

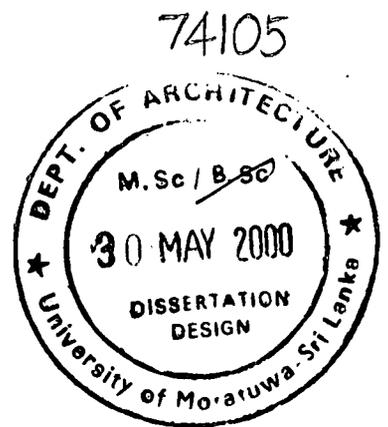
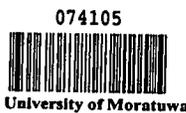
**ADAPTATION TO DISASTER: HOUSING IN FLOOD PRONE AREAS
WITH SPECIAL REFERENCE TO THE COLOMBO DISTRICT**

A dissertation presented
to the
Faculty of Architecture
of the
University of Moratuwa
for the

MSc. (Architecture) Examination
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Wathsala Sepalage
Department of Architecture
University of Moratuwa
Sri Lanka



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ABSTRACT

Water is a precious commodity and considered a source of life. This life giving water appears as a common thread woven through the religion, literature and art of every culture. Architectural compositions too, are greatly enhanced by the use of water. Moreover, many of the worlds earliest civilization's originated in areas where water was readily available, such as in the Nile Delta and the Indus valley. Even in Sri Lanka, early human settlements were founded near sources of water such as the Malwatu Oya. Despite water's role as a common denominator for life, it also brings death and disaster with it when it floods, showing that too much water is as bad as too little. Flooding causes extensive damage to people and property and can be considered as the most widespread natural disaster which occurs in Sri Lanka.

Flooding is common in many areas of the country and the district of Colombo also has this particular problem. However, one may be tempted to ask "Are there really floods in Colombo?" The answer is a definite "yes". One may not hear of great catastrophes related to floods within the Colombo district, but it nevertheless causes much damage to property and imposes hardships on the people when parts of the city and surrounding areas get flooded after intense rainfalls of even short duration. Therefore, it is imperative that mitigatory measures be taken in order to minimise the damaging effects of floods. In this regard, Architectural solutions for housing and building and proper planning procedures incorporating regulatory controls will ensure that people will have the opportunity of coping with and adapting to floods without incurring loss or damage.



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INTRODUCTION

INTRODUCTION

Amongst the natural disasters that occur worldwide, flooding could be considered as the most common, causing much damage and suffering to millions of people. Sri Lanka too, is faced with this particular hazard and people living in both rural and urban areas are inconvenienced from time to time as a result of it.

Floods in urban areas are caused primarily by inappropriate human activities, which have contributed greatly to the increase in frequency as well as impact of flooding. The phenomenon of urban flooding continues to grow in proportion due to various reasons such as unplanned development and areas in the Colombo district in particular have been susceptible to it. Considering the trend of urbanisation in Sri Lanka it can be safely assumed that the environs of Colombo will see more development and urbanisation in the future and if due attention is not paid to the issue of floods in such development activities, the nature and magnitude of floods will indeed become more critical in times to come.

It must also be noted here that architects have also contributed somewhat to this sorry state of matters by not giving proper guidance to clients who consult them for building and development projects, especially in areas under threat of floods. It must be remembered that the contribution and involvement of architects in the design and construction of buildings within the district of Colombo is considerably more so than in any other area of the country and unfortunately it appears that architects themselves have aggravated the urban flood situation. This can be clearly seen in a situation where a client is desirous of building on a piece of land which he has acquired in a low lying area susceptible to flooding. The common practice that is observed in such an instance would be to put up a parapet wall around the site and to fill the land with soil brought from elsewhere, after which construction is carried out with the aid and supervision of an architect, who is responsible for its design. This is an unhealthy approach which will undoubtedly wreak havoc in the natural drainage patterns of the area, ultimately paving the way for inundation and floods.

However, since the process of development cannot be halted, it is obvious that people living in the environs of Colombo will be exposed more and more to flood situations in the future, if proper measures are not taken in this regard. Since the occurrence of flooding cannot be totally

eliminated the only option available is to learn to adapt to floods and try to live with it, while at the same time not worsening the situation. Moreover, it must be very clearly stressed at this juncture that architects can indeed contribute to the betterment of the flood situation by bringing forward design solutions that are justifiably suitable in this regard. Therefore, this study will examine the impacts of flooding on urban human settlements and will look at housing in particular, in order to find viable solutions for co-existing with floods.

PROBLEM AREA

For the past five centuries, the city of Colombo gradually developed as the main commercial and administration city of Sri Lanka. However, flooding in the city of Colombo and as well as other parts of the district is an issue that needs to be addressed in order to prevent both social problems and economic losses. There is a network of large canals and tributaries constructed with drains to discharge storm water, but it is proving ineffective due to insufficient maintenance, encroachment and obstructions. As a consequence one would find roads and many parts of the city flooded during heavy rainstorms of even short duration.

