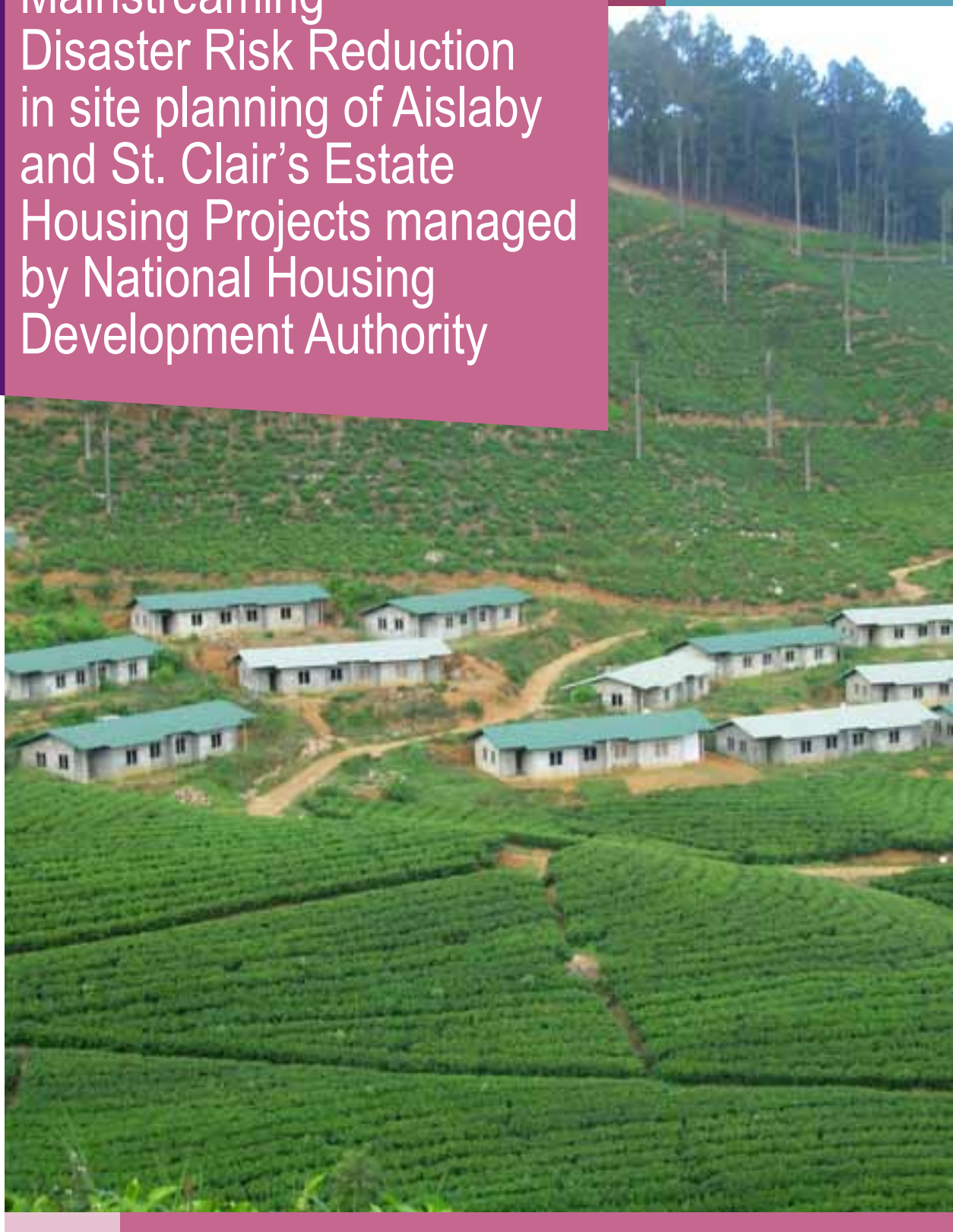
Sri Lanka

Safer Housing Projects

Mainstreaming Disaster Risk Reduction in site planning of Aislaby and St. Clair's Estate Housing Projects managed by National Housing Development Authority



A Priority Implementation Partnership (PIP) undertaken by the Disaster Management Centre (DMC), Ministry of Disaster Management and national agencies responsible for planning, construction and approval of housing in Sri Lanka.

