

INTEGRATED ENVIRONMENTAL MANAGEMENT SYSTEMS IN EGYPTIAN HOSPITALS

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ABSTRACT

Given that health services facilities operate continuously throughout the year, as they include offices, laboratories, operating rooms, intensive care, laundries, restaurants, and other hotel services, which results in a wide variety of outputs, whether solid, liquid or gas, which may require the presence of power generators, water purification units and others. For wastewater treatment, a third for solid waste treatment, and a fourth for dealing with hazardous waste, which makes such facilities very complex in terms of design and operation in order for them to play their role fully, and to manage this type of facility requires an integrated engineering system, which is currently in place in most These facilities, however, with the emergence of concern for the environment, the management system must include the environmental side to achieve and raise the operational and administrative efficiency of the facility, and accordingly this message was concerned with establishing foundations or a system for integrated environmental management for existing hospitals, taking into account the available budgets and providing low-cost solutions with the least possible modifications. To develop the existing health service buildings.

KEYWORDS: *Hospital Management–Environmental Management for Healthcare Facilities–Healthcare Facilities Management–Integrated Hospital Management–Hospital Buildings Improvement*

INTRODUCTION & LITERATURE REVIEW

Healing facilities began around the year 500 BC. In ancient Greece, temples were used to diagnose and heal people, because during that period, people believed in the power of rituals and holy settings in healing. The other purpose of the emergence of hospitals for military purposes, with the ancient Romans developing hospitals to serve their army, where the plans and designs of hospitals were based on the barracks. Both religious and military purposes were important aspects of hospital development. Hospital, a word derived from the Latin word "Hospitum" which means providing shelter for the needy [5].

Hospital buildings are considered a vital matter for every society, due to their significant impact on health and environment. Therefore, designing, constructing and operating hospital buildings is one of the complex tasks worldwide in general, and in Egypt particularly. Egyptian healthcare system faces many challenges, as the construction of a new hospital with the necessary medical equipment and devices has become over the allocated budget that is burdening the economy.

The Egyptian hospitals require a clear environmental system management as a part of its medical curriculum. This deficiency in management requires innovative solutions. One innovative solution may be the development of a contextual management environmental system suitable for hospitals in Egypt [6].

Accordingly, development, maintenance and upgrading of existing hospitals have become an important matter and a national duty. Hence, the research problem can be summarized as follows:

- The Egyptian health sector is characterized by major contradictions and suffers from the lack of an integrated environmental engineering management.
- The absence of Egyptian standards and environmental engineering and health codes while assessing hospitals environmentally.
- The lack of participation of environmental discussions which is related to environmental design that should be taught in public universities [7].

Most of relevant studies were assessing the sustainability of healthcare buildings that is aimed at evolving existing approaches. Some of proposed structures are based on the limitations of the recognized existing methods and on ongoing standardization. This kind of studies and initiatives may be of significant advantage in seeking improvement to the performance of healthcare buildings. Some conclusions that can be relevant to the debate regarding the efficiency of investment in healthcare buildings are:

First, these assessment methods can be used: to raise awareness and to promote sustainable practices in healthcare buildings; to reduce consumptions and costs and consequently the environmental and economic impacts of these buildings; and to support decision-making of both design teams and building managers in the process of designing and operating sustainable healthcare buildings;

Secondly, by considering the main stakeholders' opinion, both the list of indicators and system of weights are more aligned with their expectations, therefore increasing their potential effectiveness.

Thirdly, by proving a list of sustainability indicators and the corresponding assessment method and benchmarks, it allows hospital managers to compare the operating efficiency of their building with conventional and best practices on the national scene [8].

Another relevant study was conducting a whole-building analysis using a host of metrics, including green building metrics, with the goal of providing designers and healthcare providers quantitative data that can be used in their design and operations decisions. The intent was to fill a gap in the research, which previously analyzed only individual rooms, specific design elements, and green building metrics. Therefore, a comparative longitudinal assessment was completed that quantified the effects of building design on performance of a paediatric healthcare facility by comparing a new, LEED-certified hospital relative to its previous, traditional counterpart [8].

This study found statistically significant improvements in productivity, staff satisfaction, and quality of care, including a 19 % decrease in actual mortalities despite an 11 % increase in expected mortalities (both $P < 0.005$). Children's energy consumption and electricity per square meter decreased over 50 %, while water and sewage intensity decreased over 60 % (all $P < 0.001$). In their LEED-certified facility, Children's significantly improved

their productivity, quality of care, and staff satisfaction, in addition to utility intensity. These improvements can be credited to green building design, mechanical equipment upgrades, and organizational or cultural shifts related to Magnet nursing designation.

