Preface

The scale of urbanization in India is unprecedented- it is estimated that nearly 140 million people will move to cities by 2020 and 700 million people by 2050. This large scale of urbanization is expected to transform existing urban agglomeration into mega-cities. In this proliferation & with this large inflow of people, the resources & environment will bear the brunt.

Housing being one of the basic necessities also consumes lot of energy in construction & operation. The energy resources are limited and hence there is an urgent need to reduce the consumption of energy through various means. With the over-exploitation & over consumption of energy the need for reducing it grew globally & subsequently Green/ Sustainable/ Eco friendly building principles were propagated & evolved. Various methods were adopted worldwide prominent amongst them was by LEEDS (Leadership in Energy & Environment).

India also adopted various measures in the field through LEEDS (India) by IGBC and the energy rating of the building. Soon TERI evolved a nation vide rating system through GRIHA which was later endorsed by Ministry of Renewal Energy & Resources (Government of India).

These rating systems apply nation vide irrespective of different & varied climatic conditions in India. Rajasthan, a state in India located to the western side has particularly Hot & Dry Climate. Though there are various criteria as applicable in LEEDS(India)/IGBC & GRIHA which are applicable particularly to this region, yet few approaches suitable for this particular area needs to be evolved.

In this particular thesis first & foremost literature review on relevant topic is done & then affordability & sustainability has been dealt upon in detail.

In order to understand the various criteria for rating of the buildings detailed study of LEED (India) & GRIHA rating system has been done.
Few case studies particularly of Rajasthan & also at other places have been done to evaluate the implications of various methodologies been adopted and understand the different process.

In order to make houses affordable to the common man various innovation in materials, methods & means have to be done. The bricks being, the most important building material & incurring substantial cost there is a need to make it cost effective. It was experimented by making bricks using fly-ash & stone dust with cement as binding material. Fly-Ash & stone dust are readily available in Rajasthan due to large thermal plants & stone quarries. These bricks therefore need to be tested for their suitability & techo-economic viability. In an experimental setup these bricks were tested with various parameters against the conventional bricks and it was found to be better technically & economically.

After the study of various parameters in making a building sustainable & eco-friendly it was found that the orientation of the building plays a very important role & directly influences the energy consumption by buildings. In order to analyze the effect of orientation in the overall energy consumption by buildings an IT tool namely EnEffResBuild has been used for a particular building located at four different cities of Rajasthan. The building was rotated in all the four directions & the energy consumption savings were worked out. It was concluded that the appropriate orientation of the buildings in different cities of Rajasthan helps in maximizing the cumulative energy savings by reducing the energy consumption & providing comfort to the occupants.

Finally through the study of relevant literature, study of energy rating codes prevalent in India, case studies of buildings, experimental research on affordable building material, testing of IT tool kit for perfect orientation various appropriate design approaches/strategies for major climatic condition prevalent in Rajasthan i.e Hot & Dry / Composite, have been evolved & schematically drawn so that if these approaches/strategies are followed it shall facilitate in getting the green rating for the building in Rajasthan.