ØÇç ³½· ³ÛÇÝ Ð³Ù³ ·áñÍ³ ÏóáõÃÛ³Ý
Ö³åáÝ³Ï³Ý ¶áñÍ³Ï³ÉáõÃÛáõÝ
(ØÐÖ¶)

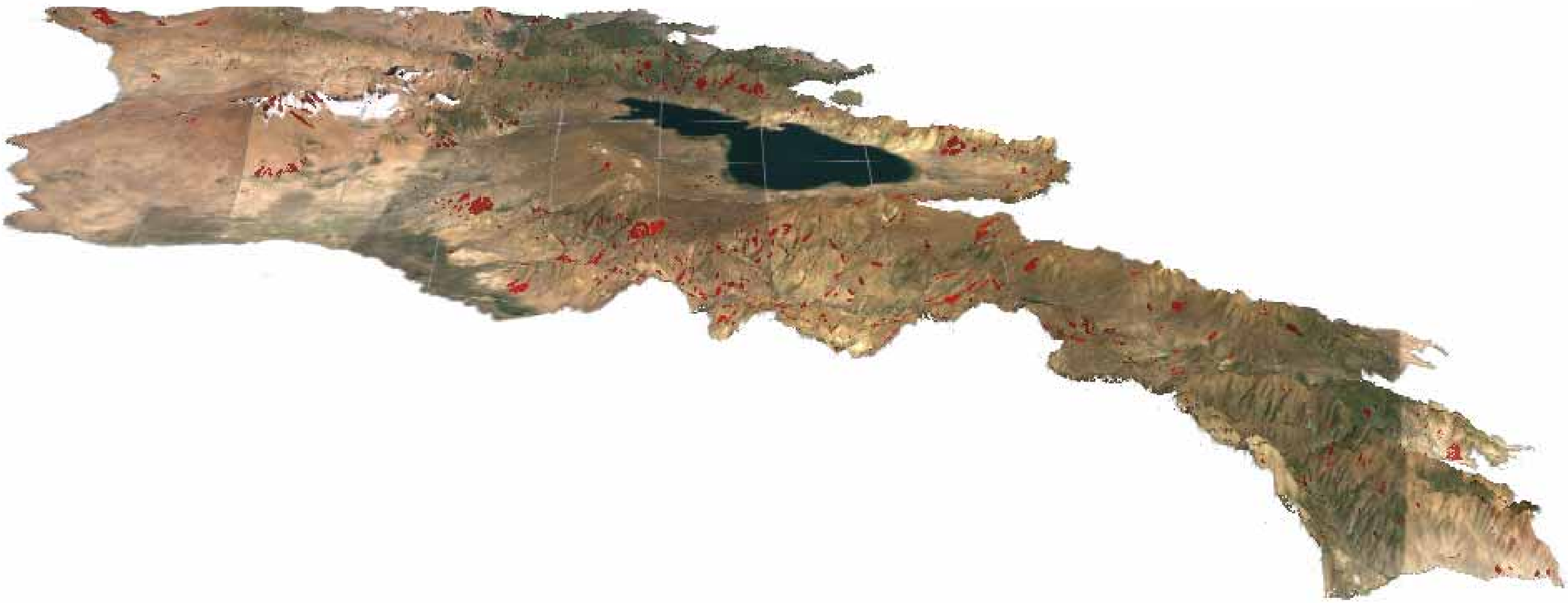
JAPAN
INTERNATIONAL
COOPARATION AGENCY
(JICA)

Ð³Û³ëï³ÝÇ
Ð³Ýñ³å»ï áõÃÛ³Ý
ø³Õ³ù³ßÇÝáõÃÛ³Ý
Ü³Ë³ñ³ñáõÃÛáõÝ

THE REPUBLIC OF
ARMENIA
MINISTRY OF URBAN
DEVELOPMENT
(MoUD)

Ð³Û³ëï³ÝáõÙ ëáÕ³ÝùÝ»ñÇ ï»ËÝÇÏ³Ï³Ý ï»Õ»Ï³·Çñ
I-ÇÝ Ñ³ï áñ: “êáÕ³ÝùÝ»ñÁ Ð³Û³ëï³ÝáõÙ” ¸»Ï ï»Ùµ»ñ 2005

Technical Bulletin of Landslides in Armenia
Volume I: “Landslides in Armenia” December 2005



ØÇç³½·³ÛÇÝ Ð³Ù³·áñÍ³ÏóáõÃÛ³Ý Ö³å áÝ³Ï³Ý ¶áñÍ³Ï³ÉáõÃÛáõÝ (ØÐÖ¶)

JAPAN INTERNATIONAL COOPARATION AGENCY (JICA)

Ð³Ûó³ë ï ³ÝÇ Ð³Ýñ³å»ï áõÃÛ³Ý ø³Õ³ù³ßÇÝáõÃÛ³Ý Ü³Ë³ñ³ñáõÃÛáõÝ

THE REPUBLIC OF ARMENIA MINISTRY OF URBAN DEVELOPMENT (MoUD)

Ð³Ûó³ë ï ³ÝáõÙ ëáÕ³ÝùÝ»ñÇ ï»ËÝÇÏ³Ï³Ý ï»Õ»Ï³·Çñ
I-ÇÝ Ñ³ï áñ: “êáÕ³ÝùÝ»ñÁ Ð³Ûó³ë ï ³ÝáõÙ” ¸»Ï ï»Ùµ»ñ 2005

Technical Bulletin of Landslides in Armenia
Volume I: “Landslides in Armenia” December 2005

Ü²Ê²´²Ü

ê³ñë³÷»ÉÇ »Ý Çñ»Ýó ã³÷»ñáí ³Õ»ï³ÉÇ Ñ»ï¨³ÝùÝ»ñÝ ³ÛÝåÇëÇ ï³ñ»ñ³ÛÇÝ ³Õ»ïÝ»ñÇ, ÇÝãåÇëÇù »Ý »ñÏñ³ß³ñÅ»ñÁ, Ññ³µáõËÝ»ñÇ Å³ÛÃùáõÙÝ»ñÁ, áñáÝù ³é³ç³óÝáõÙ »Ý ÑëÏ³Û³Ï³Ý íÝ³ëÝ»ñ áõ Ù»Í³Ù³Ý³Ï Ù³ñ¹³ÛÇÝ ½áÑ»ñ:

ê³Ï³ÛÝ, Ñ³Ù»Ù³ï³µ³ñ ³í»ÉÇ ÷áùñ Çñ»Ýó ã³÷»ñáí ³ñï³ÍÇÝ (Ù³Ï»ñ¨áõÛÃ³ÛÇÝ) »ñÏñ³µ³Ý³Ï³Ý »ñ¨áõÛÃÝ»ñÝ ³é³ç³óÝáõÙ »Ý ³í»ÉÇ Ù»Í íÝ³ëÝ»ñ: Æ ï³ñµ»ñáõÃÛáõÝ ³é³çÇÝÝ»ñÇ, áñáÝù ·áñÍáõÙ »Ý Å³Ù³Ý³Ï ³é Å³Ù³Ý³Ï, Ñ³Ù»Ù³ï³µ³ñ »ñÏñ³ï¨ Å³Ù³Ý³Ï³ÛÇÝ ÙÇç³Ï³ÛùáõÙ áõ »ñÏñÇ ³é³ÝÓÇÝ Ñ³ïí³ÍÝ»ñáõÙ, í»ñçÇÝÝ»ñë ·áñÍáõÙ »Ý ³ÝÁÝ¹Ñ³ï Ï³Ù Ù»Í Ñ³×³Ë³Ï³ÝáõÃÛ³Ùµ ¨ áõÝ»Ý É³ÛÝ ï³ñ³ÍáõÙ »ñÏñÇ ·ñ»Ã» ³ÙµáÕç Ù³Ï»ñ¨áõÛÃáí:

Ð³Ûë³ëï³ÝÇ Ð³Ýñ³å»ïáõÃÛ³Ý ï³ñ³ÍùáõÙ ³Û¹ »ñ¨áõÛÃÝ»ñÇó ³é³í»É É³ÛÝ ½³ñ·³óáõÙ áõÝ»Ý ·ñ³íÇï³óÇáÝ åñáó»ëÝ»ñÁ, áñáÝó ß³ñùáõÙ Çñ»Ýó ï³ñ³Íí³ÍáõÃÛ³Ùµ áõ ³½¹»óáõÃÛ³Ùµ ³é³ÝÓÝ³Ñ³ïáõÏ »Õ »Ý ½µ³Õ»óÝáõÙ ëáÕ³ÝùÝ»ñÁ:

Êáë»Éáí ëáÕ³ÝùÝ»ñÇ ï³ñ³ÍÙ³Ý áõ ³½¹»óáõÃÛ³Ý áÉáñïÝ»ñÇ Ù³ëÇÝ µ³í³Ï³Ý ¿ Ãí³ñÏ»É ÙÇ ù³ÝÇ ïíÛ³ÉÝ»ñ, áñáÝù ëï³óí»É »Ý Ñ³ïÏ³å»ë íñ»ÏÇÝ Å³Ù³Ý³ÏÝ»ñáõÙ Ï³ï³ñí³Í Ñ»ï³½áï³Ï³Ý³Ï³Ý ³ßË³ï³ÝùÝ»ñáõÙ.

- Ñ³Ýñ³å»ïáõÃÛ³Ý ï³ñ³ÍùáõÙ µ³ó³Ñ³Ûï í³Í ¿ 2,5 Ñ³½³ñÇó ³í»ÉÇ ëáÕ³Ýù³ÛÇÝ ï»Õ³Ù³ë
- ëáÕ³Ýù³ÛÇÝ ï»Õ³Ù³ë»ñÇ ÁÝ¹Ñ³Ýáõñ Ù³Ï»ñ»ëÁ Ñ³í³ë³ñ ¿ ßáõñç 122 Ñ³½³ñ ù³é. ÏÙ-Ç, ÇÝãÁ Ï³½ÙáõÙ ¿ Ñ³Ýñ³å»ïáõÃÛ³Ý ÁÝ¹Ñ³Ýáõñ Ù³Ï»ñ»ëÇ 4,1%-Á
- Ñ³Ýñ³å»ïáõÃÛ³Ý ßáõñç 960 Ñ³Ù³ÛÝùÝ»ñÇó ëáÕ³ÝùÝ»ñáí íÝ³ëí³Í »Ý 233-Á, áñÇó 100-Çó ³í»ÉÇ µÝ³Ï³í³Ûñ»ñáõÙ ¹Ç ï íáõÙ ¿ ëáÕ³ÝùÝ»ñÇ ½·³ÉÇ ³Ï ïÇíáõÃÛáõÝ, áñÇ Ñ»ï¨³Ýùáí íÝ³ëí»É »Ý Ñ³ñÛáõñ³ íáñ µÝ³Ï»ÉÇ ïÝ»ñ, Ñ³Õáñ¹³ÏóáõÕÇÝ»ñ áõ ³ÛÉ Ï»Ýë³³å³Ñáí Ù³Ý ûµÛ»ÏïÝ»ñ
- ³í ïáÙ³Ý³å³ñÑÝ»ñÇ ó³ÝóÇ 7400 ÏÙ-Çó 240-Á (3,2%) íÝ³ëí³Í ¿ 280 ëáÕ³Ýùáí
- »ñÏ³ÃáõÕÇ ó³ÝóÇ ÁÝ¹Ñ³Ýáõñ 870ÏÙ-Çó 4,8-Á (0,5%) íÝ³ëí³Í ¿ 10 ëáÕ³Ýùáí ¨ ³ÛÉÝ:

êáÕ³Ýù³ÛÇÝ »ñ¨áõÛÃÝ»ñÇó Ñ³Ýñ³å»ïáõÃÛ³Ý ëáóÇ³É-ïÝï»ë³Ï³Ý Ï³éáõÛóÝ»ñÇÝ Ñ³ëóí³Í áõÕÕ³ÏÇ íÝ³ëÁ, Ñ³Ù³Ó³ÛÝ ëáÕ³Ýù³ÛÇÝ ï»Õ³Ù³ë»ñÇ ·áÛù³·ñÙ³Ý ïíÛ³ÉÝ»ñÇ, Ï³½ÙáõÙ ¿ ßáõñç 43 ÙÉÝ ²ØÜ ¹áÉ³ñ, ÇëÏ åáï»ÝóÇ³É íÝ³ëÁ` ßáõñç 54 ÙÉÝ ²ØÜ ¹áÉ³ñ:

Ð³Ýñ³å»ïáõÃÛ³Ý ³Ûë Ï³ñ¨áñ³·áõÛÝ ËÝ¹ñÇ ÉáõÍÙ³Ý å³Ñ³ÝçáõÙ ¿ Ñ³Ù³Ï³ñ·í³Í Ùáï»óáõÙ, Ñ³ïáõÏ é³½Ù³í³ñáõÃÛ³Ý Ùß³ÏáõÙ ¨ Çñ³Ï³Ý³óáõÙ: ²Û¹ Ýå³ï³Ïáí u³Õ³ù³ßÇÝáõÃÛ³Ý Ý³Ë³ñ³ñáõÃÛ³Ý ÏáÕÙÇó Ùß³ÏíáõÙ »Ý Ñ³Ù³å³ï³ëË³Ý íñ³·ñ»ñ: 2001Ã. ÐÐ Ï³é³í³ñáõÃÛ³Ý áñáßÙáõÙáí Ñ³ëï³ïíó §ÐÐ ï³ñ³ÍùáõÙ Ñ³Ï³ëáÕ³Ýù³ÛÇÝ ³é³çÝ³Ñ»ñÃ ÙÇçáó³éáõÙÝ»ñÇ Íñ³·Çñ¦, áñÁ ÑÇÙù Ñ³Ý¹Çë³ó³í Ö³åáÝ³Ï³Ý Ï³é³í³ñáõÃÛ³Ý ÏáÕÙÇó Ñ³ïÏ³óí³Í ¹ñ³Ù³ßÝáñÑáí §Ð³Ûë³ëï³ÝÇ Ð³Ýñ³å»ïáõÃÛáõÝáõÙ ëáÕ³Ýù³ÛÇÝ ³Õ»ïÇ Ï³é³í³ñÙ³Ý áõëáõÙÝ³ëÇñáõÃÛáõÝ¦ Íñ³·ñÇ Çñ³Ï³Ý³óáõÙÁ: Ìñ³·ÇñÝ Çñ³Ï³Ý³óí»É ¿ 2004-2005ÃÃ. ÁÝÃ³óùáõÙ, ×³åáÝ³Ï³Ý ØÇç³½·³ÛÇÝ Ð³Ù³·áñÍ³ÏóáõÃÛ³Ý ¶áñÍ³Ï³ÉáõÃÛ³Ý (ÖØÐ¶) Ð»ï³½áï³Ï³Ý ËÙµÇ ÏáÕÙÇó` Ñ³Ù³Ï³Ý³Ï Ù³ëÝ³·Ç ï³óí³Í Ï³½Ù³Ï»ñåáõÃÛáõÝÝ»ñÇ áõ ³é³ÝÓÇÝ Ù³ëÝ³·»ï»ñÇ Ý»ñ·ñ³íÙ³Ùµ, ÐÐ ù³Õ³ù³ßÇÝáõÃÛ³Ý Ý³Ë³ñ³ñáõÃÛ³Ý Ù³ëÝ³ÏóáõÃÛ³Ùµ, ÇÝãå»ë Ý³¨ ÙÇ ß³ñù ³ÛÉ ·»ñ³ï»ëãáõÃÛáõÝÝ»ñÇ ³ç³ÏóáõÃÛ³Ùµ:

Ìñ³·ñÇ ßñç³Ý³ÏÝ»ñáõÙ Çñ³Ï³Ý³óí»óÇÝ ÷áñÓ³Ï³Ý` åÇÉáï³ÛÇÝ Ý³Ë³·Íñ 4 ï»Õ³Ù³ëáõÙ, áñÇó 2-áõÙ` ·ÛáõÕ³Ï³Ý Ñ³Ù³ÛÝùÝ»ñÇ ³é³í»É íÝ³ëí³Í ï»Õ³Ù³ë»ñáõÙ Ï³ï³ñí»óÇÝ Ñ³Ï³ëáÕ³Ýù³ÛÇÝ ÷áùñ³Í³í³É ÙÇçáó³éáõÙÝ»ñ, áñáÝó ³ÏïÇí Ù³ëÝ³ÏóáõÃÛáõÝ »Ý áõÝ»ó»É Ñ³Ù³ÛÝùÝ»ñÇ ³Ý¹³ÙÝ»ñÁ` ë»ÕÙ³Í Å³Ù³ÏÇ ¨ ÙÇçáóÝ»ñÇ Ï³½Ù³Ï»ñå³Ý Ñ³Ù³ñ: Ìñ³·ñÇ ³ñ¹ÛáõÝùáõÙ ³é³ç³ñÏíáÕ Ï³é³í³ñÙ³Ý Ñ³ÙÁÝ¹Ñ³Ýáõñ Ùá¹»ÉÁ Ý³¨ Ý»ñ³éáõÙ ¿ ëáÕ³ÝùÝ»ñÇ ÏÇñ³é³ÕÙ³Ý áõ ïíÛ³ÉÝ»ñÇ Ñ³í³ù³·ñÙ³Ý ³ÝÑñ³Å»ßïáõÃÛáõÝÁ` ³ñ¹Ç³Ï³Ý ¨ åñ³ÏïÇÏ ÙÇçáó³éáõÙÝ»ñÇ Ùß³ÏÙ³Ý áõ Çñ³Ï³Ý³óÙ³Ý Ñ³Ù³ñ:

Ìñ³·ñÇ Çñ³Ï³Ý³óáõÙÁ Ñ³ïÏ³å»ë Ï³ñ¨áñ ¿ ³é³ç³óáÕ ³é³ç³ñÏÝ»ñÇ Çñ³Ï³Ý³óÙ³Ý Ñ³Ù³ñ: Ì³é³ÛáÕ ÏÇñ³é»ÉÇ Ï³é³í³ñÙ³Ý ·áñÍÁÝÃ³óÇ Ï³éáõóí³ÍùÁ Ý»ñ³éáõÙ ¿ Ñ³Ýñ³å»ïáõÃÛ³Ý ÙÇ ß³ñù Ñ³Ù³å³ï³ëË³Ý ·»ñ³ï»ëãáõÃÛáõÝÝ»ñÇ ³ßË³ï³ÏÇóÝ»ñÇ ëáóÇ³É³Ï³Ý å³ñï³íáñáõÃÛáõÝÝ»ñÇ Ùß³ÏáõÙÝ áõ ë³ÑÙ³ÝáõÙÁ, ï»Õ»Ï³ïíáõÃÛ³Ý ÷áË³Ý³ÏÙ³Ý ¨ ûµÛ»ÏïÇí ·Ý³Ñ³ï³Ï³ÝÝ»ñÇ ÙÇçáóÝ»ñÇ Ùß³ÏáõÙ, ÇÝãå»ë Ý³¨ Ñ³Ýñ³ÛÇÝ ³Ýíï³Ý·áõÃÛ³Ý ¨ ¿ÏáÉá·Ç³Ï³Ý ³Ýíï³Ý·áõÃÛ³Ý Ñ³Ù³ñ:

Ð³ßíÇ ³éÝ»Éáí, áñ ³Ûë ï»Õ»Ï³ïíáõÃÛ³Ý ³é³çÇÝ ÝÛáõÃ ¿ Ð³Û³ëï³ÝáõÙ, ã»Ýù Ï³ñáÕ ³ë»É, áñ Ñ³Ù³ñ ËÝ¹ñ³ÛÇÝ »Ýù Ñ³Ù³ñáõÙ ï»Õ»Ï³ïíáõÃÛ³Ý Ñ³í³ù³·ñÙ³Ý ï»ËÝÇÏ³Ï³Ý ÷áõÉÁ: Ø»Ýù Ñ³Ùá½í³Í »Ýù, áñ ³Û¹ ï»Õ»Ï³ïíáõÃÛáõÝÝ»ñÁ ÏÉÇÝ»Ý û·ï³Ï³ñ Ñ³Ù³ñ ¨ ÏÍ³é³Û»Ý ÐÐ ù³Õ³ù³ßÇÝáõÃÛ³Ý Ý³Ë³ñ³ñáõÃÛ³Ý:

ø³Õ³ù³ßÇÝáõÃÛ³Ý Ý³Ë³ñ³ñáõÃÛáõÝ
ÐÐ ù³Õ³ù³ßÇÝáõÃÛ³Ý Ý³Ë³ñ³ñáõÃÛ³Ý, ·Ç ï³ï»ËÝÇÏ³Ï³Ý í³ñãáõÃÛ³Ý, ÇÝÅ»Ý»ñ³Ï³Ý áõëáõÙÝ³ëÇñáõÃÛ³Ý ¨ ï³ñ³ÍùÇ áõÙç³óÙ³Ý å³Ñå³ÝÙ³Ý å»ï

INTRODUCTION

The disastrous consequences of natural disasters, like earthquakes, volcano outburst, are terrible in their size as. They cause huge damages and human victims.

But comparatively small-size surface geological phenomena cause bigger damages. Unlike the first ones, which take place time by time, in comparatively long-term intervals on particular parts of the earth, the latter ones emerge all the time or with high frequency and have a wide extension within almost the whole surface of the earth.

From those phenomena, gravitation processes are more developed in the area of the Republic of Armenia. Among them landslides are most common and influential.

Talking about landslide extension and impact, it is enough to count several data which have especially been obtained as a result of recently performed investigations:

- more than 2,5 thousand landslide sites are discovered in the area of the republic
- total area of landslide sites are about 122 thousand km^2, which is 4.1% of total area of the republic
- from about 960 communities 233 are damaged by landslides in the republic. Among them, in more than 100 settlements landslides are quite active. Due to it, hundreds of residential houses have been damaged, communication ways and other life-support objects
- 240km (3.2%) of total 7400km highways are damaged by 280 landslides
- 4.8km (0.5%) of total 870km railways are damaged by 10 landslides.

According to inventory data of landslide sites, direct damage of republic’s social-economic buildings caused by landslide phenomena forms around 43 million USA dollars and potential damage forms around 54 million USA dollars.

The solution of this important issue in the republic requires a systemized approach, elaboration of a special strategy and implementation. Correspondent projects are being elaborated by MoUD for this purpose. The government of RA confirmed “Priority countermeasures project in the area of RA” in 2001. It became a base for the implementation of the project “Landslide disaster management investigation in RA” by means of the grant paid by the government of Japan. The project was implemented during 2004-2005 by Japan International Cooperation Agency (JICA) Study Team, involving Armenian specialized companies and particular specialists, with the participation of MoUD of RA as well as with the help of other authorities.

Within the program, pilot projects were realized in 4 sites, in 2 of them i.e. in more damaged sites of rural communities small-scale countermeasures were performed. The communities’ members had active participation in those works both among working commissions (for the elaboration and implementation of the projects and discussions) as well as in the realization of the constructions.

The main principle of landslides management, proposed as a result of the project, plans the active participation of communities and direct initiatives for solving of the problem. It involves starting from substantiation of the main problem until organizing and implementation of measures, which will be financially and technically supported by the government and state bodies all the time.

The implementation of the mentioned principle is impossible without a particular circle of society, including correspondent information of specialists, administrative workers about the situation in the field, about present works, projects. It should especially include information on the knowledge of the residents (who live without landslide area) about landslide, its activeness and emerging as well as about countermeasures, which are simple, don’t require big expenses and are possible to realize by own skills, especially taking into account the fact that in many cases residents themselves become the reason of the activation of landslides due to their wrong, unconscious activities. Especially it concerns water use and construction.

In order to fill the mentioned lack of information, it became necessary to create the following technical bulletin which is the first experiment in Armenia.

The technical bulltein contains quite wide information about landslides, their monitoring, preventive and other countermeasures, short information on Armenia’s natural-climatic, geological, social-economic and other conditions. It will also include rich topographic and graphical materials and pictures, which makes the newsletter more interesting and accessible for the wide sectors of population, and for specialists.

Of course, it’s impossible to involve the whole information concerning landslides in one technical bulletin, especially about annual works and new information connected with the development of the field. By reason of this we consider that it is necessary to publish the newsletter annually. It will help much to solve the problems within landslide management sphere in Armenia. It will be useful for communities, municipalities, authorities, the government, and, why not, for arousing the interest of potential donors.

Considering that this technical bulletin is the first attempt in Armenia, we don’t except some mistakes and defects, for which we ask to be excusable. We express our thankfulness for all useful remarks and suggestions beforehand, which will certainly be taken into account in case we have an opportunity to prepare the next technical bulletin. Please, present the latter ones to MOUD of RA.

Sagris Margaryan

Head of Section of Enginnering Syrvey and Protection of Territory and Facilities, Department of Science and Technical Poricy, Ministry of Urban Development

Ð³Ûë³ï³ÝáõÙ êáÕ³ÝùÝ»ñÇ ï»ËÝÇ³Ï³Ï³Ý µÝáõÃ³·Çñ

Ð³ï áñ 1 “êáÕ³ÝùÝ»ñÁ Ð³Ûë³ï³ÝáõÙ”

Technical Bulletin of Landslides in Armenia

Volume I: “Landslides in Armenia”

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Îóí³Í É³½»ñ³ÏÇÝ ëÏ³í³é³ÏÇ Ñ³í»É³Í
Appendix in Attached Compact Disc

1. ´Ü³Ï³Ý å³ÛÙ³ÝÝ»ñÁ

1.1 ¸ÇñùÁ ¨ ºñÏñ³·Ç ïáõÃÛáõÝÁ

Ð³Ûë³ï ³ÝÇ Ð³Ýñ³å»ï áõÃÛáõÝÁ (ÐÐ) ÁÝÏ³Í ¿ Îáí Ï³ëÇ Ñ³ñ³í³ÛÇÝ Ù³ëáõÙ` èáõë³ë ï ³ÝÇó Ñ³ñ³í-³ñ¨Ùáõ ï ù ÁÝÏ³Í ï ³ñ³ÍùáõÙ` ê¨ Ìáíç ¨ Î³ëåÇó Ìáíç ³ñ³ÝùáõÙ: Ð³Ûë³ï ³ÝÁ ÑÛáõëÇëáõÙ ë³ÑÙ³Ý³ÏÇó ¿ ì ñ³ë ï ³ÝÇÝ, ³ñ¨»ÉùáõÙ ²¹ñµ»ç³ÝÇÝ, Ñ³ñ³í-³ñ¨Ùáõ ï ùáõÙ ²¹ñµ»ç³ÝÇ ÆÝùÝ³í³ñ Ð³Ýñ³å»ï áõÃÛáõÝ Ü³ËÇç¨ ³ÝÇÝ, Ñ³ñ³íáõÙ Æñ³ÝÇÝ ¨ ³ñ¨Ùáõ ï ùáõÙ Âáõñù Ç³ÛÇÝ:

1.2 ²ßË³ñÑ³·ñáõÃÛáõÝÁ

öáùñ Îáí Ï³ëÇ ßÕÃ³Ý ï³ñ³ÍíáõÙ ¿ ÐÛáõëÇë³ÛÇÝ Ð³Ûë³ï ³ÝáõÙ ¨ ÁÝÏ³Í ¿ ê¨³Ý³ É×Ç ¨ ²¹ñµ»ç³ÝÇ Ñ³ñ³í-³ñ¨Ùáõ ï ùáõÙ, ÇëÏ Ñ³ñ³íáõÙ Ð³Ûë³ï ³ÝÇ ï³ñ³ÍùÇ Ùáï ³íáñ³å»ë Ï»ëÁ` Ñ³Ù³ñÛ³ 29.800 ùÏÙ-Á áõÝÇ Ýí³½³·áõÛÝÁ 2.000 ÙÍÙ µ³ñÓñáõÃÛáõÝ, (Ù» ï ñ ÍáíÇó Ù³Ï³ñ¹³ÏÇó), ¨ »ñÏñÇ ÙÇ³ÛÝ 3 ï áÏáëÝ ¿ ÁÝÏ³Í 650 ÙÍÙ ó³Íñ: ²Ù»Ý³ó³Íñ Ï»ï»ñÁ ²ñ³½·»ï Ç ¨ Ñ»éáõ ÑÛáõëÇëáõÙ ¸»µ»¹·»ï Ç Ñáí ï áõÙ »Ý, áñáÝó µ³ñÓñáõÃÛáõÝÁ Ñ³Ù³å³ï³ëË³Ý³µ³ñ 380 ¨ 430 ÙÍÙ ¿: öáùñ Îáí Ï³ëÇ ßÕÃ³ÛÇ Ñ³ñ³í ³ñ¨»ÉùáõÙ Ð³ÛÏ³Ï³Ý µ³ñÓñ³í³Ý¹³ÏÝ ¿, áñÁ ½³éÇÃ³÷ ÇçÝáõÙ ¿ Ñ³ñ³í -³ñ¨Ù ï Û³Ý Ñ³ ï í³Í ¹»åÇ ²ñ³½·»ï Á Ãáõñù³Ï³Ý ë³ÑÙ³ÝáõÙ: ´³ñÓñ³í³Ý¹³ÏÁ ßñç³å³ï í³Í ¿ ÙÇçÇÝ É»éÝ³ßÕÃ³Ý»ñáí ¨ Ñ³Ý·³Í Ññ³µáõËÝ»ñáí: êñ³ÝóÇó Ù»Í³·áõÛÝÁ` ²ñ³·³Í É»éÁ áõÝÇ 4.430 Ù» ï ñ µ³ñÓñáõÃÛ³Ùµ, áñÁ Ý³¨Ý³¨ Ð³Ûë³ï ³ÝÇ ³Ù»Ý³µ³ñÓñ ï» ï Ý ¿:

ê¨³Ý³ ÈÇ×Á Çñ 72.5 ÏÙ É³ÛÝáõÃÛ³Ùµ ¨ 376 ÏÙ »ñÏ³ñáõÃÛ³Ùµ ³Ù»Ý³Ù»Í ÉÇ×Ý ¿: ´³ñÓñ³í³Ý¹³ÏáõÙ ³ÛÝ ÁÝÏ³Í ¿ 2.070 ÙÍÙ µ³ñÓñáõÃÛ³Ùµ: ²Ù»Ý³ ³ÝÑ³ñÃ ï»Õ³ÝùÁ Ñ³ñ³í ³ñ¨»ÉùáõÙ ¿: Ð³Ûë³ï ³ÝÇ Ù»Í Ù³ëÁ áÕáÕí³Í ¿ ²ñ³½áí Ï³Ù Ýñ³ í ï ³Ï Ðñ³½¹³Ýáí, áñÁ ÑáëáõÙ ¿ ê¨³Ý³ È×ÇÓ: ²ñ³½Á Ï³½ÙáõÙ ¿ Ð³Ûë³ï ³ÝÇ ¨ Âáõñù Ç³ÛÇ áõ Æñ³ÝÇ ÇÝãå»ë Ý³¨ ²¹ñµ»ç³ÝÇÝ ë³Ñ³Ý³ÏÇó Ü³ËÇç¨ ³ÝÇ ÆÝùÝ³í³ñ Ð³Ýñ³å»ï áõÃÛ³Ý ¨ Æñ³ÝÇ ÙÇç¨ ë³ÑÙ³ÝÝ»ñÇ Ù»Í Ù³ëÁ: **(²ÕÛáõñ: ÐÇÙÝ³Ï³ÝáõÙ “2004 --- Ñ³Ù³ßË³ñÑ³ÛÇÝ ÷ ³ë ï »ñÇ ·ñùÇó)**

ÐÐ-Ý ïÇåÇÏ É»éÝ³ÛÇÝ »ñÏÇñ¿: ²ÕÛáõë³Ï 1.1-Á ¨ ·Í³·Çñ 1.1-Á É³ÝçÇ ·ñ³¹Ç»Ý ïÇ áõñí³·ÇÍ¿, áñÝ ³ñí³Í¿ ³Ûë áõëáõÙÝ³ëÇñáõÃÛ³Ý ÏáÕÙÇó áñå»ë GIS ³ñï³¹ñ³Ýù:

²ÕÛáõë³Ï 1.1 È³ÝçÇ ¶ñ³¹Ç»Ý ï

È³ÝçÇ ·ñ³¹Ç»Ý ïÇ ¹³ëÁ (²ëïÇ×³Ý: D)	àõëáõÙÝ³ëÇñíáÕ ï³ñ³ÍùÁ	
	î³ñ³ÍùÁ (Ñ³)	áõëáõÙÝ³ëÇñíáÕ ï³ñ³ÍùÇ ïáÏáëÁ (%)
0=< D < 5	1,038,753	35.0
0=< D < 10	599,896	20.2
10=< D < 20	816,286	27.5
20=< D < 30	439,804	14.8
30=< D < 40	72,550	2.4
D>=40	2,369	0.1
Total	2,969,658	100

1. NATURAL CONDITION

1.1 Location and Study Area

Republic of Armenia (RA) is located at the southern part of the Caucasus, the region southwest of Russia between the Black Sea and the Caspian Sea. Armenia is bordered on the north by Georgia, on the east by Azerbaijan, on the southwest by the Nakhijevan Autonomous Republic of Azerbaijan, on the south by Iran, and on the west by Turkey.

1.2 Geography

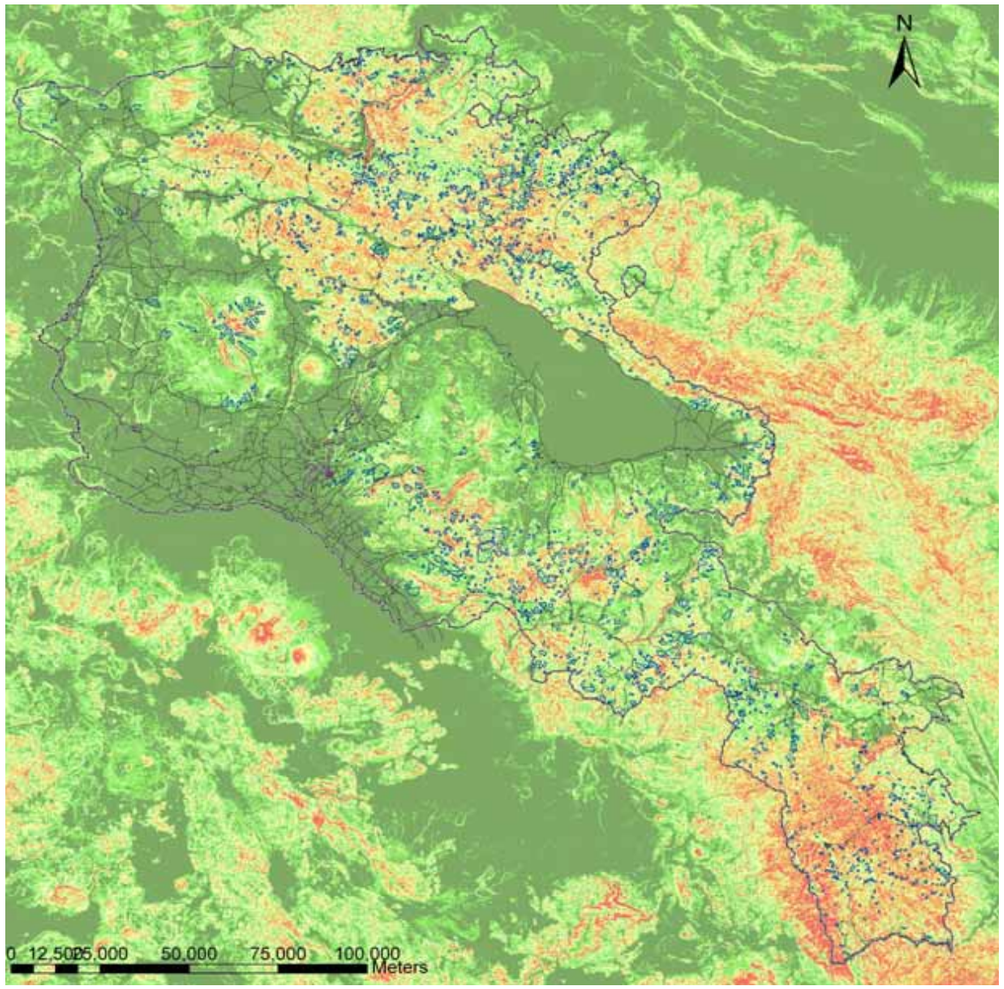
As the Lesser Caucasus range extends through northern Armenia, runs southeast between Lake Sevan and Azerbaijan, then to the south, about half of Armenia's area of approximately 29,800 square kilometers has an elevation of at least 2,000 masl (meters above see level), and only 3 percent of the country lies below 650 masl. The lowest points are in the valleys of the Aras River and the Debet River in the far north, which have elevations of 380 and 430 masl, respectively. To the southwest of the Lesser Caucasus range is the Armenian Plateau, which slopes southwestward toward the Aras River on the Turkish border. The plateau is masked by intermediate mountain ranges and extinct volcanoes. The largest of these, Mount Aragats, 4,430 m high, is also the highest point in Armenia.

Lake Sevan, 72.5 km across at its widest point and 376 km long, is by far the largest lake. It lies at 2,070 masl on the plateau. Terrain is most rugged in the extreme southeast. Most of Armenia is drained by the Aras or its tributary, the Razdan, which flows from Lake Sevan. The Aras forms most of Armenia's border with Turkey and Iran as well as the border between Azerbaijan's adjacent Nakhichevan Autonomous Republic and Iran. (SOURCE: Mainly from ‘2004 CIA WORLD FACTBOOK’)

RA is a typical mountainous country. Table 1.1 and Figure1.1 present the slope gradient outline made by this study as GIS output.

