

PHD:
**Economic Evaluation Of External Wall Types In Residential
Buildings Based On Their Thermal Performance And Egyptian
Energy Code**

Abstract:

This research could be approached as a new attempt of studying the triple symmetry of which Architecture, Environment and Economy. Doubtlessly the buildings in Egypt suffer from many problems. It mainly exists because of the fact that the architectural design of most of the buildings in Egypt ignores the effect of the surrounding climatic conditions on the indoor climate and thus failing to achieve full thermal comfort for the users through the natural potentialities of the climatic design. This in turn affects their health and the way they perform the usual daily activities within their homes .Some buildings may achieve the thermal comfort, but in order for them to do that, they use financially costly mechanical means, and they may be highly consuming in energy which harms the environment .This may increase the previously mentioned negative effects. It becomes clear the urgent need to improve the buildings' energy consumption efficiency, if we take into consideration the fact that the building sector is the second largest electricity consuming one in Egypt-it consumes approximately %38.6 of the total electricity consumption. This shows the need to reduce power consumption in buildings by taking into consideration the surrounding climate when designing buildings.

The authorities responsible for energy and construction sectors in Egypt have recently paid increasing attention to this problem. They have issued the first *Egyptian Energy Efficiency Residential Building Code* which deals with efficiency in energy use in Egyptian buildings .

One can appreciate the value of this research, when realizing the multiple benefits of it. The most important of these benefits are reaching thermal comfort for the building users, improving the health of the inhabitants, increasing the economic feasibility of the building, reducing the environmental pollution and increasing individuals' productivity.

The research aims at setting a methodology with which to evaluate the economic feasibility of the thermal performance of external walls as a basic element of the building envelope ones, in an attempt to facilitate the process of design-making-decision as for the kind of external walls to be chosen, after applying some environmental and economic criteria. Such methodology depends on the comparison between the additional costs the owner has to pay in exchange for having a thermally efficient building envelope .

The research assumes that since The Egyptian Energy Efficiency Residential Building Code has set some specific values to be mandatorily achieved, the code must have aimed at reducing the consumption of energy by cooling or heating appliances. This is regardless of whether **the owner will regain the costs he spent for achieving the thermal values in return for reducing the energy consumption and doing without the mechanical air-conditioning appliances , or not.** So long as the owner doesn't get a clear answer to this question, it will be hard to convince him of the value of abiding by the regulations of the Egyptian Energy Code. The regulations will remain to be mainly theoretical studies difficult to be applied.

The research will attempt an answer to the previous inquiry in the applicable part of it. This will be done by conducting an analysis of (cost-thermal performance) of one of the elements of the building envelope; the external walls of one of the residential buildings.

To reach the previously mentioned objectives, and to verify the hypothesis, two approaches were used in the research:

First: The Theoretical Approach:

It follows the analytical method in studying two of the most effective factors over the design of the building envelope. They are: the climate and the economic cost..

Second: The Practical Approach:

This approach depends on the practical method through studying the economic feasibility achieved when matching the thermal performance of the building with the surrounding climate .This can be done by calculating the financial cost of reaching such match.

For starter, this approach identifies the criteria and the tools which will be used and applied in the practical part of the study. Hence, suggesting the results and the recommendations of the research.

The researcher has designed a program for the computer that fulfills all of the steps to calculate the (Cost-Thermal Performance) Analysis , from calculating the thermal criterion of the Egyptian energy code in residential buildings to the calculation of the economic criterion as represented by calculating the payback period of the different alternatives of external walls sections in residential buildings this program is called :

Software Program of (Cost-Thermal Performance) Analysis for External Walls Sections in Residential Building .

Master:
**دراسة تحليلية لقياس كفاءة الأداء البيئي للتجمعات السكنية في المدن
المصرية (دراسة تقييمية لبعض نماذج التجمعات السكنية بمصر)**

ملخص البحث :

بدأت المحاولات الجادة من جانب الدولة لغزو الصحراء خلال العقدين الأخيرين من خلال بناء المدن الجديدة ثم بعد ذلك من خلال المشروعات القومية الكبرى مثل مشروع توشكى فى جنوب الوادى، إلا أن الدولة أغفلت جانباً هاماً وهو إعداد تشريع خاص بالتخطيط العمراني يتمشى مع الظروف المناخية والبيئة القاسية التي تسود الإقليم الصحراوي فى جنوب مصر، وهنا تكمن المشكلة البحثية، إذ أن مصر مازالت تعتمد على قانون التخطيط العمراني (رقم ٣ لسنة ١٩٨٢) والذي يتحكم فى العمران المصري من الإسكندرية شمالاً حتى أسوان جنوباً رغم اختلاف ظروف المناخ فى كل منهما بصورة كبيرة عن الآخر.

ويتمثل الهدف الرئيسي للبحث فى قياس كفاءة الأداء البيئي لبعض نماذج الأنسجة السكنية فى مصر، وبالتالي تحديد الاعتبارات البيئية التي يجب مراعاتها عند تخطيط التجمعات السكنية فى الأقاليم المناخية المختلفة بمصر.

و يرجع اختيار موضوع البحث لعدة أسباب أهمها ما يمثله المسكن من أهمية للفرد والمجتمع باعتباره أحد الاحتياجات الإنسانية الأساسية، بالإضافة إلى ارتباط المناطق السكنية الوثيق بسائر الاستعمالات الأخرى، وما يمثله غياب البعد البيئي من آثار سلبية، كما أننا كدولة نامية نحتاج إلى ترشيد استخدام الطاقة فى مجال تعديل الحالة الحرارية بالمباني.

ويفترض البحث وجود اختلاف فى الاعتبارات البيئية التي يجب مراعاتها عند تخطيط المناطق السكنية فى مصر من منطقة لأخرى نتيجة لاختلاف الظروف المناخية بها.

وينتهج البحث المنهج التحليلي للنظريات والفرضيات التي ناقشت علاقة الإنسان بالبيئة الطبيعية المحيطة به، والعلاقة بين البيئة الطبيعية والبيئة المشيدة، ثم ينتقل البحث إلى المدخل التطبيقي الذي يعنى بوضع معايير بيئية لتطبيقها على نماذج الدراسة المختارة من أقاليم مناخية مختلفة من البيئة المصرية.

وقد توصل البحث إلى وجود ثلاث مناطق بمصر لكل منها اعتبارات بيئية مختلفة، وبالتالي متطلبات تصميمية وعمرانية مختلفة يجب مراعاتها عند تخطيط المناطق السكنية بها.