Following the move into a new, LEED-certified facility, Children's Hospital significantly improved their productivity, quality of care, staff satisfaction, and utility use per square meter while their expenses per patient in bed remained stable. The length of this longitudinal assessment limited the ability to separate the impacts of green building design from the effects of leadership and programmatic changes to the hospital. Over the study period, organizational and individual changes related to Magnet nursing designation and modified hiring practices greatly affected Children's hospital performance metrics. The relative effect of behavioural and organizational changes or green building design decisions is unknown, but there may also be a reinforcing symbiosis between the two elements in regards to improved employee performance and patient outcomes. Since Magnet designation required significant cultural change for Children's, the new, green hospital may have helped catalyze or foster those changes [9].

New, whole-building hospital design and green, efficient technologies, however, directly influenced the improvements to utility-related metrics. For future studies of this scale, researchers recommend the additional analysis of data such as employee and patient surveys or focus groups to better understand the perceived and psycho-social impacts of the structure's design. Children's continues to improve their quality of care and the environmental sustainability of their services through green purchasing and alternative cleaning products, and they credit the building with increased safety, improved staff satisfaction, and reduced patient and parent stress. Children's new, green campus is emblematic of their dedication to being a model of environmental sustainability and health for the Pittsburgh community and other hospitals nationwide [9].

MATERIALS AND METHODS

It includes an explanation of the data collection methods, materials used, and topics interviewed. A model was designed and generated to help to improve management of the healthcare facilities environmentally in Egypt and to improve performance.

Accordingly, inspection has been performed on a hospital under the authority of "Ain Shams University". The following are main criteria that selected to evaluate the hospital based on; the first is the "Building Properties" and the second is the "Infra-structure", this is in addition – to preparing a questionnaire, and inspection filed visits.

The questionnaires were handed out to the Egyptian hospitals operators. This questionnaire includes a mix of structured and several tend for environmental management questions which helped researchers and decision makers to spend less time to choose the suitable option. The aim of the survey was to find out the optimum management hospitals in perspective of environmental systems.

This questionnaire is considered a structured process of collecting independent information on the efficiency, effectiveness and reliability of the total health and safety management system and drawing up plans for corrective action.

This questionnaire examines each stage in the health and safety management system by measuring compliance with the local and international codes, with the ultimate aim of assessing their effectiveness and their validity.

MODELLING

With tightening budgets across the healthcare industry, hospitals are unable to have dedicated engineers on their experience, and therefore sacrifice regular, proactive maintenance on equipment. Instead, they are operating with a more reactive approach and bring in third-party contractors when issues arise. This model is decreases the risk of spontaneous outages and decreases the occurrence of random outages which ultimately saves the hospital time and money.

- Becoming resilient to the risks.
- Proper management of critical resources (medicine, food, medical supplies and equipment) based on climate change considerations.
- Committing to sustainable environmental practices such as water and energy conservation, promoting active transportation, and local food procurement.
- Engaging in ongoing communication, education and awareness of behaviour.

This study created an integrated environmental model that provides an interactive effect to help decision-makers and operators to enhance the hospital's efficiency by proposing better solutions to the technical and environmental problems that usually arise due to the inefficiency of the maintenance process after operating the hospital, and the solutions provided often take into account the low - moderate cost options, also ensure the continuity of the hospital's operation and prevent it from stopping.

The model goes through three main stages as illustrated in Figure 1, The First Stage which includes a comprehensive inventory of the hospital components, which is similar to the surveying process in which a complete listing of the facility components is made, which is divided as follows: The first part includes the structural and architectural components (internal and external) and general site works (landscaping), then the second part includes the infrastructure or main networks which are water, sewage, electricity, air conditioning, fire, medical gases and solid waste, and then comes The Second Stage of the model, which includes A holistic evaluation of the aforementioned components while shedding light on the engineering and environmental problems that hinder the building from effectively performing its functions, and based on these obstacles the building is evaluated engineering and environmentally and hypothetical solutions are developed by experts and specialists in each field from the aforementioned, these solutions are based mainly on Egyptian codes And international and environmental laws, hence the last stage, which is The Third Stage; Which includes setting a regulatory framework to improve the building's technical and environmental performance, so that the most environmentally effective solutions are chosen to improve and raise the values of the initial evaluation results, so that the problems that had the greatest impact in reducing the initial results of the building are selected and also taken into account in choosing those solutions to be effective It is low cost and also will not stop the operation of the hospital.

- The above Figure 1 is reflecting the main strategy of the model which is comprising of three main stages that the model will start based on them subsequently;

Hospital Inventory as shown in Figure 2; which includes a complete survey for the hospital's components in the following fields:

- Structure
- Architecture

- Infra-structure (Electrical–HVAC–Plumbing–Sewage–Solid Wastes–Medical Gas–Fire Fighting)
- Landscape

Hospital Evaluation as shown in Figure 3, 4, 5 and 6; which illustrates and lists the existed issues relevant to each above mentioned fields.