Table 1.1 Slope Gradient

pe Gradient Class (Degree: D)	Study Area	
	Area in the study area (ha)	Area percentage in the study area (%)
0=< D < 5	1,038,753	35.0
0=< D < 10	599,896	20.2
10=< D < 20	816,286	27.5
20=< D < 30	439,804	14.8
30=< D < 40	72,550	2.4
D>=40	2,369	0.1
Total	2,969,658	100



È»·»Ý¹

È³Ýç·ñ³¹Ç»Ý ï Ç ßÕÃ³Ý

0-5 ²ë ï Ç×³Ý

5-10 ²ë ï Ç×³Ý

10-15 ²ë ï Ç×³Ý

15-20 ²ë ï Ç×³Ý

20-25 ²ë ï Ç×³Ý

25-30 ²ë ï Ç×³Ý

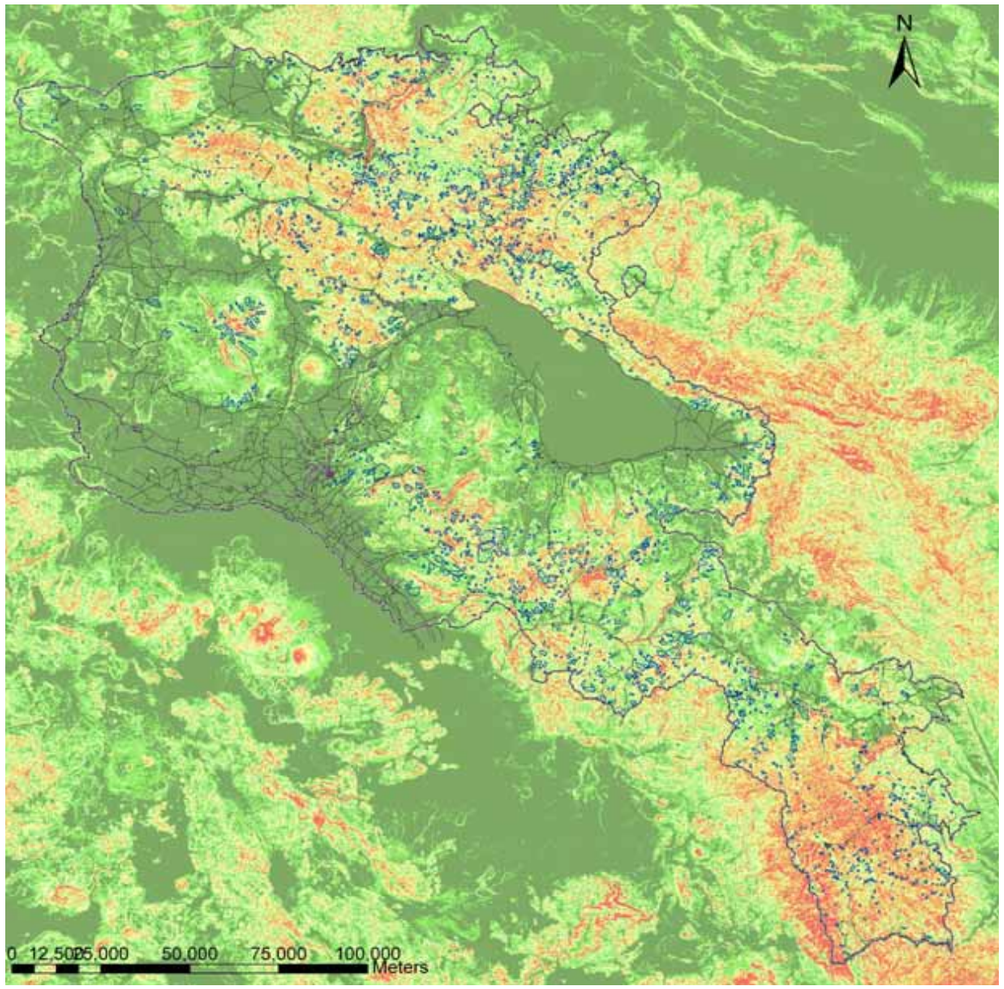
30-70 ²ë ï Ç×³Ý

ºñÏ³ÃáõÕÇ

Ø³ÛñáõÕÇ

ÐáÕÇ ÷éí³ÍùÝ»ñÁ (2 Ñ³-Çó ³í»ÉÇ Ù»Í) ÝáõÛÝ³Ï³Ý³óí³Í ¿ ÖØÐ¶ 2004 Ã-Ç áõëáõÙÝ³ëÇñáÕ ËÙµÇ ÑáÕÇ ÷éí³ÍùÝ»ñÇ ÇÝí»Ýï³ñ áõëáõÙÝ³ëÇñáõÃÛ³ÝÁ 2004

¶Í³·Çñ 1.1 ÐÐ-Ç È³ÝçÇ·ñ³¹Ç»Ý ï Ç ÑÇÙÝ³ÛÇÝ ù³ñï»½Á: (ÖØÐ¶ áõëáõÙÝ³ëÇñáÕ ËáõÙµ 2005)



LEGEND

Slope Gradient Ranges

0-5 Deg

5-10 Deg

10-15 Deg

15-20 Deg

20-25 Deg

25-30 Deg

30-70 Deg

Rail Way

High Way

Landslides (Larger than 2 ha) identified by JICA Study Team landslide inventory survey in 2004

Figure 1.1 Slope Gradient Base Map of RA (JICA Study Team 2005)

1.3 ºñÏñ³µ³ÝáõÃÛáõÝ ¨ ÑáÕ

1.3.1 ºñÏñ³µ³ÝáõÃÛáõÝ ¨ ·áñÍáÕ µ»Ï í ³ÍùÝ»ñ

Ð³Ù³ë ï ³ÝÇ »ñÏñ³µ³ÝáõÃÛáõÝÁ µ³Å³Ýí³Í ¿ 11 »ñÏñ³µ³Ý³Ï³Ý ßñç³ÝÝ»ñÇ ÇÝãå»ë ³ÕÛáõë³Ï 1.2-Á: ÆëÏ ·Í³·Çñ 1.2-Á óáõÛó ¿ ï³ÉÇë Ýñ³Ýó µ³ßËáõÙÁ ·áñÍáÕ µ»Ï í ³ÍùÝ»ñáí: ¶áñÍáÕ µ»Ï í ³ÍùÁ ÝÏ³ñ³·ñí³Í ¿, áñå»ë í»ñçÇÝ 10,000 ï³ñÇÝ»ñÇ ÁÝÃ³óùáõÙ ï»Ï ï áÝÇÏ ï»Õ³ß³ñÅ»ñáí ¨ »ñÏñ³ß³ñÅÇ Ñ» ï Ï³å í³Í (ë»ÛëÙá·»Ý) Ù³Ï»ñ¨áõÃ³ÛÇÝ ×»Õùí³ÍùÝ»ñáí ÙÇ µ³Ý:

Table 1.2 ºñÏñ³µ³Ý³Ï³Ý ßñç³Ý ¨ ÝÏ³ñ³·ñáõÃÛáõÝ

	ºñÏñ³µ³Ý³Ï³Ý ßñç³Ý	Ð»ï³½áï áõÃÛ³Ý ï³ñ³ÍùÁ		ÜÏ³ñ³·ñáõÃÛáõÝ
		Ø³Ï»ñ»ë (Ñ³)	Úáõñ³ù³Ýã¨áõñ »ñÏñ³µ³Ý³Ï³Ý ßñç³ÝÇ ëáÕ³Ýùáí ï»Õ³ß³ñÅí³Í ½³Ý·í³ÍÇ Ù³Ï»ñ»ëÇ ïáÏáë³ÛÇÝ Ñ³ñ³µ»ñáõÃÛáõÝÁ	
âáñÑáñ¹³Ï³Ý	1: Üë ï í³ÍùÝ»ñ	424,899	14.3%	âáñÑáñ¹³Ï³Ý ÉÇ×, ·»ï³ÛÇÝ ¨ çñ³-ë³ñó³¹³ß ï³ÛÇÝ Ýë ï í³ÍùÝ»ñ
Ü»á·»Ý	2: Ðñ³µË³ÛÇÝ Å³Ûé»ñ ¨ åÇñáÏÉ³ë ï ÇÏ Ýë ï í³ÍùÝ»ñ	1,187,037	40.0%	Ü»á·»Ý ¨ âáñÑáñ¹³Ï³Ý µ³½³É ï Ý»ñ, ³Ý¹»½Ç ï Ý»ñ, Ññ³µË³µñ»ÏãÇ³Ý»ñ, åÇñáÏÉ³ë ï ÇÏ Ýë ï í³ÍùÝ»ñ, ûµëÇ¹Ç³ÝÝ»ñ, å»ñÉÇ ï Ý»ñ, Ç·ÝÇÙµñÇ ï Ý»ñ
ä³É»á·»Ý	3:ÃÃí³ÛÇÝ ÙÇç³ÝÏÛ³É Ññ³µË³ÛÇÝ Å³Ûé»ñ	115,521	3.9%	¾áó»Ý, ûÉÇ·áó»Ý ¨ ÙÇÉáó»Ý ·ñ³ÝÇ ï Ý»ñ, ¹ÇáñÇ ï Ý»ñ, ÙáÝóáÝÇ ï, ëÇ»ÝÇ ï Ý»ñ
	4: Üë ï í³Íù³ÛÇÝ ¨ Ññ³µË³ÛÇÝ Å³Ûé»ñ	576,390	19.4%	ä³É»á·»Ý Ïñ³ù³ñ»ñ, ³í³½³ù³ñ»ñ, Ï³í»ñ, ³Ý¹»½Ç ï³-µ³½³É ï Ý»ñ, ¹³óÇ ï Ý»ñ, ï áõý»ñ, ï áõý³ÏáÝ·ÉáÙ»ñ³ ï
Ø»½á½áÛ³Ý	5: Øáô· Ññ³µË³ÛÇÝ Å³Ûé»ñ	20,519	0.7%	Ø»É³ÛÇÝ å»ñÇ¹á ï Ç ï, ¹áõÝÇ ï, å»ñÇ¹á ï Ç ï
	6: Üë ï í³Íù³ÛÇÝ ¨ Ù» ï³ÙáñÝ³ÛÇÝ Å³Ûé»ñ	541,513	18.2%	Úáõñ³ÛÇÝ (ØÇçÇÝ ¨ áõß) ¨ Ù»É³ÛÇÝ ³í³½³ù³ñ»ñ, Ï³í»ñ, ÏáÝ·ÉáÙ»ñ³ ï Ý»ñ, Ïñ³ù³ñ»ñ, Ù» ï³ÙáñÝÇÏ Ã»ñÃ³ù³ñ»ñ
	7: Ðñ³µË³ÛÇÝ Å³Ûé»ñ	32,233	1.1%	Úáõñ³ÛÇÝ (ØÇçÇÝ ¨ áõß) ¨ Ù»É³ÛÇÝ Ññ³µË³ÛÇÝ åÇñáÏÉ³ë ï ÇÏ µñ»ÏãÇ³Ý»ñ, µ³½³É ï Ý»ñ ¨ ³Ý¹»½Ç ï³-µ³½³É ï Ý»ñ, ï áõý»ñ
ä³É»á½áÛ	8: Üë ï í³Íù³ÛÇÝ ¨ Ù» ï³ÙáñÝ³ÛÇÝ Å³Ûé»ñ	43,624	1.5%	ä³É»á½áÛ Ïñ³ù³ñ»ñ, ³í³½³ù³ñ»ñ, Ï³í»ñ, ùí³ñóÇ ï Ý»ñ, Ã»ñÃ³ù³ñ»ñ
äñá ï »ñá ½áÛ	9: Ø» ï³ÙáñÝ³ÛÇÝ , Ññ³µË³ÛÇÝ ¨ Ù» ï³Ññ³µË³ÛÇÝ Å³Ûé»ñ	19,926	0.7%	ÄñáïÙáñÝÇÏ Ã»ñÃ³ù³ñ»ñ, ·Ý»Ûë»ñ, ýÇÉÇ ï Ý»ñ, Ù³ñÙ³ñÝ»ñ
				äñá ï »ñá½áÛ Ù» ï³-Ññ³µË³ÛÇÝ ¨ ·ñ³ÝÇ ï³ÛÇÝ ÇÝ ï ñáõ½Ç³

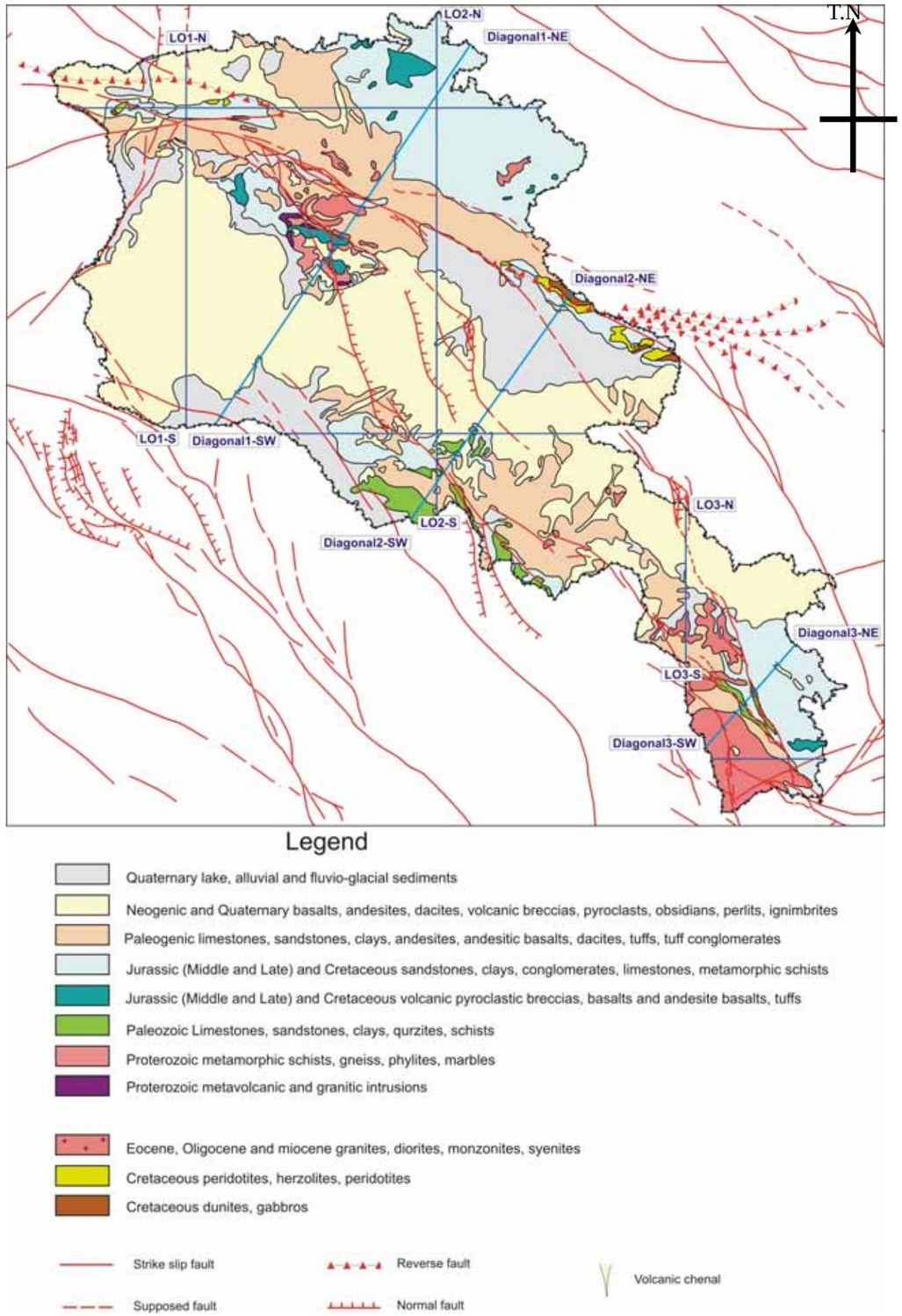
1.3 Geology and Soil

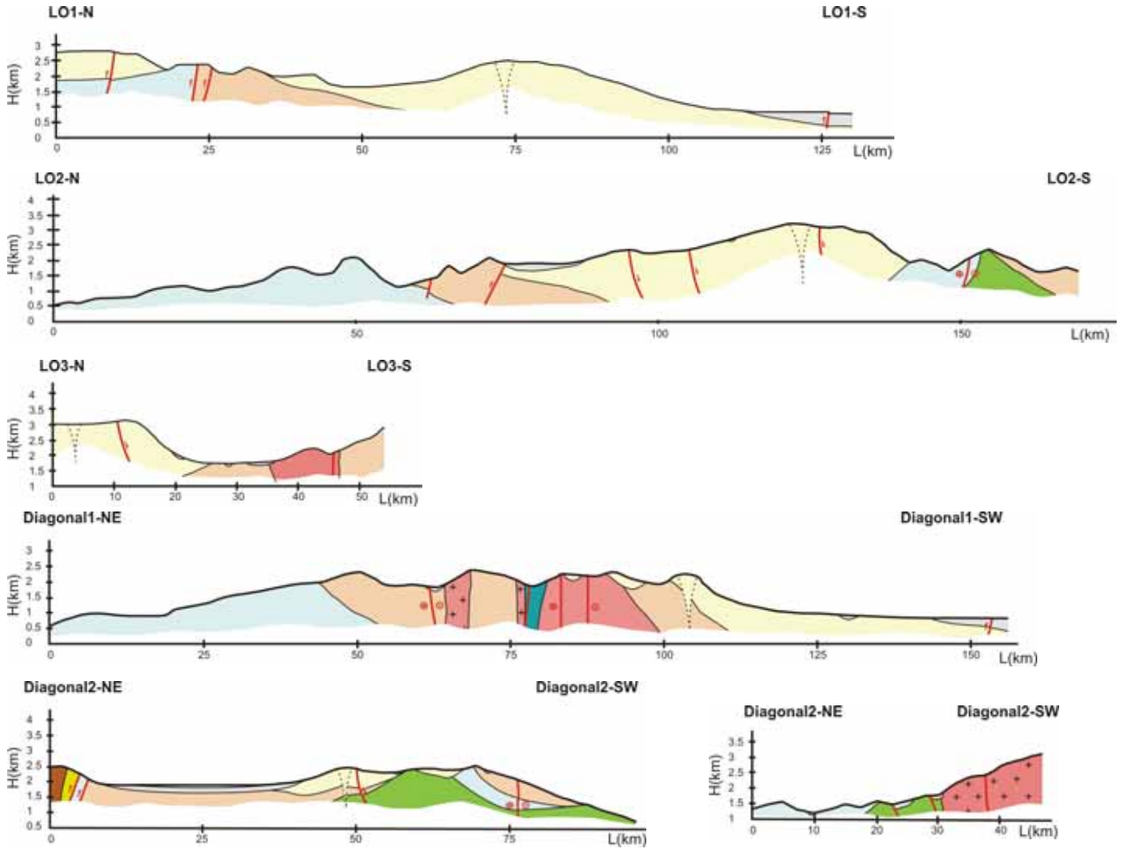
1.3.1 Geology and Active FaultsArmenia is divided into 11 geologic provinces. Table 1.2. and Figure 1.2 show their distribution, with active faults indicated.

An active fault is defined as a fault with tectonic displacements and earthquake-related (seismogenic) surface ruptures during the last 10,000 years.

Table 1.2 Geologic province and Description

	Geologic province	Study area		Description
		Area (ha)	Area percentage of landslide-displaced mass to each geologic province area	
Quaternary	1: Sediments	424,899	14.3%	Quaternary lake, alluvial and fluvio -glacial sediments
	2: Volcanic rocks & pyroclastic deposits	1,187,037	40.0%	Neogene and Quaternary basalts, andesites, dacites, volcanic breccias, pyroclastic deposits, obsidians, perlite, ignimbrites
Neogene	3:Acidic-intermediated plutonic rocks	115,521	3.9%	Eocene, Oligocene and Miocene granites, diorites, monzonite, syenites
Paleogene	4: Sedimentary rocks & volcanic rocks	576,390	19.4%	Paleogene limestones, sandstones, clays, andesites, andesitic basalts, dacites, tuffs, tuff conglomerate
Mesozoic	5: Mafic plutonic rocks	20,519	0.7%	Cretaceous peridotite, dunite, peridotite
	6: Sedimentary & metamorphic rocks	541,513	18.2%	Jurassic (Middle and Late) and Cretaceous sandstones, clays, conglomerates, limestones, metamorphic schists
	7: Volcanic rocks	32,233	1.1%	Jurassic (Middle and Late) and Cretaceous volcanic pyroclastic breccias, basalts and andesite basalts, tuffs
Paleozoic	8: Sedimentary & metamorphic rocks	43,624	1.5%	Paleozoic limestones, sandstones, clays, quartzites, schists
Proterozoic	9: Metamorphic, plutonic & meta volcanic rocks	19,926	0.7%	Proterozoic metamorphic schists, gneiss, phyllites, marbles
				Proterozoic meta -volcanic and granitic intrusions





²ÕÛáõë ³ Ï 1.2 ÐáÕÇ ÷Éí ³ ÍùÝ»ñÇ ¹ÇñùÁ, ºñÏñ ³ µ ³ Ý ³ Ï ³ Ý Ý ³ Ñ ³ Ý · Á ¨ ³ Ï ï Ç í ëË ³ ÉÝ»ñÇ ù ³ ñ ï »½Á

²Ûë ·»áÉá · Ç ³ Ï ³ Ý Ý ³ Ñ ³ Ý · Ý»ñÁ í »ñ ³ · ñ í áõÙ »Ý Ñ» ï ¨Û ³ É »ñ Ï ñ ³ µ ³ Ý ³ Ï ³ Ý ù ³ ñ ï »½ÇÝ:
Ð ³ Û ³ ë ï ³ ÝÇ ëË»Ù ³ ï ÇÏ »ñ Ï ñ ³ µ ³ ÝáõÃÛáõÝÁ (Ø=1:1,000,000) ²ÕµÛáõñ: ¶¾àèÆê Î ö ´ À Ñ»ÕÇÝ ³ Ï ². ² í ³ · Û ³ Ý
Ð ³ Û ³ ë ï ³ ÝÇ Ð ³ Ýñ ³ å» ï áõÃÛ ³ Ý ºñ Ï ñ ³ µ ³ Ý ³ Ï ³ Ý ø ³ ñ ï »½Á (Ø=1:1,000,000) ¾ ¸ . Ê ³ ñ ³ ½Û ³ Ý
¶»áÉá · Ç ³ Ï ³ Ý ë»ÏóÇ ³ Ý»ñÁ ³ ñ í ³ Í »Ý ². ² í ³ · Û ³ ÝÇ ÏáÕÙÇó ³ Ûë ï »ËÝÇÏ ³ Ï ³ Ý ³ Ù ÷ á ÷ ³ · ñÇ Ñ ³ Ù ³ ñ
²Ûë · áñ Íá Õ ³ ÝáõÕÕ»ÉÇáõÃÛáõÝÝ»ñÁ í »ñ ³ · ñ í ³ Í »Ý Ñ» ï ¨Û ³ É · áñ Íá Õ ³ ÝáõÕÕ»ÉÇ ù ³ ñ ï »½ÇÝ
ø ³ ñ ï »½Á ¨ · áñ Íá Õ ³ ÝáõÕÕ»ÉÇáõÃÛ ³ Ý ï íÛ ³ ÉÝ»ñÇ µ ³ ½ ³ Ý Ð ³ Û ³ ë ï ³ ÝÇ ï ³ ñ ³ Íù áõÙ (1:100,000)
²ÕµÛáõñ; ¶ºàèÆê Î ö ´ À
Ð»ÕÇÝ ³ ÏÝ»ñ: ². Î ³ ñ ³ Ë ³ ÝÛ ³ Ý, ì.¶. îñÇÝÇýáí, Ð. üÇÉÇå, ². ² í ³ · Û ³ Ý, Ð. ´ ³ Õ ¹ ³ ë ³ ñ Û ³ Ý, ê. ²é ³ ù»ÉÛ ³ Ý, î ³ ñÇ 2001

Figure 1.2 Geologic Province and Active Fault Map

These geologic provinces referred to the following geologic maps.
Schematic Geologic Map of Armenia (S=1:1,000,000) Source: GEORISK CJSC Aoutor: A. Avagyan
Geological Map of the Republic of Armenia (S=1:1,000,000) by Ed. Kharazian
Geologic sections are made by A. Avagayan for this technical bulletin
These active faults referred to the following active fault map.
Map and database for active faults in the territory of Armenia (1:100,000)
Source : GEORISK CJSC
Authors: A. Karakhanyan, V. G. Trifinov, H. Philip, A. Avagyan, H. Baghdassaryan, S. Arakelyan, Year: 2001

1.3.2 ÐáÕÁ

(1) ø³Õí³Íù

²Ûë µ³ÅÇÝÁ ÑÇÙÝ³Ï³ÝáõÙ Ù»çµ»ñí³Í ¿ ÐÐ´Ý³å³Ñå³ÝáõÃÛ³Ý Ü³Ë³ñ³ñáõÃÛ³Ý 2002Ã-Ç “Ð³Ûë³ï ³ÝáõÙ ³Ýµ³í³ñ³ñí³ÍáõÃÛ³Ý ¹»Ù å³Ûù³ñ»Éáõ ²½·³ÛÇÝ ²ßË³ï³Ýù³ÛÇÝ Ìñ³·ñÇó”: ÆÝã¨Çó», é»ïáõß- áõÕÕáõÙÁ Ï³ï³ñí»É ¿ ³Ûë áõëáõÙÝ³ëÇñáõÃÛáõÝÇó ëï³óí³Í Ýáñ ïí۳ÉÝ»ñáí:.

(2) ÐáÕÇ µ³ßËÙ³Ý ÁÝ¹Ñ³Ýáõñ ÝÏ³ñ³·Çñ

²ÕÛáõë³Ï 1.2 óáõÛó¿ ï³ÉÇë ÑáÕÇ µ³ßËÙ³Ý ÁÝ¹Ñ³Ýáõñ ÝÏ³ñ³·ÇñÁ:

²ÕÛáõë³Ï 1.2 ÐÐ-áõÙ ÑáÕÇ µ³ßËÙ³Ý ÜÏ³ñ³·ÇñÁ

¼áÝ³Ý»ñ	Þñç³Ý/Ù³ñ½	ÐáÕÇ ï»ë³ÏÝ»ñ	î³ñ³Íù		´³ñÓñáõÃÛáõÝ Ù»ï ñ ÍáíÇ Ù³Ï³ñ¹³ÏÇó
			Ð³½³ñ Ñ³	%	
ÎÇë³³Ý³å³ï³ÛÇÝ	²ñ³·³Íáï Ý, ²ñ³ñ³ï, ²ñÙ³íÇñ, Îáï³Ûù, ºñ¨³Ý	ÎÇë³³Ý³å³ï³ÛÇÝ ÙáËñ³·áõÛÝ	152	5.8	850-1250
		òñï³¹ÇÙ³óÏáõÝ Ù³ñ·³·»ïÝ³ÛÇÝ ÙáËñ³ÑáÕ	53	2.0	
		òñï³¹ÇÙ³óÏáõÝ Å³Ûé³ÑáÕ	31	1.2	
ÀÝ¹Ñ³Ýáõñ:			236	9.0	
âáñ ï³÷³ë ï³Ý³ÛÇÝ	²ñ³ñ³ï, ²ñ³·³Íáï Ý, Îáï³Ûù, êÛáõÝÇù, ì³Ûáó Òáñ	Þ³·³Ý³Ï³·áõÛÝ	242	9.2	1250-1950
î³÷³ë ï³Ý³ÛÇÝ	²ñ³·³Íáï Ý, ²ñ³ñ³ï, ¶»Õ³ñùáõÝÇù, ÈáéÇ, Îáï³Ûù êÛáõÝÇù ì³Ûáó Òáñ. ÞÇñ³Ï	ê¨³ÑáÕ, Ø³ñ·³·»ïÝ³ÛÇÝ ë¨³ÑáÕ, ·»ïÑáí ï³ÛÇÝ µ³ñÓñ³í³Ý¹³ÏÇ, ë¨³ÑáÕ, ó³Ù³ù³ÛÇÝ »ÝÃ³ÑáÕ	718 13 48 18	27.4 0.5 1.8 0.7	1300-2450
ÀÝ¹Ñ³Ýáõñ:			797	30.4	
²Ýï³é	²ñ³ñ³ï, ²ñ³·³Íáï Ý, ¶»Õ³ñùáõÝÇù, ÈáéÇ, Îáï³Ûù, êÛáõÝÇù, î³íáõß,	²Ýï³éÇ ÙáËñ³·áõÛÝ, îáñý-Ï³ñµáÝ³ï», Þ³·³Ý³Ï³ÑáÕ	133 15 564	5.2 0.6 21.6	500-2400
ÀÝ¹Ñ³Ýáõñ:			712	27.4	
´³ñÓñ³í³Ý¹³ÏÇ Ù³ñ·³·»ïÝ³ÛÇÝ	²ñ³ñ³ï, ²ñ³·³Íáï Ý, ¶»Õ³ñùáõÝÇù, ÈáéÇ, Îáï³Ûù, êÛáõÝÇù, ì³Ûáó Òáñ, î³íáõß	´³ñÓñ³í³Ý¹³ÏÇ-Ù³ñ·³·»ïÝ³ÛÇÝ, Ø³ñ·³·»ïÝ³ÛÇÝ-ï³÷³ë ï³µ³ÛÇÝ,	346 283	13.2 10.8	2200-4000
ÀÝ¹Ñ³Ýáõñ:			629	24.0	
ÀÝ¹Ñ³Ýáõñ			2616	100	

*) 358.3 Ñ³½³ñ Ñ³ Å³Ûé»ñÁ, ³í³½Ý»ñÁ, çñ»ñÁ, ×³Ý³å³ñÑÝ»ñÁ ¨ ³ÛÉ ßÇÝáõÃÛáõÝÝ»ñÝ »Ý:

1.3.2 Soil

(1) Quotation

This section is chiefly a reiteration of the “Ministry of Nature Protection of the RA 2002, National Action Programme to Combat Dissatisfaction in Armenia”. However, it is corrected by this study’s new findings.

(2) Outline of soil distribution

Table 1.2 shows outline of soil distribution in the RA.

Table 1.3 Outline of Soil Distribution in the RA

Zones	Region/ Marzes	Soil types	Area		Altitude ASL m
			Thousand ha	%	
Semi-desert	Aragatsotn, Ararat, Aramavia, Kotayk Yerevan	Semi-desert grey	152	5.8	850-1250
		Irrigated meadow	53	2.0	
		Hard weathering rock soil	31	1.2	
Sub-total:			236	9.0	
Dry steppe	Arrat, Aragatson, Kotayk, Syunik, Vayorts Dzor	Brown	242	9.2	1250-1950
Steppe	Aragatson, Ararat, Gegharkunik,Lori, Kotayk, Syunik, Vayorts Dzor, Shirak,	Black-soil, meadow-black-soil, river-valley-plateau, land-subsoil	718 13 48 18	27.4 0.5 1.8 0.7	1300-2450
Sub-total:			797	30.4	
Forest	Ararat, Aragatson, Gegharkunik, Lori, Kotayk, Syunik, Tavush	Forest grey, Turf-carbonate, chestnut	133 15 564	5.2 0.6 21.6	500-2400
Sub-total:			712	27.4	
Highland meadow	Ararat, Aragatsotn, Gegharkunik, Lori, Kotayk, Syunik, Vayots Dzor, Tavush	Highland-meadow, Meadow-steppe	346 283	13.2 10.8	2200-4000
Sub-total:			629	24.0	
Total:			2616	100	

*) 358.3 thousand ha are covered by rocks, sand, water, roads and other buildings.

(3) ÎÇë³-³Ý³å³ï³ÛÇÝ ÑáÕ»ñ

(a) ÎÇë³-³Ý³å³ï³ÛÇÝ ÙáËñ³ÑáÕ

ÎÇë³-³Ý³å³ï³ÛÇÝ ÙáËñ³ÑáÕ»ñÁ ½µ³Õ»óÝáõÙ »Ý ²ñ³ñ³ïÇ ·á·³íáñ Ù³Ï»ñ»ëÇ Ý³Ë³É»éÝ³ÛÇÝ ½áÝ³ÛÇ ï³÷³ëï³ÝÝ»ñÁ 850-1250Ù µ³ñÓñáõÃÛ³Ý íñ³: Üñ³Ýù µÝáõÃ³·ñíáõÙ »Ý ÑáõÙáõë³ÛÇÝ ÑáñÇ½áÝÇó ó³Íñ áõÝ³ÏáõÃÛ³Ùµ /25 – 40ëÙ/, ÑáõÙáõëÇ ó³Íñ ïáÏáë³ÛÝáõÃÛ³Ùµ (2%), ù³ñù³ñáïáõÃÛ³Ùµ, ÏÙ³Ëù³ÝÙ³Ý ¨ Ï³ñµáÝ³ïÝ»ñÇ ½·³ÉÇ ïáÏáë³ÛÝáõÃÛ³Ùµ: Î³ñµáÝ³ïÝ»ñÇ ÑáñÇ½áÝÇó Ý»ñù¨ Ý»ñï³Ûó³Í¿ ·Çåë-Ï³í» ß»ñïÁ: ²ûëáõ³ÛÝïÕ ÝÏ³ï»ÉÇ »Ý »Éáõë ïÝ»ñ: Üñ³Ýù áõÝ»Ý ÃáõÛÉ ÏÉ³Ý»Éáõ áõÝ³ÏáõÃÛáõÝ, ³ÝÑ³Ù³å³ï³ëË³Ý ÑÇ¹ñá-ýÇ½ÇÏ³Ï³Ý Ñ³ï ÏáõÃÛáõÝÝ»ñ, Ñ³·»ó³Í»Ý ÑáÕ- ³ÉÏ³ÉÇ³Ï³Ý ÑÇÙùáí:

(b) àÕáÕí³Í Ù³ñ·³·»ï³Ý³ÛÇÝ ÙáËñ³ÑáÕ

àÕáÕí³Í Ù³ñ·³·»ï³Ý³ÛÇÝ ÙáËñ³ÑáÕÁ Ó¨³íáñí»É¿ ²ñ³ñ³ï³Ûûݵ³ñÓñ³í³Ý¹³ÏáõÙ 800-900 Ù» ï ñ µ³ñÓñáõÃÛ³Ý íñ³`Ñ³Ù³ï»Õ »ÝÃ³ÑáÕÇ ¨ Ù³Ï»ñ»ëÇ ËáÝ³íé»ÅÇÙÇ ¨ Ù»Ï¹³ñÛ³ ÑÝáõÃÛáõÝ áõÝ»óáÕ Ù³ñ¹Ï³ÛÇÝ ·áñÍáõÝ»áõÃÛ³Ý å³ÛÙ³ÝÝ»ñÇ ³½¹»óáõÃÛ³Ý ï³Ï³ äñáýÇÉÇ Ï³ñáÕáõÃÛáõÝÁ 80-120ëÙ ¿: Üñ³Ýù µÝáõÃ³·ñíáõÙ »Ý Ï³ñµáÝ³ïÝ»ñÇ µ³ñÓñ (3-7%) ¨ ÑáõÙáõë³ÛÇÝ ó³Íñ (1.5-2%) ïáÏáë³ÛÝáõÃÛ³Ùµ, ÑáÕ³ÛÇÝ ¨ Ï³í-³í³½³ÛÇÝ Ù»Ë³ÝÇÏ³Ï³Ý µ³Õ³¹ñáõÃÛ³Ùµ: Üñ³Ýù ÁÝ¹Ñ³Ýñ³å»ë óóí³Íã»Ý, ãÝ³Û³Í Ï³Ý ï³ñ³ÍùÝ»ñ, áñáÝù ÃáõÛÉ ³ñï³Ñ³Ûïí³Í Ï»ñåáí óóí³Í»Ý ¨ ³ÉÏ³ÉÇ³Ï³Ý³óí³Íª ÁÝ¹»ñùÇ çñ»ñÇ µ³ËÙ³Ý å³ï×³éáí: Üñ³Ýù áõÝ»Ý Ñ³Ù³å³ï³ëË³Ý ÑÇ¹ñá-ýÇ½ÇÏ³Ï³Ý Ñ³ï ÏáõÃÛáõÝÝ»ñ:

(c) òñï³¹ÇÙ³óÏáõÝ Å³Ûé³ÑáÕ»ñ

òñï³¹ÇÙ³óÏáõÝ Å³Ûé³ÑáÕ»ñÁ ·ïÝíáõÙ »Ý µ³½Ù³·áõÛÝ Ï³í»ñÇ íñ³, áñáÝù Ñ³Ý¹ÇåáõÙ »Ý ºñ¨³Ý ù³Õ³ùÇÝ ßñç³å³ïáÕ ï³ñ³ÍùÝ»ñáõÙ: ØÖÐ¶ ËáõÙµÁ å³ñ½»ó, áñ ³Ûë ÑáÕÁ Çñ ï»ë³ÏÇ Ù»ç “” ï³ñ³ÍíáÕ ÑáÕ ¿”: Üñ³Ýù µÝáõÃ³·ñíáõÙ »Ý ×»Õùí³ÍùÝ»ñáí, ËáÕáí³Ï³ß³ñÇ ³Ýóù»ñáí, ÑáõÙáõëÇ (0.8-2.6%) ¨ Ï³ñµáÝ³ïÝ»ñÇ ó³Íñ ïáÏáë³ÛÝáõÃÛ³Ùµ, áõÝ»Ý ³ÉÏ³ÉÇ³Ï³Ý ¨ ·Çåë³ÛÇÝ µÝáõÛÃ; Üñ³Ýù áõÝ»Ý ã³÷³½³Ýó ³Ýµ³ñ»Ñ³×ÑÇ¹ñá-ýÇ½ÇÏ³Ï³Ý Ñ³ï ÏáõÃÛáõÝÝ»ñ:

(4) âáñ ï³÷³ëï³Ý³ÑáÕ

âáñ ï³÷³ëï³Ý³ÑáÕÝ ÁÝ¹·ñÏáõÙ ¿ ÙÇ³ÛÝ ß³·³Ý³Ï³·áõÛÝ ÑáÕ»ñÁ: Þ³·³Ý³Ï³ÑáÕÁ Ùß³ÏíáõÙ ¿ ²ñ³ñ³ï³Ûûݷ³Ý ·á·³íáñ ÑáíÇïÝ»ñáõÙ, ì³ÛùÇ ¨ ¼³Ý·»½áõñÇ µ³ñÓñ³í³¹³ÏÇ ãáñ ï³÷³ëï³Ý³ÛÇÝ ½áÝ³Ý»ñáõÙ 1250-1950 Ù µ³ñÓñáõÃÛ³Ý íñ³, ÙÇçÉ»éÝ³ÛÇÝ ÑáíÇïÝ»ñáõÙ ¨ Ñ³ñ¨³Ý µ³ñÓñ³í³Ý¹³ÏÇ É³Ýç»ñáõÙ: Üñ³Ýù µÝáõÃ³·ñíáõÙ »Ý ÑáõÙáõëÇ ÙÇçÇÝ µ³Õ³¹ñáõÃÛ³Ý ³éÏ³ûáõÃÛ³Ùµ(2-4%), ù³ñù³ñáïáõÃÛ³Ùµ, ËÇëï ³ñï³Ñ³ûï³Í ³Éáõí Ç³É -Ï³ñµáÝ³ï» ÑáñÇ½áÝáí, áñÁ Ù³ë³Ùµ å Ý¹³ó³Í íÇ×³ÏáõÙ ¿: Üñ³Ýù áõÝ»Ý ÃáõÛÉ ÑÇÙÝ³Ï³Ý é»³ÏóÇ³ (ÃÃí³ÛÝáõÃÛáõÝ=7.4-8.5), ÙÇçÇÝ ÏÉ³ÝáÕ³Ï³Ý Í³í³ÉÁ Ñ³·»óí³Í¿ »Éáõë ï³ÛÇÝ ÑáÕ»ñáí (30-35 Ù·/¿Ïí) ¨ áõÝ»Ý ³Ýµ³ñ»Ñ³×ÑÇ¹ñá-ýÇ½ÇÏ³Ï³Ý Ñ³ï ÏáõÃÛáõÝÝ»ñ:

(3) Semi-desert soils

(a) Semi-desert grey soils

The semi-desert grey soils cover the lower hilly plains of the foothill zone of the Ararat concavity at the altitude of 850-1250 m. They are characterized by low capacity of humus horizons (25 – 40cm), low percentage (2%) of humus, stoniness, skeleton-type and considerable percentage of carbonadoes. Below the carbonate horizons the gypsum-clay stratums are represented. Salinity is notable here and there. The soils have weak absorption–ability, inadequate hydro-physical properties, and are saturated by soil- alkali grounds.