Under the Regional Consultative Committee on Disaster Management (RCC) Program on Mainstreaming Disaster Risk Reduction into Development in Asia.

implemented by

Disaster Management Centre (DMC)

National Housing Development Authority (NHDA)

with support from

Australian Government AusAID

adpc

Introduction

Challenges faced by the housing sector in Sri Lanka are many and includes issues such as legal rights to shelter especially by urban poor, improper construction, poor access to clean drinking water, inadequate drainage systems, accumulated garbage, lack of proper internal access roads etc. Often houses are built alongside canals, and on riverbanks and many of these areas are low lying and hence are subject to flooding during heaving rains. The importance of reducing risk faced by the housing sector from natural hazards is increasingly being recognised by the Government. The National Physical Plan & Policy calls for adoption of non-structural and structural mitigation measures in planning and implementation of development activities.

To address some of these problems through a partnership based approach, the Disaster Management Centre (DMC) under the Ministry of Disaster Management, Sri Lanka, has been implementing the Priority implementation Partnership (PIP) on mainstreaming disaster risk reduction (DRR) into housing sector in Sri Lanka. The Phase 1 of the PIP was implemented in 2008-2009 and the phase 2 over the period of 2009-2011. The primary objective of this initiative is to strengthen the partnership between national agencies involved in planning, design, construction, maintenance and approval of housing development and provide support through each other and through relevant national technical agencies in integrating DRR in on-going and planned housing development initiatives. The adjacent box shows the composition of the Technical Working Group (TWG) formed in year 2008 to implement the PIP under the leadership of Ministry of Disaster Management.

PIP-TECHNICAL WORKING GROUP

Chair
Disaster Management Centre

Members
Ministry of Construction, Engineering Services, Housing and Common Amenities
Ministry of Nation Building and Estate Infrastructure Development
Ministry of Public Administration and Home Affairs
Ministry of Local Government and Provincial Councils
Ministry of Fisheries and Aquatic Resources
Ministry of Irrigation and Water Management
Central Environmental Authority
Coast Conservation Department
Urban Development Authority
National Physical planning Department
National Housing Development Authority
Sri Lanka Land Reclamation and Development Corporation
National Building Research Organisation
Rana Viru Sewa Authority

One of the recommendations of the TWG from phase I of the PIP was to provide technical support for integrating DRR into selected housing development projects of the Ministry of Construction, Engineering Services, Housing & Common Amenities, as this would demonstrate the processes and techniques to be undertaken for ensuring regular housing development projects are safe from natural hazards.

It was noted that site selection of housing projects are generally undertaken on the basis of availability of land, rather than suitability and considering the views of beneficiaries. Land subdivision is carried out without taking into account natural water flow. Thus the TWG recommended the following activities for selected housing projects of NHDA as an approach to incorporate DRR:

