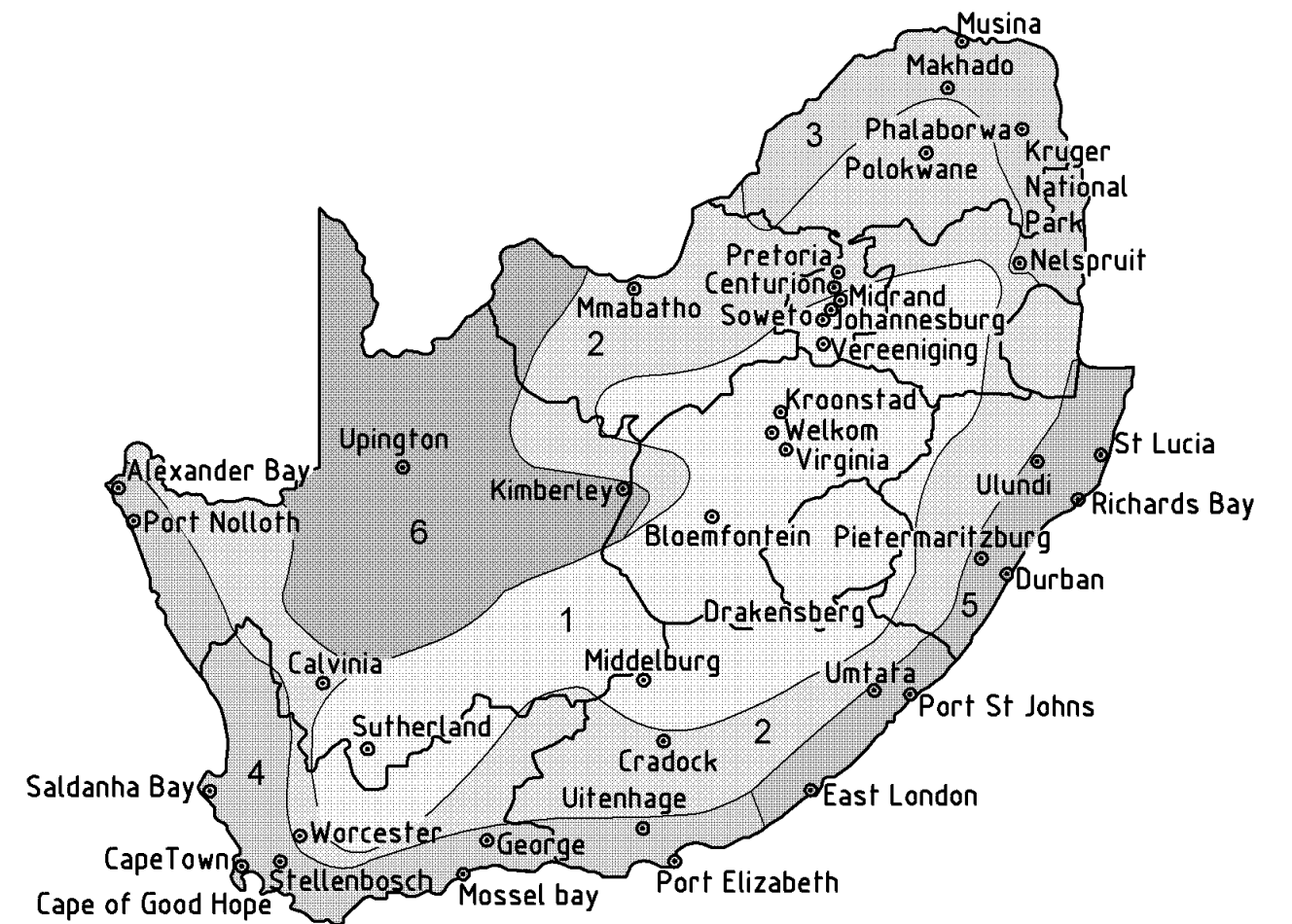
However, these books differ in their interpretation of the boundaries and number of climatic regions in South Africa. Holm divides South Africa into 12 climatic regions, and has additional data for Namibia and Botswana, whereas Napier refers to 9 climatic regions. For the purposes of this book SANS identification of 6 climatic regions was used- but Holm, Napier and Van Lengens specific regions are noted for reference.

The book "The Barefoot Architect A Handbook for Green Building" Johan Van Lengen, 2008, is also a good resource, but needs to be read with local conditions in mind.

Definitions:

Equatorial Window = north facing windows in Southern Hemisphere. "A single equatorial window equal in size to $\pm 20\%$ of the size of the floor area of the room in question, provides sufficient heating for the entire winter period in most climatic regions" HOLM 1996

Stack Effect = movement of warm to hot air upwards in a space leaving cooler air below.



Zone	Climatic conditions
1	Cold interior
2	Temperate interior
3	Hot interior
4	Temperate coastal
5	Sub-tropical coastal
6	Arid interior

CLIMATIC ZONES OF SOUTH AFRICA - SANS

PASSIVE CLIMATIC DESIGN

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