(b) Irrigated meadow grey lands

Irrigated meadow grey lands have been formed on the Ararat plateau areas at the altitude of 800-900 m under the conditions of joint impact of the subsoil and surface wetting regimes, and a century of human activity. The capacity of the profile is 80-120 cm. They are characterized by high percentage of carbonates (3-7%) and low percentage of humus (1.5-2%) earthen and clay-sand mechanical composition. They are normally not saline, although there are areas that are weakly saline and alkali under the impact of mineralized groundwater. They possess adequate hydro-physical properties.

(c) Hard weathering rock soils

Hard weathering rock soil is located on multi-color clays in the areas surrounding the city of Yerevan. The JICA study team clarified that this soil is “dispersive soil”. It is characterized by crevices/ piping holes, low percentage of humus (0.8-2.6%) and carbonates, alkalinity and plastered nature. They have extremely unfavorable hydro-physical properties.

(4) Dry steppe soils

Dry steppe soils include only brown soils.

Brown soils are developed in the Ararat concave valley, in the plateau of Vayk and Zangezur dry steppe zones at the altitude of 1250-1950 m, intermountain valleys and on the adjacent highland slopes. They are characterized by the presence of a medium content of humus (2-4%), stoniness, extremely expressed alluvial-carbonate horizon, which is partly in a cemented state. They have weak basic reaction (PH=7.4-8.5), medium absorption volume saturated by salinated soils (30-35 mg/ekv) and unfavorable hydro-physical properties.

(5) î³÷³ëï³Ý³ÑáÕ

(a) ê¨³ÑáÕ

ê¨³ÑáÕ»ñÁ ÙßÙ³Ï³íáõÙ »Ý ²ñ³ñ³ï³Ç ·á·³íáñ ÑáíÇïÝ»ñáõÙ, ÞÇñ³ÏÇ µ³ñÓñ³í³Ý¹³Ïáõ Ù, Èáéáõ ï³÷³ëï³ÝÝ»ñáõÙ, ê¨³ÝÇ ³í³½³Ýáõ Ù, ¼³Ý·»½áõñÇ µ³ñÓñ³í³Ý¹³Ïáõ Ù ¨ É»éÝ³É³Ýç»ñÇ Ñ³Ù»Ù³ï³µ³ñ Ù»ÕÙ ½³éÇÃ³÷³ÛÇÝ ï³ñ³ÍùÝ»ñáõÙ 1350-2450Ù µ³ñÓñáõÃÛ³Ý íñ³: Üñ³Ýù µÝáõÃ³·ñíáõÙ »Ý ÑáõÙáõëÇ ï³ñµ»ñ ïáÏáë³ÛÝáõÃ³Ùµ (3.5- 1.2%), ÙÇçÇÝÇó µ³ñÓñ ÏÉ³Ý»Éáõ áõÝ³ÏáõÃÛ³Ùµ (35-55 Ù·/¿Ï í.), µ³ñÓñ ³·ñ»·³ï³Ï³ÝáõÃÛ³Ùµ, ÑÇÙÝ³Ï³ÝáõÙ ã»½áù, »ñµ»ÙÝ ÃáõÛÉ ÃÃíáõï³ÛÇÝ ¨ ÃáõÛÉ ÑÇÙÝ³Ï³Ý é»³ÏóÇ³Ûáí, (ÃÃí³ÛÝáõÃÛáõÝ = 6.0-8.2), ÇÝãå»ë Ý³¨ ÝÛáõÃ³Ï³Ý µ³Õ³¹ñáõÃÛ³Ý É³í³·áõÛÝ óáõóÇãÝ»ñáí¨ ÑÇ¹ñá- ýÇ½ÇÏ³Ï³Ý Ñ³ï ÏáõÃÛáõÝÝ»ñáí:

(b) Ø³ñ·³·»ïÝ³ÛÇÝ ë¨³ÑáÕ

Ø³ñ·³·»ïÝ³ÛÇÝ ë¨³ÑáÕÁ Ó¨³íáñí»É ¿ ï³÷³ëï³Ý³ÛÇÝ ½áÝ³Ûáõ Ù ë¨³ÑáÕÇ, ¹Çëå»ñëÇ³ÛÇ ë³ÑÙ³ÝÝ»ñÇ Ý»ñëáõÙª Ù³Ï»ñ»ëÇ ¨ ÁÝ¹»ñùÇ ËáÝ³íáõÃÛ³Ý, å³ÛÙ³ÝÝ»ñÇ ³½¹»óáõÃÛ³Ý ï³Ï: Üñ³Ýù ÑÇÙ³Ï³ÝáõÙ ï³ñ³Íí³Í »Ý Èáéáõ, ï³÷³ëï³ÝÝ»ñáõÙ, ÞÇñ³ÏÇ µ³ñÓñ³í³Ý¹³ÏáõÙ ¨ ê¨³ÝÇ ³í³½³ÝÝ»ñáõÙ, áñáÝù, áõÝ»Ý »½³ÏÇ ÑÇ¹ñáËá·Ç³Ï³Ý å³ÛÙ³ÝÝ»ñ, áñáÝù ¿É Ýå³ëïáõÙ »Ý ÑáõÙáõëÇ, (10-13 %) ¨ Ï³íÇ ½·³ÉÇ ³×ÇÝ ó³Íñ ß»ñï»ñáõÙ: Üñ³Ýù áõÝ»Ý ÃáõÛÉ ÃÃíáõï³ÛÇÝ é»³ÏóÇ³, ÏÉ³ÝáÕ ·áñÍáÕáõÃÛáõÝÝ»ñÇ ·áõÙ³ñÁ ÙÇÝã¨ 57 Ù·/¿Ï í.

¶»ï-Ñáíï³ÛÇÝ µ³ñÓñ³í³Ý¹³ÏÇ ÑáÕ»ñÁ Ó¨³íáñí»É »Ý ·»ïÇ ÑáíÇïÝ»ñáõÙ ê¨³Ý³ É×Ç çñÇ ³÷³Ù»ñÓ ï³ñ³ÍùÝ»ñáõÙ, Ñáõ Ùáõëç µ³Õ³¹ñáõÃÛáõÝÁ ÙÇçÇÝÇó µ³ñÓñ ¿ (2-4%), ã»½áù ¿, »ñµ»ÙÝ ÃáõÛÉ ÑÇÙÝ³Ï³Ý é»³ÏóÇ³Ûáí (ÃÃí³ÛÝáõÃÛáõÝ= 6.9-8.1) ¨ ÏÉ³ÝáÕ³Ï³Ý ½³Ý³½³Ý Í³í³ÉÝ»ñáí (14-35 Ù·/¿Ï í), áñï»Õ Ý»ñÍÍí³Í Ù³·Ý»½ÇáõÙÇ ïáÏáë³ÛÝáõÃÛáõÝÁ ¿³Ï³Ý ¿:

ºÝÃ³ÑáÕÁ Ó¨³íáñí»É ¿ ê¨³Ý³ É×Ç ³÷³Ù»ñÓ ï³ñ³ÍùÝ»ñáõÙ çñÇ ×ÝßÙ³Ý ³ñ¹ÛáõÝùáõÙ: Üñ³Ýù Í³ÍÏáõÙ »Ý ¿³Ï³Ý ï³ñ³Íù, µÝáõÃ³·ñíáõÙ »Ý ³í³½»-Ï³í³ÛÇÝ »ÝÃ³ÑáÕáí, ÇëÏ ï³ñ³ÍùÝ ¿É µÝáõÃ³·ñíáõÙ ¿ Ù»Ë³ÝÇÏ³Ï³Ý Ï³í-³í³½³ÛÇÝ µ³Õ³¹ñáõÃÛ³Ùµ ¨ ó³Íñ ÑáõÙáõë³ÛÇÝ ïáÏáë³ÛÝáõÃÛ³Ùµ (0.3-0.5%):

(5) Steppe soils

(a) Black-soils

Black-soils are developed in the Ararat concave valley, Shirak highland, Lori steppe, Sevan basin, Zangezur plateau and other areas in the comparatively mild steepness of the mountain slopes at altitudes of 1300-2450 m. They are characterized by a humus content of 3.5- 1.2%, have above–medium absorption ability (35-55 mg/eq.), high aggregation, are mainly neutral, but may sometimes have weak acidic and basic reactions (pH= 6.0-8.2), have the best material composition and hydro-physical properties.

(b) Meadow black-soils

Meadow black-soils have been formed in the steppe zone within the limits of black-soil dispersion under surface and ground wetting conditions. They are basically spread in the Lori steppes, Shirak plateau and Sevan basin. They have unique hydrological conditions, promote considerable increase of humus (10-13 %) and clay in lower stratums. They have weak acidic reaction; the amount of absorbed actions is up to 57 mg/eq.

River-valley-plateau soils have been formed in the river valleys and the coastal areas related from the Lake Sevan water. Humus composition is from low to moderate (2-4%), they are neutral, sometimes have weak basic reaction (pH 6.9-8.1) and varying volume of absorption (14-35 mg/evk), where the percentage of absorbed magnesium is essential.

Subsoils have been formed in the Lake Sevan coastal areas as a result of the depression of the water table. They cover an essential area, characterized by sand-clay subsoil, by mechanical sand-and-clay composition, and by low humus percentage (0.3-0.5%).

(6) ²Ý ï ³é³ÛÇÝ ÑáÕ»ñ

(a) ²Ý ï ³é³ÛÇÝ ÙáËñ³ÑáÕ

²Ý ï ³é³ÛÇÝ ÙáËñ³ÑáÕÁ Ó¨³íáñí»É ¿ Ð³Ù³ë ï ³ÝÇ ÑÙáõëÇë-³ñ¨»ÉÙ³Ý É³ÝçÇÝ 1800-2250 Ù µ³ñÓñáõÃÙ³Ý íñ³: Üñ³Ýù µÝáõÃ³·ñíáõÙ »Ý Çñ»Ýó ÑáÕ³ÙÝáõÃÙ³Ùµ Ã»Ã¨³óÙ³Ý ³ñ¹ÛáõÝùáõÙ: Üñ³Ýù áõÝ»Ý µ³ñÓñ ÑáõÙáõë³ÛÇÝ ï áÏáë³ÛÝáõÃÛáõÝ (4.8%), ÙÇçÇÝ ÏÉ³ÝáÕ³Ï³Ý áõÝ³ÏáõÃÙ³Ùµ, ÃáõÛÉÇó áõÅ»Õ ÃÃíáõ ï³ÛÇÝ é»³ÏóÇ³Ûáí (ÃÃí³ÛÝáõÃÛáõÝ 4.6-5.9/ ¨ µ³ñ»Ñ³× ÑÇ¹ñá-ýÇ½ÇÏ³Ï³Ý Ñ³ ï ÏáõÃÛáõÝÝ»ñáí: ²Ý ï ³é³ÛÇÝ ïáñý- Ï³ñµáÝ³ï» ÑáÕ»ñÁ Ó¨³íáñí»É »Ý ÙÇçÇÝ µ³ÓÑáõÃÙ³Ý íñ³ ¶áõ·³ñùÇ, Ð³ÏáõÙÇ,´³ñ·áõß³ï Ç É»éÝ»ñáõÙ, áñáÝù Ñ³ñáõë ï »Ý Ï³ñµáÝ³ïÝ»ñáí: Üñ³Ýù µÝáõÃ³·ñíáõÙ »Ý ½·³ÉÇ ÑáõÙáõë³ÛÇÝ ïáÏáë³ÛÝáõÃÙ³Ùµ (7.5- 11%), í»ñÇÝ ß»ñï»ñáõÙ Ý»Ù ï ñ³É (ÃÃí³ÛÝáõÃÛáõÝ 7.0-7.4/ ¨ ÃáõÛÉ ÑÇÙÝ³Ï³Ý é»³ÏóÇ³Ý»ñáí ó³Íñ ß»ï»ñáõÙ / ÃÃí³ÛÝáõÃÛáõÝ 7.8- 8.5/, Ñ³·»ó³Í »Ý ³ÉÏ³ÉÇ³Ï³Ý ÑáÕáí, ÙÇçÇÝ ¨ ÙÇçÇÝÇó µ³ñÓñ ÏÉ³Ý»Éáõ áõÝ³ÏáõÃÙ³Ùµ:

(b) ²Ý ï ³é³ÛÇÝ ß³·³Ý³Ï³ÑáÕ»ñ

²Ý ï ³é³ÛÇÝ ß³·³Ý³Ï³ÑáÕ»ñÁ ï ³ñ³Íí³Í »Ý ìÇñ³Ñ³Ûáó, ¶áõ·³ñù, ö³Ùµ³Ï, ¨ ¼³Ý·»½áõñ É»éÝ³ßÃ³Ý»ñáõÙ 500-1700 Ù µ³ñÓñáõÃÙ³Ý íñ³, ÙÇÝã¹»é ³ñ¨ÏáÕ ãáñ É³Ýç»ñáõÙ ÙÇÝã¨ 2400 Ù µ³ñÓñáõÃÙ³Ý íñ³: Î³ñ¨áñ ÑáõÙáõë³ÛÇÝ ïáÏáë³ÛÝáõÃÛáõÝÁ 4-10% ¿: Üñ³Ýù áõÝ»Ý ÙÇçÇÝ ÏÉ³Ý»Éáõ áõÝ³ÏáõÃÛáõÝ, ÇÝãå»ë Ý³¨ Ï³ñµáÝ³ï³ÛÇÝ ïáÏáë³ÛÝáõÃÛáõÝ:

(c) ê³ñ³Ñ³ñÃ³ÛÇÝ Ù³ñ·³·»ïÝ³ÑáÕ

ê³ñ³Ñ³ñÃ³ÛÇÝ Ù³ñ·³·»ïÝ³ÑáÕ»ñÁ ÉÇÝáõÙ »Ý ë³ñ³Ñ³ñÃ³ÛÇÝ Ù³ñ·³·»ïÝÇ ¨ Ù³ñ·³·»ïÝ³-ï³÷³ë ï³Ý³ÛÇÝ ÑáÕ ï»ë³ÏÝ»ñÇ:

(6) Forest soils

(a) Forest gray soils

Forest gray soils have been formed on the slopes of Northeastern Armenia at an altitude of 1800-2250 m. They are characterized by earthiness as a result of alleviation. They have high humus content (4.8%), average absorption capacity, may have weak to strong acid reaction (pH 4.6-5.9) and favorable hydro-physical properties.

Forest turf-carbonate soils have been formed at average altitude on the plicate mountains of Gugark, Hakhum, Bargushat on mother types rich in carbonate. They are characterized by considerable humus percentage (7.5- 11%), are neutral on upper stratums (pH 7.0-7.4), and basic in lower stratums (pH 7.8- 8.5), they are saturated with alkali soils, and have medium and above medium absorption capacity.

(b) Forest brown soils

Forest brown soils are spread over the Virahayots, Gegark, Pambak and Zangezur mountain ranges at altitudes of 500-1700 m, and in the sunny-side dry slopes, in areas up to 2400 m high. Essential humus percentage is 4-10%. They have medium absorption capacity, and medim carbonate percentage.

(c) Highland-meadow soils

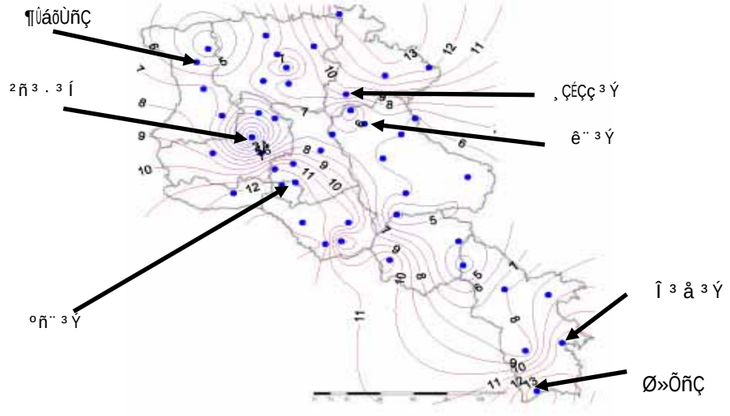
Highland-meadow soils include the highland-meadow and meadow-steppe types of soils.

Highland-meadow soils originated on the fragment mountain slopes and plateaus spread over the area at altitudes of 2002-2600 m ASL, under cold and humid climatic conditions. They have high humus percentage (13-20%), light mechanical composition and fragile structure, absorption ability below medium (15-20 mg/ ekv), have slightly acidic reactions (pH 5.5-6.8), expanded absorption capacity, medium and low mechanical clay-and-sand composition and favorable hydro-physical properties.

1.4 ÎÉÇÙ³

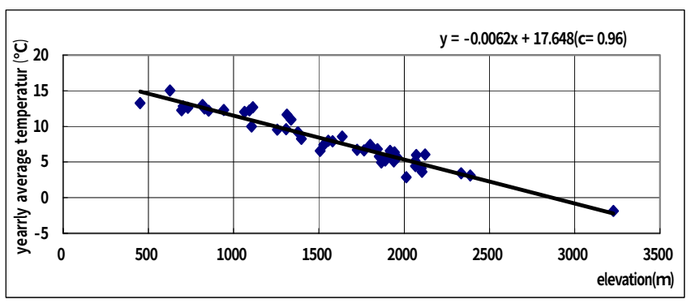
1.4.1 ú¹Ç ç»ñÙ³ëïÇ×³Ý

ú¹Ç ÙÇçÇÝ ³Ùë»Ï³Ý ç»ñÙ³ëïÇ×³ÝÁ ºñ¨³ÝáõÙ` ÐÐ Ù³ûñ³ù³Õ³ùáõÙ, áñÁ ·ïÝíáõÙ ¿ 907-ÙÍÙ-Çó µ³ñÓñáõÃÛ³Ý íñ³ ï³ñµ»ñíáõÙ ¿ ëÏë³Í 0.5³ëïÇ×³Ý C.ÐáõÝí³ñÇÝ ÙÇÝã¨ 32.9 ³ëïÇ×³Ý C. ÐáõÉÇëÇÝ (1961-1990), ÙÇÝã ê¨³Ý ù³Õ³ùáõÙ Ùáï 2,350-ÙÍÙ-Çó ï³ñµ»ñíáõÙ ¿ ëÏë³Í 4.0 ³ëïÇ×³Ý C. ÓÙé³ÝÁ ÙÇÝã¨ 14.0 ³ëïÇ×³Ý C. ³Ùé³ÝÁ: î³ñ»Ï³Ý û¹Ç ÙÇçÇÝ ç»ñÙ³ëïÇ×³ÝÁ (Ç½áÃ»ñÙ) ÐÐ ï³ñ³ÍùáõÙ óáõÛó ¿ ïñí³Í 1.3 ÝÏ³ñáõÙ: ìÏ³ûï³ÏáãéáÍ ï³ñ³ÍùÇ ï»Õ³·ñ³·Çï³Ï³Ý Ñ³ï Ï³ÝÇßÝ»ñÁ ï»Õ³ÛÇÝ ç»ñÙ³ëïÇ×³ÝÁ Ù»Í³å»ëÏ³Ë³Í¿·»ïÝÇµ³ñÓñáõÃÛáõÝÇó:



ÜÏ³ñ 1.3 ú¹Ç ï³ñ»Ï³Ý ÙÇçÇÝ ç»ñÙ³ëïÇ×³ÝÁ Ñ³ñ³µ»ñ³ÏóáõÃÛáõÝÁ ï³ñ»Ï³Ý û¹Ç ÙÇçÇÝ ç»ñÙ³ëïÇ×³ÝáÍ (1993-2003)

²ÕÛáõë³Ï 1.4-Á Ý»ñù¨áõÙ óáõÛó ¿ ï³ÉÇë å³ñ½ Ñ³ñ³µ»ñ³ÏóáõÃÛáõÝÁ ï³ñ»Ï³Ý û¹Ç ÙÇçÇÝ ç»ñÙ³ëïÇ×³ÝÇ ¨ ·»ïÝÇ µ³ñÓñáõÃÛ³Ý ÙÇç¨` óáõÛó ï³ÉáíÍ û¹Ç ç»ñÙ³ëïÇ×³ÝÇ Ýí³½áõÙÁ 6.2 ³ëïÇ×³Ý C-áí Ûáõñ³ù³ÝãÛáõñ 1000 Ù» ïñáõÙ 0.96 µ³ñÓñ Ñ³ñ³µ»ñ³ÏóáõÃÛ³Ý ·áñÍ³Ïóáí:



²ÕÛáõë³Ï 1.4 Ð³ñ³µ»ñ³ÏóáõÃÛáõÝÁ î³ñ»Ï³Ý ØÇçÇÝ ç»ñÙ³ëïÇ×³ÝÇ ¨ ¶»ïÝÇ´³ñÓñáõÃÛ³Ý ÙÇç¨

1.4 Climate

1.4.1 Air-temperature

Average monthly air-temperature in Yerevan, the capital city of RA situated at 907-masl, varies from -0.5 ºC in January to 32.9 ºC in July (1961-1990). In Sevan City, at approximately 2,350-masl, it varies from 4.0 ºC in winter to 14.0 ºC. in summer. Average yearly air-temperature (isotherm) in the territory of RA is shown in Figure1.3 With reference to topographical characteristics of the territory, local temperatures largely depend on ground heights

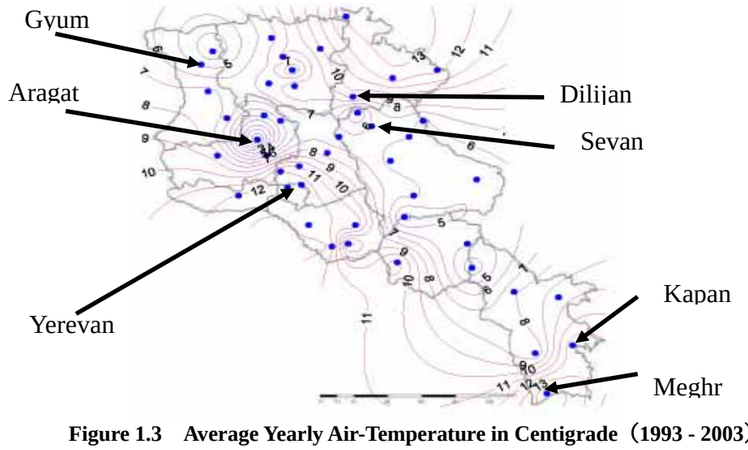


Figure 1.3 Average Yearly Air-Temperature in Centigrade（1993 - 2003）

Figure 1.4 below demonstrates a good correlation between average annual air-temperatures and ground heights, showing that the air-temperature decreases by 6.2ºC with every 1,000-m increase in height, with a high correlation coefficient of 0.96.

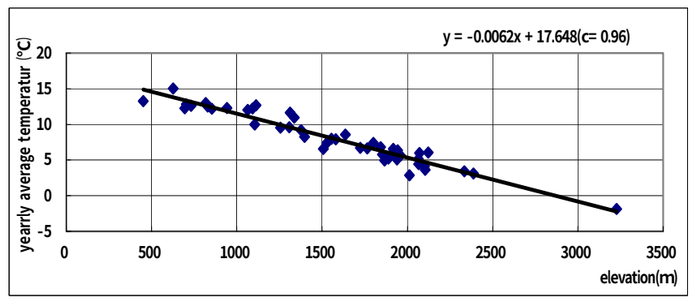
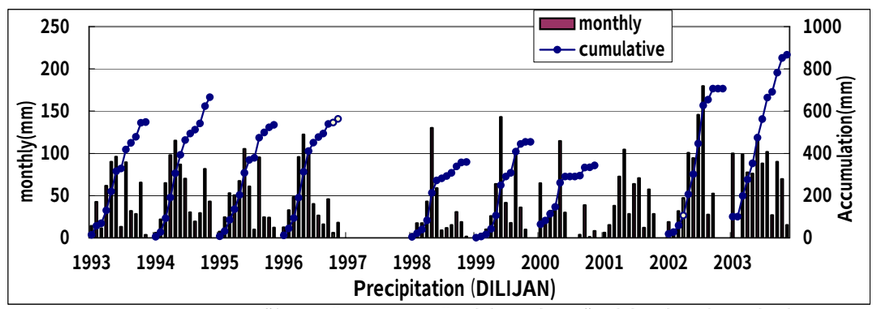


Figure 1.4 Correlation between Average Yearly Temperature and Ground Height

1.4.2 î»ÕáõÙÝ»ñ

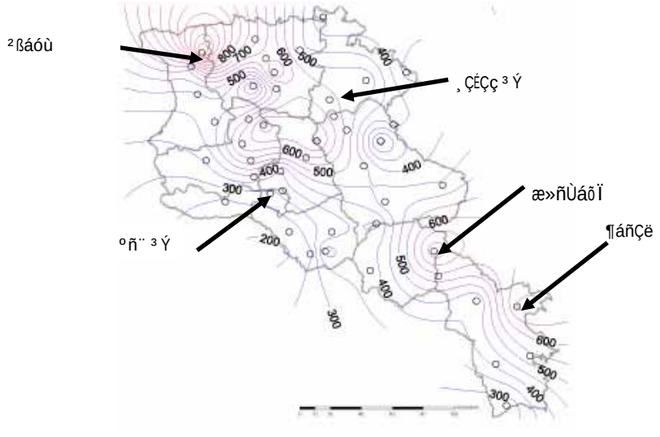
ÐÐ ï³ñ³ÍùáõÙ ÁÝ¹Ñ³Ýñ³å»ë Ù»Í ï»ÕáõÙÝ»ñ »Ý ÝÏ³ï íáõÙ ²åñÇÉÇó- Ø³ÛÇë ³ÙÇëÝ»ñÇÝ, Ñ³Ù»Ù³ï³Í ú·áë ïáëÇó ê»å ï»Ùµ»ñ ³ÙëÇÝ»ñÇÝ ³í»ÉÇ ó³Íñ ï»ÕáõÙÝ»ñÇ Ñ» ï:

ºñ¨³ÝáõÙ ÙÇçÇÝ ³Ùë»Ï³Ý ï»ÕáõÙÝ»ñÇ ù³Ý³ÏÁ ï³ï³ÝíáõÙ ¿ 7.2 ÙÙ ú·áë ïáëÇÝ ÙÇÝã¨ 36.5 ÙÙ ²åñÇÉÇÝ (1961-1990), ï³ñ»Ï³Ý ÙÇçÇÝ 593.2 ÙÙ ï»ÕáõÙÝ»ñÇ ù³Ý³ÏáÍ: ¸ÇÉÇç³Ý ù³Õ³ùÇ Ñ³Ù³ñ ³éÏ³ ¿ Ù³Ýñ³Ù³ëÝ ³Ùë»Ï³Ý ï»ÕáõÙÝ»ñÇ ÝÙáõßÁ¹Ùá ï 75 ÏÙ Ñ۪áõëÇë-³ñ¨»éù ºñ¨³ÝÇó ÇÝãå»ë óáõ۪ó ¿ ïñí³Í ³Õ۪áõë³Ï 1.6-áõÙ: ²Ùë»Ï³Ý ÙÇçÇÝ Ñ³Ù»Ù³ï³µ³ñ µ³ñÓñ ï»ÕáõÙÝ»ñÁ, áñáÝù ·»ñ³½³ÝóáõÙ »Ý 100ÙÙ –Á ÑÇÙÝ³Ï³ÝáõÙ ¹Çï í»É »Ý ³Ùé³ÝÁ ¨ ³í»ÉÇ ó³Íñ ï»ÕáõÙÝ»ñ ÓÙé³ÝÁ, ÙÇçÇÝ ³Ùë»Ï³Ý ï»ÕáõÙÝ»ñáí Ùá ï 560 ÙÙ:



²Õ۪áõë³Ï 1.6 î³ñ»Ï³Ý ÙÇçÇÝ ï»ÕáõÙÝ»ñÁ ¸ÇÉÇç³ÝáõÙ

²Õ۪áõë³Ï1.7-Á óáõ۪ó ¿ ï³ÉÇë ï³ñ»Ï³Ý ÙÇçÇÝ ï»ÕáõÙÝ»ñÇ µ³ßËáõÙÁ (1993-2000) ÐÐ-Ç ï³ñ³ÍùáõÙ: ´³ñÓñ ï»ÕáõÙÝ»ñÇ ï³ñ³ÍùÝ»ñÁ Ùá ï 1,000ÙÙ ¹Çï íáõÙ »Ý ï»ÑÇ ïáñÇ³۪Ç Ñ۪áõëÇë³۪ÇÝ Ù³ëáõÙ, ÙÇÝã¹»é ³í»ÉÇ ó³Íñ ï»ÕáõÙÝ»ñÇ ï³ñ³ÍùÁ 300 ÙÙ –Çó ó³Íñ ÝÏ³ï»ÉÇ ¿ »ñÏñÇ ³ñ¨Ù³ï۪³Ý Ù³ëáõÙ: î³ñ»Ï³Ý ÙÇçÇÝ ï»ÕáõÙÝ»ñÇ ù³Ý³ÏÁ áÕç ï»ÑÇ ïáñÇ³۪áõÙ Ñ³ßí³ñÏí³Í¿ 480ÙÙ:



²Õ۪áõë³Ï 1.7 î³ñ»Ï³Ý ÙÇçÇÝ ï»ÕáõÙÝ»ñÇ µ³ßËáõÙÁ

1.4.2 Precipitation

In general, higher precipitation is observed in the months of April and May, and lower precipitation in the months of August and September, in the territory of RA.

In Yerevan, the monthly average rainfall ranges from 7.2 mm in August to 36.5 mm in April (1961-1990), with average annual rainfall of 593.2 mm. A detailed monthly rainfall pattern is available for Dilijan City situated approximately 75 km northeast of Yerevan as shown in Figure 1.6. Higher average monthly precipitations exceeding 100 mm were usually observed in summers and lower precipitations in winters, with average annual rainfall of approximately 560 mm.

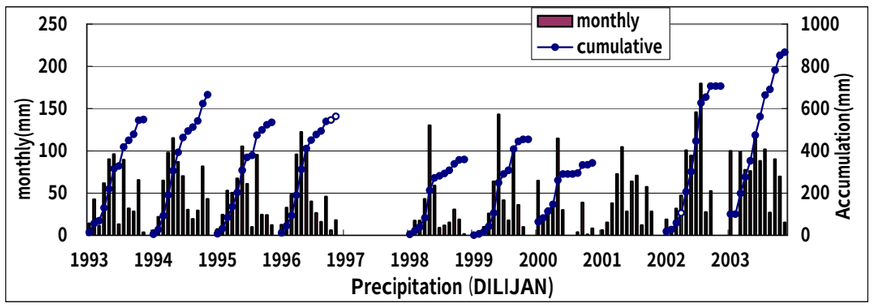


Figure 1.6 Average Monthly Precipitation in Dilijan

Figure 1.7 shows the average annual rainfall distribution (1993-2000) in the territory of RA. Areas of higher rainfall, or over 1,000 mm, are observed in the northern part of the territory, whereas an area of lower precipitation, or below 300 mm, is seen in the western part of the country. Average annual precipitation of the whole territory is estimated to be 480 mm.

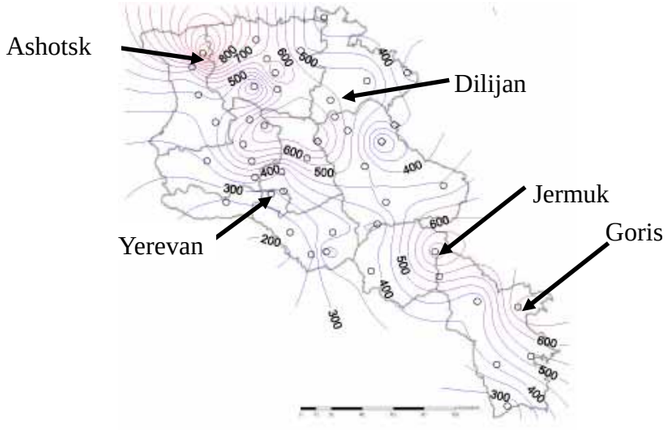


Figure 1.7 Distribution of Average Annual Precipitation

2. ՍՈՑԻԱԼԱԿԱՆ և ՏՆՏԵՍԱԿԱՆ ՊԱՅՄԱՆՆԵՐԸ

2.1 Հողային Ռեսուրսներ

Հողային ռեսուրսների տեսակների բաշխումը և նրանց մանրամասն գործառույթները ՀՀ-ում հետևյալ 2.1 և 2.2 աղյուսակներում է, համաձայն " 1997 թ-ի հողի բալանսը Հայաստանում”:

Աղյուսակ 2.1 Հողային ռեսուրսների բաշխումը ՀՀ-ում (հազար հա)

Մարզեր	Ընդհանուր	Գյուղատնտեսական հողի տեսակները	Վարելահող	Բազմամյա պլանտացիաներ	Խոտի դաշտեր	Արոտավայր	Անտառներ և ջ³ó³éáõ ï տներ	Այլ հողեր
Սյունիք	450.5	194.3	48.3	2.7	9.6	133.7	57.0	199.2
Գեղարքունիք	407.1	240.1	95.3	1.8	35.6	107.4	16.0	278.9
Լոռի	378.9	192.2	48.4	4.5	39.4	99.9	90.0	96.7
Արագածոտն	275.6	136.7	56.2	7.7	4.1	68.7	7.5	131.4
Տավուշ	270.4	98.6	27.8	6.8	15.0	49.0	123.9	47.9
Շիրակ	268.0	165.7	84.5	0.5	16.8	63.9	2.5	99.8
Վայոց Ձոր	230.8	75.9	20.6	3.3	4.6	47.4	6.5	148.4
Արարատ	209.9	99.1	30.0	11.8	2.9	54.4	9.5	101.3
Կոտայք	209.5	99.8	40.6	7.6	10.9	40.7	20.0	89.7
Արմավիր	124.2	80.7	40.4	13.6	0.2	26.5	1.0	42.5
Երևան	21.5	8.3	2.2	3.3	0.0	2.8	0.0	13.2
Ընդհանուր	2,846.4	1,391.4	494.3	63.6	139.1	694.4	333.9	1,249.0

²ÕÏáõë³Ï 2.2 ÐÐ-Ç ÑáÕÇ Ù³Ýñ³Ù³ëÝ ·áñÍ³éáõÛÃÝ»ñÁ (Ñ³½³ñÑ³)

Կատեգորիաները	ÀÝ¹Ñ³Ýáõñ ÑáÕ³ï³ñ³íù	ÐÐ-áõÙ ï³ñ³ÍùÁ ï³ëí³ëÝ»ñáí	²ñá ï³í³ûñ	ì³ñ»£³ÑáÕ	´³½ÙÙ³ûï³ âÉ³Ý ï³ÓÇ³Ý»ñ	Êáíï Ç¹³ß ï»ñ	²ñá ï³í³ûñ	²ûë ÑáÕ»ñ; ³Ýí³éÝ»ñ, Á÷áõ ï Ý»ñ, ß»Ýù»ñ ¨³ûëÝ
	Ð³½³ñÑ³	îáÏáë	Ð³½³ñÑ³					
Գյուղատնտեսական հողեր	551.0	19%	509.0	368.0	54.0	66.0	21.0	42.0
Բնակեցված հողեր	66.0	2%	8.4	4.0	2.3	0.1	2.0	57.6
Արդյունաբերություն, տրանսպորտ, հաղորդակցություն և այլ հողեր	95.0	3%	7.5	1.3	0.5	1.6	4.1	87.5
Շրջակա միջավայր, առողջ³ñ³Ý³ÙÇն, վերականգնողական, սպորտ³ÙÇÝ, պատմական և մշակութային հողեր	230.0	8%	4.3	0.3	0.1	0.3	3.6	225.7
Անտառի հաշվին հիմնված հողեր	352.0	12%	18.1	0.5	1.8	3.1	12.7	333.9
Ջրի հաշվին հիմնված հողեր	20.0	1%	0.0	0.0	0.0	0.0	0.1	19.9
è»½»ñíÝ»ñÇ Ñ³ßíÇÝ ÑÇÙÝí³Í ÑáÕ»ñ	1,660.3	56%	844.1	120.2	5.1	67.8	650.9	816.3
ÀÝ¹Ñ³Ýáõñ	2,974.3	100%	1,391.4	494.3	63.8	139.1	694.4	1,582.9

2. SOCIAL AND ECONOMIC CONDITION

2.1 Land Resources

The distribution of the land resources and their detailed functions in the Republic of Armenia are shown in Tables 2.1 and 2.2, according to the “1997 land balance found in Armenia”.