STEP 1: PLANNING STAGE

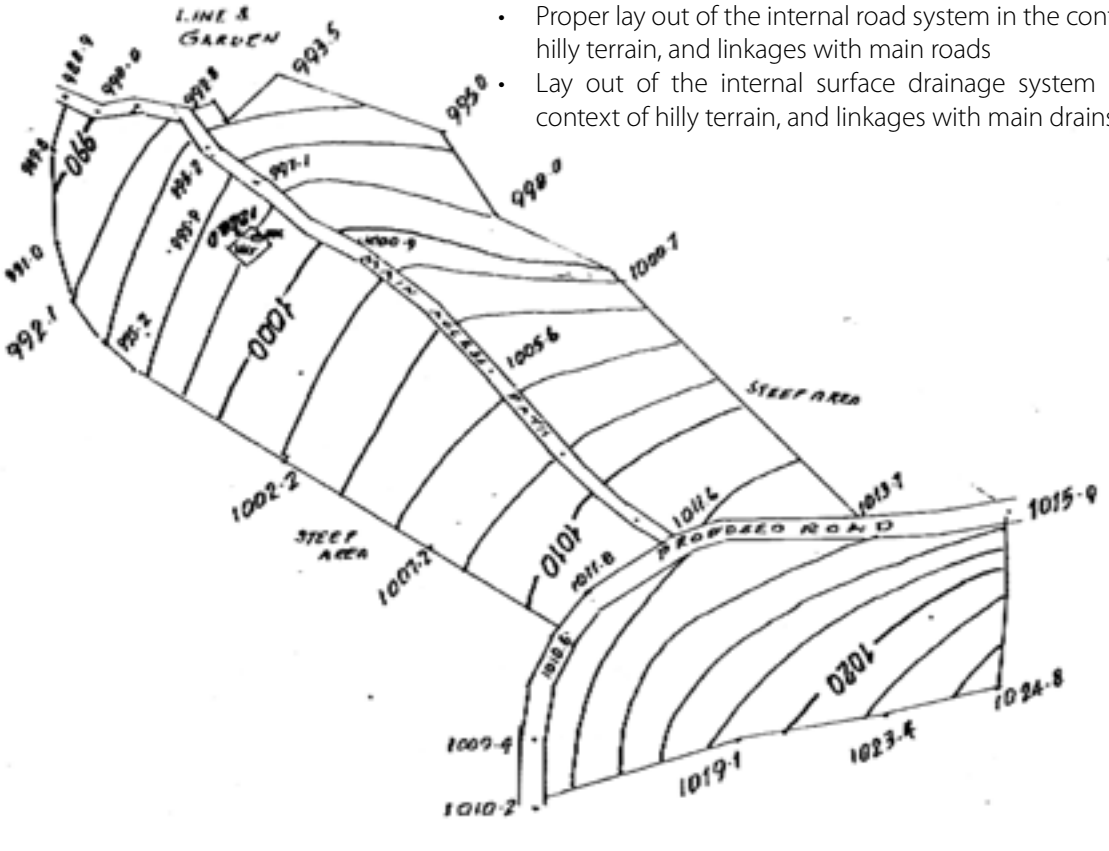
- **Site selection / Site inspection** – If possible the site should be free from hazards, or with least proneness; the site inspection should include assessment of hazards.

- **Conduct house owners meeting for their views and suggestions** – This is of utmost importance as they are the occupants of the houses and are aware of the prevalent hazards, surrounding conditions and traditional ways of construction. This would help build their confidence in the officials, and would support and implement DRR proposals suggested by the officials.

- **Initial data collection** – Data such as the following need to be gathered:
  - Any indications of disaster occurrences in the surrounding areas and patterns of cutting failures, if any
  - In the context of hilly terrains, house designs adopted in adjoining housing schemes and their adequacy
  - Layouts and technology used in internal roads and drainage systems in the surrounding areas (to decide if they are satisfactory for use in the new scheme or if there is a need for other better technologies) etc.

