

## Mitigation and Redevelopment as a Sustainable Development Strategy for Disaster Prone Human Settlements: With special reference to Landslide at Peradeniya Town

K.C.Sugathapala<sup>1</sup>, P.H.C.S. Rathnasiri<sup>2</sup>  
<sup>1, 2</sup>National Building Research Organization  
 No.99/1, Jawatta Road,  
 Colombo 05  
 SRI LANKA  
 Email: [kishan1962@hotmail.com](mailto:kishan1962@hotmail.com)

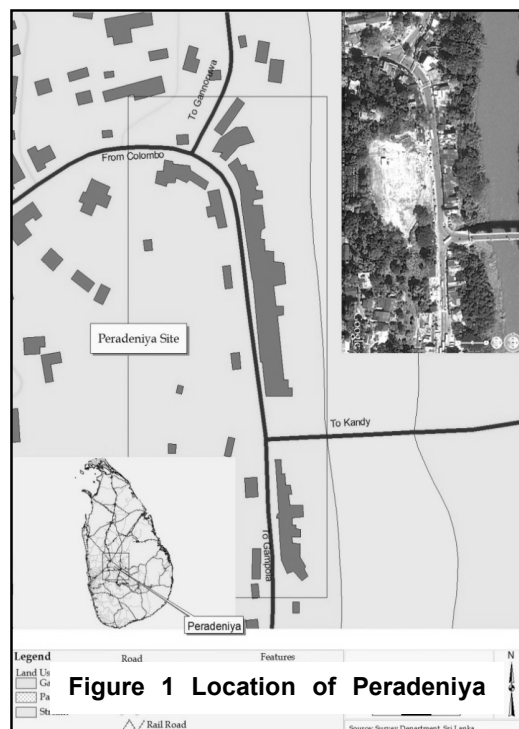
**Abstract:** Settlements cannot be relocated due to two reasons; cost of infrastructure and the socio-economic factors in that particular location. As such Peradeniya town center has been developed at a key road intersection. Peradeniya has been identified as landslide prone in 2004 through the Landslide Hazards Mapping Programme (LHMP). In 2009 NBRO initiated a project to mitigate the landslide at Peradeniya. With the implementation of the landslide mitigation activities successfully NBRO initiated another study to formulate town development plan for Peradeniya as a post landslide mitigation redevelopment strategy. The study conducted considering multidisciplinary aspects of land. Finally, town development plan was formulated under the vision of “Gateway to the Kandy city, University and Botanical Garden.” This is to preserve the main character of the town while enhancing aesthetic and economic value of the settlement. Likewise, there are settlements vulnerable for natural hazards but it’s possible to redevelop following proper geological and land use planning principles to preserve the character of that particular settlement to ensure the sustainable development without allowing valuable land resources to be abandoned.

**Key Words:** Mitigation and redevelopment, development plan, multidisciplinary aspects of land, socio-economic factors

### 1. INTRODUCTION

Peradeniya town centre is located in Kandy District, Central Province, Sri Lanka (Figure 1). It is located 110 Km’s from the capital city of Colombo and just 6 Km away from the historic city of Kandy. Mainly, the town centre has been evolved from the history due to location at a key road intersection of A1 road and A5 road, where physical development is inevitable with high road connectivity (Munasinghe, 2010). Because of this, the town centre is functioning as a transition node which has lead to perform as a market centre providing opportunity to perform as a livelihood as well.