Table 2.1 Land Resources Distribution in the RA (thousand ha)

Marzes	Total	Agricultural land types	Arable land	Perennial plantations	Hay-fields	Pasture	Forests and shrubbery	Other lands
Syunik	450.5	194.3	48.3	2.7	9.6	133.7	57.0	199.2
Gegharkunik	407.1	240.1	95.3	1.8	35.6	107.4	16.0	278.9
Lori	378.9	192.2	48.4	4.5	39.4	99.9	90.0	96.7
Aragatsotn	275.6	136.7	56.2	7.7	4.1	68.7	7.5	131.4
Tavush	270.4	98.6	27.8	6.8	15.0	49.0	123.9	47.9
Shirak	268.0	165.7	84.5	0.5	16.8	63.9	2.5	99.8
Vayots Dzor	230.8	75.9	20.6	3.3	4.6	47.4	6.5	148.4
Ararat	209.9	99.1	30.0	11.8	2.9	54.4	9.5	101.3
Kotayk	209.5	99.8	40.6	7.6	10.9	40.7	20.0	89.7
Armavir	124.2	80.7	40.4	13.6	0.2	26.5	1.0	42.5
Yerevan	21.5	8.3	2.2	3.3	0.0	2.8	0.0	13.2
Total	2,846.4	1,391.4	494.3	63.6	139.1	694.4	333.9	1,249.0

Table 2.2 Land detail function of RA (thousand ha)

Categories	Total land area	Area percentage to the RA	Agricultural land types	Arable land	Perennial plantations	Hay-fields	Pasture	Other lands: forests, bushes, buildings, etc.
	Thousand ha	Percentage	Thousand ha					
Agricultural function lands	551.0	19%	509.0	368.0	54.0	66.0	21.0	42.0
Settlements lands	66.0	2%	8.4	4.0	2.3	0.1	2.0	57.6
Industry, transportation, communication and other lands	95.0	3%	7.5	1.3	0.5	1.6	4.1	87.5
Environmental, health, recreational, sport and historical and cultural land	230.0	8%	4.3	0.3	0.1	0.3	3.6	225.7
Forest found lands	352.0	12%	18.1	0.5	1.8	3.1	12.7	333.9
Water found lands	20.0	1%	0.0	0.0	0.0	0.0	0.1	19.9
Reserve found lands	1,660.3	56%	844.1	120.2	5.1	67.8	650.9	816.3
Total	2,974.3	100%	1,391.4	494.3	63.8	139.1	694.4	1,582.9

2.2 îÝï»ëáõÃÛáõÝ

²ÕÛáõë³Ï 2.3 óáõÛó¿ ï³ÉÇë ÐÐ-Ç ·ÉË³íáñ ïÝï»ë³Ï³Ý ïíÛ³ÉÝ»ñÁ

²ÕÛáõë³Ï 2.3 ÐÐ-Ç ïÝï»ë³Ï³Ý·ÉË³íáñ ïíÛ³ÉÝ»ñÁ

òáõóÇã/ ï³ñÇ	1996	1997	1998	1999	2000	2001	2002	2003	2004
îÝï»ë³Ï³Ý³×, %					5.9	9.6	12.9	7.0	10.0
ÆÝýÉ³óÇ³, %					-0.8	3.1	1.1	3.0	6.0
¶áñÍ³½ñÏáõÃÛáõÝ/³Õù³ ïáõÃÛáõÝ									
îÝï»ëáõÃÛáõÝáõÙ ³ßË³ ïáõÝ³ÏáõÃÛ³Ý ÙÇçÇÝ ÃÇíÁ, 000 ³ÝÓ			1,337.3	1,298.2	1,277.7	1,264.9	1,106.4		
¶ñ³Ýóí³Í³Ý³ßË³ ïáõÝ³ÏáõÃÛ³Ý ÙÇçÇÝ ÃÇíÁ, 000 ³ÝÓ			133.8	175.0	153.9	138.4	127.3		
²Ùë»Ï³Ý ÙÇçÇÝ ³Ýí³Ý³Ï³Ý í³ñÓ³ ï ñáõÃÛáõÝ ,ÐÐ¸			18,000	20,157	22,706	24,483	27,324		
²Õù³ï µÝ³ÏãáõÃÛ³Ý ÃÇíÁ, %	54.7		49.1						
áñáÝóÇó Í³Ûñ³Ñ»Õ³Õù³ï, %	*27.7*		*15.3*						
²Õù³ï ù³Õ³ù³ÛÇÝ µÝ³ÏãáõÃÛáõÝ, %	58.8		55.0						
áñáÝóÇó Í³Ûñ³Ñ»Õ³Õù³ï, %	*29.6*		*17.7*						
²Õù³ï·ÛáõÕ³Ï³Ý µÝ³ÏãáõÃÛáõÝ %	48.0		40.6						
áñáÝóÇó Í³Ûñ³Ñ»Õ³Õù³ï, %	*24.4*		*11.9*						
ÀÝ¹Ñ³Ýáõñ³Õù³ïáõÃÛ³Ý ß»ÙÇÝ ÐÐ¸/³ÙÇë	10,784		12,273						
ì³ïëÝí»Éáõ ß»ÙÇÝ	6,612		7,525						
ÜÐ²									
ÜÐ², ÐÐ¸µ³É³Ýë.	660.3	798.5	798.5	987.4	1,031.3	1,175.9	1,362.5	1,623.3	1,893.4
ÜÐ² ÛáõñÏ³å Ç ï³ÉÇ Ñ³Ù³ñ, 000ÐÐ¸	175.0	210.9	210.9	259.8	271.2	309.3	357.2	505.3	589.4
ÜÐ²-ÛÇ Ï³éáõóí³ÍùÁ									
²ñ¹ÛáõÝ³µ»ñáõÃÛáõÝ						20.1	20.5	20.4	19.7
¶ÛáõÕ³ïÝï»ëáõÃÛáõÝ						25.5	23.6	23.0	22.5
ÞÇÝ³ñ³ñáõÃÛáõÝ						9.7	12.8	15.2	15.3
î ñ³Ýëåáñï¨ Ñ³Õáñ¹³ÏóáõÃÛáõÝ						7.0	6.7	6.5	5.9
²é¨ïáõñ						10.2	10.3	9.9	11.0
²ÛÉë»Ïïáñ Ý»ñ						17.8	16.4	15.5	17.2
¼áõï³ÝáõÕÕ³ÏÇ Ñ³ñÏ»ñ						9.7	9.7	9.5	8.4
ÀÝ¹Ñ³Ýáõñ ÜÐ² Ñ³ßí³ñÏí³Í ßáõÏ³Ûë³Ï³Ý·Ý»ñáí						100.0	100.0	100.0	100.0

²ÕµÛáõñ: Ð³Ûë³ï³ÝÇ ³½·³ÛÇÝ íÇ×³Ï³·ñ³Ï³Ý Í³é³ÛáõÃÛáõÝ (http://www.armsat.am/)- Ð³Ûë³ï³ÝÇ ï³ñ»Ï³Ý íÇ×³Ï³·ñ³Ï³Ý·Çñù

2.2 Economy

Table 2.3 shows key economic data of the RA.

Table 2.3 Key Economic Data of Armania

Indicator / year	1996	1997	1998	1999	2000	2001	2002	2003	2004
Economic growth, %					5.9	9.6	12.9	7.0	10.0
Inflation, %					-0.8	3.1	1.1	3.0	6.0
Unemployment/ poverty									
Average number of employed in economy, 000 persons			1,337.3	1,298.2	1,277.7	1,264.9	1,106.4		
Total number of registered unemployed, 000 persons			133.8	175.0	153.9	138.4	127.3		
Average monthly nominal wage, AMD			18,000	20,157	22,706	24,483	27,324		
Number of poor population, %	54.7		49.1						
of which number of very poor, %	*27.7*		*15.3*						
Poor population urban, %	58.8		55.0						
of which number of very poor, %	*29.6*		*17.7*						
Poor population rural, %	48.0		40.6						
of which number of very poor, %	*24.4*		*11.9*						
General poverty threshold, AMD/month	10,784		12,273						
Poverty food threshold, AMD/month	6,612		7,525						
GDP									
GDP, AMD bln.	660.3	798.5	798.5	987.4	1,031.3	1,175.9	1,362.5	1,623.3	1,893.4
GDP per capita, 000AMD	175.0	210.9	210.9	259.8	271.2	309.3	357.2	505.3	589.4
Structure of GDP									
Industry, %						20.1	20.5	20.4	19.7
Agriculture, %						25.5	23.6	23.0	22.5
Construction, %						9.7	12.8	15.2	15.3
Transport& Communication, %						7.0	6.7	6.5	5.9
Trade, %						10.2	10.3	9.9	11.0
Other sectors, %						17.8	16.4	15.5	17.2
Net indirect taxes, %						9.7	9.7	9.5	8.4
Total GDP computed at market prices, %						100.0	100.0	100.0	100.0

Source: National Statistical Service of Armenia (http://www.armsat.am/)- Statistical Yearbook of Armenia

2.3 öáË³¹ñ³ÙÇçáó

Ð³Ûí³ë ï ³ÝÇ Ñ³Ýñ³å»ï áõÃÛ³Ý ÷áË³¹ñ³í³ñÓÇ ·áõÙ³ñÁ 1997-2001 Ã. ÁÝÏ³Í 5 ï ³ñÇÝ»ñÇ ÁÝÃ³óùáõÙ Ýí³½»É ¿ ï ñ³Ýëåáñ ï Ç µáÉáñ µÝ³·³í³éÝ»ñáõÙ: (ï»ë ³ÕÛáõë³Ï 2-4). Ð³ ï Ï³å»ë ½·³ÉÇ ¿ ³í ï áÙáµÇÉ³ÛÇÝ ÷áË³¹ñ³í³ñÓÇ ¨ û¹³ÛÇÝ µ»éÇ ÷áË³¹ñ³ÙÇçáóÝ»ñÇ ·áõÙ³ñÇ Ýí³½áõÙÁ:

²ÕÛáõë³Ï 2.4 Úáõñ³ù³ÝãÛáõñ ï ñ³Ýëåáñ ï ³ÛÇÝ µÝ³·³í³éÇ ÷áË³¹ñ³í³ñÓÇ ·áõÙ³ñÁ

ÙÇ³íáñ:Ñ³½³ñ ï áÝÝ³

àÉáñ ï / ï ³ñÇ	1997	1998	1999	2000	2001	2002	2003	2004	2001/1997 (%)
ºñÏ³ÃáõÕ³ÛÇÝ µ»éÝ»ñ	1,471	1,763	1,390	1,424	1,394				94.8
²í ï áÙáµÇÉ³ÛÇÝ ÷áË³¹ñáõÙÝ»ñ	4,180	3,174	2,493	2,077	2,555				61.1
ú¹³ÛÇÝ µ»éÝ»ñ	27	19	14	14	11				40.7
Êáõñí³Ï³ß³ñ³ÛÇÝ	1,011	1,053	859	968	959				94.6
ÀÝ¹Ñ³Ýáõñ	6,639	6,010	4,755	4,482	4,920				74.1

²ÕÛáõñ: Ð³Ûí³ë ï ³ÝÇ ³½·³ÛÇÝ íÇ×³Ï³·ñ³Ï³Ý Í³é³ÛáõÃÛáõÝ (http://www.armsat.am/)- Ð³Ûí³ë ï ³ÝÇ ï ³ñ»Ï³Ý íÇ×³Ï³·ñ³Ï³Ý ·ÇñùÁ

²ÕÛáõë³Ï 2.5-Á óáõÛó ¿ ï ³ÉÇë »ñÏ³ÃáõÕ³ÛÇÝ µ»éÇ ÷áË³¹ñÙ³Ý ·áõÙ³ñÁ ÐÐ-áõÙ, Ýñ³Ý ßñç³å³ï áÕ »ñÏñáõÙ, »ñÏñÇ Ý»ñëáõÙ ¨ Ö³åáÝÇ³ÛáõÙ: Ð³ÛÏ³Ï³Ý »ñÏ³ÃáõÕ³ÛÇÝ ÷áË³¹ñáõÙÝ»ñÇ Ù³ëßï ³µÁ ÷áùñ¿ ÙÇç³½·³ÛÇÝ Ñ³Ù»Ù³ ï áõÃÛ³Ý Ù»ç:

²ÕÛáõë³Ï 2.4 Úáõñ³ù³ÝãÛáõñ ï ñ³Ýëåáñ ï ³ÛÇÝ µÝ³·³í³éÇ ÷áË³¹ñ³í³ñÓÇ ·áõÙ³ñÁ

ºñÏñÇ ³Ýí³Ýáõ ÙÁ	ºñÏñÇ ï ³ñ³ÍùÁ (Ñ³½³ñ ùÏÙ)	´Ý³Ïã áõÃÛáõÝÁ 1999-ÇÝ (ÙÇÉÉÇáÝÙ³ñ¹)	1997 (ÙÇÉÉÇáÝ ï áÝÝ³ *ÏÙ)	1998	1999	2000	ºñÏñÇ ï ³ñ³ÍùáõÙ ÷áË³¹ñáõÙÝ»ñÇ ·áõÙ³ñÁ ÛáõñÏÙ-Ç Ñ³Ù³ñ (ÙÇÉÇáÝ ï áÝÝ³/ùÏÙ)	öáË³¹ñ³ÙÇç áóÝ»ñÇ ·áõÙ³ñÁ Ù»Ï³ÝÓÇ Ñ³Ù³ñ (ï áÝÝ³*ÏÙ/ ³ÝÓ)
Ð³Ûí³ë ï ³Ý	29.8	3.8	400	400	300	400	13 (2000ÇÝ)	105 (2000ÇÝ)
²¹ñµ»ç³Ý	86.6	8.0	3,500	4,700	5,100	5,800	67 (2000ÇÝ)	125 (2000ÇÝ)
ìñ³ë ï ³Ý	69.7	5.4	2,000	2,600	3,100	3,900	56 (2000ÇÝ)	722 (2000ÇÝ)
Âáõñù Ç³	774.8	64.4	9,700	8,500	8,300	-	11 (1999ÇÝ)	129 (1999ÇÝ)
àõ½µ»Ïë ï ³Ý	448.9	24.3	16,500	15,700	13,900	-	31 (1999ÇÝ)	572 (2000ÇÝ)
²íë ï ñÇ³	83.9	8.2	14,800	15,300	15,600	17,100	204 (2000ÇÝ)	2085 (2000ÇÝ)
Ö³åáÝÇ³	377.8	126.3	24,900	22,900	22,600	-	60 (1999ÇÝ)	179 (1999ÇÝ)

²ÕµÛáõñ: Ð³Ûí³ë ï ³ÝÇ ³½·³ÛÇÝ íÇ×³Ï³·ñ³Ï³Ý Í³é³ÛáõÃÛáõÝ (http://www.armsat.am/)- Ð³Ûí³ë ï ³ÝÇ î³ñ»Ï³Ý ì Ç×³Ï³·ñ³Ï³Ý ¶Çñù:

2.3 Transportation

The amount of freight of Republic of Armenia has decreased for all forms of transportation in the 5 years from 1997 to 2001 (Refer to Table 2.4). The decrease of motor freight and air cargo transportation are especially remarkable.

Table 2.4 Amounts of freight of each transportation field

unit: thousand ton

Field/ year	1997	1998	1999	2000	2001	2002	2003	2004	2001/1997 (%)
Rail cargo	1,471	1,763	1,390	1,424	1,394				94.8
Motor freight	4,180	3,174	2,493	2,077	2,555				61.1
Air cargo	27	19	14	14	11				40.7
Pipeline	1,011	1,053	859	968	959				94.6
Total	6,639	6,010	4,755	4,482	4,920				74.1

Sauce: National Statistical Service of Armenia (http://www.armsat.am/)- Statistical Yearbook of Armenia

Table 2.5 shows a comparison of the volume of rail cargo transportation of RA, surrounding countries, inland countries, and Japan. The Armenian rail cargo transportation scale is small in an international comparison.

Table 2.4 Amounts of freight of each transportation field

Country name	Country Area (thousand km²)	Population in 1999 (million persons)	1997 (million ton*km)	1998	1999	2000	Transportation amount for each square km of country area (million ton/ km²)	Transportation amount for one person (ton*km/ person)
Armenia	29.8	3.8	400	400	300	400	13 (in 2000)	105 (in 2000)
Azerbaijan	86.6	8.0	3,500	4,700	5,100	5,800	67 (in 2000)	125 (in 2000)
Georgia	69.7	5.4	2,000	2,600	3,100	3,900	56 (in 2000)	722 (in 2000)
Turkey	774.8	64.4	9,700	8,500	8,300	-	11 (in 1999)	129 (in 1999)
Uzbekistan	448.9	24.3	16,500	15,700	13,900	-	31 (in 1999)	572 (in 2000)
Austria	83.9	8.2	14,800	15,300	15,600	17,100	204 (in 2000)	2085 (in 2000)
Japan	377.8	126.3	24,900	22,900	22,600	-	60 (in 1999)	179 (in 1999)

Sauce: National Statistical Service of Armenia (http://www.armsat.am/)- Statistical Yearbook of Armenia

3. êàÔ²ÜøÆ´Ü²Î²Ü ä²Ú²ØÜÜºðÀ

3.1 êáÕ³ÝùÇ ÇÝí»Ýï³ñ áõëáõÙÝ³ëÇñáõÃÛ³Ý Ù»Ãá¹³µ³ÝáõÃÛáõÝÁ

3.1.1 ÆÝí»Ýï³ñ áõëáõÙÝ³ëÇñáõÃÛ³Ý å³ï Ï»ñÁ

êáÕ³ÝùÇ ÇÝí»Ýï³ñ áõëáõÙÝ³ëÇñáõÃÛ³Ý Ýß³Ý³Ï»ïÁ Ð³Ûí³ë ï³ÝÇ Ð³Ýñ³å»ï áõÃÛ³Ý áÕç ï³ñ³ÍùÝ ¿ñ: ÆÝí»Ýï³ñ áõëáõÙÝ³ëÇñáõÃÛáõÝÁ Çñ³Ï³Ý³óí»ó ØÐÖ¶ áõëáõÙÝ³ëÇñáÕ ËÙµÇ ¨ Ñ³ÛïÏ³Ï³Ý ÙÇ å³ÛÙ³Ý³·ñ³ÛÇÝ ÁÝÏ»ñáõÃÛ³Ý ÏáÕÙÇó 2004Ã. ²åñÇÉ–ê»å ï»ÙµÍ»ñ ³ÙÇëÝ»ñÇÝ: êáÕ³ÝùÝ»ñÁ áñáßí»óÇÝ û¹³ÛÇÝ Éáõë³ÝÏ³ñÝ»ñÇ Ù»ÏÝ³µ³ÝÙ³Ý ÙÇçáóáí, ¨ ï»Õ³·ñ³·Çï³Ï³Ý »½ñ³·Í³ÛÇÝ ù³ñï»½Ý»ñáí 1:50,000 ¨ 1:100,000 Ù³ëßï³µÝ»ñáí: Æ Ñ³í»ÉáõÙÝ ëñ³, ¹³ßïÇ ÇÝí»Ýï³ñ áõëáõÙÝ³ëÇñáõÃÛáõÝÁ Çñ³Ï³Ý³óí»ó 162 í³Ûñ»ñáõÙ, áñ ï»Õ ·ñ³Ýóí»óÇÝ ëáÕ³ÝùÝ»ñÇ íÝ³ëÝ»ñÁ: ÆÝã¨Çó», ëáÕ³ÝùÝ»ñ ãÏ³ÛÇÝ 17 í³Ûñ»ñáõÙ ³Û¹ 162 ¹³ßïÇ ÇÝí»Ýï³ñ áõëáõÙÝ³ëÇñáõÃÛ³Ý Å³Ù³Ý³Ï: (ì³ÝëÁ ³ÝÏÙ³Ý ³ÛÉ ï»ë³ÏÇ å³ï×³éáí ¿ñ):

3.1.2 êáÕ³ÝùÇ ë³ÑÙ³ÝáõÙÁ

êáÕ³ÝùÁ ë³ÑÙ³ÝíáõÙ ¿ áñå»ë ½³Ý·í³ÍÇ ß³ñÅ, áñÁ ï»Õ³ß³ñÅ»É ¿ ½³Ý·í³ÍÁ ¨ ×»ÕùÍ³ÍùÇ Ù³Ï»ñ»ëÁ: î³ñ³÷Ç, ³ñ³·ÑáëùÇ ¨ ÑáÕÇ Ñ³ëï³ïÙ³Ý ß³ñÅÙ³Ý ï»ë³ÏÝ»ñÁ ÁÝ¹·ñÏí³Í ã»Ý ëáÕ³ÝùÝ»ñáõÙ:

Ð³Ù³Ó³ÛÝ Â»ñ½³·ÇÇ ë³ÑÙ³ÝÙ³Ý (1950) ÷Éí³Íù ï»ñÙÇÝÁ í»ñ³µ»ñáõÙ ¿ Í³Ûñ³Ñ»Õ ¹³Ý¹³Õ (ï³ñÇÝ 30ÙÙ-Çó ¹³Ý¹³Õ ½³Ý·í³ÍÇ ß³ñÅÇÝ): öÉí³ÍùÁ ãáõÝÇ ½³Ý·í³ÍÇ ß³ñÅÇ å³ñ½ áõñí³·ÇÍ ¨ ×»ÕùÍ³ÍùÇ Ù³Ï»ñ»ë: ²Ûë áõëáõÙÝ³ëÇñáõÃÛ³Ý Ù»ç ÷Éí³ÍùÁ ÁÝ¹·ñÏí³Í ¿ëáÕ³ÝùÝ»ñáõÙ áñå»ë ¹ñ³ ÙÇ ³ÛÉ ï»ë³Ï:

ì»ñÁ Ýßí³Íß³ñÅÙ³Ý ï»ë³ÏÝ»ñÇ Ù³Ýñ³Ù³ëÝë³ÑÙ³ÝáõÙÝ»ñÁ óáõÛó»Ý ï ñí³Í 3.7 µ³ÅÝáõÙ:

3. NATURAL CONDITION OF LANDSLIDES

3.1 Methodology of Landslide Inventory Survey

3.1.1 Outline of Inventory Survey

The target area of the landslide inventory survey was the whole territory of the Republic of Armenia. The inventory survey was conducted by the JICA study team and Armenian subcontractor from April to September in 2004. Landslides were identified by interpreting aerial photographs, and topographical contour maps of 1:50,000 and 1:100,000 scales. In addition, the field inventory survey was conducted for 162 sites in which damages of landslides were reported. However, landslides did not exist in 17 sites among 162 field inventory survey sites (Damage was due to another reason for the subsidence etc.)

3.1.2 Definition of Landslide

A landslide is defined as the movement of a displaced mass and surface of rupture. Movement type of fall, rapid flow, and land settlement are not included in landside.

The term creep refers to extremely slow (slower than 30 mm/year) displacement of a mass according to the definition of Terzaghi (1950). The creep doesn't have the clear outline of displaced mass and surface of rupture. In this study, creep is included as a type of landslide.

Detailed definitions of the movement types above-mentioned are shown in section 3.7.

3.1.3 ÆÝí»Ýï³ñáõëáõÙÝ³ëÇñáõÃÛ³Ý Ý»ñ¹ñáõÙÁ ¨ ³ñï³¹ñ³ÝùÁ

ØÐÖ¶ áõëáõÙÝ³ëÇñáÕ ËáõÙµÁ å³ï³ñ³ë ï»ó ÇÝí»Ýï³ñ Ó¨»ñ (Ò¨ 1-Çó Ò¨ 7) ¨ Ýñ³Ýó Ññ³Ñ³Ý·Ý»ñÁ óáõÛó »Ý ï³ñ³íÍ³ñ³í»Éí³Í 4-áõÙ: ÐÇÙÝ³Ï³Ý ³ñï³¹ñ³ÝùÁ, áñ Ó»éù µ»ñí»ó ÇÝí»Ýï³ñ áõëáõÙÝ³ëÇñáõÃÛ³Ý Å³Ù³Ý³Ï, óáõÛó ¿ ï³ñí³Í ³ÕÛáõë³Ï 3.1-áõÙ:

²ÕÛáõë³Ï 3.1 ÆÝí»Ýï³ñáõëáõÙÝ³ëÇñáõÃÛ³Ý ÑÇÙÝ³Ï³Ý Ý»ñ¹ñáõÙÁ ¨ ³ñï³¹ñ³ÝùÁ

ÐÇÙÝ³Ï³Ý³ñï³¹ñ³ÝùÁ	ú·ï³·áñÍí³Í ï»Õ»Ï³ï íáõÃÛáõÝ
ÐÐ-áõÙ Ñ³Ûï Ý³µ»ñí³Í 2504 ëáÕ³ÝùÝ»ñÇ áõñí³·ÇÍÁ (êáÕ³ÝùÝ»ñ, áñ ï»Õ íÝ³ëÝ»ñÁ ã»Ý ½»ïáõóí»É î»Õ³Ï³Ý ¼³ñ·³óÙ³Ý Ü³Ë³ñ³ñáõÃÛáõÝ, ÇëÏ Ù³ëßï³µÁ, áñÁ 2 Ñ³-Çó å³Ï³ë ¿, ãÇ ×³Ý³ãí»É û¹³ÛÇÝ Éáõë³ÝÏ³ñÝ»ñÇ Ù»ïÝ³µ³ÝÙ³Ý ÙÇçáóáí, ÁÝ¹·ñÏí³Í ã»Ý³Ûë ÃíáõÙ)	
1)êáÕ³ÝùÇ µ³ßËÙ³Ý ù³ñï»½ (Ø= 1:100.000) 2)êáÕ³ÝùÝ»ñÇ óáõó³Ï (ÆÝí»Ýï³ñÓ¨ 1, ëáÕ³ÝùÇ×³Ý³ãÙ³Ýâ³÷áñáßÇãÝ»ñÁ)	-1:100.000 ¨ 500.000 µáÉáñ ï³ñ³ÍùÝ»ñÇ ï»Õ³·ñ³·Çï³Ï³Ý ù³ñï»½Ý»ñ - ÂÇñ³Ë³ÛÇÝ ï³ñ³ÍùÇ Ùáï³íáñ³å»ë 1/3-ñ¹Ç Éáõë³ÝÏ³ñÝ»ñÁ ³ñí»É»Ý 1974-1988ÃÃ. 1:9,000-1:2.000 Ù³ëßï³µÝ»ñáí -´áÉáñ ï³ñ³ÍùÝ»ñÇ Éáõë³ÝÏ³ñÝ»ñÁ, µ³óÇ ë³ÑÙ³Ý³ÛÇÝ ï³ñ³ÍùÝ»ñÇó, ³ñí»É»Ý 1974Ã, 1:110,000 -1:100,000 Ù³ëßï³µáí: -êáÕ³ÝùÝ»ñÇ 746 ù³ñï»½Ý»ñ Ð³ÛÏ³Ï³Ý êêÐ- ï³ñ³ÍùáõÙ 1986Ã. (Ø³ëßï³µ 1:200.000) -Øáï 1400 ëáÕ³ÝùÇ ù³ñï»½Ý»ñ ¨ ï íÛ³ÉÝ»ñ “³ÝÓÝ³·ñáõÙ” ³ñí³Í §êáÕ³ÝùÇ ÊáãÁÝ¹áï Ý»ñ ¨ éÇëÏ Ø²Î-Ç ½³ñ·³óÙ³Ý Íñ³·Çñ 2000¦-áõÙ -²ñï³Ï³ñ· Çñ³íÇ×³ÏÝ»ñÇ Ï³é³í³ñÙ³Ý í³ñãáõÃÛ³Ý ³é³çÝ³ÛÇÝ íÝ³ëÑ³ëóÝáÕ ëáÕ³ÝùÝ»ñÇ óáõó³Ï (²ÆÎì) (2003) -Ð³ñó³½ñáõÙóÝ»ñ »ÝÃ³Ï³éáõóí³Íù³ÛÇÝ ÁÝÏ»ñáõÃÛáõÝÝ»ñÇ Ñ³Ù³ñ
155 ëáÕ³ÝùÝ»ñ, áñáÝóÇó ·ñ³Ýóí»É »Ý ëáÕ³Ýù³ÛÇÝ íÝ³ëÝ»ñ ¨ áñï»Õ Çñ³Ï³Ý³óí»É ¿ ¹³ßï Ç ÇÝí»Ýï³ñ áõëáõÙÝ³ëÇñáõÃÛáõÝ	
²ßË³ñÑ³·ñ³Ï³Ý, »ñÏñ³µ³Ý³Ï³Ý, ¨ ³ÛÉ ëáÕ³Ýù³ÛÇÝ ³é³ÝÓÝ³Ñ³ï ÏáõÃÛáõÝÁ Áëï ¹³ßï Ç ÇÝí»Ýï³ñ áõëáõÙÝ³ëÇñáõÃÛ³Ý (ÆÝí»Ýï³ñÓ¨ 1-5)	-î»Õ»Ï³ï íáõÃÛáõÝÁ Áëï ¹³ßï Ç ÇÝí»Ýï³ñ áõëáõÙÝ³ëÇñáõÃÛ³Ý
èÇëÏ³ÛÇÝ ûµÛ»Ï ï îÝ»ñÇ·ñ³ë»ÝÛ³ÏÝ»ñÇ/¨ Ñ³ë³ñ³Ï³Ï³Ý ·áñÍ³ñ³ÝÝ»ñÇ/¹åñáóÝ»ñÇ/ ßÇÝáõÃÛáõÝÝ»ñÇ/ÑÇí³Ý¹³ÝáóÝ»ñÇ/³í»ñ³ÏÝ»ñÇ/×³Ý³å³ñÑÝ»ñÇ/»ñÏ³Ã·Í»ñÇ/ Ï³Ùáõñç Ý»ñÇ/·³½Ç ËáÕáí³ÏÝ»ñÇ/ çñÇ ËáÕáí³ÏÝ»ñÇ/Ñ»é³ËáëÛ³ÛÇÝ É³ñ»ñÇ/ý»ñÙ³Ý»ñÇ¨³ÛÉÝÇ ÃÇíÁ	î»Õ»Ï³ï íáõÃÛáõÝ Áëï ·ÛáõÕ³å»ï»ñÇ¨³ÛÉÝ

3.1.3 Output and Input of Inventory Survey

The JICA Study Team prepared the inventory formats (Form 1 to Form 7) and their instructions are as shown in Appendix 4. The main output obtained from the inventory survey is as shown in Table 3.1.

Table 3.1 The Main Output and Input Information of the Inventory Survey

The main output	Information used
Outline of 2,504 identified landslides in RA (landslides from which damages are not reported to the Ministry of Urban Development, and on the scale as for less than 2ha that cannot recognized by the aerophotograph interpretation are not included in this number.)	
1) Landslide distribution map (S=1:100,000) 2) Landslide list (Inventory form1, landslide ID setting)	- 1:100,000 and 1:500,000 topographical maps of all areas. - Aerophotograph of about 1/3 regions of the target area, taken in the years 1974 -1988, in scales of 1:9,000 -1:2,000 - Aerophotograph photographs of all areas except the border areas, taken in the year 1974, in scales of 1:110,000 -1:100,000 - 746 landslide maps within the territory of the Armenian SSR, 1986 (Scale 1:200,000) - Around 1400 landslide maps and data in ‘passport’ made by “Landslide hazard and risk UNDP, 2000” - Priority damaging landslides list of Emergency Management Administration (EMA) (2003) - Interviews for infrastructure companies
The 155 landslides from which landslide damage are reported and field inventory survey was conducted	
Geographical features, geological features and so on of landslides (Inventory forms 1-5)	- Information by the field inventory survey
Risk object: Number of houses/offices and public factories/schools/buildings/hospitals/ ruins/roads /railways/bridges/gas pipelines/water pipelines/power lines/phone wires/farmlands/etc.	- Information by heads of villages and so on

²ÕÙáõë³Ï 3.2-áõÙ óáõó³¹ñí³Í »Ý ·áÙáõÃÙáõÝ áõÝ»óáÕ ëáÕ³ÝùÝ»ñÇ Ñ³Ù³éá ï óáõó³Ï ¨ ëáÕ³ÝùÝ»ñÇ µ³ßËÙ³Ý ù³ñ ï »½Ý»ñ, áñáÝù í»ñ³µ»ñáõÙ »Ý ëáÕ³ÝùÝ»ñÇ ×³Ý³ãÙ³ÝÁ:

²ÕÙáõë³Ï 3.2 ¶áÙáõÃÙáõÝ áõÝ»óáÕ ëáÕ³ÝùÝ»ñÇ Ñ³Ù³éá ï óáõó³Ï ¨ ³é³ÝÓÝ³óÙ³Ý ù³ñ ï »½Ý»ñ

No.	ÆÝýáñÙ³óÇ³ÙÇ ³Õµ¡áõñÝ»ñ	Üß í³Í ëáÕ³ÝùÝ»ñÇ ÃÇíÁ	ÜÏ³ñ³·ñáõÃÙáõÝÁ
1	2002-2004ÃÃ Ñ³Ï³ëáÕ³Ýù³ÙÇÝ ·áñÍáÕáõÃÙáõÝÝ»ñÇ Çñ³Ï³Ý³óÙ³Ý åÉ³Ý ÐÐ-áõÙ å³ï ñ³ë ï í³Í î»Õ³Ï³Ý½³ñ·³óÙ³ÝÜ³Ë³ñ³ñáõÃÙ³Ý Ï¡áÕÙÇó(î¼Ù)	31	²é³çÝ¨»ñÏñáñ¹ ï»Õ»ñÇ Ï³ñ¨áñáõÃÙáõÝÁë³ÑÙ³Ýí³Í¿ áñå»ë éÇëÏ³ÙÇÝ û鬻Ï ï¨ÝÏ³ñ³·ñí³Í »ÝÁÝ ï ñáõÃÙ³Ý å³ï×³éÝ»ñÁ
2	2005-2007ÃÃ. ÙÇçÇÝÃ³ÙÏ»ï Ý»ñÇ Í³Ëëç ßñç³Ý³Ï³Ý»ñÁÑ³ëï ³ï í³Í ÐÐ Ï³é³í³ñáõÃÙ³Ý 07.11.2001 N 1074 áñáßÙ³Ùµ	60	ÙÏ³ñ³·ñí³Í »Ý ÙÇ³ÙÝí³ñ»ñÇ ³ÝáõÝÝ»ñÁ: ²ë óáõó³ÏÁ ÁÝ¹·ñÏáõÙ¿ í»ñáÝß³É»ñ»ëáõÝÙ»Ï (31) ëáÕ³ÝùÝ»ñÁ
3	2004Ã. ÑáõÝÇë ³ÙëÇÝ î¼Ù-Ç ÏáÕÙÇó å³Ñ³Ýçí³Í íÝ³ë å³ï×³éáÕ ëáÕ³ÝùÝ»ñÇ óáõó³Ï	150	òáõó³ÏÝÁÝ¹·ñÏáõÙ¿ í»ñáÝß³É31 ¨ 60 ëáÕ³ÝùÝ»ñÁ
4	î¼Ù ö´Á ê ëàÀ-Ç ARMINZHP Ýå³ï³Ï³ÙÇÝ Íñ³·ÇñÁ 1997Ã. ì ï³Ý·³íáñ»ñÏñ³µ³Ý³Ï³Ý ·áñÍÁÝÃ³óÇ í»ñ³µ»ñÙ³É:	89 Ñ³Ù³ÙÝùÝ»ñ	êáÕ³ÝùÝ»ñÇó³í»ñí³Í Ñ³Ù³ÙÝùÝ»ñÇó³ÝÏÁ
5	²é³çÝ³ÙÇÝ Ï³ñ¨áñáõÃÙ³Ý íÝ³ë Ñ³ëóÝáÕ ëáÕ³ÝùÝ»ñ å³ï ñ³ë ï í³Í ²ÆÎì-Ç ÏáÕÙÇó(2003) ²Ï ï Çí ëáÕ³ÝùÝ»ñÇó³ÝÏ, áñáÝù ·ñ³í»É»Ý ²ÆÎì-Ç áõß³¹ñáõÃÙáõÝÁ: Ðë ï ³ Ïáñ»Ý ÝÏ³ñ³·ñí³Í »Ý éÇëÏ³ÙÇÝ û鬻Ï ï Ý»ñÁ:	59	²Ï ï Çí ëáÕ³ÝùÝ»ñÇó³ÝÏ, áñáÝù ·ñ³í»É»Ý ²ÆÎì-Ç áõß³¹ñáõÃÙáõÝÁ: Ðë ï ³ Ïáñ»Ý ÝÏ³ñ³·ñí³Í »Ý éÇëÏ³ÙÇÝ û鬻Ï ï Ý»ñÁ:
6	ÐÐ êÙáõÝÇùÇÙ³ñ½Ç ëáÕ³ÝùÝ»ñÇ ½áÝ³Ý»ñÇ ó³ÝÏ`Ûß³Ï í³Í î¼Ù-Ç Õ»Ï³í³ñÇ ÏáÕÙÇó, êÙáõÝÇù (Ù³ÙÇë 2003)	14	ÜÏ³ñ³·ñí³Í »Ý ³ÝáõÝÝ»ñÁ¨ ¹»åù»ñÇ ³Ùë³Ãí»ñÁ
7	ÊÙµÇÑ³ñó³½ñáõÙóÁ×³Ý³å³ñÑ³ßÇÝ³Ï³Ý ÁÝÏ»ñáõÃÙ³Ý Ñ» ï	3	Ê×áõÕÇÝ»ñÇÝ íÝ³ë Ñ³ëóÝáÕ ëáÕ³ÝùÝ»ñ
8	ÊÙµÇÑ³ñó³½ñáõÙóÁ ·³½Ù³ ï ³Ï³ñ³ñáÕ ÁÝÏ»ñáõÃÙ³Ý Ñ» ï (Ð³Ùèáõë¶³½äñáÙ ö´À)	âÇ í»ñ³µ»ñáõÙ	¶³½Ç ËáÕáí³ÏÝ»ñÇÝ íÝ³ë Ñ³ëóÝáÕ ëáÕ³ÝùÝ»ñ
9	ÊÙµÇÑ³ñó³½ñáõÙóÁ Ñ»é³Ñ³Õáñ¹³Ïó³Ï³Ý ÁÝÏ»ñáõÃÙ³Ý Ñ» ï (²ñÙ»ÝÃ»É)	âÇ í»ñ³µ»ñáõÙ	Ð»é³Ñ³Õáñ¹³Ïóáõà Ù³Ý»ÝÃ³Ï³éáõóí³ÍùÇÝ íÝ³ë Ñ³ëóÝáÕ ëáÕ³ÝùÝ»ñ
10	ÊÙµÇÑ³ñó³½ñáõÙóÁ çñÙáõÕ-Ï á¡áõÕÇ ÁÝÏ»ñáõÃÙ³Ý Ñ» ï (ºñ¨³ÝÇ æñÙáõÕ Ï á¡áõÕÇ ÁÝÏ»ñáõÃÙáõÝ)	âÇ í»ñ³µ»ñáõÙ	æñÇ¨Ï á¡áõÕáõ»ÝÃ³Ï³éáõóí³ÍùÇÝ íÝ³ë Ñ³ëóÝáÕ ëáÕ³ÝùÝ»ñ
11	1986 Ã ÐÊêÐ ï³ñ³Íùáõù íÇÙ³·ñ³Ï³Ý Ñ³Ù³ÉÇñÝ»ñÇ¨ ÑÇÙÝ³Ï³Ý Ï³éáõÙóÝ»ñÇ ÙÇç¨ µÝáñáß ëáÕ³ÝùÝ»ñÇ µ³ßËáõÙÁ (Ø³ëß ï³µ 1:200.000)	746 ëáÕ³ÝùÝ»ñ	î³ñµ»ñ³Ï í³Í »Ý ·áñÍáõÝ»áõÃÙ³Ý »ñÏáõ Ù³Ï³ñ¹³ÏÝ»ñ` ³Ï ï Çí¨å³ëÇí: òáõÙó»Ý ï ñí³Í ·ï Ýí»ÉáõÍ³Ùñ»ñÁ, Ù³ëß ï³µÝ»ñÁ, ï»ë³ÏÝ»ñÁ¨ ·áñÍáõÝ»áõÃÙ³Ý Ù³Ï³ñ¹³ÏÝ»ñÁ: âÏ³ ëáÕ³ÝùÝ»ñÇ Ñ³Ù³ñ áñ¨¿ ³é³ÝÓÇÝ ÇÝí»Ý ï³ñ³ÕÙáõë³Ï
12	êáÕ³ÝùÝ»ñÇ ù³ñ ï »½Ý»ñ¨³ÝÓÝ³·Çñ³ñí³Í §êáÕ³ÝùÝ»ñÇ í ï³Ý·Ý»ñ¨ éÇëÏ Ø²Î-Ç ½³ñ·³óÙ³Ý Íñ³·Çñ 2000¦-Çó	Øá ï 1400 ëáÕ³ÝùÝ»ñ	êáÕ³ÝùÝ»ñÇ áõñí³·Í»ñÁ óáõÙó»Ý ï ñí³Í: ²ÙË ëáÕ³ÝùÇÝ ³é³ÝÓÝ³Ñ³ï ÏáõÃÙáõÝÝ»ñ, ÇÝãåÇëÇù »Ý Ã»ùÉ³ÝçáõÃÙáõÝÁ Ï³Ù½³Ý·í³ÍÇß³ñÅÁã»Ý óáõÙó ï ñí³Í: ÆÝí»Ý ï ³ñÓ¨»ñÁ (³ÝÍ³ÝáõÙ»Ý ³ÝÓÝ³·Çñ) Éñ³óí³Í »Ý ï ³ñ³ÍùÇ Ùá ï 25%-Ç Ñ³Ù³ñ:
13	²ÆÎì.²ñ ï ³Ï³ñ·Çñ³íÇ×³ÏÝ»ñÇ Ï³é³í³ñÙ³Ý í³ñáõÃÙáõÝ §êáÕ³ÝùÝ»ñÇ GIS¦	Øá ï 1400 ëáÕ³ÝùÝ»ñ	²ë GIS-Á í»ñáÝßí³Í 2000Ã Ø²Î-Ç ½³ñ·³óÙ³Ý Íñ³·ñÇ ÷á÷áËí³Í ï ³ñµ»ñ³ÏÝ¿: ÆÝí»Ý ï ³ñÓ¨»ñÁ (³ÝÓÝ³·Çñ) Éñ³óí³Í »Ý Ùá ï 200 ëáÕ³ÝùÝ»ñÇ Ñ³Ù³ñ

A summary of the existing landslide lists and landslide distribution maps referred for landslide identification are shown in Table 3.2.