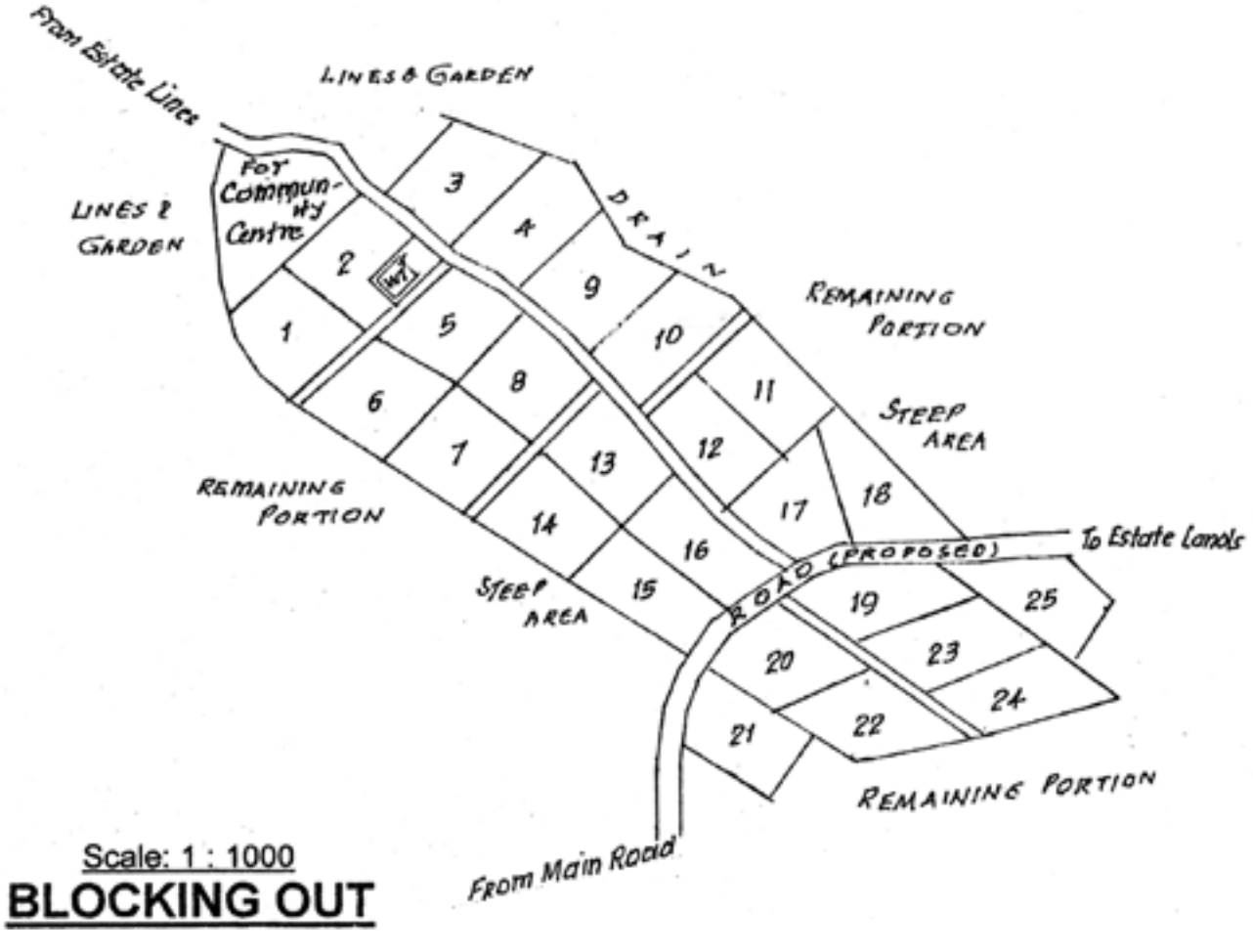
- **Contour survey and finalizing boundaries** – Presently contour plan is not a practice or a requirement for land subdivisions. In hilly terrains this is a crucial need as in addition to the fact that the boundaries must be specifically known; this contour map as explained below, is the base for land sub division. Furthermore, with a contour plan it is possible to look at the surrounding lands regarding several vital factors, such as,
  - How the given land is affected by the surrounding lands? For example, in case of high rainfall whether the surface drainage water from those lands flows into the given land, and if there is any possibility of a land slide or a cutting failure which would affect the given land.
  - Proper lay out of the internal road system in the context of hilly terrain, and linkages with main roads
  - Lay out of the internal surface drainage system in the context of hilly terrain, and linkages with main drains.

Contour plan of the site of Stirling Division, St. Clair's Estate



- **Preparation of land sub division plans based on contour survey** – This is an extremely important aspect in hazard prone areas. Especially in hilly terrains new floods could be created or cutting or bund failures could result due to improper land sub division. This practice is being introduced in Sri Lanka as a measure of incorporating DRR. In this process, based on the contour map, land sub division should be done:
  - in conformity to the contours and avoiding the blocking of the natural drainage path with land plots or roads
  - simultaneously with the internal road and drainage layouts, minimising road gradients for maximum convenience, also minimising erosion
  - providing convenient access to each plot with minimum level difference with the access road
  - deciding on good orientation of any given plot, and length/breadth ratio keeping in mind the possible need to go for split level housing units and also minimising earth cutting and filling.

Land sub division (blocking out) plan of Stirling Division, St. Clair's Estate



STEP 2: DESIGN STAGE

- **Preparation of the design brief** - Include in the architectural brief DRR components that need to be considered in the context of the hilly terrain:
  - In most of the plots the need may arise to go for split level housing units and as this is not a concept widely used at present, it would be helpful to give an idea about the arrangement of different utility areas and staircases of the housing unit and landscaping within and outside the plots to minimise erosion
  - Similarly, and engineering brief may have to be prepared on different aspects of the house design considering different hazards; need for retaining walls in specific locations to avoid earth slips; specific design considerations for internal roads, surface drainage and sewerage systems.