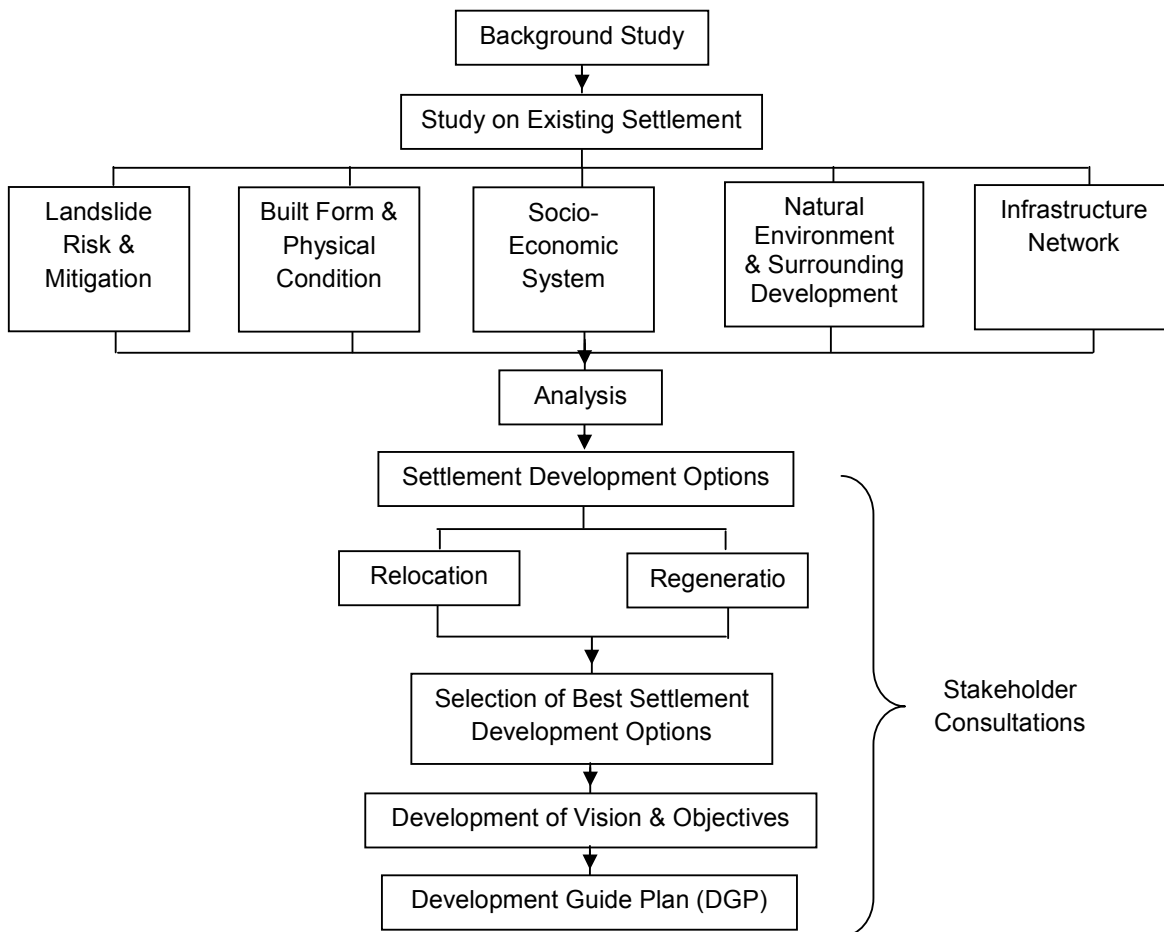
In regional context, Peradeniya town got its reputation with the location of nationally important places closed to the town. Most importantly, location of Peradeniy Botanical Garden and University of Peradeniya, which is functioning in national context, make significant influence on town development. At the same time, the town is operating as a gateway to the Kandy city which is the second largest city of Sri Lanka. Therefore, the Peradeniya is an important place even in regional context. But, the Peradeniya town center had been identified as vulnerable to landslide hazard by National Building Research Organization (NBRO) in 2004 through Landslide Hazards Mapping Programme (LHMP). Then, NBRO initiated its first and ever landslide mitigation



project at Peradeniya in 2009, with the increased capacity and skills to mitigate the landslide incidents. At the same time, another project has been formulated to relocate the Peradeniya town by another public organization without considering the socio-economic value of Peradeniya town at the present location or the landslide risk reduction measures. As Arambepola, 2008 describes that there are some instances especially where human settlements are threatened by landslide it will be difficult to relocate a complete settlement to another area as socio-economic factors may force the inhabitant communities in getting relocated into a new area.