Inhabitants living in areas subjected to flooding are frequently required to seek refuge elsewhere when their houses go under water and to depend on rations handed out until they can return to their normal lifestyle when the waters subside. It goes on without saying that some people lose their daily wages as a consequence of these disruptions. Therefore, the problem that can be very clearly identified here, is the lack of proper adaptive methods to floods in housing and building that would enable people to go on with their lives with the minimum of disruption during floods. Furthermore, the architectural problem that is apparent here is the lack of appropriate flood resistant housing that are functional, aesthetically pleasing and suited to the Sri Lankan context.

RATIONALE

Usually the attitude towards a natural disaster such as floods, predominantly concerns with the provision of relief after it has occurred or in the reconstruction of buildings that have been affected. Sometimes people tend to ignore the possibility of a disaster until it actually happens,

and are rather reluctant to go to the trouble of preparing for it beforehand. Therefore, it is felt that there is a very pressing need for a document that would present adequate information to people to help them learn to live with and adapt to floods.

It must also be noted that urban planning activities have not given consideration to hazard aspects adequately. Even when information related to disasters is available, it is not integrated in regional and city planning, nor in zonation map preparation. Moreover, the local authorities do not have regulations controlling development in hazard prone areas. The same regulations are adopted in hazard prone areas as in other areas without any special restriction. So, it is hoped that this study, emphasizing the need for enforcing regulatory measures in order to minimise flood damages to human settlements will prove beneficial in this regard.

The issue of flooding has been considerably dealt with by many, such as engineers, R & D scientists and relief workers, but not so much by architects. Since there is not much literature written with an architectural point of view on this particular subject it can be considered that there is justifiable cause so as to study the present subject. A considerable amount of responsibility is vested in an architect to accommodate built environments conducive to the well being of those who occupy them. It is therefore, essential that architects be well equipped with the necessary knowledge of how to design in areas under threat of floods. Therefore, there is a very pressing need of a study focussing on relevant issues outlined above.

RESEARCH OBJECTIVES

The overall objective of this research is to understand how households in urban areas get affected by floods and to identify ways and means of adapting to the disasters caused by them. Disasters caused by floods can be addressed primarily in two ways. The first method employs structural measures such as the establishment of drains and canal networks to control standing floods that are a frequent occurrence within the Colombo district. The second method employs nonstructural measures like development of a mechanism for living with floods. This method could also be viewed as a more viable means of addressing the problem



of floods, since more and more people are forced to occupy flood prone areas due to the scarcity of land.

The ultimate goal of this study is to bring forward ideas that conform to nonstructural methods, incorporating architectural solutions to deal with floods. Under this broad perspective, various specific problems are dealt with in order to formulate a comprehensive solution which in turn, would address the issues outlined above.

- The specific problem that needs to be looked at first is the lack of consideration when construction and development takes place in areas subjected to flooding. Therefore, the objective is to identify various land use control and regulatory measures that would prevent haphazard blocking out of land and uncontrolled development in hazard prone areas.
- The next problem that needs to be addressed is the lack of appropriate flood resistant housing. Therefore, the second objective is to investigate methods of designing flood resistant housing for urban areas.
- The final problem that needs to be looked into is how to facilitate the construction of flood resistant housing. Thus the objective here is to identify appropriate technology and materials in this regard.



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Hence the overall intention of this dissertation is to present a practical solution and a course of action to be taken when dealing with housing design and construction in areas that are susceptible to floods.

METHOD OF STUDY

The research design to be incorporated in this dissertation would comprise of many different methods depending on the specific objectives that are hoped to be achieved. A reconnaissance survey in affected areas will be carried out in order to gain an insight into the situation of floods in the Colombo district. It will also be beneficial to study how people react to flood situations and try to understand how housing is affected in a flood.

It would also be necessary to selectively read and gather information related to the study area and conduct a literature survey in order to achieve the first objective, which is the

identification of land use control and regulatory measures. The next specific objective of investigating methods of designing flood resistant housing could be achieved by both literature surveys and case illustrations. Search in the electronic media through Web Sites for current research work done in that area of study would also be beneficial. Finally, the specific objective of identifying appropriate technologies to be utilized in the design of flood resistant housing could be mainly obtained by literature surveys and through the electronic media giving all the latest information regarding the subject.

The study can be considered as having three main parts, *Introductory*, consisting of Chapter one, *Investigative*, consisting of Chapter two and *Illustrative*, consisting of Chapter three and four. In the introductory section various conceptual issues dealing with disasters and floods are discussed. In the investigative section the situation of floods in the Colombo district is examined. Finally, in the illustrative section various methods are presented by which adaptation to floods is achieved in housing and building.

SCOPE AND LIMITATIONS

The purpose of this investigation is to document the situation of floods in the Colombo district, its effects on households and buildings and finally to present some guidelines for human settlement planning and the for the designing of flood resistant housing.

However, in this endeavour it is not possible to record the flood situation of the entire Colombo district. Therefore, the study is limited to three areas within the district; firstly, the threat of floods in built-up areas within the City of Colombo which gets inundated even after a short period of intense rainfall but usually remaining dry for most of the time when there is no rain. The second situation to be considered is the flooding of the so-called flood detention areas which are low lying marshy lands such as those in the Sri Jayawardenapura Kotte areas. The third situation is the flooding of human settlements located in the flood plains of the Kelani river.

Also, it must be mentioned here that the guidelines presented here do not deal with any construction techniques that are very sophisticated so as to be beyond the scope of this study.