Table 3.2 Summary of Existing Landslide Lists and Distribution Maps

No.	Information sources	Number of listed landslides	Descriptions
1	‘Anti-landslides activities realization plan in RA for 2002-2004’ prepared by Ministry of Urban Development (MoUD)	31	The 1st and 2nd priority is defined. Risk objects and selection reasons are described.
2	‘Medium Term Expenditure Framework for 2005 - 2007’ approved by RA Governmental decision 07.11.2001 N1074	60	Only names of locations are described. This list includes the above thirty one (31) landslides.
3	A list of damage-causing landslides for field inventory survey requested by MoUD in June 2004.	150	This list includes the above 31 and 60 landslides.
4	‘MoUD CJSC Ltd “ARMINZHP” Purposeful program on dangerous geological processes in 1997’	89 communities	List of communities destroyed by landslides
5	A list of Priority damage-causing landslides prepared by EMA (2003)	59	List of active landslides EMA pays attention to. Risk objects are simply described.
6	A list of landslide zones in RA Syuniq Marz designated by the head of MoUD, Syuniq (May 2004)	14	Names and event dates are described
7	An interview by the Team with a road construction company	3	Landslides causing damage to highway
8	An interview by the Team with the gas supply company (Armrusgasprom CJSC)	N/A	Landslides causing damage to gas pipe lines
9	An interview by the Team with the telecommunication company (ARMENTEL)	N/A	Landslides causing damage to telecommunication infrastructure
10	An interview by the Team with the Water & Sewerage Company (Yerevan Water & Sewerage Company)	N/A	Landslides causing damage to water & sewerage infrastructure
11	‘Distribution of typical landslides among the lithological complexes and main structures within the territory of the Armenian SSR, 1986 (Scale 1:200,000)’	746 landslides	Two activity levels -active and inactive - are categorized. Locations, scales, types and activity level are shown. There is no inventory table of individual landslides.
12	Landslide Maps and ‘Passport’ made by “Landslide hazard and risk UNDP, 2000”	Around 1400 landslides	The configurations of the landslides are shown. Other landslide features such as scarps or moved masses are not shown. The inventory forms (named ‘passport’) are completed for about 25% of the territory.
13	EMA: Emergency Management Administration; Landslide GIS	Around 1400 landslides	This GIS is a revised version of the above UNDP2000. The inventory forms (‘passport’) are completed for about 200 landslides.

²ÕÏáõë ³ Ï 3.3-Á óáõÙó ¿ ï ³ÉÇë 2004Ã ëáÕ ³ÝùÝ»ñÇ áõëáõÙÝ ³ëÇñáõÃÙ ³ Ý ÑÇÙÝ ³ Ï ³ Ý Ï» ï »ñÁ

Աղյուսակ 3.3. Տվյալների բազայի կետերը

Î» ï	2005 êáÕ ³ÝùÝ»ñ	¸³ß ï Ç ÇÝí»Ý ï ³ñ áõëáõÙÝ ³ ëÇñáõÃÙáõÝ. 155 ëáÕ ³ÝùÝ»ñ
î»Õ ³ÝùÇ ÇÝ¹»ùë ³ÏÇÝ ù ³ ñ ï »½	*	*
êáÕ ³ÝùÇ Ö ³Ý ³ ãáõÙ	*	*
êáÕ ³ÝùÇ ³Ýí ³ÝáõÙÁ	*	*
î»Õ ³Ýù	*	*
êáÕ ³ÝùÇ Ï»Ý ï ñáÝÇ Ïááñ¹ÇÝ ³ ï Ý»ñ ¨ µ ³ ñÓñáõÃÙáõÝ	*	*
¼³Ý· í ³ ÍÇß ³ ñÅÇ Ù ³ ëß ï ³µ	*	*
¼³Ý· í ³ ÍÇß ³ ñÅÇ ³½ÇÙáõ ï	*	*
ì ï ³Ý·Ç Ù ³ Ï ³ ñ¹ ³ ÏÇ áõñí ³ ·ÇÍ	*	*
èÇë ÏÇ Ù ³ Ï ³ ñ¹ ³ ÏÇ áõñí ³ ·ÇÍ	*	*
²é ³ çÝ ³ÏÇÝ ß ³ ñùÇ í»ñ ³ ÑëÏáõÙ	*	*
êáÕ ³ÝùÇ Ù ³ Ï ³ ñ¹ ³ Ï(êù»ã)		*
êáÕ ³ÝùÇ å ñáýÇ£		*
êáÕ ³ÝùÇ £áõë ³ÝÏ ³ ñ		*
È ³ÝçÇ ß ³ ñÅÙ ³Ý ï »ë ³ Ï		*
Æñ ³ ¹ ³ ñÓáõÃÙáõÝÝ»ñÇ å ³ ï ÙáõÃÙáõÝ		*
î»Õ ³ ·ñ ³ ·Ç ï ³ Ï ³ Ý ¨ ¹»ýáñÙ ³ óÇáÝ ³é ³ ÝÓÝ ³Ñ ³ ï ÏáõÃÙáõÝÝ»ñ		*
Ä ³ÙéÇ ÑÇÙùÇ ¨ ½ ³ Ý· í ³ ÍÇ ï »Õ ³ ß ³ ñÅÇ å ³ÏÙ ³ ÝÝ»ñ		*
ÐÇ¹ñáÉá· Ç ³ Ï ³ Ý å ³ÏÙ ³ ÝÝ»ñ		*
ì »· » ï ³ óÇáÝ å ³ÏÙ ³ ÝÝ»ñ		*
Ð ³ Ï ³ ÙÇçáóÝ»ñ		*
èÇë Ï ³ÏÇÝ ûµÛ»Ï ï (· áÙáõÃÙáõÝ áõÝ»óáÕ íÝ ³ ë)		*
èÇë Ï ³ÏÇÝ ûµÛ»Ï ï (åá ï »ÝóÇ ³ É íÝ ³ ë)		*

Table 3.3 shows database items of the landslide inventory survey in 2004

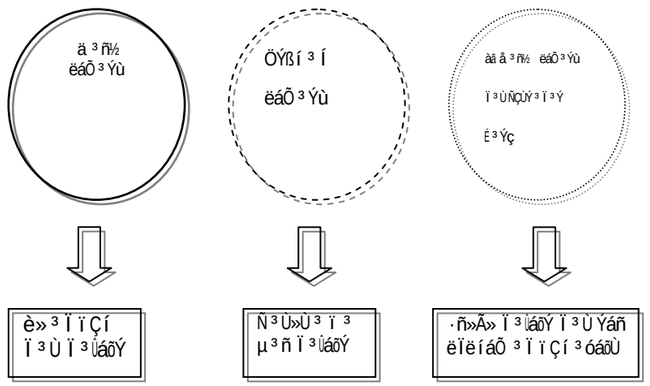
Table 3.3 Data Base Items

Item	2005 landslides	Field inventory survey 155 landslides
Location Index Map	*	*
Landslide ID	*	*
Landslide name	*	*
Location	*	*
Coordinates and altitude of landslide center	*	*
Displaced mass scale	*	*
Displaced mass azimuth	*	*
Hazard level outline	*	*
Risk level outline	*	*
Priority rank to be managed	*	*
Landslide Plane (Sketch)		*
Landslide Profile		*
Landslide Photograph		*
Slope movement type		*
Event History		*
Topographic & Deformation Features		*
Base Rock & Displaced Mass Condition		*
Hydrological Condition		*
Vegetation Condition		*
Countermeasures Condition		*
Risk Object (existing damage)		*
Risk Object (potential damage)		*

3.1.3 ú¹³ÛÇÝ Éáõë³ÝÏ³ñÝ»ñ¨»½ñ³·Í³ÛÇÝ ù³ñï»½ÇÙ»Ï³Ý³µÝáõÙ

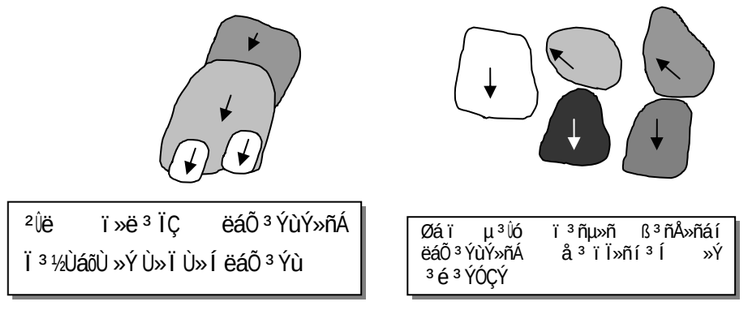
ú¹³ÛÇÝ Éáõë³ÝÏ³ñÝ»ñÇ¨»½ñ³·Í³ÛÇÝ ù³ñï»½ÇÙ»ÏÝ³µ³ÝÙ³Ý Ýå³ï³ÏÝ ¿ ÷Ýïñ»É¨Ñ»ï¨»É §ëáÕ³ÝùÇ ï»Õ³·ñáõÃÙ³ÝÁ¦ (Ã»ùÉ³ÝçáõÃÙáõÝÁ, ½³éÇí³Ûñ É³ÝçÇ ·ñ³¹Ç»Ýï Á, ¨ ÏáÙå É»ù³ ï»Õ³·ñ³·Çï³Ï³Ý ³é³ÝÓÝ³Ñï ÏáõÃÙáõÝÝ»ñÁ):

²Ûª áõÑ³Ý¹»ñÓ, ëáÕ³ÝùÝ»ñÇ ³Ï ï ÇíáõÃÙ³Ý Ù»ÏÝ³µ³ÝÙ³Ý Ñ³Ù³ñ ·áÙáõÃÙáõÝ áõÝÇ ë³ÑÙ³Ý³÷³ÏáõÙ: î»Õ³·ñ³·Çï áõÃÙ³Ý å³ñ½ ëáÕ³ÝùÝ»ñÁ ÙÇß ï ã¿ áñ ³Ï ï Çí »Ý ÉÇÝáõÙ: ²Ûë ëáÕ³ÝùÝ»ñÁ »ñµ»ÙÝ Ï³ÙáõÝ »Ý: ØÙáõë ÏáÕÙÇó ëáÕ³ÝùÝ»ñÁ, ×Ýßí³Í ëáÕ³Ýù³ÛÇÝ ï»Õ³·ñáõÃÙ³Ùµ Ñ³Ù³ñíáõÙ »Ý Ñ³Ù»Ù³ï³µ³ñ Ï³ÙáõÝ: àã å³ñ½ ëáÕ³ÝùÝ»ñÁ Ñ³Ù³ñÙ³ Ï³ÙáõÝ »Ý, ÇÝã¨Çó» Ñ³ñÏ¿ Ýßí»É, Ýáñ ëÏëíáÕ³Ï ï Çí³óÙ³Ý¹»åùáõÙ:



²ÕÙáõë³Ï 3.1 êáÕ³ÝùÇ å³ñ½áõÃÙáõÝÁ Ï³Ù Ï³ÙáõÝáõÃÙáõÝÁ

¼³Ý·í³ÍÇ ß³ñÅÇ ßñç³·ÇÍÁ ¨ ëáÕ³ÝùÇ Ã»ùÉ³ÝçáõÃÙáõÝÁ ÙÇ³ÛÝ å³ï Ï»ñí³Í ¿ÇÝ áñå»ë Ù»Ï ëáÕ³Ýù` ï»Õ³ÝùÇ ù³ñï»½Ý»ñÇ íñ³: (Ð³í»Éí³Í 1¨ 2): ä³ï Ï»ñí³Í ã¿ÇÝ ÙÇ³ÛÝ ëáÕ³ÝùÝ»ñÇ Ù»ç ³éÏ³ ÷áùñ ëáÕ³ÝùÝ»ñÁ, ÷áùñ ëáÕ³ÝùÝ»ñÇ ½³éÍ³Ûñ»ñÁ, ×»ÕÙ»ñÁ¨Ñ»ï ù»ñÁ:



ÜÏ³ñ 3.2 êáÕ³ÝùÝ»ñÇ ë³ÑÙ³Ý³÷³ÏáõÙÁ

3.1.3 Aerial Photograph and Contour Map Interpretation

The purpose of aerial photo and counter map interpretation is to search for and trace ‘landslide topography’ (scarps, gentle gradient slopes and complex topographic features).

Therefore, there is a limitation in interpretation of activeness of landslides. A clear landslide topography does not always represent an active landslide. These landslides are sometimes stable. On the other hand, a landslide with subdued landslide topography is said to be relatively stable. Obscure landslides are almost stable, however, it is necessary to note them in case they are starting to become activite.

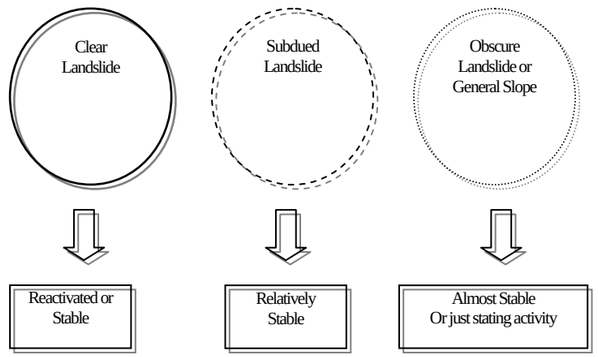


Figure 3.1 Clearness of Landslides and their Stability

Only the periphery of the displaced mass and the landslide scarp were delineated for each landslide on the landslide location maps (Appendix 1 & 2). Minor landslides within a larger landslide, scarps of minor landslides, fissures & steps were not drawn.

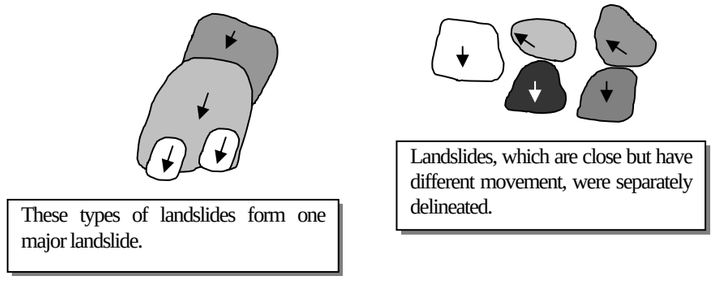


Figure 3.2 Delineation of Landslides

3.1.4 ¸³ßï Ç ÇÝí»Ýï ³ñ áõëáõÙÝ³ëÇñáõÃÙáõÝ

(1) êáÕ³ÝùÇ ÁÝï ñáõÃÙáõÝÁ ¹³ßï Ç ÇÝí»Ýï ³ñ áõëáõÙÝ³ëÇñáõÃÙ³Ý Ñ³Ù³ñ

Øáï 162 í³Ûñ»ñ ÁÝï ñí»É ¿ÇÝ ¹³ßï Ç ÇÝí»Ýï ³ñ áõëáõÙÝ³ëÇñáõÃÙ³Ý Ñ³Ù³ñ, áñáÝù ½»Ïáõó í»É »Ý áñå»ë “íÝ³ëí³Í”:

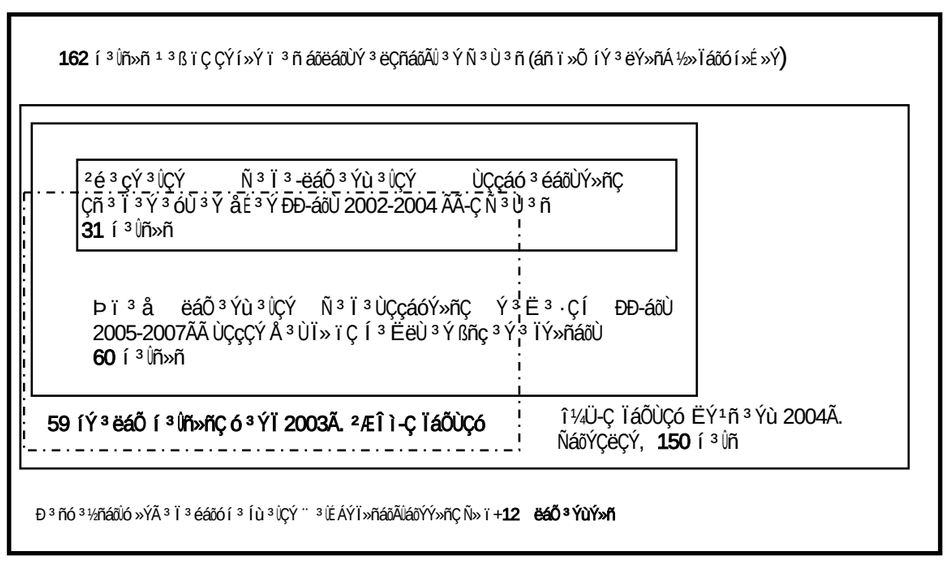
150 íÝ³ëí³Í í³Ûñ»ñ å³ï ñ³ë ï í»É ¿ÇÝ Î¼Ü-Ç ÏáÕÙÇó 2004Ã.: Î³ñ¨áñ³·áõÙÝ ëáÕ³ÝùÝ»ñÁ Ñ»ï¨Ù³É ÷³ë ï ³ÃÕÃ»ñáõÙ ÁÝ¹·ñÏí³Í»Ý í»ñáÝßÙ³É 150 ÑáÕÇ ëáÕ³ÝùÝ»ñÇ óáõó³ÏáõÙ:

- êáÕ³ÝùÝ»ñÇ óáõó³ÏÁ, áñáÝó Ñ³Ù³ñ ³é³ç³ñÏí»É ¿ñ Ñ³Ï³ëáÕ³Ýù³ÛÇÝ ÙÇçáó³éáõÙÝ»ñÇ Çñ³Ï³Ý³óÙ³Ý åÉ³Ý ÐÐ-áõÙ 2002-2004 ÃÃ., áñáÝù ³é³ÝÓÝ³óí»É ¿ÇÝ î»Õ³Ï³Ý ¼³ñ·³óÙ³Ý Ù³Ë³ñ³ñáõÃÙ³Ý ÏáÕÙÇó: (Î¼Ü);

- êëáÕ³ÝùÝ»ñÇ ó³ÝÏÁ áñÁ ³é³ç³ñÏí»É ¿ñ ÐÐ-áõÙ ÙÇçÇÝ Å³ÙÏ»ïÇ ³ßË³ï ³ÝùÝ»ñÇ ßñç³Ý³ÏÝ»ñáõÙ ¨ Ñ³ë ï ³ï í»É ¿ñ ÐÐ Ï³é³í³ñáõÃÙ³Ý 07.11.2001 N1074 áñáßÙ³Ùµ:

- ²é³çÝ³ÛÇÝ íÝ³ë Ñ³ëóÝáÕ ëáÕ³ÝùÝ»ñÇ ó³ÝÏ ²ñï³Ï³ñ· Æñ³íÇ×³ÏÝ»ñÇ Î³é³í³ñÙ³Ý ì³ñãáõÃÙ³Ý ÏáÕÙÇó (²ÆÎì) (2003);

ØÝ³ó³Í ï³ë»ñÏáõ (12) íÝ³ëí³Í í³Ûñ»ñÁ, áñáÝó Ù³ëÇÝ ½»Ïáõó í»É¿ñ ³ÛÉ Ï³½Ù³Ï»ñåáõÃÙáõÝÝ»ñÇ ÏáÕÙÇó, ÇÝãåÇëÇù »Ý »ÝÃ³Ï³éáõó í³Íù³ÛÇÝ Ï³½Ù³Ï»ñåáõÃÙáõÝÝ»ñÁ, ³í»É³ó í»É »Ý 150 ëáÕ³ÝùÝ»ñÇÝ: ì»ñçÝ³Ï³Ý³å»ë, 162 í³Ûñ»ñÁ ÁÝï ñí»É »Ý¹³ßï Ç ÇÝí»Ýï ³ñ áõëáõÙÝ³ëÇñáõÃÙ³Ý Ñ³Ù³ñ:



ÜÏ³ñ 3.3 ¸³ßï Ç ÇÝí»Ýï ³ñ í³Ûñ»ñÇ ÁÝï ñáõÃÙáõÝÁ

3.1.4 Field Inventory Survey

(1) Selection of Landslide for Field Inventory Survey

162 sites were selected for the field inventory survey on the basis of reported “damage”.

150 damaged sites were prepared by the MoUD in June 2004. Priority landslides in the following documents, are included in the above-mentioned list of 150 landslides.

- List of the landslides suggested in the anti-landslides activities realization plan in RA for 2002-2004, which was specified by the Ministry of Urban Development (MoUD);

- List of the landslides suggested in RA 2005-2007 medium term expenditure framework and affirmed by RA Governmental Decision 07.11.2001 N1074;

- Priority damaging landslides list from the Emergency Management Administration (EMA) (2003);

Twelve (12) other damaged sites reported by other organizations, such as infrastructure companies, were added to the 150 landslides. Finally, 162 sites were selected for the field inventory survey.

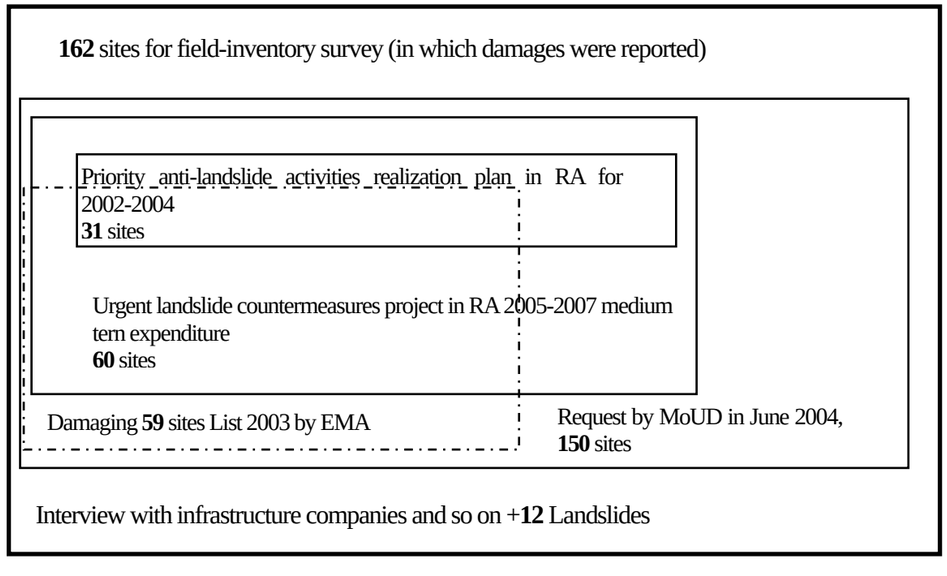
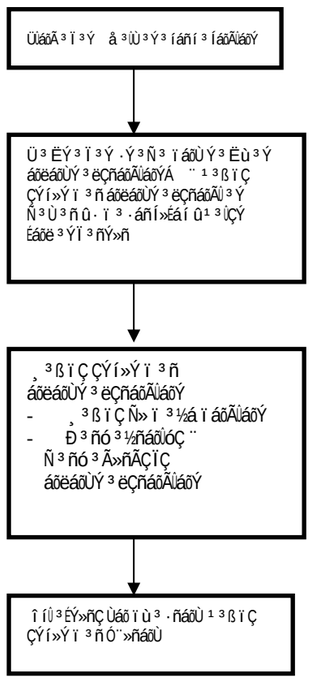


Figure 3.3 Selection of Field Inventory Sites

(2) ¸³ßïÇ ÇÝí»Ýï³ñ áõëáõÙÝ³ëÇñáõÃÙ³Ý Ù»Ãá¹Á

¸³ßïÇ ÇÝí»Ýï³ñ áõëáõÙÝ³ëÇñáõÃÙ³Ý Ù»Ãá¹Á Ù³Ýñ³Ù³ëÝ Ï»ñåáí óáõÙó ¿ ï ñí³Í “Ð³í»Éí³Í 4-1”-áõÙ Ðñ³Ñ³Ý·Ý»ñÇ Ò»éÝ³ñÏ êáÕ³ÝùÝ»ñÇ ÆÝí»Ýï³ñ àõëáõÙÝ³ëÇñáõÃÙ³Ý Ñ³Ù³ñ”: ²Ûë ³ßË³ï áõÃÙ³Ý Ýå³ï³ÏÝ¿éñ³óÝ»É ÇÝí»Ýï³ñ Ó¨»ñÁ, Ò¨2-Çó Ó¨ 7 ¨ áõÕÕ»É Ò¨1-Á, ÇÝãå»ë óáõÙó ¿ ï ñí³Í Ð³í»Éí³Í 4-2-áõÙ, ¹³ßïÇ áõëáõÙÝ³ëÇñáõÃÙ³Ý Å³Ù³Ý³Ï:

¸³ßïÇ ÇÝí»Ýï³ñ áõëáõÙÝ³ëÇñáõÃÙáõÝÁ µ³Å³Ýí³Í¿Ñ»ï¨Ù³É 4 ³ßË³ï³ÝùÝ»ñÇ:



î»Õ³·ñ³·Çï³Ï³Ýù³ñï»½Ý»ñÇ ÃÇñ³Ë³ÙÇÝ µ³ÅÇÝÝ»ñÁ ëÏ³Ý³íáñí»É»Ý¨÷³Ïóí»É ÇÝí»Ýï³ñÓ¨ 2-ÇÝ: ¿É»Ïï ñ³Ï³Ýï³ñ³Íí áÕ¿ç»ñ.

Ü³ËÝ³Ï³Ý ëáÕ³Ýù³ÙÇÝ·Ý³Ñ³ïÙ³Ýù³ñï»½Ý»ñÁ å³ï ñ³ë ï í»É ¿ÇÝû·ï³·áñÍ»Éáí û¹³ÙÇÝ Éáõë³ÝÏ³ñÝ»ñ Ý³Ëù³Ý áõëáõÙÝ³ëÇñáõÃÙáõÝÁ, ÇÝãå»ëÝ³¨¹³ßïÇ áõëáõÙÝ³ëÇñáõÃÙ³Ý Ñ³Ù³ñ: ì ï ³Ý·Ç¨ éÇëÏÇ Ï³ï·áñÇ³Ý»ñÁ áñáßí»É¿ÇÝÝ³Ë³å»ë:

- ¸³ßïÇ Ñ»ï ³½áï áõÃÙáõÝ
- Ð³ñó³½ñáõÙó íÝ³ëÇ å³ï ÙáõÃÙ³Ý ¨ éÇëÏ³ÛÇÝ ûµÛ»Ï ïÇ í»ñ³µ»ñÙ³É Ñ³ñó³Ã»ÃÇÏÝ»ñÇ µ³Å³ÝáõÙ (ÆÝí»Ýï³ñ Ó¨ 6 – ì Ý³ëÇ ¶Ý³Ñ³ ï áõÙ)

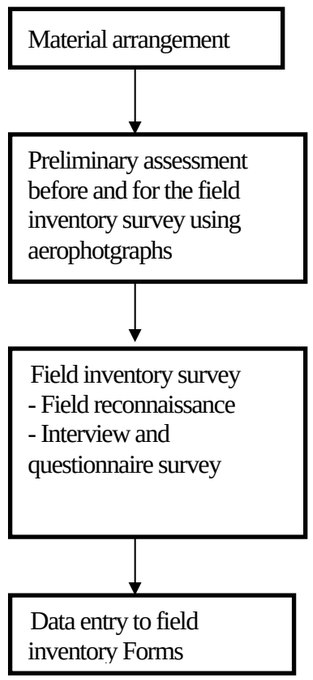
- î íÛ³ÉÝ»ñÇ Ùáõï ù³·ñáõÙ ÇÝí»Ýï³ñ Ó¨»ñ 2, 3, 4, 5, 6 ¨ 7-áõÙ
- ì ï ³Ý·Ç, éÇëÏÇ ¨ ³é³çÝ³ÛÇÝ Ï³ï»·áñÇ³Ý»ñÇ áõÕÕáõÙ ÇÝí»Ýï³ñ Ò¨1-áõÙ

²ÕÛáõë³Ï 3.4 ÆÝí»Ýï³ñ àõëáõÙÝ³ëÇñáõÃÙ³Ý ²ßË³ï³ÝùÇ ÐáëùÁ

(2) Method of Field Inventory Survey

The detailed methods of the field inventory survey are shown in “Appendix 4-1: Instruction Manual for Landslide Inventory Survey”. This work is to complete the inventory forms, Form 2 to Form 7 and correct Form 1 as shown in Appendix 4-2, through the field survey.

The field inventory survey is divided into the following four activities.



Target portion of topographical maps are scanned and pasted to inventory form 2: electrical spreadsheet.

Preliminary landslide assessment maps were prepared using aerophotgraphs, for and before the field inventory survey. Hazard ranking and Risk ranking were preliminarily determined.

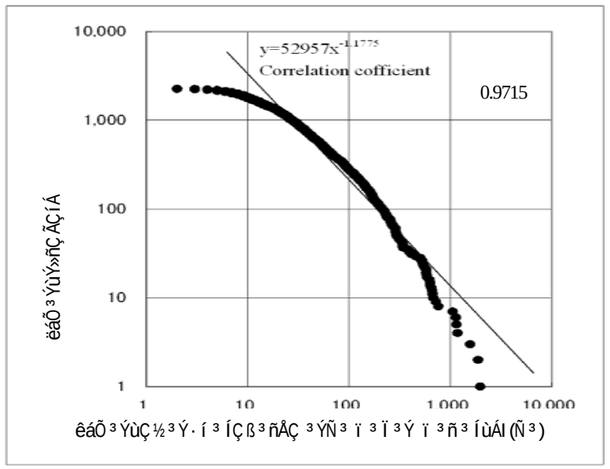
-Field reconnaissance
-Interview for damage histories and distribution of the questionnaire on risk objects (Inventory Form 6 - Damage evaluation)

- Data entry to inventory Forms 2, 3, 4, 5, 6 & 7
- Corrections of hazard rank, risk rank, and priority rank of inventory Form 1

Figure 3.4 Work Flow of Inventory Survey

3.2 êáÕ³ÝùÝ»ñÇ ÃÇíÁ¨ ï³ñ³ÍùÁ

êáÕ³ÝùÝ»ñÇ ÇÝí»Ýï³ñ áõëáõÙÝ³ëÇñáõÃÛáõÝáõÙ, 2,504 ëáÕ³ÝùÝ»ñ ×³Ý³ãí»óÇÝ û¹³ÛÇÝ éáõë³ÝÏ³ñÝ»ñÇ¨ Ñ³Ï³¹Çñ ù³ñï»½Ç Ù»ÏÝ³µ³ÝÙ³Ý ÙÇçáóáí, ¨ ·ñ³Ýóí»óÇÝ162 íÝ³ëí³Í í³Ûñ»ñ ¹³ßï Ç ÇÝí»Ýï³ñ áõëáõÙÝ³ëÇñáõÃÛ³Ý Å³Ù³Ý³Ï: ²ÕÛáõë³Ï 3.5-Á óáõÛó ¿ ï³ÉÇë, áñ µáÉáñ ëáÕ³ÝùÝ»ñÁ, áñáÝù áõÝ»Ý ÷áùñ ã³÷ë»ñ ÑÝ³ñ³íáñ ¿, áñ ã»Ý ÝÏ³ï í»É: Ð³ñ³µ»ñ³ÏóáõÃÛ³Ý Ñ³í³ë³ñ»óáõÙÁ ³ÕÛáõë³Ï 3.5-áõÙ Ó»éù ¿ µ»ñí³Í µ³ó ÃáÕÝ»Éáí 20Ñ³-Çó ÷áùñ ï íÛ³ÉÝ»ñÁ: Âí»ñÇ¨ ï³ñ³ÍùÇ Ï³ÝË³·áõß³Ï³Í ³ñÅ»ùÁ Ñ³ßí³ñÏí³Í Ñ³ñ³µ»ñ³ÏóáõÃÛ³Ý Ñ³í³ë³ñ»óáõÙáí, óáõó³¹ñí³Í¿ ²ÕÛáõë³Ï 3.4 –áõÙ:



ÜÏ³ñ 3.5 Ð³ñ³µ»ñ³ÏóáõÃÛáõÝÁ ëáÕ³ÝùÇ½³Ý·í³ÍÇß³ñÅÇ³ÝÑ³ï³Ï³Ý ï³ñ³ÍùÇ¨ ëáÕ³ÝùÝ»ñÇ ÃÇíÇ ÙÇç¨ ²ÕÛáõë³Ï 3.4 Ð³Ûë ï³ÝÇ Ð³Ýñ³ å»ï áõÃÛáõÝáõÙ ëáÕ³ÝùÝ»ñÇ ÃÇíÁ¨ ¹ñ³Ýó ï³ñ³ÍùÁ

êáÕ³ÝùÇ½³Ý·í³ÍÇß³ñÅÇ ³ÝÑ³ï³Ï³Ý ï³ñ³ÍùÁ (Ñ³)	êáÕ³ÝùÝ»ñÇ ÃÇíÁ	Ð³Ûë ï³ÝÇ Ð³Ýñ³å» ï áõÃÛáõÝáõÙ ëáÕ³ÝùÇ½³Ý·í³ÍÇß³ñÅÇ ÁÝ¹Ñ³Ýáõñ ï³ñ³ÍùÁ (Ñ³)	Ð³Ûë ï³ÝÇ Ð³Ýñ³å» ï áõÃÛáõÝáõÙ ëáÕ³ÝùÇ½³Ý·í³ÍÇß³ñÅÇ ï á ïáõÃÛáõÝáõÙ ëáÕ³ÝùÝ»ñÇ ÃÇíÁ¨ ¹ñ³Ýó ï³ñ³ÍùÁ (2,969,658 Ñ³)
Ð»ï¨Ûí³ÉÁ ³ÍÝ³ñÅ»ùÝ»ñÝ», áñáÝù áñáßí»É»Ý ÇÝí»Ýï³ñ áõëáõÙÝ³ëÇñáõÃÛ³Ý Å³Ù³Ý³Ï 2004Ã			
³í»ÉÇÙ»Íù³Ý	1000	7	42,428	1.4%
³í»ÉÇÙ»Íù³Ý	100	276	68,442	2.3%
³í»ÉÇÙ»Íù³Ý	50	582	89,678	3.0%
³í»ÉÇÙ»Íù³Ý	20	1,296	111,780	3.8%
Ð»ï¨Ûí³ÉÁ ÏÝË³·áõß³Ï³ÍÙ³ñÅ»ùÝ»ñÝ», áñáÝù Ñ³ßí³ñÏí³Í ³ñÅ»ùÝ»ñÝ³Ñ³ñ³µ»ñ³ÏóáõÃÛ³Ý Ñ³í³ë³ñ»óáõÙáí ²ÕÛáõë³Ï 3.5-áõÙ			
³í»ÉÇÙ»Íù³Ý	10	3,500	140,000	4.8%
³í»ÉÇÙ»Íù³Ý	5	8,000	170,000	5.8%
³í»ÉÇÙ»Íù³Ý	2	23,000	210,000	7.1%
³í»ÉÇÙ»Íù³Ý	1	53,000	250,000	8.2%

3.2 Numbers and Areas of Landslides

In the landslide inventory survey, 2,504 landslides were identified by aerophotograph and counter map interpretation, and by damage reports followed up with site field inventory surveys. Figure 3.5 shows that small landslides might not be identified. The correlation equation in figure 3.5 is obtained by dismissing data of landslides smaller than 20 ha. The prediction value of numbers and area estimated by the correlation equation are shown in Table 3.4.