Therefore, this research study was conducted to formulate an appropriate Peradeniya town development plan, as post landslide mitigation redevelopment strategy. The study was based on the multidisciplinary assessment of land; physical, social, economic and environmental aspects.

## 2. METHODOLOGY



**Figure 2 Study Process**

Peradeniya town development plan formulation is involved with sequence of actions described by figure 02. Accordingly, extensive field investigations were carried out at the initial stage with the objective of identifying the characteristics of Peradeniya town. In this, study was carried out on five sections as landslide risk and mitigation activities, built form and physical condition, socio-economic system, natural environment and surrounding development and infrastructure network. Landslide risk and the mitigation

activities being implemented by NBRO is key, since formulation of redevelopment strategy for the Peradeniya is heavily depend on the geological stabilization of landslide. As well as socio-economic studies were important in order to identify the functionality of the existing settlement which must be considered in the formulation of redevelopment plan. The data was collected on each of these sections through field surveys. Secondly, analysis was done to identify the dominant issues and potentials associated with the settlement. In this, SWOT analysis was done. Thirdly, decision was taken on appropriate Peradeniya town development scenario based on initial studies. In this, key stakeholders of the project were consulted extensively since the responsibility is vested with the stakeholders on Peradeniya development. In this, vision and objectives for Peradeniya town development was formulated which would guide the future development. Finally, Development Guide Plan (DGP) was formulated including structure plan, master plan and precinct plan.

## 2. LANDSLIDE LOCATIONS AND LANDSLIDE RISK MITIGATION PROJECT

Location of Landslide at Peradeniya town is illustrated by figure 3. Accordingly, shops located in front of the landslide locations are at high risk. At the same time vehicular and pedestrian traffics at main artery are the other categories at high risk. The landslide mitigation activities are implemented by NBRO in two phases (figure 3). The entire mitigation project will be completed by 2015 liberating the settlement from the landslide risk. The project included investigation, design and implementation of structural mitigation measures in the area. At present, phase 1 of the mitigation activities are implemented successfully and will be completed by 2012 (figure 4 and 5).

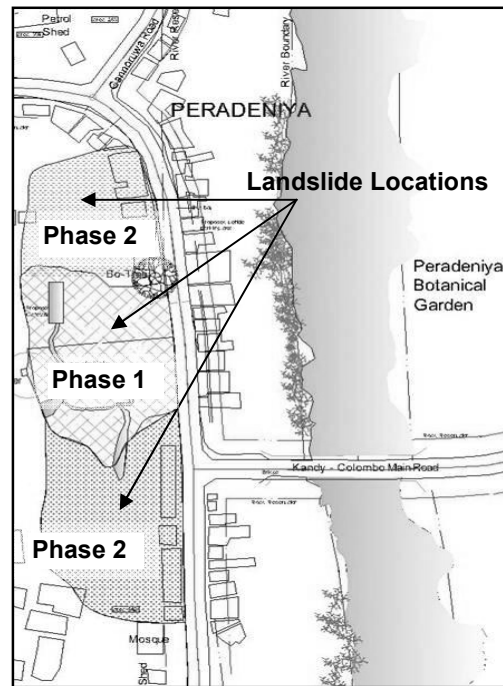


Figure 3 Landslide Location and phases of Mitigation project



Figure 4 Landslide mitigation programme in 2010



Figure 5 Current situation of Landslide mitigation by 2012

### 3. KEY FINDINGS

Key findings of the analysis are listed below;

