UNIVERSITY OF NAIROBI
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BIOCLIMATIC DESIGN AND TECHNOLOGY:
A CASE OF WAJIR TOWN

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B02/36625/2010
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DECLARATION

This thesis is my original work and, to the best of my knowledge, has not been presented for the purpose of awarding a degree in any other institution.

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This thesis is submitted in part fulfillment of the examination requirements for the award of Bachelor of Architecture degree (B. Arch), Department of Architecture and Building Science, University of Nairobi.

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Gratitude turns what we have into enough, and more. It turns denial into acceptance, chaos into order, confusion into clarity...it makes sense of our past, brings peace for today, and creates a vision for tomorrow. (Melody Beattie)

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ABSTRACT

The growth and development of Wajir can be attributed to its location; which is centralized between the towns of Marsabit, Moyale, Mandera and Bardere; that saw it grow into a trading centre. This eventually led to the growth of other support facilities like religious centres and administrative centres. The town is characterised by high temperatures as it experiences a hot semi-arid climate. The town was initially occupied by the Somali who built traditional houses (hori). Over time modernism has affected the architecture of the region whereby more modern buildings are being brought up transforming the architectural style that defined the town. These new designs create hot indoor environments during the day, thus challenging the user comfort. They use mechanical cooling systems which release heat (that is trying to be avoided) and also recycle used up air within the interior spaces, therefore increasing the chances of the occupants to contract air-borne diseases. The study was done to look into the architecture of Wajir as well as see which type of buildings pay attribute to the defining factors of the region and most importantly provide thermal comfort for the buildings’ users. The study was done by critically analysing three buildings of varying architecture and time periods; which is pre-colonial (traditional Somali house - hori), colonial (Maternal Child Healthcare [MCH] Wajir) and post-colonial (Huduma Centre, Wajir) periods. The results showed that the MCH Wajir provided more comfortable indoor conditions than the other studies because of its ability to utilise both technology and bioclimatic design. It is then followed by the traditional Somali house and finally, the Huduma Centre. Concluding from that, it is recommended that for a building to provide user comfort, it needs to have a good design receptacle; that arises from technology utilisation; and utilisation of natural resources; bioclimatic design.
Chapter 01  INTRODUCTION

‘Lamahuraan waa cawska jilaal’ (Somali Proverb)
In the rainless season dry grass is fodder

Figure 1.01: Artistic photo
Source: Christelsen, 2011
As life has arisen through the hidden aspects of natural laws, so for better or worse the rules of nature command that life make a close adjustment to natural background. The vetting is impartial; it can be kind or cruel, but all living species must either adapt their physiology, through selection or mutation, or find other defenses against the impact of environment. (Olgyay, 1962)

In any climate, a building should be designed with respect to the climate in which it is located (figure 1.02). Some of the major factors that influence a building’s design include: sunlight, precipitation and wind (figure 1.03). The sun, being the natural source of heat, is a primary factor that should be considered while designing in the climate in study; hot semi-arid climate. Buildings in Wajir’s hot semi-arid climate should offer optimum levels of comfort as they are shelters against the hot sun. The development of a nearly thermostable state in our buildings should be regarded as one of the most valuable advances in the evolution of buildings (Cannon, 1962). In this spirit, an architect should keep in mind that heat is the major source of discomfort in this climate.

Bioclimatic design is the design of buildings based on the local climate. This involves utilising the climatic elements to create a comfortable environment for the building’s users. Technology use in design involves the use of innovative strategies to come up with more habitable buildings.
Building designs suited for Savannah climatic regions have been adapted in Wajir which has a hot semi-arid climate. This was done, and still is being done, without putting thought into the fact that buildings and shelters are designed to suit their climate. Moreover, it poses difficulties as the forms are inappropriate symbols of cultural progress.

Consequently, Bioclimatic design strategies and technology are not being utilised. Traditional Somali houses (figure 1.04) were built with respect to the high temperatures. However, these traditional strategies are no longer in use because they are viewed as not being ‘modern enough’.

These foreign designs (figure 1.05) create hot indoor environments during the day, worsening the situation. They utilise mechanical cooling systems (figure 1.05) which release heat (that is trying to be avoided) and also recycle used up air within the interior spaces, thus increasing the chances of the occupants to contract air-borne diseases. A visit to the region showed that in some of the buildings, most activity is halted at times of the day (between noon and three O’clock) when there is too much heat. The buildings’ occupants opted to shelter in traditional shelters that offer cooler indoor environments. The effect of this phenomenon is the existence of buildings that can’t serve their primary purpose in this environment, which is protection against adverse heat.

The study hopes to show how design of buildings that provide optimum comfort can be achieved and the technology that can be used.
1.2 RESEARCH QUESTIONS

The research questions are:

(a) How has the architecture of Wajir utilised bioclimatic design to provide user comfort?

(b) How have the buildings in Wajir utilised technology in their design?

(c) How has the Somali traditional architecture been influenced by climate and the locals’ cultural practices?

1.3 RESEARCH OBJECTIVES

The research objectives are:

(a) To establish how the architecture of Wajir has utilised bioclimatic design to provide user comfort.

(b) To analyse how buildings in Wajir have utilised technology in their design in a bid to provide thermal comfort.

(c) To examine the climate of Wajir and the cultural practices of the Somali that influenced the architecture of their traditional houses.

1.4 RESEARCH JUSTIFICATION

The encroachment of alien designs that lack in regionalism has led to the rise in buildings that don’t relate well to their environments. This in turn, leads to buildings that don’t provide adequate comfort to their users. There is need to re-think how to design buildings, especially those in harsh climates.
1.5 SCOPES AND LIMITATIONS

This research was limited to Kenya (figure 1.08) and specifically Wajir town (figure 1.09) and its environs. The town in study is rich in architectural variety between modern and traditional Somali architecture.

There is a lot of material that has been documented about designing in hot semi-arid climates. It is challenging to review all the material with the given time frame. The study has limited this research to only the most vital issues that affect the architecture of the said climate.

Financial and time constraints limited the amount of material that can be gathered. Most information was borrowed from secondary data. Primary data sources were a select of the author.
It is important for the building industry players to understand the importance and significance of buildings that relate well with their environments. This research can be of great significance to the domain of builders and designers seeking to set up buildings and structures in hot climates.

Chapter one introduces the study as well as explaining the key terms which are: ‘bioclimatic design’ and ‘technology’ as well as explaining the state of architecture in Wajir. It goes further to break down the problem in hand. It explains the research questions and objectives that are the guide lines of the research.

The literature review is presented in chapter two with review of literature on designing in hot semi-arid climates. Building materials and strategies are discussed. This chapter helped formulate variables that formed the basis of analytical research on the case studies.

Chapter three gives a detailed explanation of the methods employed in carrying out the research. It explains the type of cases studies that were used as well as the time and population scope with an explanation of why the author chose the methods.

Chapter four presents field work, especially on analysis and presentation of data which encompasses an examination of the study area and its architecture, giving a rendition of location, spatial planning of the town and the architectural language.

Chapter five is the final chapter of this study, where the author gives his conclusions and recommendations based on the findings of his fieldwork analysis.

Bioclimatic Design and Technology: A case of Wajir Town