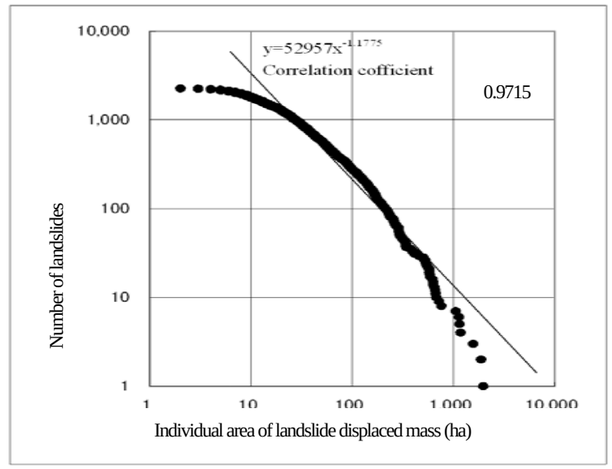


Figure 3.5 Correlation of Individual Area of Landslide Displaced Mass and Number of Landslides

Table 3.4 Numbers and Area of landslides in the Republic of Armenia

Individual Area of Landslide displaced Mass (ha)	Number of landslides	Total area ea of landslide displaced Mass in the Republic of Armenia (ha)	Area percentage of landslide displaced mass in the Republic of Armenia (2,969,658 ha)
Following are values identified by inventory survey in 2004			
larger than	1000	7	42,428	1.4%
larger than	100	276	68,442	2.3%
larger than	50	582	89,678	3.0%
larger than	20	1,296	111,780	3.8%
Following are prediction values calculated by correlation equation in figure 3.5.			
larger than	10	3,500	140,000	4.8%
larger than	5	8,000	170,000	5.8%
larger than	2	23,000	210,000	7.1%
larger than	1	53,000	250,000	8.2%

3.3 ºñÏñ³Ï³½ÙáõÃÛáõÝ¨ëáÕ³ÝùÇ µ³ßËáõÙ

3.3.1 ÀÝ¹Ñ³Ýáõñ

Ð»ï¨Û³É ùÝÝáõÃÛáõÝÝ»ñÁ ³ñí³Í »Ý Ùáï 2504 ëáÕ³ÝùÝ»ñáõÙ, áñáÝù Ñ³ÛïÝ³µ»ñí»É »Ý 2004Ã. ÇÝí»Ýï³ñ áõëáõÙÝ³ëÇñáõÃÛ³Ý Å³Ù³Ý³Ï: Â»Ù³ï ÇÏ ù³ñï»½ÝáÕ, áñáÝù Ñ³ñ³µ»ñíáõÙ »Ý ³ßË³ñÑ³·ñ³Ï³Ý ³é³ÝÓÝ³Ñ³ï ÏáõÃÛáõÝÝ»ñÇÝ¨ëáÕ³ÝùÇ µ³ßËÙ³ÝÁ óáõÙó »Ý ïñí³Í ³ÕÛáõë³Ï 3.5-Çó ³ÕÛáõë³Ï 3.7-áõÙ:

3.3.2 È³ÝçÇ·ñ³¹Ç»Ýï

êáÕ³ÝùÝ»ñÁ áñáß³ÏÇáñ»Ý Ï»Ýï ñáÝ³ó³Í »Ý 5-20 ³ëï Ç×³Ý áõÝ»óáÕ É³Ýç»ñÇ íñ³: ²é³í»É³å»ë, ëáÕ³ÝùÇ Ççí³ÍùÇ áõÅÁ Ù»Í ¿ ÑáñÇ½áÝ³Ï³Ý É³Ýç»ñáõÙ, ë³ Ãí³óÙ³Éáñ»Ý Ñ³Ï³ëáõÙ ¿ ëáÕ³ÝùÇ Ï»Ýï ñáÝ³óÙ³Ý Ñ³Ï³ÍáõÃÛáõÝÁ ¹»åÇ Ã»ù É³Ýç»ñ, ÇÝã å»ë áñ óáõÙó ¿ ïñí³Í ²ÕÛáõë³Ï 3.4-áõÙ: ä³ï×³éÁ Ï³ñ»ÉÇ ¿ Ñ³Ù³ñ»É, áñ Ã»ù É³Ýç»ñÁ ³é³ç³ó»É»Ý Ççí³ÍùÝ»ñÇ Ï³Ù¹ñ³Ýó·áñÍÁÝÃ³óÇ³ñ¹ÛáõÝùáõÙ:

êáÕ³ÝùÇ ÙÇçÇÝ ï³ñ³ÍùÁ Ñ³Ïí³Í ¿ ÉÇÝ»É ³í»ÉÇ Ù»Í Ã»ù É³Ýç»ñáõÙ, ÇÝã å»ë áñ óáõÙó ¿ ïñí³Í ²ÕÛáõë³Ï 3.5-áõÙ: ²Ûë Ñ³Ïí³ÍáõÃÛáõÝÁ »ÝÃ³¹ñíáõÙ ¿ ÉÇÝ»É ³Ûݵ³ÝÇ ³ñ¹ÛáõÝùáõÙ, áñ ³Û¹ï»Õ` Ã»ù É³ÝÇ½³ñ·³óÙ³Ý í»ñçÇÝ ÷áõÉáõÙ ÉÇÝáõÙ »Ýß³ï ëáÕ³ÝùÝ»ñ:

²ÕÛáõë³Ï 3.5 êáÕ³ÝùÇ µ³ßËÙ³Ý ³é³ÝÓÝ³Ñ³ï ÏáõÃÛáõÝÁ É³ÝÇ·ñ³¹Ç»Ýï áõÙ:

È³ÝçÇ·ñ³¹Ç»Ýï Ç¹³ëÁ (²ë ï Ç×³Ý: D)	àõëáõÙÝ³ëÇñíáÕ ï³ñ³ÍùÁ ëáÕ³ÝùÇ½³Ý·í³ÍÇ ï»Õ³ß³ñÅÁ							
	î³ñ³ÍùÁ áõëáõÙÝ³ëÇñíáÕÙ³ëáõÙ	îáÏáë³ÏÇÝ ï³ñ³ÍùÁ áõëáõÙÝ³ëÇñíáÕÙ³ëáõÙ	Ð³ñ³µ»ñíÇ ëáÕ³ÝùÝ»ñÇ ÃÇíÁ	îáÏáë³ÏÇÝ ÃÇíÁ µáÉáñ ëáÕ³ÝùÝ»ñáõÙ	î³ñ³ÍùÁ ëáÕ³Ýù Ý»ñáõÙ	îáÏáë³ÏÇÝ ï³ñ³ÍùÁ µáÉáñ ëáÕ³ÝùÝ»ñáõÙ	îáÏáë³ÏÇÝ ï³ñ³ÍùÁ Ïáõñ³ù³Ýã Ïáõñ ·ñ³¹Ç»Ýï ¹³ëÇ ½áÝ³Ïáõ Ù	ëáÕ³ÝùÇ ÙÇçÇÝ ï³ñ³ÍùÁ
	(Ñ³)	(%)		(%)	(Ñ³)	(%)	(%)	(Ñ³)
0=<D<5	1,038,753	35.0	163	6.5	12,189	10.0	1.2	74.8
5=<D<10	599,896	20.2	584	23.3	39,573	32.6	6.6	67.8
10=<D<20	816,286	27.5	1,264	50.5	54,820	45.1	6.7	43.4
20=<D<30	439,804	14.8	451	18.0	13,672	11.2	3.1	30.3
30=<D<40	72,550	2.4	41	1.6	1,274	1.0	1.8	31.1
D>=40	2,369	0.1	1	0.0	47	0.0	2.0	47.0
ÀÝ¹Ñ³Ýáõñ	2,969,658	100.0	2,504	100.0	121,575	100.0	4.1	48.6

3.3 Geomorphology and Landslide Distribution

3.3.1 General

The following examinations were done to 2504 landslides identified by the inventory survey in 2004. Thematic maps related to geographical features and the landslide distribution are shown in Figure 3.5 to Figure 3.7

3.3.2 Slope Gradient

Most of the landslides have slopes from 5 to 20 degrees as shown in Table 3.5. This contradicts the general idea that landslide slide power is expected to be larger in steep slopes. The reason can be that the gentle slopes have been made by landslides, or are still in the process of slides. As a result the average area of the landslide became large in a gentle slope as shown in Table 3.5.

Table 3.5 Feature of Landslide Distribution in Slope Gradient

Slope Gradient Class	Study Area		Landslide Zone					
(Degree: D)	Area in the study area	Area percentage in the study area	Number of related landslides	Number percentage in all landslides	Area in landslides	Area percentage in all landslides	Area percentage in each gradient class zone	Average landslide area
	(ha)	(%)		(%)	(ha)	(%)	(%)	(ha)
0=<D<5	1,038,753	35.0	163	6.5	12,189	10.0	1.2	74.8
5=<D<10	599,896	20.2	584	23.3	39,573	32.6	6.6	67.8
10=<D<20	816,286	27.5	1,264	50.5	54,820	45.1	6.7	43.4
20=<D<30	439,804	14.8	451	18.0	13,672	11.2	3.1	30.3
30=<D<40	72,550	2.4	41	1.6	1,274	1.0	1.8	31.1
D>=40	2,369	0.1	1	0.0	47	0.0	2.0	47.0
Total	2,969,658	100.0	2,504	100.0	121,575	100.0	4.1	48.6

3.3.3 È³ÝçÇ ³ë»Ï ïÁ

ÐÙáõëÇëÇ µÝ³·³í³éÇ É³ÝçáõÙ Ï³Ý Ñ³Ù»Ù³ï³µ³ñ Ù»Í ÃíáíëáÕ³ÝùÝ»ñ, ÇÝãå»ë óáõÙó¿ ïñí³Í ³ÕÙáõë³Ï 3.6-áõÙ: ²Ûë Ñ³Ï³í³ÍáõÃÙáõÝÁ å»ïù¿ áñ ³é³ç³ó³Í ÉÇÝÇ Ñ³Ù»Ù³ï³µ³ñ ÃáõÙÉ ³ñ¨Ç å³ÛÙ³ÝÝ»ñÇ¨ ÑÇÙÝ³Å³ÙéÇ áõÅ»Õ ë³éã»Éáõ ×ÝßÙ³Ý ³ñ¹ÙáõÝùáõÙ ³í»ñí³ÍáõÃÙ³Ý ½³ñ·³óÙ³Ý Ñ»ï ÑÙáõëÇë³ÛÇÝ ³ë å»ïïÇ É³ÝçáõÙ:

àÕç Ñ³ÛïÏ³Ï³Ý å»ïáõÃÙáõÝáõÙ Ñ³ñ³í-³ñ¨ÙïÛ³Ý ³ë å»ïïÇ É³ÝçÇ Ñ³ñ³µ»ñáõÃÙáõÝÁ Ñ³Ù»Ù³ï³µ³ñ Ù»Í¿¨ ëáÕ³ÝùÇ ³ÝÑ³ï³Ï³Ý ï³ñ³ÍùÁ, áñÁ ·áÙáõÃÙáõÝ áõÝÇ ³ÛÝï»Õ Ñ³Ï í³Í¿ÝáõÝå»ë ÉÇÝ»É Ù»Í, ÇÝãå»ë áñ óáõÙó¿ ïñí³Í ³ÕÙáõë³Ï 3.6-áõÙ:

²ÕÙáõë³Ï 3.6 êáÕ³ÝùÇ µ³ßËÙ³Ý ³é³ÝÓÝ³Ñ³ï ÏáõÃÙáõÝÁ È³ÝçÇ ³ë å»ïïáõÙ

È³ÝçÇ ³ë å»ïïÇ ¹³ëÁ	àõëáõÙÝ³ëÇñíáÕ ï³ñ³ÍùÁ		ÐáÕÇ ëáÕ³ÝùÇ½³Ý·í³ÍÇ ï»Õ³ß³ñÅÁ						ØÇçÇÝ ëáÕ³Ýù³ÛÇÝ ï³ñ³ÍùÁ
	î³ñ³ÍùÁ áõëáõÙÝ³ëÇñíáÕÙ³ëáõÙ	îáÏáë³ÛÇÝ ï³ñ³ÍùÁ áõëáõÙÝ³ëÇñíáÕÙ³ëáõÙ	Ð³ñ³µ»ñí³Íëáõ³ÝùÝ»ñÇ ÃÇíÁ	îáÏáë³ÛÇÝ ëáÕ³ÝùÝ»ñáõÙ	î³ñ³ÍùÁ Ý»ñáõÙ	îáÏáë³ÛÇÝ ï³ñ³ÍùÁ µáëáñ ëáÕ³ÝùÝ»ñáõÙ	îáÏáë³ÛÇÝ ï³ñ³ÍùÁ Ùáõñ. ³ë å»ïïÇ ¹³ëáõÙ	
	(Ñ³)	(%)		(%)	(Ñ³)	(%)	(%)	(Ñ³)
N	330,847	11.1	417	16.7	17,280	14.2	5.2	41.4
NE	348,009	11.7	368	14.7	14,524	11.9	4.2	39.5
E	361,412	12.2	294	11.7	12,317	10.1	3.4	41.9
SE	378,038	12.7	263	10.5	13,153	10.8	3.5	50.0
S	414,774	14.0	244	9.7	14,463	11.9	3.5	59.3
SW	431,620	14.5	250	10.0	15,868	13.1	3.7	63.5
W	368,408	12.4	282	11.3	16,705	13.7	4.5	59.2
NW	336,550	11.3	386	15.4	17,265	14.2	5.1	44.7
ÀÝ¹Ñ³Ýáõñ	2,969,658	100	2,504	100	121,575	100	4.1	48.6

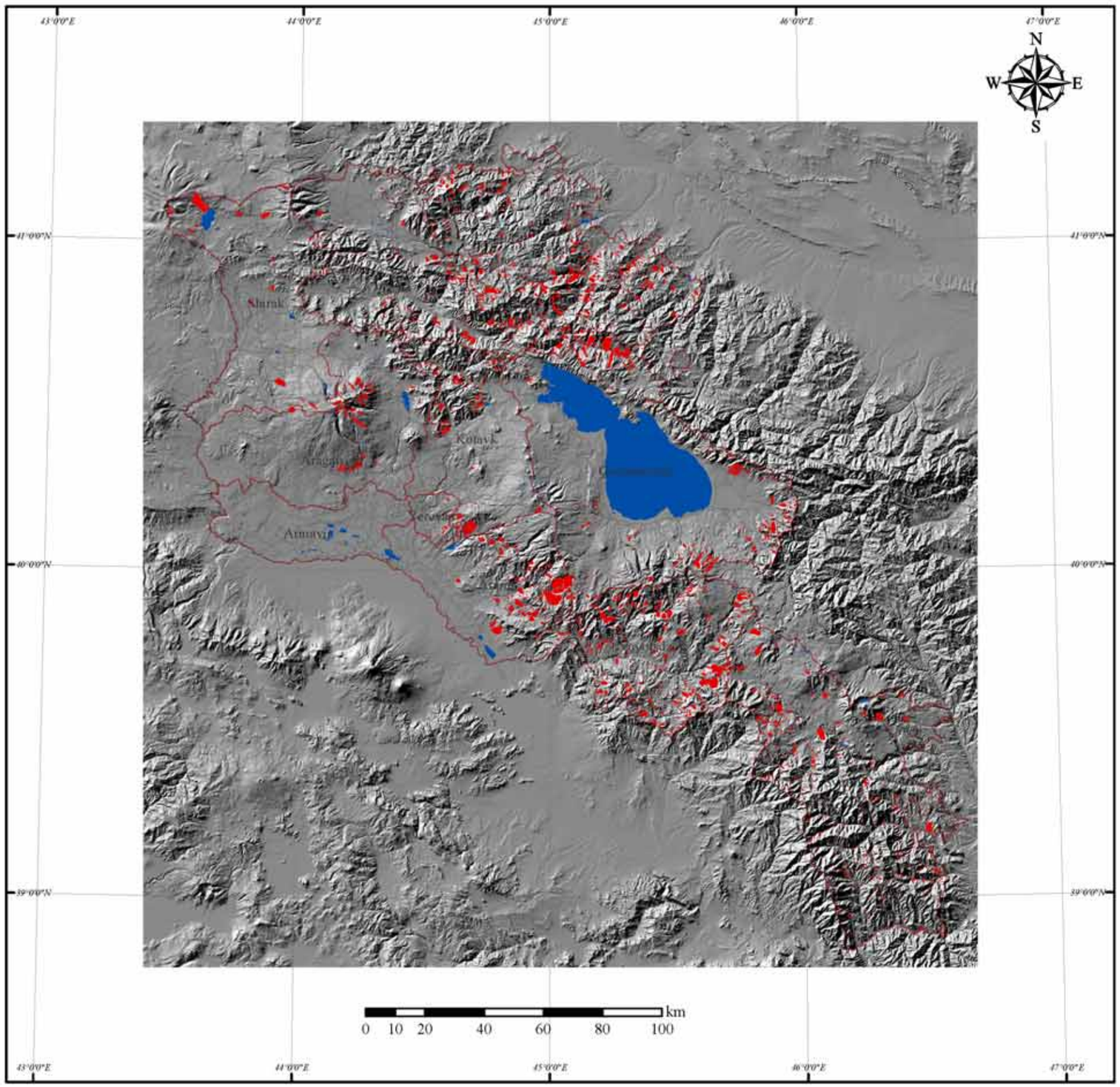
3.3.3 Slope Aspect

There are comparatively many landslides in the north aspect slope as shown in Table 3.6. This may be caused by the comparatively bad sunshine condition, and the destruction of the bedrock by frozen heaving pressure in the north aspect slope.

In theentire state of Armenia, the proportion of the southwest aspect slope is comparatively large, and the area covered by individual landslides there tends to be also large as shown in Table 3.6.

Table 3.6 Feature of Landslide Distribution in Slope Aspect

Slope Aspect Class	Study Area		Landslide Displaced Mass					
	Area in the study area	Area percentage in the study area	Number of related landslides	Number percentage in all landslides	Area in landslides	Area percentage in all landslides	Area percentage in each aspect class	Average landslide area
	(ha)	(%)		(%)	(ha)	(%)	(%)	(ha)
N	330,847	11.1	417	16.7	17,280	14.2	5.2	41.4
NE	348,009	11.7	368	14.7	14,524	11.9	4.2	39.5
E	361,412	12.2	294	11.7	12,317	10.1	3.4	41.9
SE	378,038	12.7	263	10.5	13,153	10.8	3.5	50.0
S	414,774	14.0	244	9.7	14,463	11.9	3.5	59.3
SW	431,620	14.5	250	10.0	15,868	13.1	3.7	63.5
W	368,408	12.4	282	11.3	16,705	13.7	4.5	59.2
NW	336,550	11.3	386	15.4	17,265	14.2	5.1	44.7
Total	2,969,658	100	2,504	100	121,575	100	4.1	48.6



Legend

- Landslide >= 2 ha.
- Lake, pond
- Roads
- Administrative Boundary

Map Projection: UTM 38N (WGS1984)

Data Source:
DEM: Space Shuttle Radar Topographic Mission, NASA
Landslides: The JICA Study Team for The Study on Landslide Management in The Republic of Armenia

Figure 3.6 Landslides and Shade Relief Map

ÜÏ ³ ñ 3.6êáÕ ³ ÝùÝ»ñ ¨ ë ï ï»ñ ³ ÏÇÝ é»ÉÇ»ýÇ ù ³ ñ ï »½

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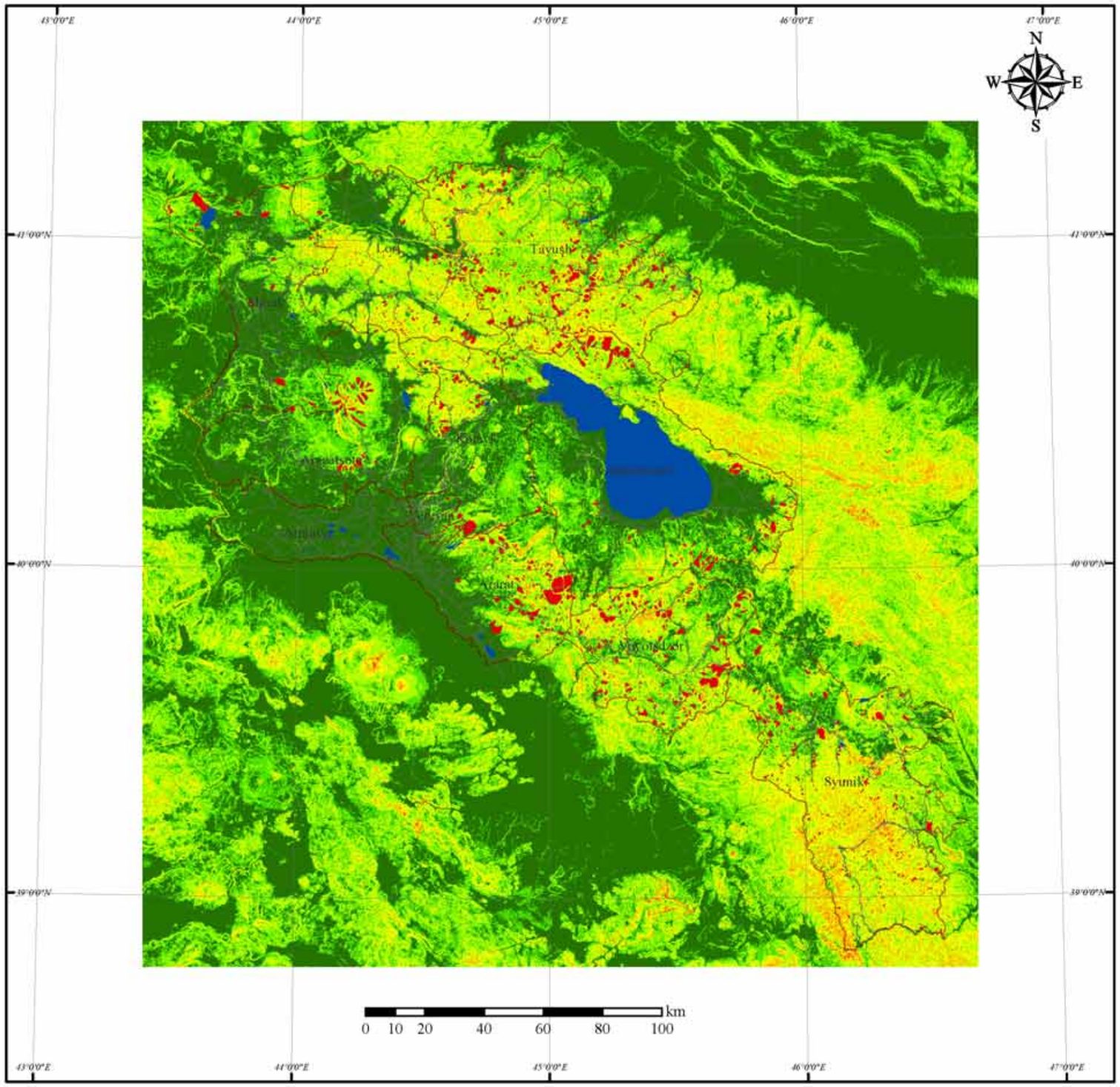

Legend

Slope Gradient

Class

- 0=<Degree<5
- 5=<Degree<10
- 10=<Degree<20
- 20=<Degree<30
- 30=<Degree<40
- 40=<Degree
- Landslide >= 2 ha.
- Lake, pond
- Roads
- Administrative Boundary

Map Projection: UTM 38N (WGS1984)

Data Source:

DEM: Space Shuttle Radar Topographic Mission, NASA
Landslides: The JICA Study Team for The Study on Landslide Management in The Republic of Armenia

Figure 3.7 Landslides and Slope Gradient Map
ÜÏ ³ ñ 3.7 êáÕ ³ ÝùÝ»ñ ¨ È ³ ÝçÇ ·ñ ³ ¹Ç»Ý ï Ç ù ³ ñ ï »½

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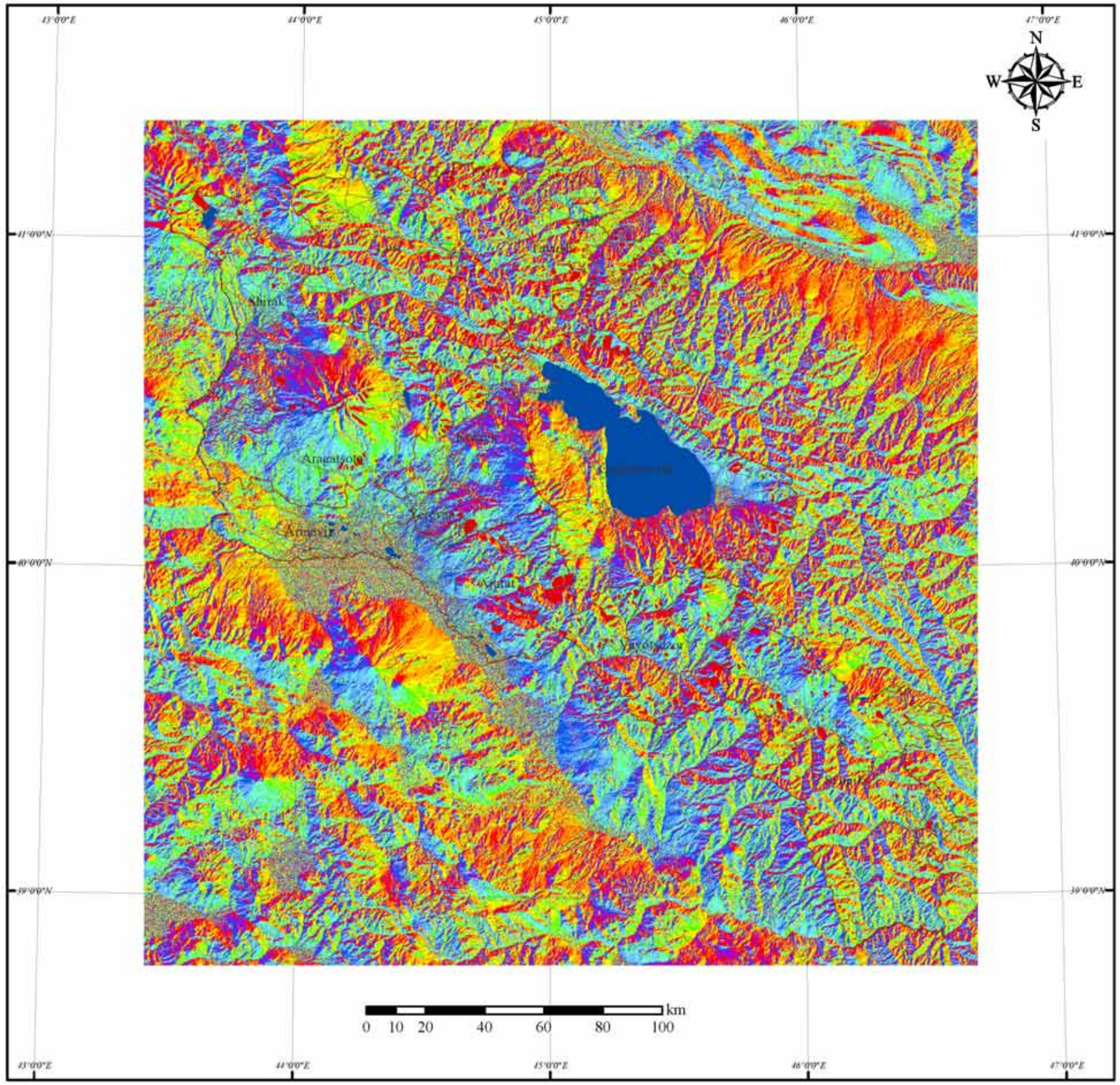

Legend

Slope Aspect

Class

- North
- Northeast
- East
- Southeast
- South
- Southwest
- West
- Northwest
- Landslide >= 2 ha.
- Lake, pond
- Roads
- Administrative Boundary

Map Projection: UTM 38N (WGS1984)

Data Source:

DEM: Space Shuttle Radar Topographic Mission, NASA
Landslides: The JICA Study Team for The Study on Landslide Management in The Republic of Armenia

Figure 3.8 Landslides and Slope Aspect Map

ÜÏ ³ ñ 3.8 êáÕ ³ ÝùÝ»ñ ¨ È ³ ÝçÇ ³ ëå»Ï ï Ç ù ³ ñ Ï »½

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IN THE REPUBLIC OF ARMENIA

3.3.4 ´ ³ñÓñ ³ óáõÙ

¶» ï ÝÇ µ ³ ñÓñáõÃÛ ³ Ý ¨ ëáÕ ³ ÝùÝ»ñÇ Ï»Ý ï ñáÝ ³ óÙ ³ Ý ÙÇç¨ ãÏ ³ å ³ ñ½ Ñ ³ ñ ³ µ»ñ ³ ÏóáõÃÛáõÝ, ÇÝãå»ë áñ óáõÛó ¿ ï ñí ³ Í ²ÕÛáõë ³ Ï 3.7-áõÙ:

²ÕÛáõë ³ Ï 3.7 ÐáÕÇ ëáÕ ³ ÝùÇ µ ³ ßËÙ ³ Ý ³ é ³ ÝÓÝ ³ Ñ ³ ï ÏáõÃÛáõÝÁ µ ³ ñÓñ ³ óáõÙÝ»ñáí

´ ³ ñÓñ ³ óÙ ³ Ý ¹ ³ ëÁ (Ù)	àõëáõÙÝ ³ ëÇñíáÕ ï ³ ñ ³ ÍùÁ		ÐáÕÇ ëáÕ ³ ÝùÇ ï »Õ ³ ß ³ ñÅí ³ Í ½ ³ Ý · í ³ ÍÁ				
	î ³ ñ ³ ÍùÁ áõëáõÙÝ ³ ëÇñíáÕ Ù ³ ëáõÙ (Ñ ³)	î ³ ñ ³ ÍùÇ ï áÏáë ³ ÛÝáõÃÛáõÝÁ áõëáõÙÝ ³ ëÇñíáÕ Ù ³ ëáõÙ (%)	Ð ³ ñ ³ µ»ñíáÕ ëáÕ ³ ÝùÝ»ñÇ ÃÇíÁ	´ áÉáñ ëáÕ ³ ÝùÝ»ñÇ ï áÏáë ³ ÌÇÝ ÃÇíÁ (%)	êáÕ ³ ÝùÝ»ñÇ ï ³ ñ ³ ÍùÁ (Ñ ³)	´ áÉáñ ëáÕ ³ ÝùÝ»ñÇ ï áÏáë ³ ÌÇÝ ÃÇíÁ (%)	î áÏáë ³ ÌÇÝ ï ³ ñ ³ ÍùÁ áõñ. µ ³ ñÓñ ³ óÙ ³ Ý ¹ ³ ëáõÙ (%)
300-400	284	0	0	0	3	0	1.1
400-500	3,243	0.1	1	0	79	0.1	2.4
500-600	10,815	0.4	5	0.2	243	0.2	2.2
600-700	20,358	0.7	22	0.9	820	0.7	4.0
700-800	27,123	0.9	49	2	2,068	1.7	7.6
800-900	151,755	5.1	72	2.9	2,792	2.3	1.8
900-1000	85,194	2.9	74	3	3,300	2.7	3.9
1000-1100	87,727	3	101	4	3,664	3	4.2
1100-1200	91,234	3.1	109	4.4	3,869	3.2	4.2
1200-1300	104,980	3.5	119	4.8	4,920	4	4.7
1300-1400	101,178	3.4	133	5.3	5,952	4.9	5.9
1400-1500	127,941	4.3	136	5.4	6,037	5	4.7
1500-1600	168,810	5.7	148	5.9	6,541	5.4	3.9
1600-1700	158,155	5.3	143	5.7	6,774	5.6	4.3
1700-1800	155,348	5.2	164	6.5	8,122	6.7	5.2
1800-1900	255,311	8.6	157	6.3	8,929	7.3	3.5
1900-2000	233,997	7.9	169	6.7	8,796	7.2	3.8
2000-2100	207,760	7	161	6.4	8,890	7.3	4.3
2100-2200	180,279	6.1	146	5.8	8,033	6.6	4.5
2200-2300	153,760	5.2	153	6.1	7,036	5.8	4.6
2300-2400	128,927	4.3	100	4	5,932	4.9	4.6
2400-2500	105,167	3.5	97	3.9	4,217	3.5	4.0
2500-2600	87,131	2.9	61	2.4	2,665	2.2	3.1
2600-2700	73,096	2.5	56	2.2	2,187	1.8	3.0
2700-2800	63,152	2.1	27	1.1	1,828	1.5	2.9
2800-2900	53,275	1.8	33	1.3	1,864	1.5	3.5
2900-3000	42,140	1.4	22	0.9	1,866	1.5	4.4
3000-3100	36,996	1.2	18	0.7	1,737	1.4	4.7
3100-3200	27,494	0.9	17	0.7	1,243	1	4.5
3200-3300	14,850	0.5	2	0.1	513	0.4	3.5
3300-3400	6,060	0.2	5	0.2	310	0.3	5.1
3400-3500	3,091	0.1	4	0.2	172	0.1	5.6
3500-3600	1,766	0.1	0	0	93	0.1	5.3
3600-3700	849	0	0	0	62	0.1	7.3
3700-3800	272	0	0	0	18	0	6.6
3800-3900	105	0	0	0	0	0	0.0
3900-4000	31	0	0	0	0	0	0.0
4000-4100	4	0	0	0	0	0	0.0
ÀÝ ¹ Ñ ³ Ýáõñ	2,969,658	100	2,504	100	121,575	100	4.1

3.3.4 Elevation

There is no clear relation between the levels of the ground altitude and the landslide concentration as shown in Table 3.7

Table 3.7 Feature of Landslide Distribution in Elevation

Elevation Class (m)	Study Area		Landslide Displaced Mass				
	Area in the study area (ha)	Area percentage in the study area (%)	Number of related landslides	Number percentage in all landslides (%)	Area in landslides (ha)	Area percentage in all landslides (%)	Area percentage in each elevation class (%)
300-400	284	0	0	0	3	0	1.1
400-500	3,243	0.1	1	0	79	0.1	2.4
500-600	10,815	0.4	5	0.2	243	0.2	2.2
600-700	20,358	0.7	22	0.9	820	0.7	4.0
700-800	27,123	0.9	49	2	2,068	1.7	7.6
800-900	151,755	5.1	72	2.9	2,792	2.3	1.8
900-1000	85,194	2.9	74	3	3,300	2.7	3.9
1000-1100	87,727	3	101	4	3,664	3	4.2
1100-1200	91,234	3.1	109	4.4	3,869	3.2	4.2
1200-1300	104,980	3.5	119	4.8	4,920	4	4.7
1300-1400	101,178	3.4	133	5.3	5,952	4.9	5.9
1400-1500	127,941	4.3	136	5.4	6,037	5	4.7
1500-1600	168,810	5.7	148	5.9	6,541	5.4	3.9
1600-1700	158,155	5.3	143	5.7	6,774	5.6	4.3
1700-1800	155,348	5.2	164	6.5	8,122	6.7	5.2
1800-1900	255,311	8.6	157	6.3	8,929	7.3	3.5
1900-2000	233,997	7.9	169	6.7	8,796	7.2	3.8
2000-2100	207,760	7	161	6.4	8,890	7.3	4.3
2100-2200	180,279	6.1	146	5.8	8,033	6.6	4.5
2200-2300	153,760	5.2	153	6.1	7,036	5.8	4.6
2300-2400	128,927	4.3	100	4	5,932	4.9	4.6
2400-2500	105,167	3.5	97	3.9	4,217	3.5	4.0
2500-2600	87,131	2.9	61	2.4	2,665	2.2	3.1
2600-2700	73,096	2.5	56	2.2	2,187	1.8	3.0
2700-2800	63,152	2.1	27	1.1	1,828	1.5	2.9
2800-2900	53,275	1.8	33	1.3	1,864	1.5	3.5
2900-3000	42,140	1.4	22	0.9	1,866	1.5	4.4
3000-3100	36,996	1.2	18	0.7	1,737	1.4	4.7
3100-3200	27,494	0.9	17	0.7	1,243	1	4.5
3200-3300	14,850	0.5	2	0.1	513	0.4	3.5
3300-3400	6,060	0.2	5	0.2	310	0.3	5.1
3400-3500	3,091	0.1	4	0.2	172	0.1	5.6
3500-3600	1,766	0.1	0	0	93	0.1	5.3
3600-3700	849	0	0	0	62	0.1	7.3
3700-3800	272	0	0	0	18	0	6.6
3800-3900	105	0	0	0	0	0	0.0
3900-4000	31	0	0	0	0	0	0.0
4000-4100	4	0	0	0	0	0	0.0
Total	2,969,658	100	2,504	100	121,575	100	4.1

3.4 ºñÏñ³µ³ÝáõÃÛáõÝÁ ¨ ëáÕ³ÝùÝ»ñÇ ³é³ÝÓÝ³óáõÙÁ

3.4.1 ÀÝ¹Ñ³Ýáõñ

àõëáõÙÝ³ëÇñíáÕ ï³ñ³ÍùÁ µ³Å³Ýí³Í ¿ ÇÝÁ »ñÏñ³µ³Ý³Ï³Ý Ý³Ñ³Ý·Ý»ñÇ [1], ¨ ëáÕ³ÝùÝ»ñÇ ³é³ÝÓÝ³óáõÙÁ »ñÏñ³µ³Ý³Ï³Ý³Ñ³Ý·Ý»ñáõÙ óáõÛó¿ ï ñí³Í ³ÕÙáõë³Ï 3.9-áõÙ:

3.4.2 êáÕ³ÝùÇ Ë ï áõÃÛáõÝÁ Ûáõñ³ù³ÝáÛáõñ »ñÏñ³µ³Ý³Ï³Ý³Ñ³Ý·áõÙ

²ÛÝ »ñÏñ³µ³Ý³Ï³Ý³Ñ³Ý·Ý»ñáõÙ, áñáÝù ³í»ÉÇ ÑÇÝ »Ý ù³Ý ‘ä³É»á·»ÝÁ” (‘4’ ³ÕÙáõë³Ï 3.8áõÙ), ëáÕ³ÝùÇ ï»Õ³ß³ñÅí³Í ½³Ý·í³ÍÝ»ñÇ ï³ñ³ÍùÁ Ûáõñ³ù³ÝáÛáõñ Ý³Ñ³Ý·áõÙ Ï³½ÙáõÙ ¿ Ý³Ñ³Ý·Ç ³í»ÉÇ ù³Ý 5.3 % -Á; ÙÇÝã¹»é ³ÛÝ »ñÏñ³µ³Ý³Ï³Ý³Ñ³Ý·Ý»ñáõÙ, áñáÝù ³í»ÉÇ »ñÇ ï³ë³ñ¹ »Ý, ù³Ý Ü»á·»ÝÁ (‘3’ ³ÕÙáõë³Ï 3.8-áõÙ), ÑáÕÇ ï»Õ³ß³ñÅí³Í ½³Ý·í³ÍÝ»ñÇ ï³ñ³ÍùÁ Ûáõñ³ù³ÝáÛáõñ Ý³Ñ³Ý·áõÙ Ï³½ÙáõÙ¿ Ý³Ñ³Ý·Ç ÙÇ³ÛÝ 2.6 – 2.8%-Á: øíá ï»Ù³ñÛ³Ý Ýë ï í³ÍùÇ »ñÏñ³µ³Ý³Ï³Ý³Ñ³Ý·áõÙ, ëáÕ³ÝùÝ»ñÁ Ñ³Ý¹ÇåáõÙ »Ý ³í»ÉÇ Ñ³×³Ë ÑÇÝ »ñÏñ³µ³Ý³Ï³Ý³Ñ³Ý·Ý»ñáõÙ, ù³Ý Ýáñ»ñáõÙ:

²ÕÙáõë³Ï 3.8 ºñÏñ³µ³Ý³Ï³Ý³Ñ³Ý·Ý»ñÁ ¨ ÐáÕÇ ëáÕ³ÝùÝ»ñÇ ÃÇíÝáõ ï³ñ³ÍùÁ

ºñÏñ³µ³Ý³Ï³Ý Ý³Ñ³Ý·Á	àõëáõÙÝ³ëÇñíáÕ ï³ñ³ÍùÁ		ÐáÕÇ ëáÕ³ÝùÇ ½³Ý·í³ÍÇß³ñÅÁ				êáÕ³ÝùÇ ½³Ý·í³ÍÇß³ñÅÇ ï³ñ³ÍùÁ Ûáõñ. »ñÏñ³µ³Ý³Ï³Ý ï³ñ³ÍùÁ (%)
	Î³ñ³ÍùÁ (Ñ³)	êáÕ³ÝùÇ ½³Ý·í³ÍÇß³ñÅÇ ï³ñ³ÍùÁ Ûáõñ. »ñÏñ³µ³Ý³Ï³Ý Ý³Ñ³Ý·áõÙ	êáÕ³ÝùÝ»ñÇ ÃÇíÁ	àõëáõÙÝ³ëÇñíáÕ ï³ñ³ÍùÇ ëáÕ³ÝùÝ»ñÇ ï³ñ³ÍùÁ	êáÕ³ÝùÇ ½³Ý·í³ÍÇß³ñÅÇ ï³ñ³ÍùÁ (Ñ³)	àÕç áõëáõÙÝ³ëÇñíáÕ ï³ñ³ÍùÇ ëáÕ³ÝùÝ»ñÁ	
øíá ï»Ù³ñÛ³Ý	1: Üë ï í³ÍùÝ»ñ	424,899	14.3%	80	3.2%	3,331	2.7%	0.8%
	2: Ðñ³µË³ÏÇÝ Å³Ï&³é»ñ ³é³ÝÓÝ³ó³Í Ýë ï í³ÍùÝ»ñ	1,187,037	40.0%	457	18.3%	33,717	27.7%	2.8%
Ü»á·»Ý	3: ÃÃáõÙÇç³ÝïÛ³É Ññ³µË³ÏÇÝ ÑáÕ»ñ	115,521	3.9%	126	5.0%	3,037	2.5%	2.6%
ä³É»á·»Ý	4: Üë ï í³Íù³ÏÇÝ ¨ Ññ³µË³ÏÇÝ Å³Ï&é»ñ	576,390	19.4%	868	34.7%	38,302	31.5%	6.6%
Ø»½áï½áÛ³Ý	5: Ùáõ·— Å³Ï&é»ñ	20,519	0.7%	14	0.6%	1,428	1.2%	7.0%
	6: Üë ï í³Íù³ÏÇÝ ¨ ÷áË³Ï»ñåí³Í Å³Ï&é»ñ	541,513	18.2%	840	33.5%	35,479	29.2%	6.6%
	7: Ðñ³µË³ÏÇÝ Å³Ï&é»ñ	32,233	1.1%	40	1.6%	1,703	1.4%	5.3%
ä³É»áï½áÛ³Ý	8: Üë ï í³Íù³ÏÇÝ ¨ ÷áË³Ï»ñåí³Í Å³Ï&é»ñ	43,624	1.5%	48	1.9%	3,318	2.7%	7.6%
Ý³Ë³áõ»ÉëÏ³Ý	9: ÷áË³Ï»ñåí³Í, Ññ³µË³ÏÇÝ ¨ Ù»ï³-Ññ³µË³ÏÇÝ Å³Ï&é»ñ	19,926	0.7%	29	1.2%	1,192	1.0%	6.0%
	0: ²é³Ýó³Ùë³ÃÇí	7,996	0.3%	2	0.1%	68	0.1%	0.9%
ÀÝ¹Ñ³Ýáõñ		2,969,658	100.0%	2504	100.0%	121,575	100.0%	4.1%

[1] ²Ûë »ñÏñ³µ³Ý³Ï³Ý³Ñ³Ý·Ý»ñÁ í»ñ³·ñíáõÙ »Ý “1.3 ºñÏñ³µ³ÝáõÃÛáõÝ.” µ³ÅÝÇÝ

3.4 Geology and Landslide Distribution

3.4.1 General

The study area is divided into nine geologic provinces [1], and the distribution of landslides in the geologic provinces is shown in Figure 3.9

3.4.2 Landslide Density in Each Geologic Province

In the geologic provinces as old or older than Paleogene (‘4’ in table 3.8), the area of landslide displaced masses in each province covers more than 5.3 % of the province; whereas in the geologic provinces as young or younger than Neogene (‘3’ in table 3.8), the area of landslide displaced masses in each province covers only 2.6 – 2.8 % of the province. In the geologic province of Quaternary sediments (‘1’ in table 3.8), the area of displaced masses covers only 0.8 % of the province. As a conclusion, landslides occurred more frequently in older geologic provinces than in younger geologic provinces.