- Majority of the shops are located on the Mahaweli River reservation, the buildings are obsolete and structurally not safe (Mahaweli Authority, 2008).
- Approximately 50% of the buildings are located on private lands and the balance on public lands (NBRO, 2011).
- The town experiences heavy vehicular and pedestrian traffic. Width of the carriage ways and pedestrian walkways are much below the national standards and no clearly defined pedestrian crossings are available. Due to non availability of parking facilities, on road parking takes place that further curtails the road width for vehicular traffic (NBRO, 2011).
- Retail outlets of day to day home needs (Groceries), Cafeterias, Textile shops, vegetable and fruits outlets are the main commercial activities. All together there are 148 shop units are located in the Peradeniya town centre (NBRO, 2011).
- Although the town is located in an environmentally pleasing natural environment such views are fully covered by the location of buildings on the Mahaweli River reservation (NBRO, 2011).
- Perception of the majority of the business community is that the business functions well due to the location of the town in a major intersection and being a transit point and location of national level institutions such as the University, Peradeniya Garden and Teacher Training Institution. Re-location of the town in a different location will jeopardise its existence. It is necessary to re-develop the town at the same location with good infrastructure. It is also necessary to provide spaces for some of the lacking commercial activities particularly banks (NBRO, 2011).
- Majority of the pedestrians were commuters as transit bus passengers. Only about 1/3<sup>rd</sup> of the pedestrians do retail shopping in Peradeniya town. Provision of vehicle parking facilities, sanitary facilities and pedestrian walks are the main requirements noted by the interviewed pedestrians (NBRO, 2011).
- New commercial spaces would be developed along the landslide mitigated area with the possibility to clear the land parcels through landslide mitigation (NBRO, 2011).

The study reveals that, performance of Peradeniya town is significantly important in both local and regional context with its strategic location at a key intersection. Accordingly, it is perform as a transition point, market centre and livelihood for the community dwelling at surrounding localities. Hence, the activities pertaining to those functions are inevitable from the town. At the same time, due to implementation of landslide mitigation activities successfully, the town would be developed following proper land use planning principles. In this, main issues are to be overcome while harnessing its potentials. Hence, a policy decision was taken "to re-develop the town at the same location as a model township."

### 4. PERADENIYA TOWN DEVELOPMENT PLAN

The vision for the Peradeniya town development is "**Gateway to the Kandy city, University and Botanical Garden**" that describes the Peradeniya as main gateway to such places. Realizing this vision, main objectives are; Ease traffic congestion and create a pedestrian friendly township, Integrate all the aesthetically pleasing natural and built environments into the new town design, Provide adequate public conveniences such as sanitary facilities and open spaces, Improve the business environment, Conserve the Mahaweli River and its reservation. Then, the structure plan for the Peradeniya town development has been formulated (figure 10).

Key Components of the proposed structure plan are;

- **Proposed Linear Park (figure 9)**; main requirement for the establishment of a linear park along the Mahaweli River side is to ensure the comfort, convenient and safety of the pedestrians. Proposed linear park will be consisted with pedestrians walk ways, vehicular parking places, a cafeteria, public sanitary facilities and places for leisure and recreation. This linear park will be extended integrating Peradeniya railway station and botanical garden with the town.
- **New shopping complex (figure 8)**; present development activities located along the Mahaweli river reservation will be removed and relocated at landslide mitigated area since, most of the present building units are located in river reservation and operating as a barrier to view the aesthetic view of the location. In this, 115 new shopping units will be constructed as per the relocation necessity. As well as, banking and related facilities will be provided which is demanded by town users.
- **View corridors (figure 7)**; view corridor will be provided along the proposed linear park and top of the landslide mitigated land. Major elements create aesthetic views are botanical garden, Peradeniya bridge and Hanthana mountain range.