- **House design** – Detailed architectural and engineering designs considering the above and incorporating,
  - Rain water harvesting tanks as needed with system for water collection from roof
  - Hazard resistant housing designs – e.g., raised plinth level in houses in flood prone areas; design of walls as soil retaining walls as necessitated in hilly terrains; special foundation designs as may be necessary etc.
  - Special staircase designs in split level houses as required in hilly terrains
  - designs with anchorage of all parts, one to the other, with ties and fixings; bracing and stiffening of some members; and continuity for structural integrity of the building in areas prone to high winds and cyclones

- **Infrastructure design**

- Lay out of internal road system with minimum gradients, thus minimising erosion and drainage system with the right gradient and appropriate finishes; with collection pits and culverts as needed
  - Water supply with facilities depending on the available budget; rain water harvesting tanks to ensure water availability in dry season;
  - Sewage disposal: Consider group septic tanks to avoid individual pits owing to the limited plot size (to minimise earth cutting); properly layout (in the hilly terrain) the sewage collection pipe lines with right gradient to the group septic tank/s; proper design of group septic tanks
  - Surface water drainage system: Design in the context of hilly terrain considering the correct levels, linking it with the main drains and drain lining as needed.

STEP 3: APPROVAL STAGE

In these two housing projects under PIP, the following will be done by NHDA. However, in the future this process would be mainstreamed in the local authority (LA) building application and approval procedure. Thereby the land owners (applicants for land sub division approval) and individual house builders (applicants for housing approval) would be required to adhere to the LA requirements in the respective items – (i), (ii), (iii) & (iv):

i) Ensure that DRR components are included in approving the sub division plan
ii) Check with the land use zoning maps of the local authority (LA) and other relevant details if applicable, for any requirements by LA regarding any hazard prone areas (the availability of which is very unlikely at present in most LAs)
iii) Check with the relevant LA for street lines and building lines, or any reservation clearances from other agencies if applicable
iv) Approval of site plans by NHDA
v) Submission to TWG and obtaining comments for the detailed designs of housing units

STEP 4: CONSTRUCTION STAGE

- Awareness raising and trainings for Technical Officers of NHDA and, LAs, & local craftsman on DRR

STEP 5: MAINTENANCE STAGE

- Establishment of maintenance procedures for housing construction / landscaping

STEP 6: PROJECT COMPLETION STAGE

- Review and provide recommendations for planning, application and approval procedures in collaboration with PC /LA / Ministry of Local Government & Provincial Councils

- Draft legal frame work for housing planning & approval process with the support of DMC led TWG to incorporate DRR.

The following paragraphs describe the activities undertaken by National Housing Development Authority (NHDA) under the PIP to mainstream DRR in selected housing projects.

Mainstreaming DRR into housing projects in Aislaby and St Clair's Estate

Following two project sites were identified by NHDA implementing the activity.:

AISLABY ESTATE, BANDARAWELA AGA DIVISION, BADULLA, DISTRICT, SRI LANKA

This land is a section of a tea estate on a moderate slope of about 15-30 degrees. The Northern part of the land is a steep slope of about 45 degrees. Potential hazards in the area are landslides, drought, soil erosion and high winds. The land for the NHDA housing has been released by the estate management for housing to accommodate around 25 - 30 housing units (single & twin house design) to be completed in 12 months with support of NHDA and Estate Management housing loan schemes. At the time of taking over the land by NHDA, land sub division (or blocking out of this land) had already been done (plot size about 7-10 perches.)

At the time the activities under this PIP started, land subdivision had already been done and 11 houses had already been constructed. Individual occupants had done these by directly cutting the slope vertically. Occupants have constructed individual toilets where sewage is directed to a single deep dug pit. Such pits were dug in each land plot.

Though earlier it was presumed that this area is prone to landslides, NBRO indicated that the land selected for the housing development was generally not identified as a landslide prone area. However, it was also observed that the earth cutting and filling could lead to cutting failures in the future.

It was evident this site development had not been based on a layout plan or a survey plan, and the natural contour pattern of the slope had not been followed. Internal roads, drainage, slope stabilization, erosion control measurers etc., had not been provided to the site.

STIRLING DIVISION, ST. CLAIR'S ESTATE, THALAWAKELLE AGA DIVISION, NUWARA ELIYA DISTRICT

In this site, the land has been allocated for construction of 15 - 25 housing units (single & twin house design) to be completed in 12 months based on the NHDA and Estate Management housing loans. Each family was provided with 7.5 perches of land. A water tank had been already constructed and it would serve as the storage tank for the entire community. Presently this tank is fed with untreated water through a supply canal from the tea estate.

The terrain of the land with tea is moderately sloped. Potential hazards would be cutting failures (if not properly planned and implemented), drought, soil erosion and high winds.

