INTRODUCTION

History has shown us that architectural built forms have evolved in response to the climate, lifestyle and availability of building materials. Although housing typologies are a result of multiple determinants, climate and culture are the two most important determinants (Rapoport, 1969). In hot climates where cooling is a necessity, building typologies such as detached units, townhouses, multi-story apartment/office buildings, courtyard buildings have been developed. Buildings with internal courtyards are considered the most “appropriate” in many hot regions, especially in deserts (Givoni, 1989). However, courtyard built forms are not uncommon in regions of the world where heating is a predominant requirement. This reinforces the theory that culture is also a dominant factor for built form development. How true is this philosophy of climate and culture consciousness in a global economy where adapting to technologies is the governing culture? Here the courtyard building form is evaluated of as a dominant paradigm in the context of sustainability for hot and dry climates in both the developed and developing countries.

EVALUATION OF A DOMINANT PARADIGM

Courtyard buildings were developed in an era when air-conditioning was an alien concept. Courtyard buildings were an integral part of the Chinese, Japanese, Spanish, Indian and many more cultures. In the Japanese culture, courtyards were built as an important part of the house design to combat the hot summers (Ohashi, 1988). As Givoni explains, it is the design details within the courtyard that provide pleasant outdoor environments while improving indoor comfort. Indigenous courtyards help achieve desirable thermal environmental conditions not by mechanical devices, but by architectural design in concepts, plans, forms, sections, elevations and details (Subhi-Al-Azzawi, 1989). Researchers have suggested that courtyards developed through a process of trial and error help ameliorate if not overcome adverse climatic conditions. In a recent study of housing typologies of the southern part of India, parametric modeling results show that courtyard houses have a 50% less cooling load requirement compared to other generic building forms used in the same location (Author, 1995).

RELATED TRENDS IN LIFESTYLE

In the built world, amongst the many differences between developed and developing countries, the single most important difference is to do with the use of mechanical devices for conditioning spaces. In the past, building typologies were dictated by lifestyle. Today, with the technological twist to lifestyles, building typologies (cookie-cutter forms) dictate lifestyles. If you look at traditional courtyard building forms, these are essentially inward looking buildings with a strong relationship to the street.

Various examples of courtyard building typologies are seen in Marrakech, Morocco (Fig. 1); Jaisalmer, India (Fig. 2) where the built form and the street layout have a unique relationship. The building shades not only the courtyard but the streets as well, such that the microclimate is tempered. This shading effect lowers the overall cooling load. Courtyard is a simple design strategy that enhances daylight availability in every room. In an indirect sense, daylight being a cool source of light, it further helps reduce the cooling load. Although these benefits are well known, in the context of cooling and the trend of how people in developed v/s developing countries perceive interior/exterior spaces, Table 1 below is a comparative analysis that is self-explanatory.
Figure 1. Part town plan of Marrakech with courtyards (Fathy, 1986)

Figure 2. Floor Plan /Section of a typical courtyard building and City plan of Jaisalmer (Rajasthan, India) (Gupta, 1981)
Developed countries | Developing countries
---|---
Definitions of cooling: | Passive conditioning of spaces with little or no energy use
Active conditioning of spaces with minimum energy use | 
Context | Trend: as the income level of a household increases, consumption pattern increases, endurance level drops
Buildings are designed primarily with mechanical systems in mind | 
Approach | Mechanical System oriented
Lifestyle oriented | 
E.g.: opening windows, sprinkling water in surrounding areas, use of ceiling fan for air distribution
Courtyard | Used as a garden space, decorative unit
Used as an activity space: bathing, cooking, sleeping, socializing

Table 1. Comparison of courtyard houses in developed and developing countries

A LOST OR A RECOVERING PARADIGM?

Enclosed and attached courtyards are common architectural patterns-often referred to in the professional and scientific literature as microclimate modifiers, which may improve thermal comfort conditions in the enclosed as well as the attached built volume. This statement may be correct only under certain conditions, and is subject to a number of specific requirements: the relative dimensions of open space and built volume, the treatment of exposed surfaces, and the orientation of the open space (Meir, 1995). The whole aspect of cooling involves user adaptability in terms of opening/closing windows at night/day, sprinkling water in the courtyards etc. Although courtyard built-forms were relatively successful, the concept seems to be disappearing as compact building designs take precedence. Even in developing countries the trend has been and continues to be the replication of the western building model. Many of the traditional courtyard buildings in India for example have undergone modifications, with the courtyard being completely closed off and an air-conditioning unit has thereafter been installed.

Before the division of countries into developed and developing nations, people’s perception of passive conditioning of spaces was the same, the tolerance limit for the harsh environment was also the same. But today it almost seems like we cannot do without mechanical conditioning. Even in rural areas, it is a common occurrence that as the income level of a household increases; the tendency is to increase mechanical/electrical equipment within the household. In case of courtyard built forms, this trend has a serious impact on the way courtyards are used.

DISCOURSE

As seen in Figure 1 and 2 above, it appears that traditional town and city layouts essentially promoted air flow within and around buildings. The building form, street layout and vegetation aided lowering of summer temperatures. On one hand number of publications demonstrating the cooling effect of courtyards have been published. On the other hand researchers claim that trees minimize the effect of orientation and geometry and that cooling effect is mainly dependent on the amount and extent of trees that shade an area (Dimouldi, 2000). If the latter is true, then one key question comes to mind; ‘Is the courtyard a cooling form? Most traditional building forms in hot and dry regions had a courtyard within the building as seen in Fig. 1. But these layouts were not designed to accommodate vehicular traffic. Comparing these layouts to the modern grid iron city layouts (Fig. 4), which are incidentally used as models even for hot and dry regions, the courtyard is clearly missing; or simply put the required city density does not allow for a courtyard design. Although, Leslie Martin’s has demonstrated in the case of Manhattan that the same density can be achieved even with courtyard building forms (Fig. 5).
Figure 4. Part town plan of Washington D.C. showing the gridiron pattern. (Fathy, 1986)

Figure 5. Part town plan of Manhattan showing the gridiron pattern. (Martin, 2000)
Past research has shown that a grid-iron pattern with wide straight streets and tall buildings concentrated within a certain area affect wind movement and reduces its velocity. Moreover the automobiles add to the problem of polluted air, which can only be reduced by adding more green areas. Reliance on mechanical energy on cooling has raised the thermal comfort in modern buildings that were acceptable in traditional buildings. If we have enough of energy available to use mechanical conditioning and make up for the deficiency of building design and town planning, then the current practices can go on (Gupta, 1981). But we know that there is an energy problem and we have to re-evaluate the way we design and adapt to the environment.

This brings up a whole gamut of questions. It is obvious that without wind there can be no cooling. Does this trend of a motorized lifestyle change the function of a courtyard in buildings? With changing trends in lifestyle, how does this traditional design paradigm change in function and perception? How does a courtyard adapt to modern cooling practices? In the context of sustainability, where social, economic and ecological issues are of primary importance, can a courtyard built form still be perceived as an important design element that serves the function of being a social space as well as one that helps reduce the environmental impact of a building? In the context of cooling, numerous design paradigms such as the courtyard have evolved over time. These design paradigms are either lost or their potential for a paradigm shift in a changing lifestyle are left unexplored. Hence such paradigms need further investigation.

REFERENCES