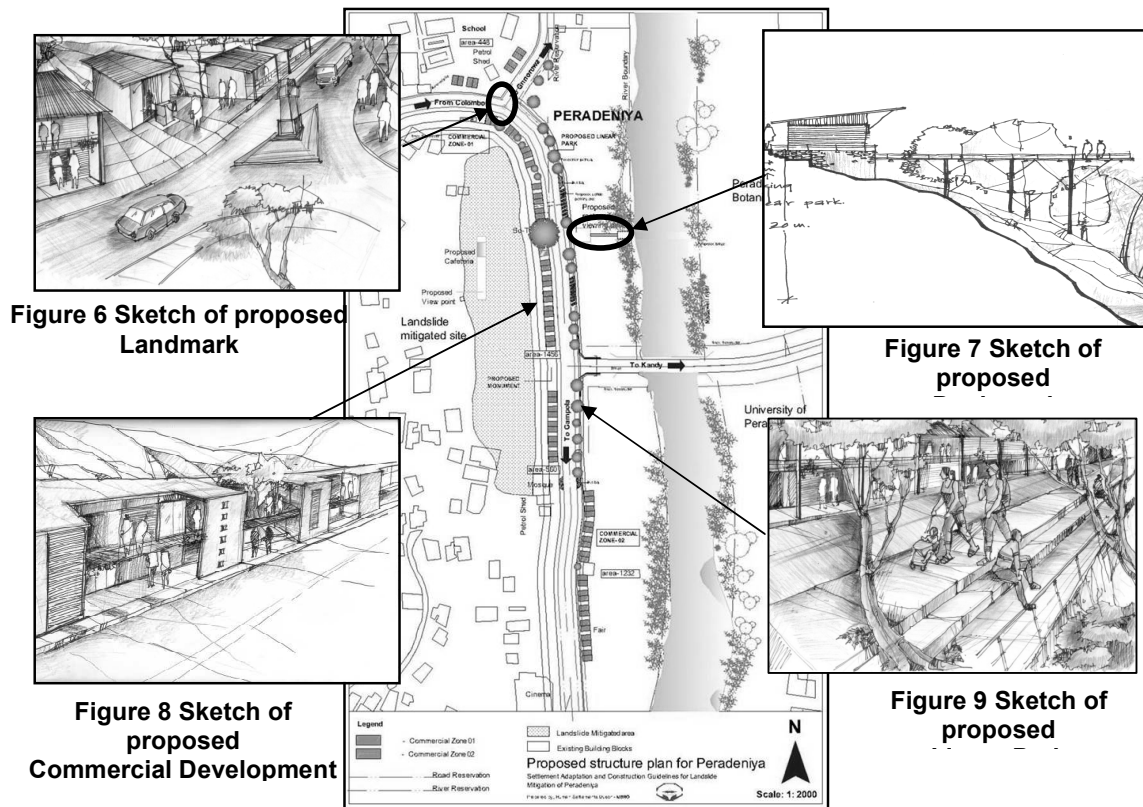


Figure 10 Proposed Structure plan for Peradeniya Town Development

## 5. CONCLUSION & RECOMMENDATIONS

This study was conducted with the objective to formulate Peradeniya town development plan as post landslide mitigation development strategy. In this, slop stabilization done through the geological investigation was a pre requirement. Then, human settlements investigation was carried out considering multidisciplinary aspects of land; physical, social, economic and environment. The study reveals that existence of Peradeniya town centre at present location is important to facilitate its functions; transition node, market centre, livelihood and gateway to historic city of Kandy, Peradeniya Botanical Garden and

University of Peradeniya mandated by its location. At the same time, common view of the town user's; traders and pedestrians, also to develop the Peradeniya town centre at present location minimizing issues associated with the settlement. Hence, considering research findings, a development plan was formulated under the vision of "**Gateway to the Kandy city, University and Botanical Garden.**" This is mainly due to its prime function as a transition node at a major road intersection. Under this vision, key design proposals are linear park, new commercial zone and viewing corridors. In this, more spaces will be allocated for vehicle parking, pedestrian walk ways and public sanitary facilities which would solve most of the issues associated with present town centre such as vehicular traffic congestion, lack of pedestrian's safety, lack of public sanitary facilities...etc, availability of obsolete building structures for commercial activities and hiding the aesthetic view by present development pattern.

Finally, necessary alterations will be done for this development plan consulting different stakeholders. Thereafter, implementation mechanism will be formulated sharing the responsibilities between respective institutions and organization.

Likewise, there are settlements vulnerable for natural hazards and posses inherited values which would not be able to relocate simply. Therefore, scientific studies to be carried out to formulate disaster risk mitigation measures and to identify the highest and best use of land such as residential, commercial and agricultural or any other form of development which can be utilized in appropriate manner to ensure the sustainable development of the country without allowing valuable land resources to be abandoned.

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