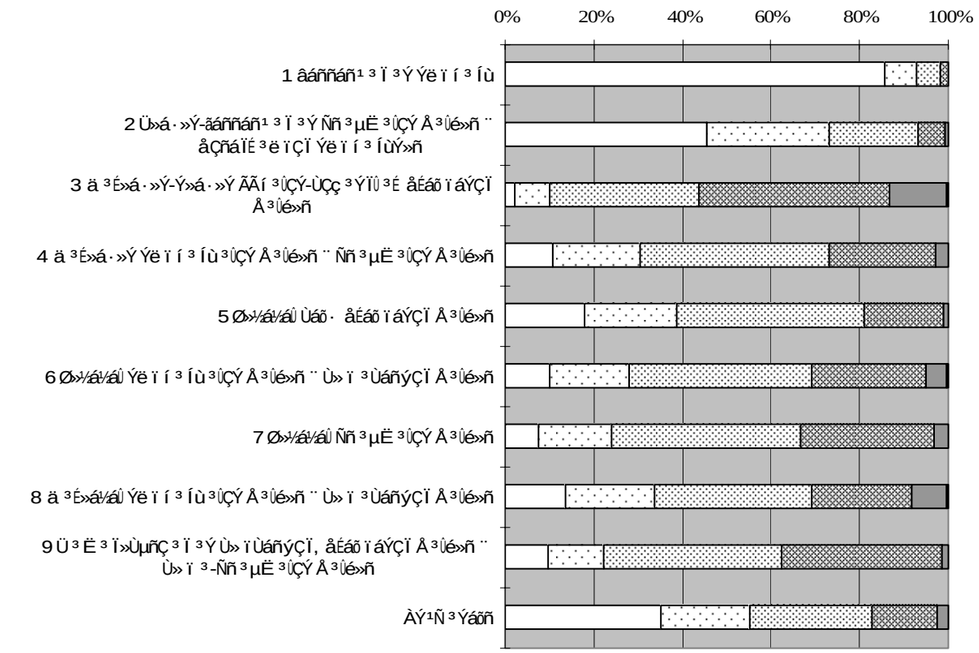
Table 3.8 Geological Province and Number and Area Percentage of Landslides

Geologic province	Study area		Landslide displaced mass				Area percentage of landslide-displaced mass to each geologic province area (%)
	Area (ha)	Area percentage of landslide-displaced mass to each geologic province area	Number of landslides	Number percentage to whole study area landslides	Landslide displaced mass area (ha)	Area percentage to whole study area landslides	
Quaternary	1: Sediments	424,899	14.3%	80	3.2%	3,331	2.7%	0.8%
	2: Volcanic rocks & pyroclastic deposits	1,187,037	40.0%	457	18.3%	33,717	27.7%	2.8%
Neogene	3: Acidic-intermediated plutonic rocks	115,521	3.9%	126	5.0%	3,037	2.5%	2.6%
Paleogene	4: Sedimentary rocks & volcanic rocks	576,390	19.4%	868	34.7%	38,302	31.5%	6.6%
Mesozoic	5: Mafic plutonic rocks	20,519	0.7%	14	0.6%	1,428	1.2%	7.0%
	6: Sedimentary & metamorphic rocks	541,513	18.2%	840	33.5%	35,479	29.2%	6.6%
	7: Volcanic rocks	32,233	1.1%	40	1.6%	1,703	1.4%	5.3%
Paleozoic	8: Sedimentary & metamorphic rocks	43,624	1.5%	48	1.9%	3,318	2.7%	7.6%
Pre Cambrian	9: Metamorphic, plutonic & meta volcanic rocks	19,926	0.7%	29	1.2%	1,192	1.0%	6.0%
	0: No data	7,996	0.3%	2	0.1%	68	0.1%	0.9%
	Total	2,969,658	100.0%	2504	100.0%	121,575	100.0%	4.1%

[1] These geologic provinces refer to section “1.3 Geology.”

êáÕ³ÝùÇ ï ³ñ³Íù³ÛÇÝ ³é³ÝÓÝ³óÙ³Ý å³ï×³éÁ ³Ûë »ñÏñ³µ³Ý³Ï³Ý Ý³Ñ³Ý·Ý»ñáõÙ Ñ³Ù³ñíáõÙ »Ý Ñ» ï ¨Ù³ÉÝ»ñÁ:

ºñÏñ³µ³Ý³Ï³Ý Ý³Ñ³Ý·Ý»ñ “1. øíáï »Ù³ñÙ³Ý Ýë ï í³ÍùÝ»ñ” ¨ “2.Ü»á·»Ý øíáï »Ù³ñÙ³Ý Ññ³µË³ÛÇÝ Å³Ûé»ñ ¨ ³é³ÝÓÝ³óí³Í Ýë ï í³ÍùÝ»ñ”, ³ÛÝÉ³Ýç»ñÁ, áñáÝù ÑÇÝ· ³ë ï Ç×³ÝÇó ³í»ÉÇ Ã»ù »Ý, Ï³½ÙáõÙ »Ý ³í»ÉÇ Ù»Í ï ³ñ³Íù, ù³Ý ³ÛÉ »ñÏñ³µ³Ý³Ï³Ý Ý³Ñ³Ý·Ý»ñÁ: êáÕ³ÝùÁ Ñ»ß ï áõÃÙ³Ùµ ãÇ½³ñ·³ó»É³Ûë »ñÇ ï ³ë³ñ¹É³Ýç»ñáõÙ, áñáíÑ» ï ¨ É³ÝçÁ Ý³ËÝ³Ï³Ý íÇ×³Ïáõù Ã»ù¿ ¨ ëáÕí³ÍùÁ ÃáõÛÉ¿:”3 ÂÃáõ ÙÇç³ÝÏÙ³É Ññ³µË³ÛÇÝ Å³Ûé»ñáõÙ, ½³Ý·í³ÍÇ ï »Õ³ß³ñÅÁ ³ÛÝÙ³ë»ñáõÙ, áñáÝù É³Ýçáõù áõÝ»Ý 20 ³ë ï Ç×³Ý ½³éÇÃ³÷áõÃÙáõÝ Ï³½ÙáõÙ »Ý Ñ³Ù»Ù³ ï ³µ³ñ ³í»ÉÇ Ù»Í ï ³ñ³Íù, ù³Ý ³ÛÉ »ñÏñ³µ³Ý³Ï³Ý Ý³Ñ³Ý·Ý»ñÁ: àã ÑÇÙÝ³Å³ÙéÇ »Õ³Ý³ÏÁ, ¨ áã ¿É ëáÕ³ÝùÇ½³ñ·³óáõÙÁ ¹»é¨ë ³Ù¹ù³Ý Ù»Í ³é³çÁÝÃ³ó ã»Ý áõÝ»ó»É ³Ûë »ñÇ ï ³ë³ñ¹ »ñÏñ³µ³Ý³Ï³Ý Ý³Ñ³Ý·áõÙ: Â»ù É³ÝçÇ Ñ³Ù³Ù³ëÝáõÃÙáõÝÁ ïÙ»Í ³óÝÇ ëáÕ³ÝùÇ½³ñ·³óáõÙÁ Ñ» ï ³·³ÙáõÙ:



È³ÝçÇ·ñ³¹Ç»Ý ï êáÕ³ÝùÇ ½³Ý·í³ÍÇ ß³ñÅÇ ï áÏáë³ÛÇÝ ï ³ñ³ÍùÁ Ûáõñ É³ÝçÇ ·ñ³¹Ç»Ý ï Ç ï ³ñ³ÍùáõÙ:

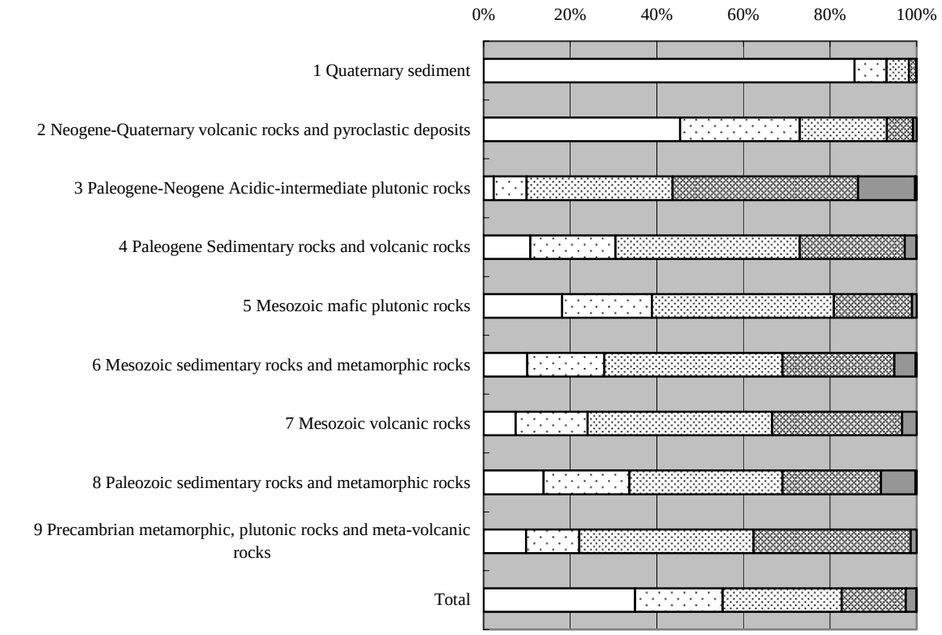
0-5	1.2 %
5-10	6.6 %
10-20	6.7 %
20-30	3.1 %
30-40	1.8 %
40-Çó ³í»ÉÇ ½³éÇÃ³÷	2.0 %

ÜÏ³ñ3.9 ºñÏñ³µ³Ý³Ï³Ý Ý³Ñ³Ý·Ý»ñÁ ¨ È³ÝçÇ ·ñ³¹Ç»Ý ï Ç½áÝ³Ý

The explanation for the landslide space distribution in these young geologic provinces is discussed below.

In the geologic provinces of “1. Quaternary sediments” and “2. Neogene-Quaternary volcanic rocks & pyroclastic deposits”, slopes gentler than five degrees cover larger areas than in other geologic provinces. Landslide do not develop easily on these young slopes because the slope is originally gentle, and slide force is weak.

In the geologic provinces of “3. Acidic-intermediated plutonic rocks”, slopes steeper than twenty degrees cover comparatively larger areas than the other geologic provinces. Neither weathering of the bedrock nor the development of the landslide have so progressed in this young geologic province yet. The proportion of gentle slope will increases with the development of the landslide in the future.



Slope Gradient	Area percentage of landslide displaced mass on each slope gradient area
0-5	1.2 %
5-10	6.6 %
10-20	6.7 %
20-30	3.1 %
30-40	1.8 %
Steeper than 40	2.0 %

Figure 3.9 Geologic Province & Slope Gradient Zone

3.4.3 êáÕ³ÝùÇ Ù»ÍáõÃÙáõÝÁ Ùáõñ³ù³ÝãÙáõñ »ñÏñ³µ³Ý³Ï³Ý Ý³Ñ³Ý·áõÙ

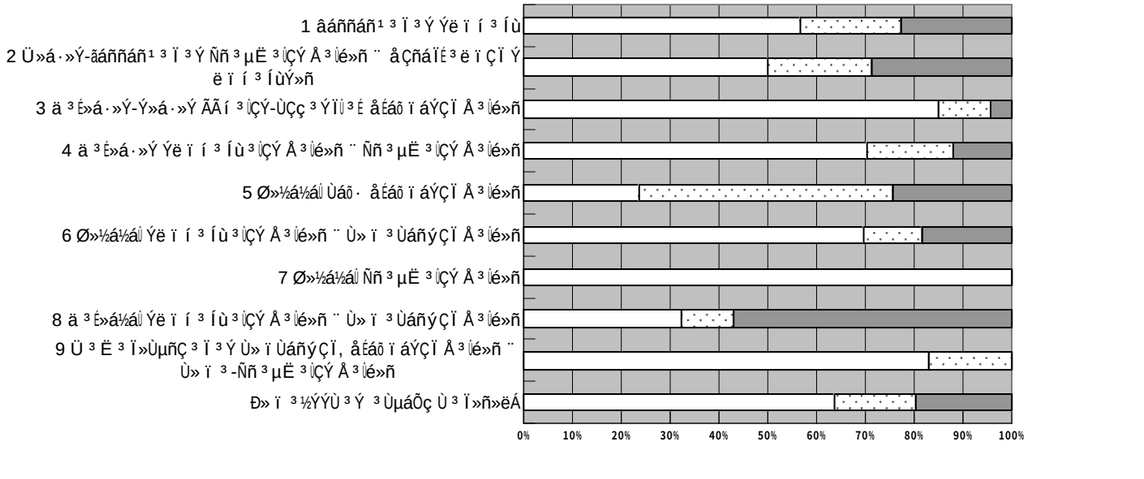
²Õ¶áõë³Ï 3.10-áõÙ ëáÕ³ÝùÇ Ù»ÍáõÃÙáõÝÝ»ñÁ óáõÙó »Ý ïñí³Í Ñ³Ù³Ó³ÛÝ »ñÏñ³µ³Ý³Ï³Ý Ý³Ñ³Ý·Ý»ñÇ: êáÕ³ÝùÇ ½³Ý·í³ÍÇß³ñÅÇ Ñ³Ù³ñÙ³ 65 %-Á 200 Ñ³-Çó Ù»Í »Ý ¨ Ùá ï³íáñ³ å»ë 20%-Á Ù»Í »Ý 400 Ñ³-Çó: ¸³ óáõÙó¿ ï³ÉÇë áñ Ù»Í ëáÕ³ÝùÇ Ñ³ñ³µ»ñáõÃÙáõÝÁ ÷áùñ¿ Ñ» ï¨Û³É»ñÏñ³µ³Ý³Ï³Ý Ý³Ñ³Ý·Ý»ñáõÙ:

- 3 ä³É»á·»Ý-Ü»á·»ÝÙ³Ý ÃÃíáõï³ÛÇÝ ÙÇç³ÝÏÛ³É Ññ³µË³ÛÇÝ Å³Ù¨é»ñ
- 7 Ø»½á½áÙ³Ý Ññ³µË³ÛÇÝ Å³Ù¨é»ñ
- 9 Ü³Ë³áõ»Éë³ÛÇÝ ÷áË³Ï»ñåí³Í, Ññ³µË³ÛÇÝ¨Ù»ï³-Ññ³µË³ÛÇÝ Å³Ù¨é»ñ:

3.4.3 Landslide Size in Each Geologic Province

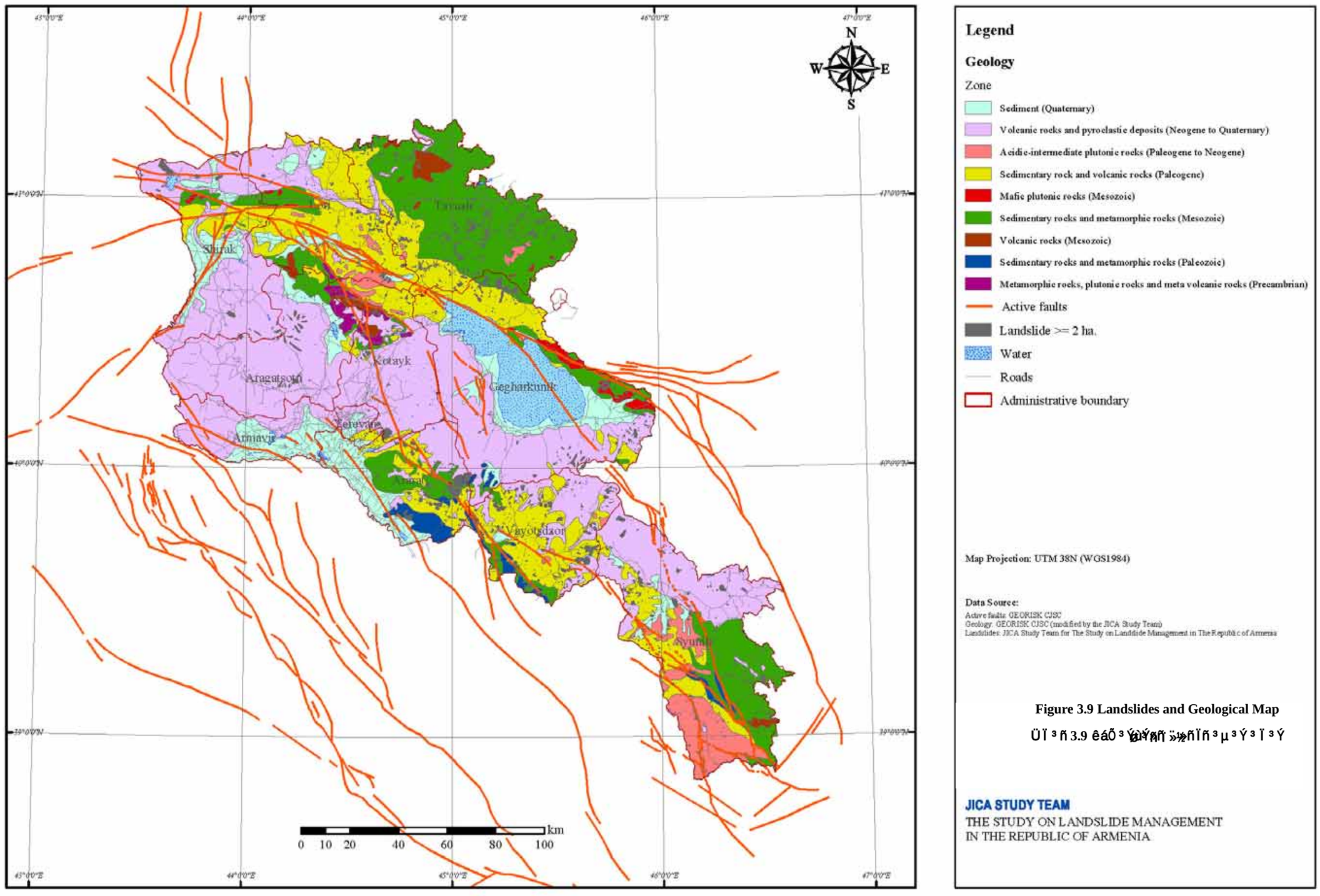
Sizes of landslides are shown according to geologic provinces in Figure 3.10. About 65 % of landslide displaced masses are larger than 200 ha and about 20 % larger than 400 ha. The proportion of large landslides is small in the following geologic provinces:

- 3 Paleogene-Neogene Acidic-intermediate plutonic rocks
- 7 Mesozpic vocanic rocks
- 9 Precambrian metamorphic, plutonic rocks and meta-volcanic rocks



ÜÏ³ñ 3.10 êáÕ³ÝùÇ ½³Ý·í³ÍÇß³ñÅÇ ¹³ë³ÛÇÝ Ñ³Ù³Ù³ëÝáõÃÙáõÝÁ Ùáõñ³ù³ÝãÙáõñ »ñÏñ³µ³Ý³Ï³Ý Ý³Ñ³Ý·áõÙ

Figure 3.10 Proportion of Landslide Displaced Mass Area Rank in Each Geologic Province



Legend

Geology

Zone

- Sediment (Quaternary)
- Volcanic rocks and pyroclastic deposits (Neogene to Quaternary)
- Acidic-intermediate plutonic rocks (Paleogene to Neogene)
- Sedimentary rock and volcanic rocks (Paleogene)
- Mafic plutonic rocks (Mesozoic)
- Sedimentary rocks and metamorphic rocks (Mesozoic)
- Volcanic rocks (Mesozoic)
- Sedimentary rocks and metamorphic rocks (Paleozoic)
- Metamorphic rocks, plutonic rocks and meta volcanic rocks (Precambrian)
- Active faults
- Landslide >= 2 ha.
- Water
- Roads
- Administrative boundary

Map Projection: UTM 38N (WGS1984)

Data Source:

Active faults: GEORISK CJSC
Geology: GEORISK CJSC (modified by the JICA Study Team)
Landslides: JICA Study Team for The Study on Landslide Management in The Republic of Armenia

Figure 3.9 Landslides and Geological Map

ÜÏ³ñ 3.9 êáÕ³Ý[illegible]»ñÏñ³µ³Ý³Ï³Ý

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THE STUDY ON LANDSLIDE MANAGEMENT
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3.5 ì»·»ï³óÇ³ ¨ êáÕ³ÝùÇ µ³ßËáõÙÁ

ì»·»ï³óÇáÝ ¹³ë»ñÁ ÝáõÙÝ³óíáõÙ ¿ÇÝ 2000 ¨ 2003ÃÃ ØÐÖ¶-Ç áõëáõÙÝ³ëÇñáÕ ËÙµÇ Ó»éù µ»ñ³Í å³ïÏ»ñÝ»ñÁ Ù»ÏÝ³µ³Ý»Éáí, áñáÝù óáõÙó »Ý ïñí³Í ³ÕÙáõë³Ï 3.12-áõÙ` ëáÕ³ÝùÝ»ñÇ ³é³ÝÓÝ³óáõÙáí:

êáÕ³ÝùÇ Ë ïáõÃÙáõÝÁ Ù»Í ¿ ³ÙÝ ßñç³Ýáõù, áñ ï»Õ í»·»ï³óÇ³Ý ËÇï ¿ Ñ³Ù»Ù³ï³Í É»ñÏ ÑáÕÇ Ñ»ï, ÇÝã å»ë óáõÙó ¿ ïñí³Í ²ÕÙáõë³Ï 3.9-áõÙ: ²Ûë ßñç³ÝÝ»ñÁ Ùï³Íí³Í »Ý ³ÙÝåëÇ Ýå³ï³ÏÝ»ñÇ Ñ³Ù³ñ, ÇÝãåÇëÇù »Ý ³é³ï çáõñÁ:

²ÕÙáõë³Ï 3.9 ì»·»ï³óÇ³ ¨ ëáÕ³ÝùÇ ´³ßËáõÙÁ

ì»·»ï³óÇáÝ ¹³ëÁ	àõëáõÙÝ³ëÇñíáÕ ï³ñ³ÍùÁ		ÐáÕÇ ÷É³ÍùÇ ï»Õ³µ³ßËí³Í½³Ý·í³ÍÁ				
	î³ñ³ÍùÁ áõëáõÙÝ³ëÇñíáÕ Ù³ëáõÙ	î³áÏáë³ÙÇÝ ï³ñ³ÍùÁ áõëáõÙÝ³ëÇñíáÕ ï³ñ³ÍùáõÙ	Ð³ñ³µ»ñíáÕ ëáÕ³ÝùÝ» ñÇ ÃÇíÁ	î³áÏáë³ÙÇÝ ÃÇíÁ µáÉáñ ëáÕ³ÝùÝ»ñáõÙ	êáÕ³ÝùÝ» ñÇ ï³ñ³ÍùÁ	î³ñ³Íù³ÙÇÝ ÇÝ ï³áÏáëÁ µáÉáñ ëáÕ³ÝùÝ»ñáõÙ	êáÕ³ÝùÇ ½³Ý·í³ÍÇ ß³ñÅÇ ï³áÏáë³ÙÇÝ ï³ñ³ÍùÁ ÙáõñÍ»·»ï³óÇáÝ¹³ëÇ ï³ñ³ÍùáõÙ
	(Ñ³)	(%)		(%)	(ha)	(%)	(%)
1: æáõñ	130,974	4.4	0	0	29	0	0.0
2: È»ñÏ	139,860	4.7	120	4.8	4,486	3.7	3.2
3:ÜáëñËá ï³Í³Í Ï ÑáÕ	293,575	9.9	272	10.9	13,605	11.2	4.6
4: Êá ï³Í³Í Ï ÑáÕ	1,647,438	55.5	1,107	44.2	62,037	51	3.8
5: Â÷áõ ï	127,976	4.3	159	6.3	7,020	5.8	5.5
6: Â÷áõ ï³Ý ï³é	159,697	5.4	169	6.7	6,604	5.4	4.1
7: ØÇçÇÝ³Ý ï³é	230,042	7.7	322	12.9	12,652	10.4	5.5
8: ÊÇ ï³Ý ï³é	173,645	5.8	282	11.3	11,095	9.1	6.4
9: Ò̈áõÝ	513	0	0	0	2	0	0.4
10: ²Ùå	37,564	1.3	35	1.4	2,360	1.9	6.3
11: ê ï í»ñ	23,914	0.8	32	1.3	1,585	1.3	6.6
12: ²ÛÉ	4,460	0.2	6	0.2	100	0.1	2.2
ÀÝ¹Ñ³Ýáõñ	2,969,658	100	2,504	100	121,575	100	4.1

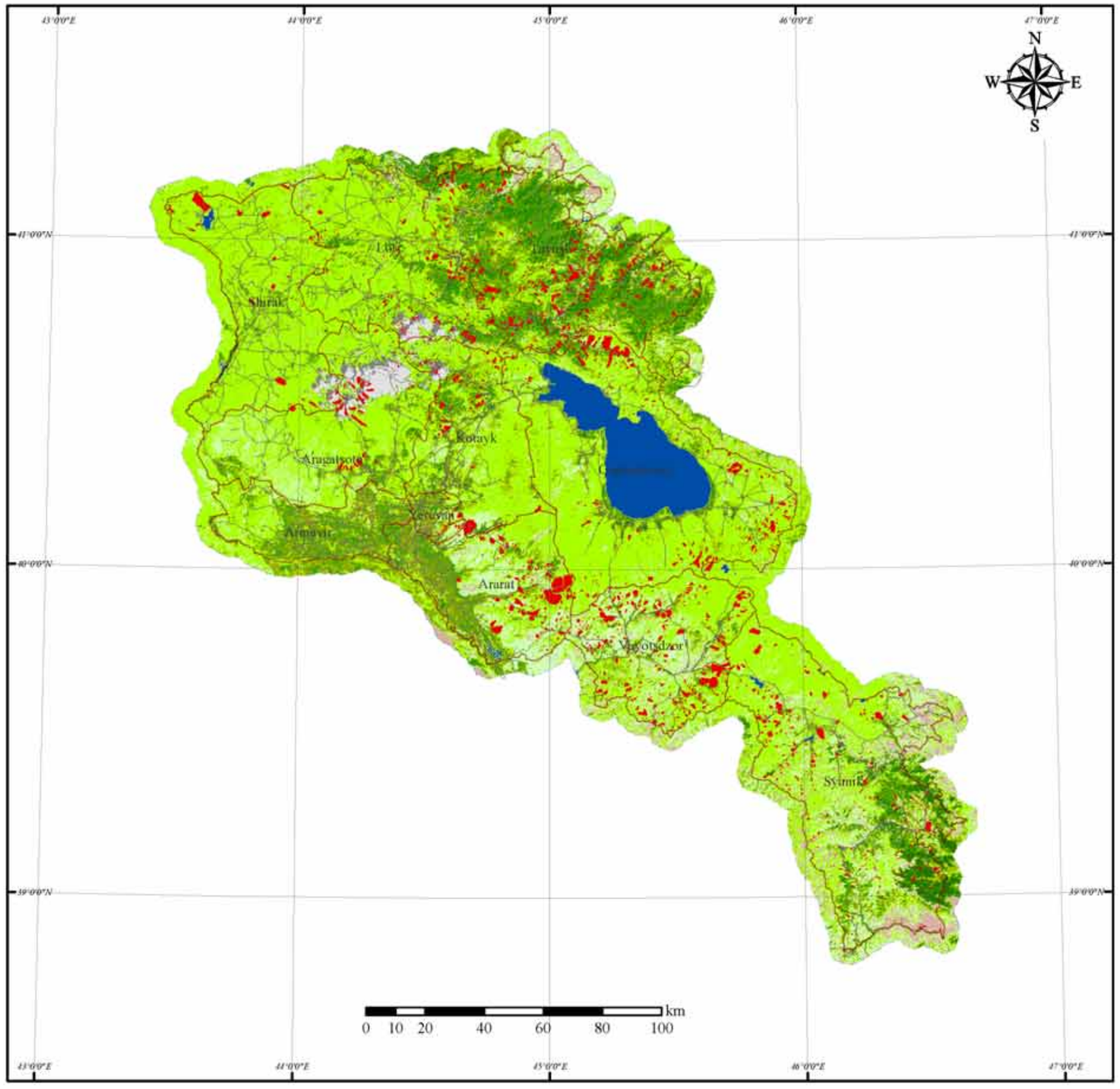
3.5 Vegetation and Landslide Distribution

Vegetation classes were identified by interpreting LANDSAT images acquired in 2000 and 2003 by the JICA study team and shown in Figure 3.12 with landslide distribution.

The density of landslides is high in the region where vegetation is thick compared with bare land as shown in Table 3.9. These regions feature abundant water.

Table 3.9 Vegetation and Landslides Distribution

Vegetation Class	Study Area		Landslide Displaced Mass				
	Area in the study area	Area percentage in the study area	Number of related landslides	Number percentage in all landslides	Area in landslides	Area percentage in all landslides	Area percentage of landslide-displaced mass to each vegetation class area
	(ha)	(%)		(%)	(ha)	(%)	(%)
1: Water	130,974	4.4	0	0	29	0	0.0
2: Bare	139,860	4.7	120	4.8	4,486	3.7	3.2
3: Sparse grass land	293,575	9.9	272	10.9	13,605	11.2	4.6
4: Grassland	1,647,438	55.5	1,107	44.2	62,037	51	3.8
5: Shrub land	127,976	4.3	159	6.3	7,020	5.8	5.5
6: Sparse forest	159,697	5.4	169	6.7	6,604	5.4	4.1
7: Medium forest	230,042	7.7	322	12.9	12,652	10.4	5.5
8: Dense forest	173,645	5.8	282	11.3	11,095	9.1	6.4
9: Snow	513	0	0	0	2	0	0.4
10: Cloud	37,564	1.3	35	1.4	2,360	1.9	6.3
11: Shadow	23,914	0.8	32	1.3	1,585	1.3	6.6
12: Others	4,460	0.2	6	0.2	100	0.1	2.2
Total	2,969,658	100	2,504	100	121,575	100	4.1



Legend

Vegetation

Class

- 1: Water
- 2: Bare
- 3: Sparse grass land
- 4: Grass land
- 5: Shrub land
- 6: Sparse forest
- 7 Medium forest
- 8: Dense forest
- 9: Snow
- 10: Cloud
- 11: Shadow
- 12: Others
- Landslide >= 2 ha.
- Roads
- Administrative Boundary

Figure 3.12 Landslides and Vegetation Map

ÜÏ³ñ 3.12 êáÕ³ÝùÝ»ñ ¨ ì»·» ï ³óÇáÝ ø³ñ ï»½

Map Projection: UTM 38N (WGS1984)

Vegetation classes were identified
by interpreting LANDSAT images acquired in 2000 and 2003.