UNDER THE PIP

Initial field visits were undertaken in the month of January, 2010 by technical experts from NHDA, UDA, NBRO, DMC and ADPC. During the field visits, the team met with the Estate Management and the beneficiaries to get their consent on incorporating DRR into the project. The estate management and the NHDA regional officers discussed the ongoing initial activities of the project such as land sub division, clearing of the land etc. However, it was observed that the proposed site at Aislaby Estate had been cleared using machineries and steep earth cutting activities carried out by the beneficiaries. The following recommendations were provided by the TWG members after completion of the initial site inspections:

- A contour survey must to be carried out by the District Office of NHDA to avoid sub-dividing land with steep slopes and obstructing natural water flow. Currently contour survey is not a requirement for land subdivision.

- In order to incorporate DRR concerns at the planning stage, land sub-division would need to be completed based on the above contour surveys. NBRO and UDA would be expected to work with the NHDA officers providing necessary technical assistance in following aspects.
  - Taking into consideration the fact that the site is not prone to landslide hazard and also would not trigger landslide hazards as a result of the planned development.
  - The sub-division should also include the layout of housing plots, roads with acceptable gradients, common areas such as locations for water tank, common septic tanks and a community centre unobstructed with free storm water flow in conformity with the contours with acceptable gradients
  - Gravity flow of sewage from the toilets of selected house clusters to group septic tanks
  - Orientation of the plot should be such that it accommodates as much as possible with minimum cut and fill

- After land subdivision and general planning of the houses suggest a suitable landscape design to mitigate soil erosion

- Propose an appropriate rainwater harvesting system to minimize the effects of drought. These need to be as much as possible inbuilt with the housing units itself

- A proper sewerage system needs to be identified to avoid construction of toilet pits within each plot as the size of the plot is very small. One possible solution would be to construct one or two common toilet pits for the housing scheme. This could be decided at the time of land sub-division.

- The plot size per family is 7.5 perches. However, TWG recommend the increase of plot size to 10 perches. This is necessary in order to undertake the structural improvements to stabilize the land, since in some plots because of hilly terrain it would be difficult to set out the house as excessive cutting will be involved. In such cases the Estate Management has agreed to increase the land plot size up to 10 perches. If larger plots are provided twin houses may be considered.

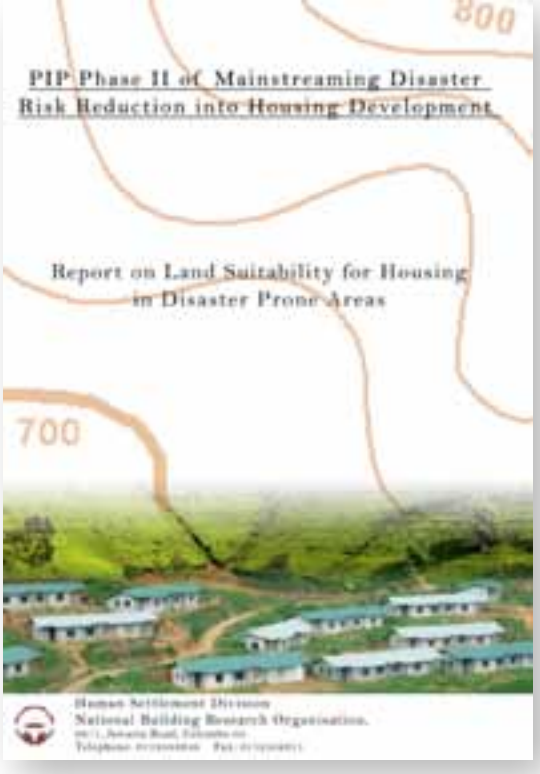
- Technical assistance will be provided to house builders by the expertise available in the relevant technical organizations to minimize the disaster risk

- Hazard resilient house designs will be developed and adopted taking the identified hazards into consideration.