Hospital Environmental Improvement as shown in Figure 7; which is the main output of the model as this efficiently will help operators and decision makers to plan for a cost efficient renovating plan that will not hinder the operation of the hospital from continuity and efficiently serving the patients.

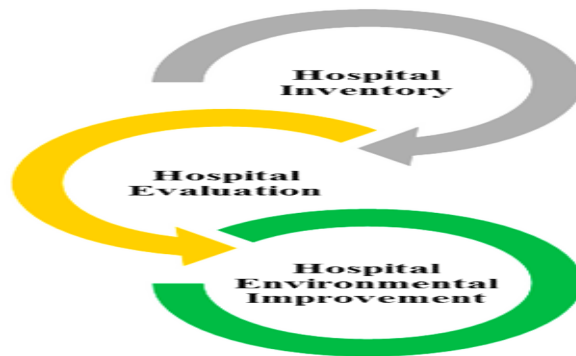


Figure 1: Integrated Environmental Model Strategy.

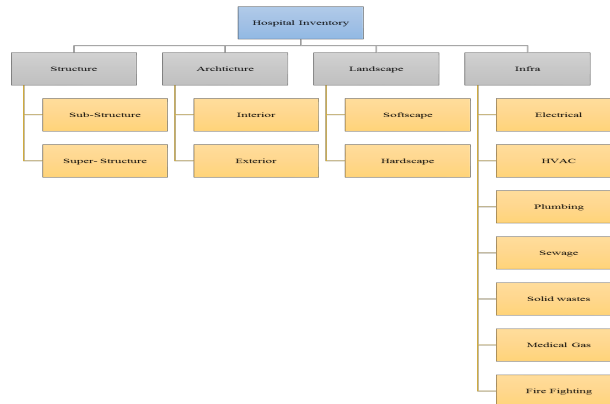


Figure 2: Hospital Inventory.

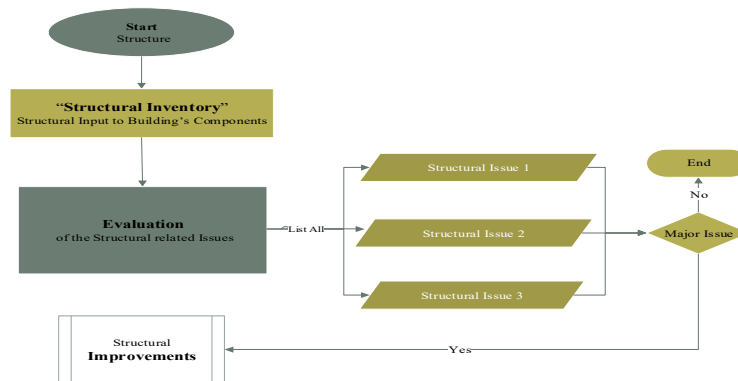


Figure 3: Hospital Building Evaluation (Structure).

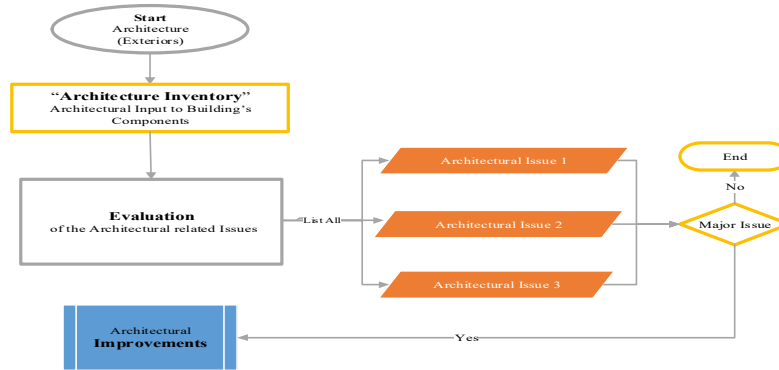


Figure 4: Hospital Building Evaluation (Architecture).

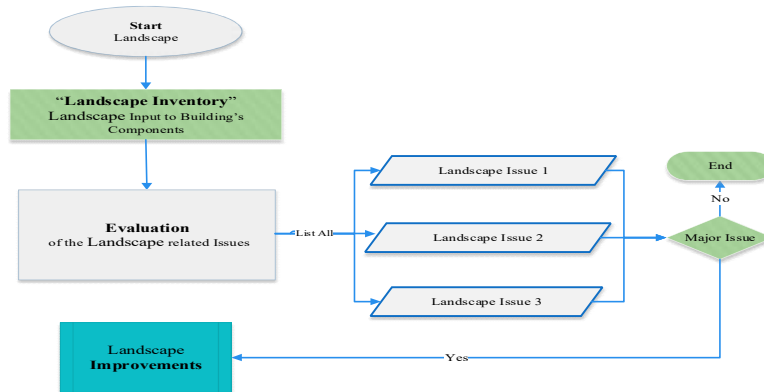


Figure 5: Hospital Building Evaluation (Landscape).