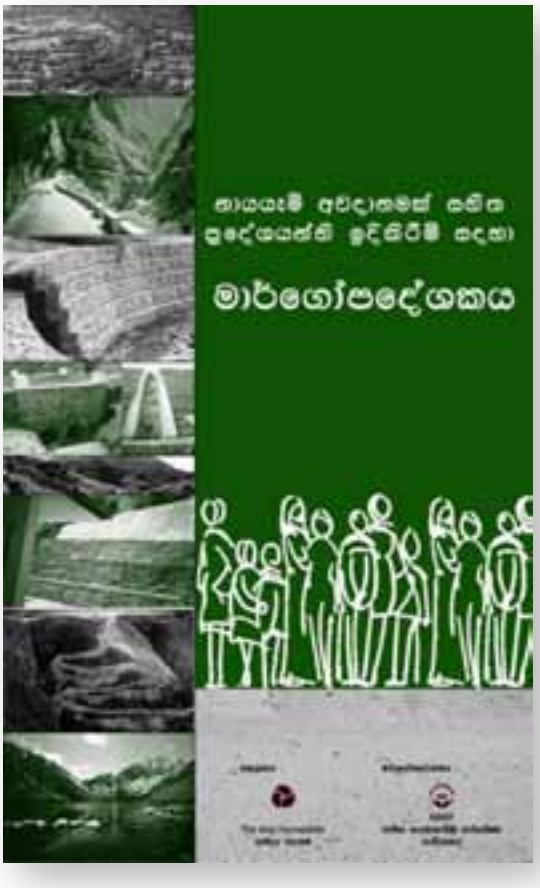
- NHDA will develop and promote the use of low cost housing designs taking in to consideration DRR elements or assist the communities to incorporate DRR elements in the their plans

- Structural and non-structural measures must be taken to minimize the possible cutting failures, landslides, soil erosion and drought.

Report on Land Suitability provided by NBRO, February 2010



A publication of NBRO - Guidelines for Construction in Landslide Prone Areas, NBRO, 2009



MEASURES SUGGESTED BY NBRO

A request was made to NBRO by NHDA through PIP to evaluate the potential slope instability and vulnerability of the selected sites and to propose necessary DRR measures in order to minimize the landslide hazard risk. Following were the recommendations provided:

- The recommended plot size for individual houses in hilly areas should be 10 perches. If twin houses are planned, plot size of 15 perch is recommended
- The road network, surface runoff drains and waste water drains should be properly planned; erosion control measures and slope stability measurers should be adopted, such as lined drains, tarred roads etc.
- Houses to be planned and construction carried out as per NBRO Guidelines for Housing in Landslide Prone Areas.
- For sewage disposal, common septic tanks for selected cluster houses are recommended as appropriate
- Bio engineering measurers to control surface erosion and slope stabilization is recommended
- Land preparation and slope cutting for housing should strictly follow recommended slope stabilization guidelines developed by NBRO (Guidelines for Construction in Hilly Areas)

In Aislaby Estate in Bandarawela, as contstruction work had already commenced without planning such work need to be re-looked at and corrective measures to be undertaken to minimize the potential risks. These measures would include introducing retaining walls, providing additional drains, backfilling deep toilet pits as appropriate.

Throughout these activities NBRO will provide technical advice and guidance to NHDA as needed.

Way Forward

Apart from implementing the recommended activities in the two project areas selected under the PIP, NHDA would consider the recommendations during implementing future housing projects and especially in using guidelines already developed by various national technical agencies.

As a result of the association with the PIP-SL TWG, NHDA is well linked with all main organisations responsible for regulatory and approval functions with respect to construction of housing in hazard prone areas. It has also provided an opportunity to NHDA to initiate a dialogue with the relevant stakeholders. Furthermore, NHDA is well versed with the need to adhere to the National Physical Plan and guidelines prepared by the National Physical Planning Department, the Coastal Zone Management Plan and the permit procedure of the CCD, the Land Zonation Planning and the Regional and Local Level Development Plans of the UDA in future housing projects planned in areas under the jurisdiction of the respective organisations.

Photo credit: DMC
Layout by: Lowil Fred Espada

This case study is part of a series of case studies developed to share the experiences of the Priority Implementation Partnership (PIP) in Sri Lanka on mainstreaming DRR into the housing sector. The activities described were led by the National Housing Development Authority (NHDA) of the Ministry of Engineering Services, Construction, Housing and Common Amenities in partnership with the Disaster Management Centre under the Ministry of Disaster Management of the Government of Sri Lanka. The Asian Disaster Preparedness Center (ADPC) and AusAID provided technical and financial support to the PIP respectively.

This PIP has been implemented under the Program of the Regional Consultative Committee on Disaster Management (RCC) on Mainstreaming disaster risk reduction into development. For more information on the program please visit ***www.rccdm.net***

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