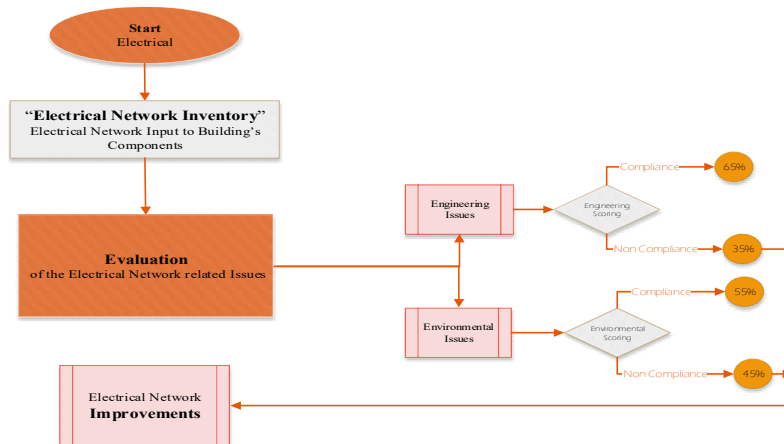


Figure 6: Hospital Building Evaluation (Electrical).

DISCUSSIONS

Then "RUN" the model program on the operated hospital, this is in order to evaluate the current status and to propose environmental cost efficient solutions for any generated issues to accomplish the integrated environmental management on the hospital building.

Then the building shall be scored based on two perspectives; engineering or technical and environmental, then results shall highlight all the non-compliance issues in all building components (Structure, Architecture, Landscape,

Electrical, Mechanical, Water, Sewage, Fire Fighting, medical gases and Solid wastes) this is by using manuals, local codes and international relevant ones.

Accordingly, and by highlighting the non-compliance environmental related issues, we shall propose all possible solutions as per Figure 7 which will enhance the building environmental performance and subsequently the earlier scoring, such solutions will be proposed by a committee of engineers, specialty consultants, technicians and experienced operators.

Each proposed solutions will have corresponding cost, duration and its impact on operation, then, the most cost efficient solutions with the minimum duration and less impact on the operation will be selected under this improvement phase.

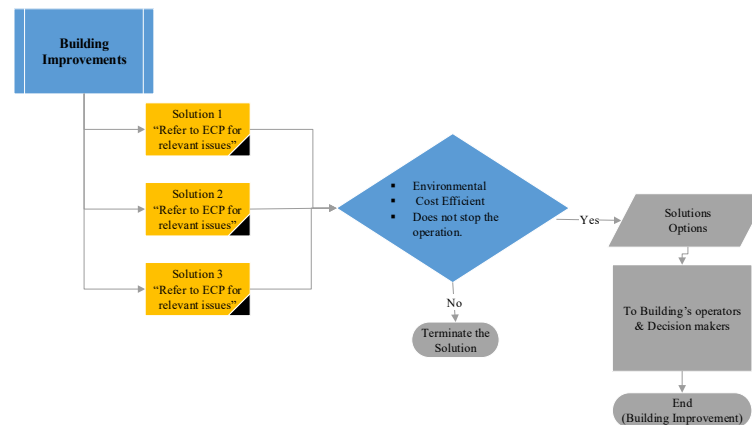


Figure 7: Phase III Hospital Building Improvements.

CONCLUSIONS

To achieve optimal environmental management of hospital buildings the following recommendations are required:

- The integrated environmental model resulting from this study should be widely disseminated in Egypt.
- It is recommended that the schematic design of the integrated environmental management model that was demonstrated in this study be developed by IT specialists for creating advanced software.
- Hospital managers and operators should refer to this tool before making technical and environmental decisions that will affect building performance.
- A committee of specialists in the field of environmental management should be appointed by the government or the Ministry of Health to oversee the development and upgrading of existing hospitals to improve the environmental and technical performance of the building.
- A budget should be allocated to finance the improvement of this tool by creating a computer program by an IT specialty company.

The following is the list of recommendations that reflect the conclusions. It proposes actions that should be taken

- The integrated environmental model generated throughout this study, should be deployed widely in Egypt.
- The schematic design for the integrated environmental management model that has been illustrated in this study must be developed by specialists to advanced software.

- Hospitals managers and operators must refer to this tool before making technical and environmental decisions that will affect the building performance.
- A committee from specialists in hospital's operation, renovation and environment should be assigned by the government to improve the overall environmental outcome.

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