Landsat Image Data Information

Path and Row	Acquisition Date
168-32	23 August 2000
168-33	8 September 2000
169-31	10 October 2003
169-32	10 October 2003
169-33	10 October 2003
170-31	21 August 2000
170-32	21 August 2000
170-33	21 August 2000

Landslides: identified by the JICA Study Team

JICA

JICA STUDY TEAM

THE STUDY ON LANDSLIDE MANAGEMENT
IN THE REPUBLIC OF ARMENIA

3.6 êáÕ³ÝùÇ ³é³ç³óÙ³Ý Ýí³½»óáõÙ

3.6.1 ²Ù÷á÷áõÙ

(1) ´Ý³Ï³Ý ä³ï×³éÝ»ñÁ

î»ÕáõÙÝ»ñÁ, ÓÝÑ³ÉÁ, ·»ïÇ ù³Ûù³ÛáõÙÁ ëáÕ³ÝùÝ»ñÇ ÑÇÙÝ³Ï³Ý µÝ³Ï³Ý å³ï×³éÝ»ñÝ »Ý, ÇÝãå»ë ³Ù÷á÷í³Í ¿ Ý»ñù¨áõÙ ¨ ÝÏ³ñ³·ñí³Í¿ 3.6.2 ÙÇÝã¨ 3.6.4 µ³ÅÇÝÝ»ñáõÙ:

- ÀÝ¹Ñ³Ýáõñ 2504 ëáÕ³ÝùÝ»ñÇó, ³í»ÉÇ Ù»Í ëáÕ³ÝùÝ»ñÇ µ³ßËÙ³Ý ï³ñ³ÍùÇ Ë ïáõÃÛáõÝÁ ·»ñÇßËáÕ¿ ³ÛÝ í³Ûñ»ñáõÙ, áñ ï»Õ ï³ñ»Ï³Ý ³í»ÉÇ µ³ñÓñ ï»ÕáõÙÝ»ñ »Ý, óáõÛó ï³Éáí áñ ï»ÕáõÙÝ»ñÁ Ï³ñáÕ »Ý ÉÇÝ»É ëáÕ³ÝùÝ»ñÇ ÑÇÙÝ³Ï³Ý å³ï×³éÝ»ñÇó Ù»ÏÁ:

- ´Ý³å³Ñå³ÝáõÃÛ³Ý Ý³Ë³ñ³ñáõÃÛ³Ý »ñ»ùÇó- ãáñë ëáÕ³ÝùÝ»ñÇ ëÛáõÝ»ñÇ ß³ñÅÙ³Ý ·Ý³Ñ³ï Ù³Ùµ, ëáÕ³ÝùÇ ³Ï ïÇí³óÙ³Ý ¨ 100-Çó 120 ÙÙ áõÅ·ÝáõÃÛ³Ý ³ÝÓñ¨Ç Ñ³Ù»Ù³ï áõÃÛ³Ý ÙÇç¨ Ù»Í ï³ñµ»ñáõÃÛáõÝ¿ÝÏ³ï í»É:

- ¶»ïÇ Ñáë³ÝùÇó 100 ÙÙ ï³ñ³ÍáõÃÛ³Ý íñ³ ·ïÝíáÕ ëáÕ³ÝùÝ»ñÇ ïáÏáëÁ 42% ¿ ×ß·ñÇï Ñ³ßí³ñÏÝ»ñáí, óáõÛó ï³Éáí, áñ ·»ïÇ ù³Ûù³ÛáõÙÁ Ï³ñáÕ¿ ÉÇÝ»É ëáÕ³ÝùÝ»ñÇ ÑÇÙÝ³Ï³Ý å³ï×³é:

- 2005Ã ¶áß ·ÛáõÕÇ áõëáõÙÝ³ëÇñáõÃÛáõÝ»ñáõÙ, Ñ³ÉùÁ ¨ Å³Ù³Ý³ÏÁ ÝÙ³Ý³å»ë¿ÇÝ ³ñí³Í ¨ ëáÕ³ÝùÝ»ñÇ ³Ï ïÇí³óáõÙÁ áñáßí»ó:

- ¶»ïÇ Ñáë³ÝùÇó 100 ÙÙ ï³ñ³ÍáõÃÛ³Ý íñ³ ·ïÝíáÕ ëáÕ³ÝùÝ»ñÇ ïáÏáëÁ Ñ³ßí³ñÏí»ó 60% , áñï»Õ ¹³ßïÇ ÇÝí»Ýï³ñ áõëáõÙÝ³ëÇñ³Í 145 ëáÕ³ÝùÝ»ñÁ, áñáÝù íÝ³ë í»É ¿ÇÝ ³ÝÙÇç³å»ë ½»ÏáõóÍ»óÇÝ Ñ³Ù³Ó³ÛÝ î¼Ü-³Ý ¨ »ÝÃ³Ï³éáõóí³Íù³ÛÇÝ ³éÝãáõÃÛáõÝ áõÝ»óáÕ Ï³½Ù³Ï»ñåáõÃÛáõÝ»ñÇ: ¶»ïÇ å³ï×³éáí ³é³ç³ó³Í ëáÕ³ÝùÝ»ñÇ ïáÏáëÁ 23% ¿, áñÇó 10% -Á ÷á÷áË»É¿ ·»ïÇ ÁÝÃ³óùÁ: ê³ Ï³ñáÕ¿ Ñ»ï³·³ÛáõÙ Ýå³ë ï»É ³ÛÝ ÷³ë ïÇÝ, áñ ·»ïÇ ÑáëùÇó ³é³ç³ó³Í É³Ýç»ñÁ ëáÕ³ÝùÝ»ñÇ ÑÇÙÝ³Ï³Ý å³ï×³éÝ»ñÇó Ù»ÏÁ ÉÇÝÇ:

Æ Ñ³í»ÉáõÙÝ ëñ³Ý, Ñ³ÏáõÙÁ ¹»åÇ ëáÕ³ÝùÇ Ù»Í Ë ïáõÃÛáõÝÁ Ñ»é³íáñ ½áÝ³Ý»ñáõÙ ·áñÍáÕ ³ÝáõÕÕ»ÉÇáõÃÛáõÝÝ»ñáí ÁÝ¹áõÝ»ÉÇ¿, ãÝ³Ûí³Í êåÇï³ÏÇ »ñÏñ³ß³ñÅÇó ³é³ç³ó³Í ëáÕ³ÝùÇ ë»ñÝ¹³ÛÇÝ ¹»åùÁ¨ 1988-Ç »ñÏñ³ß³ñÅÇ ³ÝáõÕÕ»ÉÇáõÃÛáõÝÁ Ñ³Ûï ÝÇ¿:

(2) Ø³ñ¹áõ ÏáÕÙÇó ³é³ç³óñ³Í å³ï×³éÝ»ñÁ

Ø³ñ¹Ï³ÛÇÝ ·áñÍáõÝ»áõÃÛáõÝÁ (ÇÝãå»ë ûñÇÝ³Ï, çñÇ ·áñÍ³ÍáõÙÁ ³åñ»Éáõ¨ áéá·»Éáõ Ñ³Ù³ñ, »ñÏñÇ å ïáõÛ ïÁ, Ï³Ù å³ï í³ñ Ï³Ý·Ý»óÝ»Éáõ Ñ³Ù³ñ) Ï³ñáÕ »Ý »ñµ»ÙÝ ³é³ç³óÝ»É ëáÕ³ÝùÝ»ñÇ ³Ï ïÇí³óáõÙ: ²ÛÝ Çñ³Ï³ÝáõÙ ÝÏ³ï í»É¿ áõëáõÙÝ³ëÇñíáÕ ËÙµÇ ÏáÕÙÇó ëáÕ³Ýù³ÛÇÝ ï³ñ³ÍùÝ»ñáõÙ, áñ ï»Õ çáõñÁ ÃáÕ»É »Ý ÑáëÇ íáñ³ÏÝ»ñÇó Ï³Ù ãáñ³ó³Í ³éáõÝ»ñÇó ·»ïÝÇ íñ³:

î³íáõßÇ Ù³ñ½Ç ¸ÇÉÇç³Ý ù³Õ³ùÇ ûñÇÝ³ÏÁ ½·³ÉÇ Ñ³Ù»Ù³ï áõÃÛáõÝ¿ñ çñÇ ÑáëùÇ¨ ëáÕ³ÝùÇ ³Ï ïÇí³óÙ³Ý ÙÇç¨:

àã ÙÇ å³ñ½ Ñ³ñ³µ»ñ³ÏóáõÃÛáõÝ ãÏ³ ï»ÕáõÙÝ»ñÇ¨ ëáÕ³ÝùÇ ³Ï ïÇí³óÙ³Ý ÙÇç¨, áñáÝù Ñ³Ý¹Çå»É ¿ÇÝ ¸ÇÉÇç³ÝáõÙ Ñ³ÛïÝ³µ»ñí³Í ëáÕ³ÝùÝ»ñáõÙ: ê³ ³ÛÝ å³ï×³éáí ¿, áñ- Î³ çñÇ Ù³ï³Ï³ñ³ñ³Ù³Ý ó³Ýó áñï»ÕÇó ÑáëáõÙ¿ Ùáï³íáñ³å»ë 30% çáõñ: ºñµ ëáÕ³ÝùÝ»ñÁ ³í»ÉÇ ³Ï ïÇí ¿ÇÝ ù³Ý Ý»ñÏ³ÛáõÙë 1960-1990 ³Ï³Ý ÃÃ., ÙÇ é³¹ÇáÙ³ë³ÛÇÝ ë³ñù ¿ñ ï»Õ³¹ñí³Í¨ µÝ³ÏãáõÃÛáõÝÁ ³í»ÉÇ ß³ï ¿ñ ù³Ý ³ÛÅÙ: ²Û¹ Å³Ù³Ý³ï çñÇ ß³ï ³í»ÉÇ Ù»Í ë å³éáõÙ ¿ñ ÝÏ³ï íáõÙ, ù³Ý ÑÇÙ³: Ð³Ù³ñíáõÙ ¿, áñ ³í»ÉÇ ßáõï ÑáëùÁ ù³Ý Ã» ÓÛáõÝÁ Ýå³ë ï»óÇÝ ¸ÇÉÇç³ÝáõÙ ëáÕ³ÝùÇ ³é³ç³óÙ³ÝÁ:

´³í³ñ³ñ áõß³¹ñáõÃÛáõÝ¿ ³ÝÑñ³Å»ß ï ¹³ñÓÝ»É Ù³ñ¹áõ ÏáÕÙÇó ³é³ç³óñ³Í å³ï×³éÝ»ñÇ¨ ëáÕ³ÝùÇ ³Ï ïÇí³óÙ³Ý ÙÇç¨ »ÕáÕ Ñ³ñ³µ»ñ³ÏóáõÃÛ³Ý íñ³:.

3.6 Induced Causes of Landslides

3.6.1 Summary

(1) Natural Causes

Precipitation, snow melting, and river erosion are the main natural causes of landslides, as summarized below and described in section 3.6.2 to 3.6.4

- Of the total 2,504 landslides, the area density of landslides appears to be predominant in the areas of higher annual precipitations, indicating that precipitation may be one of the main causes of landslides.
- Some existing landslide stakes movement monitoring data of the Ministry of Nature Protection indicate the corellation between landslide activation and 100 mm to 120 mm intensity of monthly rain
- In the observation of the Gosh Village in 2005, the activation of the landslide with snow melting was identified.
- 42% of the landslides are within a distance of 100 m from the center of rivers, indicating that river erosion may be a main cause of landslides.
- 60% of 145 landslides that had damage reported and were investigated in the field inventory survey were close to rivers.
- The percentage of landslides undercut by rivers is 23%, and the river is the cause of the landslides.

In addition, the landslides are more dense at a distance from active faults, but the generation of landslides by the Spitak earthquake and the earthquake fault in 1988 is recognized.

(2) Man-made Causes

Human activities (for example, the use of water for living and irrigation, earth moving and embanking) may sometimes cause landslide activities. It was in fact observed by the study team in landslide areas that water was left flowing from water taps or drainage ditches to the ground.

In Dilijan City in Tavush Martz, there is a remarkable corellation between water leakage and landslide activities.

No clear correlations between precipitation and landslide activities were seen for the landslides in Dilijan. Rather it has been seen that the water supply network leaks approximately 30% of all the water it carries to the ground. From 1960-1990, landslides were more active than they are at present. A radio parts plant was operating then, and the population was larger.. Water use at that time was far bigger than it is now. It is considered that water leakage rather than rainfall triggers the landslide activities in Dilijan.

Sufficient attention need to be drawn to such correlations between man-made causes and landslide activities.

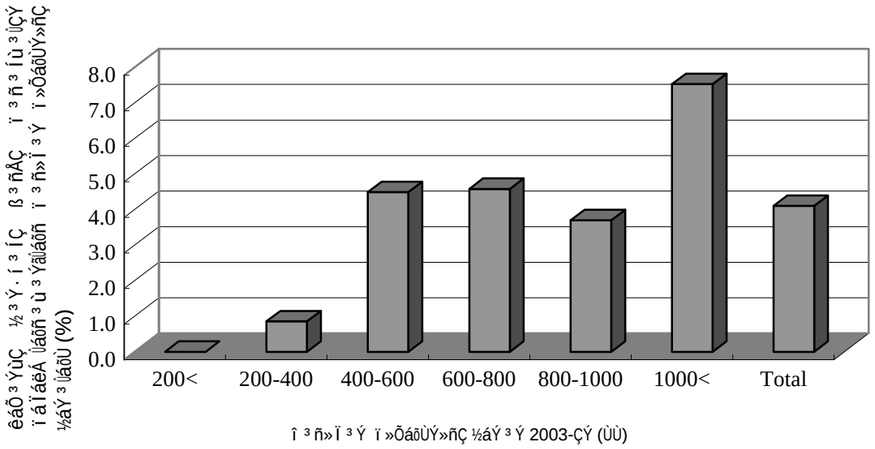
3.6.2 î»ÕáõÙÝ»ñ

2003 –ÇÝ ï³ñ»Ï³Ý ï»ÕáõÙÝ»ñÁ µ³Å³Ýí³Í »Ý 9 Ï³ñ·»ñÇ, ÇÝãå»ë óáõÛó ¿ ïñí³Í ³ÕÛáõë³Ï 3.14áõÙ ëáÕ³ÝùÇ µ³ßËáõÙáí:

êáÕ³ÝùÇ ½³Ý·í³ÍÇ ß³ñÅÇ ï³ñ³ÍùÇ ¨ ï³ñ»Ï³Ý ï»ÕáõÙÝ»ñÇ Ñ³ñ³µ»ñ³ÏóáõÃÛáõÝÁ »ñÏñ³µ³Ý³Ï³Ý Ý³Ñ³Ý·Ý»ñáõÙ áõëáõÙÝ³ëÇñí»É ¿ ³ÛÝå»ë, ÇÝãå»ë óáõÛó ¿ ïñí³Í ²ÕÛáõë³Ï 3.13-áõÙ:

êáÕ³ÝùÝ»ñÇ ½³Ý·í³ÍÇ ß³ñÅÇ ï³ñ³Íù³ÛÇÝ Ñ³Ù³Ù³ëÝáõÃÛáõÝÁ ½·³ÉÇáñ»Ý Ù»Í ¿ ³ÛÝ ï³ñ³ÍùÝ»ñáõÙ, áñ ï»Õ ï»ÕáõÙÝ»ñÁ 1000 ÙÙ-Çó ß³ï »Ý: ²ÛÝ ½·³ÉÇáñ»Ý ÷áùñ ¿ ³ÛÝåëÇ ï»ÕáõÙÝ³ÛÇÝ ½áÝ³Ý»ñáõÙ, áñ ï»Õ ï³ñ»Ï³Ý ï»ÕáõÙÝ»ñÇ ÃÇíÁ 200-Çó ÙÇÝã¨ 400ÙÙ ¿: âÏ³ ³ÛÝåëÇ ½áÝ³, áñ ï»Õ ï³ñ»Ï³Ý ï»ÕáõÙÝ»ñÇ ÃÇíÁ 200ÙÙ ¿ Ï³Ù³í»ÉÇ å³Ï³ë:

ì»ñáÝßÛ³ÉÁ óáõÛó ¿ ï³ÉÇë, áñ ï»ÕáõÙÝ»ñÁ ³½¹áõÙ »Ý ëáÕ³ÝùÇ ½³ñ·³óÙ³Ý íñ³:



ÜÏ³ñ 3.13 êáÕ³ÝùÇ ½³Ý·í³ÍÇ ß³ñÅÇ ï³ñ³Íù³ÛÇÝ ï áÏáëÁ Ûáõñ³ù³Ýáõñ ï³ñ»Ï³Ý ï»ÕáõÙÝ»ñÇ ½áÝ³Ûáõñ

3.6.2 Precipitation

Annual precipitation in 2003 is divided into 9 classes, as shown in Figure 3.14 together with landslide distribution.

The area proportion of landslide displaced masses is remarkably large in the areas with a precipitation of 1000 mm or more. The relationship between the area of landslide-displaced masses and annual precipitation was examined as shown in Figure 3.13.

(There are missing words here) kably small in the annual precipitation zone from 200 to 400 mm. The annual precipitation zone of 200 mm or less doesn't exist.

The above-mentioned shows that precipitation influences the development of landslides.

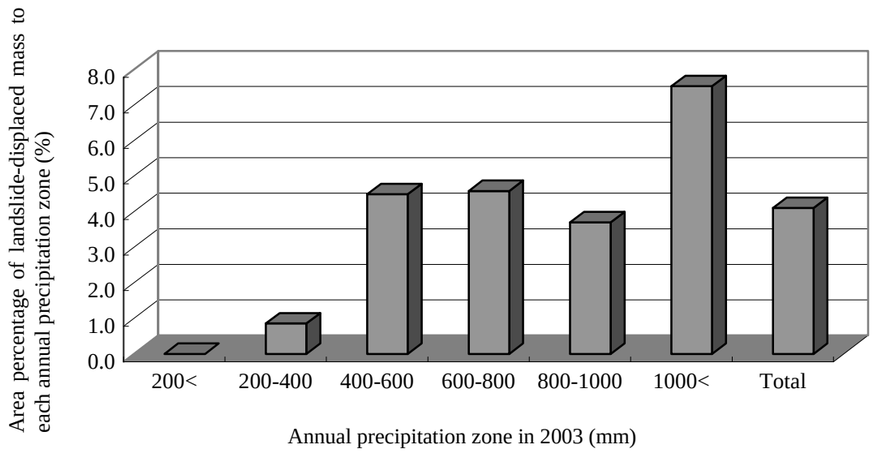
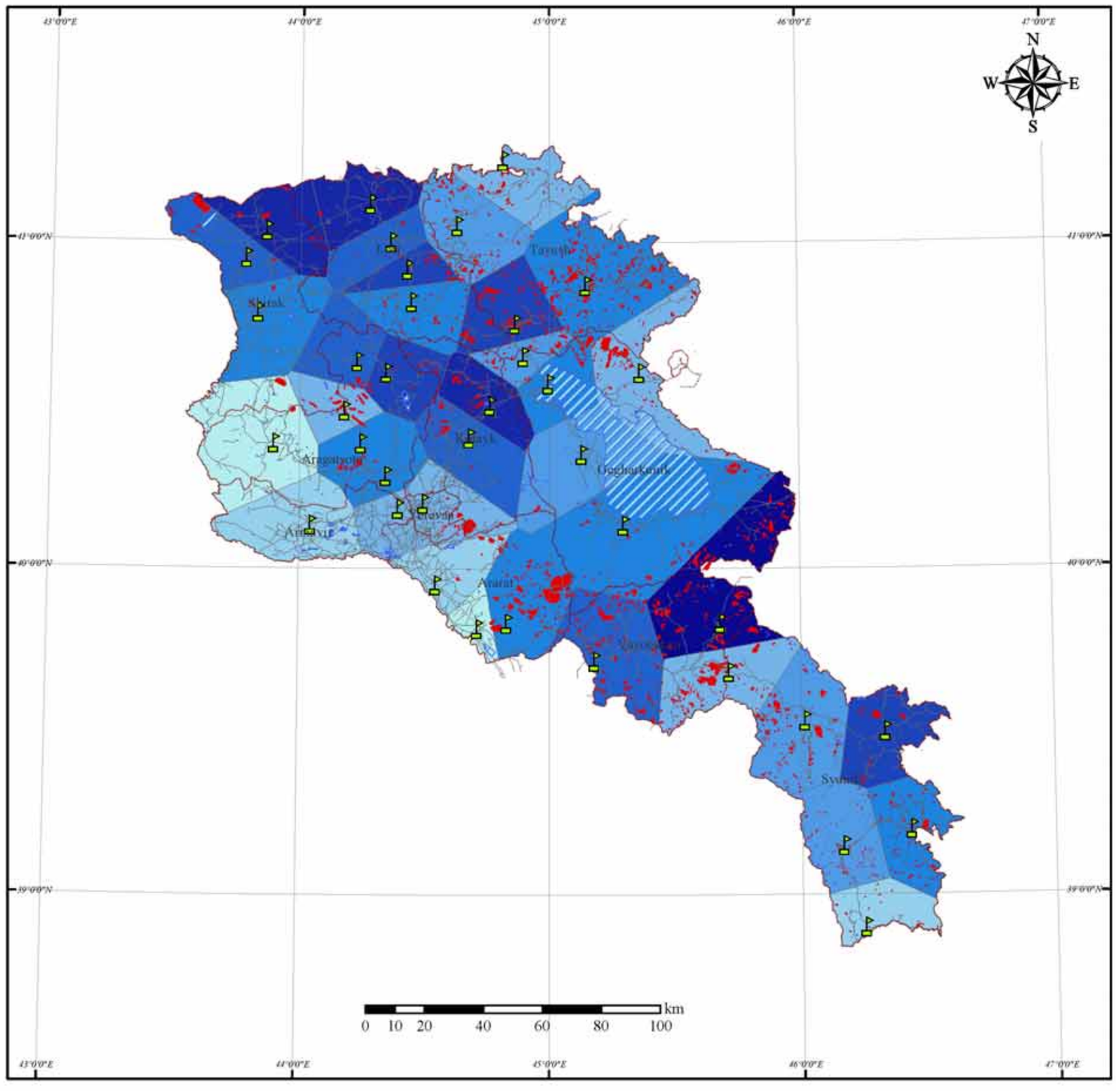


Figure 3.13 Area percentage of landslide-displaced mass for each annual precipitation zone



Legend

Rain Station

Annumal Precipitation (2003)

(mm)

- 0 < mm <= 300
- 300 < mm <= 400
- 400 < mm <= 500
- 500 < mm <= 600
- 600 < mm <= 700
- 700 < mm <= 800
- 800 < mm <= 900
- 900 < mm <= 1,000
- 1,000 > mm
- Landslide >= 2 ha.
- Lake, pond
- Roads
- Administrative Boundary

Map Projection: UTM 38N (WGS1984)

Data Source

Landslides: The JICA Study Team for The Study on Landslide Management in The Republic of Armenia
Precipitation: Armenian Ministry of Nature Protection

Figure 3.14 Landslides and Annual Precipitation (2003) Map

ÜÏ³ñ 3.14 êáÕ³ÝùÝ»ñ ¨ î³ñ»Ï³Ý î»ÕáõÙÝ»ñÇ (2003) ø³ñï»½

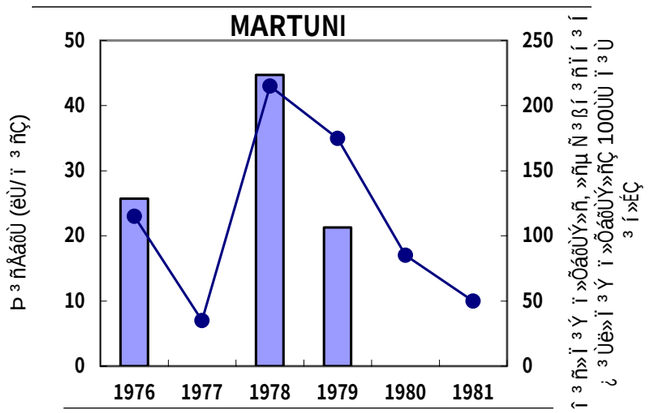
JICA
JICA STUDY TEAM
THE STUDY ON LANDSLIDE MANAGEMENT
IN THE REPUBLIC OF ARMENIA

êáÕ³ÝùÇ ï³ñ»Ï³Ý ß³ñÅ»ñÁ ¨ ï³ñ»Ï³Ý ï»ÕáõÙÝ»ñÁ áõëáõÙÝ³ëÇñí»É »Ý ´Ý³å³ÑåÃ³Ý Ü³Ë³ñ³ñáõÃÛ³Ý ï íÛ³ÉÝ»ñáí: êáÕ³ÝùÇ ß³ñÅÁ ëÛáõÝ»ñÇ ß³ñÅÙ³Ý áõëáõÙÝ³ëÇñáõÃÛ³Ùµ ³éÏ³ ¿ñ 4 í³Ûñ»ñáõÙ Ñ³ñ³µ»ñ³ÏóáõÃÛ³Ý Ñ³Ù³ñ: ²ÝÑÝ³ñ ¿ áõëáõÙÝ³ëÇñ»É Ñ³ñ³µ»ñ³ÏóáõÃÛáõÝÁ ³Ùë»Ï³Ý ï»ÕáõÙÝ»ñÇ ¨ ³Ùë»Ï³Ý ëáÕ³ÝùÝ»ñÇ ÙÇç¨, áñáíÑ»ï¨ ëÛáõÝ»ñÇ ß³ñÅÙ³Ý áõëáõÙÝ³ëÇñáõÃÛ³Ý Ñ³×³Ë³Ï³ÝáõÃÛáõÝÁ ï³ñÇÝ»ñ»ùÇó ãáñë ³Ý·³Ù¿ ¨ ë ï áõ·Ù³Ý ³Ùë³ÃÇíÁ ãÇ ³ÑÓ³Ý³·ñí»É:

ÆÝãå»ë óáõÛó ¿ ï ñí³Í ²ÕÛáõë³Ï 3.15 ¨ ·Í³·Çñ 3.10-áõÙ Ø³ñï áõÝÇ ù³Õ³ùÇ ëáÕ³ÝùÝ»ñáõÙ, Ñ³Ûï Ý³µ»ñí»É ¿, áñ ß³ñÅáõÙÁ ³Ï ï Çí³ó»É ¿, »ñµ ³Ùë»Ï³Ý ï»ÕáõÙÝ»ñÁ 100-Çó µ³ñÓñ »Ý: ìáÏ½³ÉÝÇáõÙ ëáÕ³ÝùÇ ß³ñÅ»ñÁ Ñ³Ï³í³Í »Ý ³Ï ï Çí³Ý³Éáõ, »ñµ ³Ùë»Ï³Ý ï»ÕáõÙÝ»ñÁ 120ÙÙÇó µ³ñÓñ »Ý, µ³Ûó ¸ÇÉÇç³ÝáõÙ ³Ùë»Ï³Ý ï»ÕáõÙÝ»ñÇ ¨ ÑáÕÇ ß³ñÅÇ Ñ³ñ³µ»ñ³ÏóáõÃÛáõÝÁ ãÇ Ñ³Ù³å³ï³ëË³ÝáõÙ: ºñµ ëáÕ³ÝùÇ ß³ñÅÇ ¨ ï»ÕáõÙÝ»ñÇ ÙÇç¨ »ÕáÕ Ñ³ñ³µ»ñáõÃÛáõÝÁ å³ñ½ ã¿, ÑÇÙÝ³Ï³ÝáõÙ ³ÛÉ ·áñÍáÝÝ»ñ »Ý Ýå³ë ï áõÙ ëáÕ³ÝùÇ ³Ï ï Çí³óÙ³ÝÁ:

²ÕÛáõë³Ï 3.10 Þ³ñÅ»ñÇ ù³Ý³ÏÁ ¨ ï»ÕáõÙÝ»ñÇ Ñ³ñ³µ»ñ³ÏóáõÃÛ³Ý í»ñÉáõÍáõÃÛ³Ý ³ñ¹ÛáõÝùÁ

àõëáõÙÝ³ëÇñáõÃÛáõÝ	î³ñ»Ï³Ý ï»ÕáõÙÝ»ñ	î³ñ»Ï³Ý ï»ÕáõÙÝ»ñ, »ñµ Ñ³ßí³ñÏí³Í ¿ ³Ùë»Ï³Ý ï»ÕáõÙÝ»ñÇ 100ÙÙ Ï³Ù³í»ÉÇ	î³ñ»Ï³Ý ï»ÕáõÙÝ»ñ »ñµ Ñ³ßí³ñÏí³Í ¿ ³Ùë»Ï³Ý ï»ÕáõÙÝ»ñÇ 120ÙÙ Ï³Ù³í»ÉÇ
	î³ñ»Ï³Ý ï»ÕáõÙÝ»ñÇ ¨ ëáÕ³ÝùÇ ß³ñÅÇÝ Ýå³ë ï áÕ Ñ³ñ³µ»ñ³ÏóáõÃÛáõÝÁ		
Ø³ñ ï áõÝÇ	-0.18	**0.91**	0.92
ì áÏ½³ÉÝÇ	0.51	0.90	**0.96**
²ËùÇËÉáõ	0.24	0.33	0.56
¸ÇÉÇç³Ý	-0.07	-0.81	-0.59



ÜÏ³ñ 3.15 êáÕ³ÝùÇ ß³ñÅÇ ¨ ï»ÕáõÙÝ»ñÇ Ñ³ñ³µ»ñ³ÏóáõÃÛáõÝÁ Ø³ñ ï áõÝÇ ù³Õ³ùáõÙ

Correlation between yearly landslide movement and yearly precipitation was studied with the data of the Ministry of Nature Protection. Data on landslide movement by the observation of stakes movement in 4 sites was available for correlation. It is not possible to study the correlation between monthly precipitation and monthly landslide movement, because the frequency of observation of the stake movement is three to four times a year and the observation date has not been recorded.

As shown in Figure 3.15 and Table 3.10, in the Martuni City landslide, it was found that the movement activated when the monthly precipitation is over 100 mm. In Vokzalniy, landslide movement tends to activate when the monthly precipitation is over 120 mm, but, in Dilijan, the relationship between monthly precipitation and land movement does not correlate. When the relation to landslide movement and precipitation is not clear, mainly other factors contribute to landslide activation.

Table 3.10 A Quantity of Movement and a Correlation Analysis Result of Precipitation

Observation	Yearly precipitation	Yearly precipitation when monthly precipitation **100mm** or more is accumulated	Yearly precipitation when monthly precipitation **120mm** or more is accumulated
	Correlation coefficient of Yearly precipitation and Landslide movement		
Martuni	-0.18	**0.91**	0.92
Vokzalniy	0.51	0.90	**0.96**
Akhkikhlu	0.24	0.33	0.56
Dilijan	-0.07	-0.81	-0.59

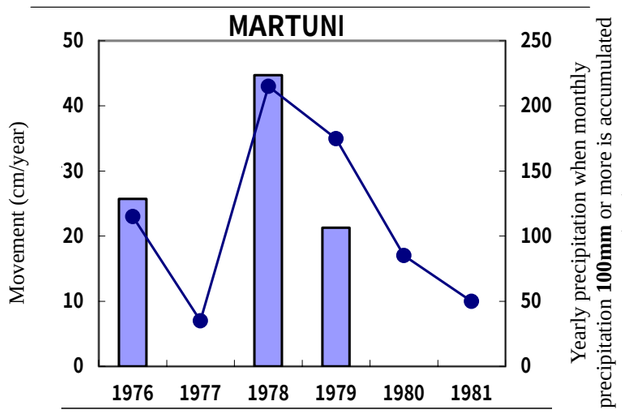


Figure 3.15 Correlation between Landslide Movement and Precipitation in Martuni City

3.6.3 ÒÝÑ³É Snow Thawing

(2005Ã-Ç ¶áß ·ÛáõÕÇ ûñÇÝ³ ÏÝ»ñÇó) (Example of Gosh village in 2005)

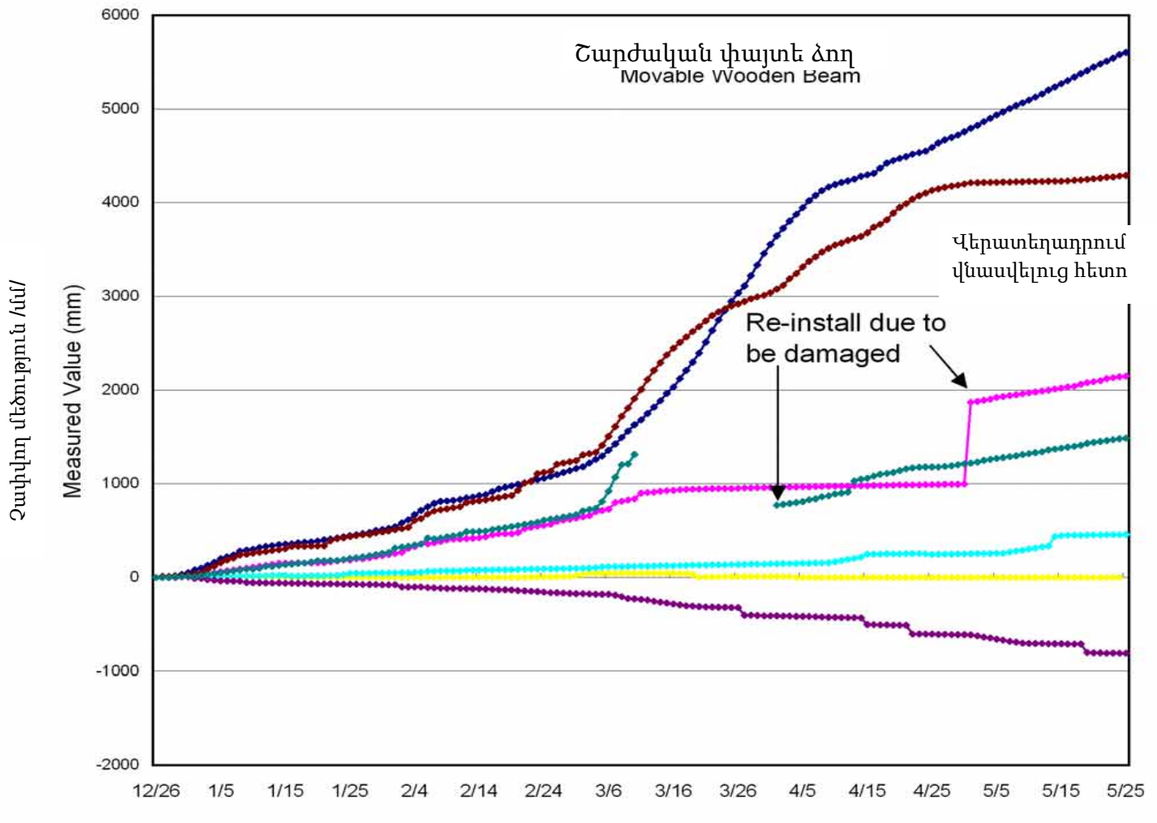
Անցած ձմռանը ձյան տեղումների հետևանքով սողանքային զանգվածի շարժը շատ մեծ էր: 2005թ. Մարտ ամսին Գոշ գյուղում մեկամսյա ուսումնասիրությունների տվյալների համաձայն գրանցվել է 2 մետր տեղաշարժ:

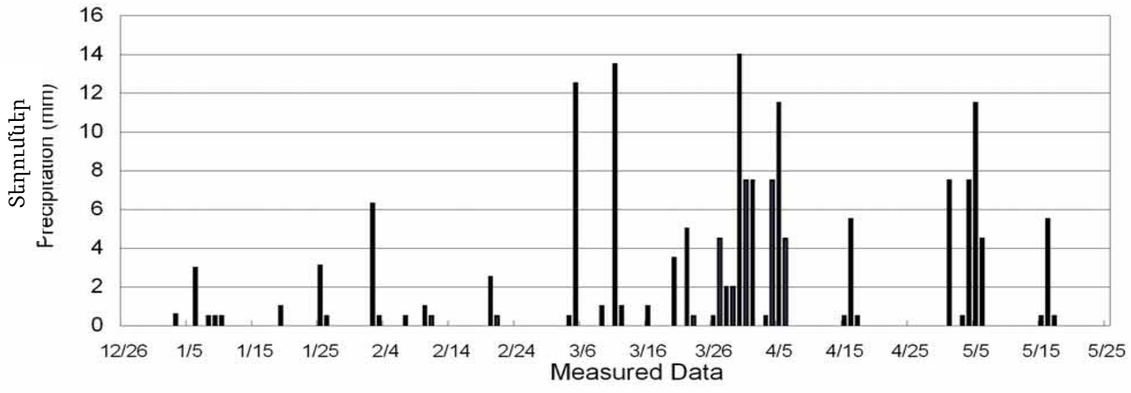
Սողանքի ակտիվության բարձր ցուցանիշը ձմռան ամիսներին պայմանավորված է ոչ միայն ձյան տեղումներով, այլև նրանով, որ բնակիչների կողմից օգտագործվող ջրերը (կենցաղային և այլ) շարունակաբար թափանցել են հողի մեջ:

When snows thaws, landslide mass movement increases. About 2 meters of movement was observed in March 2005 according to an active landslide observation result in Gosh village. Landslide activity in winter is caused not only by snow melting, but also by the continuous running of water by inhabitants to prevent water pipes from being frozen.

ÒÝÑ³ÉÇ ³ñ¹ÛáõÝùáõÙ çáõñÁ ÑáëáõÙ ¿ ×³Ý³å³ñÑÝ»ñÇ »ñÏ³ÛÝùáí, ¨ ³Û¹ ÓÝÑ³ÉÁ áã ÙÇ³ÛÝ ³Ï ï Çí³óÝáõÙ ¿ ëáÕ³ÝùÝ»ñÁ ³ÛÉ Ý³¨ ×³Ý³å³ñÑÝ»ñÁ ¹³ñÓÝáõÙ ¿ Ï»Õ ï á ï :

Situations of the thaw water flows along the road, thaw water make not only landslides activate, but also roads muddy.





ÜÏ³ñ 3.16 2005 Ãí³Ï³ÝÇ ÓÙ»éí³ÝÇó · ³ñáõÝ ¶áß ·ÛáõÕáõÙ ëáÕ³ÝùÇ ï»Õ³ß³ñÅ»ñÁ

Figure 3.16 Landslide Movements in Gosh Village in Winter to Spring 2005

ÒÛáõÝÁ ãÇ ¹³éÝáõÙ ÁÝ¹Ñ³ï³ÏÛ³ çáõñ, Ù³Ï»ñ»ëÇ çáõñ ¨ ãÇ ·áÉáñßÇ³ÝáõÙ Ý³Ëù³Ý Ñ³Éí»ÉÁ: ²Û¹áõÑ³Ý¹»ñÓ, ÝÛáõÃ³Ï³Ý ï»ÕáõÙÝ»ñÇ ³ñï³Ñ³ÛïáõÃÛáõÝÁ, áñï»Õ å»ïù ¿ ÁÝ¹áõÝí»Ý ÓÛ³Ý ï»ÕáõÙÝ»ñÁ ¨ ÓÝÑ³ÉÁ` ëáÕ³ÝùÇ ³Ï ï Çí³óÙ³Ý Ù»ç ÓÝÑ³ÉÇ ¹»ñÁ áõëáõÙÝ³ëÇñ»Éáõ Ýå³ï³Ïáí:

Ö³åáÝ³Ï³Ý ÷áñÓÇ ³ñï³Ñ³ÛïáõÃÛ³Ý ûñÇÝ³ÏÁ Ñ»ï¨Û³ÉÝ¿
SM=6*T(1/180)*P*T,
áñï»Õ
-SM: Ñ³Éí³Í ÓÛ³Ý ù³Ý³ÏÁ (ÙÙ)
-P: ï»ÕáõÙÝ»ñ (ÙÙ)
-T: ûñ»Ï³Ý ÙÇçÇÝ ç»ñÙ³ëï Ç×³Ý (ÙÙ)

- ºñµ ûñ»Ï³Ý ÙÇçÇÝ ç»ñÙ³ëï Ç×³ÝÁ 0 ³ëï Ç×³Ý ¿ Ï³Ù ³í»ÉÇ å³Ï³ë ï»ÕáõÙÝ»ñÁ ã»Ý ÁÝ¹·ñÏíáõÙ åñ³Ïï ÇÏ ï»ÕáõÙÝ»ñÇ Ù»ç¨ å³Ñå³ÝíáõÙ »Ý:
- ºñµ ûñ»Ï³Ý ÙÇçÇÝ ç»ñÙ³ëï Ç×³ÝÁ ·»ñ³½³ÝóáõÙ ¿ 0 ³ëï Ç×³ÝÁ, Ñ³Éí³Í ÓÛ³Ý ·áõÙ³ñÁ Ñ³ßí³ñÏíáõÙ¿¨ ³í»É³óíáõÙ¿ëáíáñ³Ï³Ý ï»ÕáõÙÝ»ñÇÝ:

²ÕÛáõë³Ï 3.17-Á ÝÛáõÃ³Ï³Ý ï»ÕáõÙÝ»ñÇ ûñÇÝ³Ï ¿ óáõÛó ï³ÉÇë, áñÁ Ñ³ßí³ñÏí³Í ¿ û·ï³·áñÍ»Éáí ï»ñÁ Ýßí³Í ³ñï³Ñ³ÛïáõÃÛáõÝÁ: Ò Û³Ý áõÅ»Õ ï»ÕáõÙÝ»ñ »Ý ÝÏ³ï í»É ÑáõÝí³ñÇó ÷»ïñí³ñ ³ÙëÇÝ»ñÇÝ, 2005Ã¨Ù»Í ÝÛáõÃ³Ï³Ý ï»ÕáõÙÝ»ñ Õ»É»Ý 2005Ã-Ç Ù³ñï ÇÝ` ÓÝÑ³Éáí:

²ÕÛáõë³Ï 3.11-Á ¿³Ï³Ý ï»ÕáõÙÝ»ñÇ ÏñÏÝáÕáõÃÛ³Ý Å³ÙÏ»ïÝ»ñÇ ÙÇ Ñ³Ù»Ù³ïáõÃÛáõÝ ¿ ÓÝÑ³Éáí Ñ³Ù»Ù³ï³Í 4 ù³Õ³ùÝ»ñÇ ëáíáñ³Ï³Ý ï»ÕáõÙÝ»ñÇ Ñ»ï: ØÇ ù³ÝÇ ßñç³ÝÝ»ñáõÙ ÁÝ¹áõÝí³Í¿, áñ Ñ³ÏÍ³ÍáõÃÛáõÝÁ ¿³Ï³Ý ï»ÕáõÙÝ»ñáí ÓÝÑ³ÉùÇ Ñ»ï ÙÇ³ëÇÝ ³í»ÉÇ »Ý, ù³Ý ëáíáñ³Ï³Ý ï»ÕáõÙÝ»ñÁ: Ð³ÉùÁ å»ïù ¿ áñ Ù»Í Ñ³ñí³Í Ñ³ëóÝÇ áã ÙÇ³ÛÝ ëáÕ³ÝùÝ»ñÇÝ, ³ÛÉ Ý³¨ Ýë ï í³Íù³ÛÇÝ ³Õ»ïÝ»ñÇÝ ³Û¹ ßñç³ÝÝ»ñáõÙ:

²ÕÛáõë³Ï 3.11 êáíáñ³Ï³Ý¨ ¿³Ï³Ý ï»ÕáõÙÝ»ñ ÓÝÑ³Éáí

ÎñÏÝí»Éáõ ÁÝÃ³óùÁ	úñ»Ï³Ý ï»ÕáõÙÝ»ñ (ÙÙ) ¸ÇÉÇç³Ý ëáíáñ³Ï³Ý	¿³Ï³Ý	Ö³Ùµ³ñÇÏ ëáíáñ³Ï³Ý	¿³Ï³Ý	ºñ¨³ÝÇ³·ñáÑ³ï í³ÍÁ ëáíáñ³Ï³Ý	¿³Ï³Ý	Î³å³Ý ëáíáñ³Ï³Ý	¿³Ï³Ý
2 ï³ñÇ	31	30	30	25	21	**23**	41	**44**
5 ï³ñÇ	42	41	43	**46**	26	**31**	58	**60**
10 ï³ñÇ	49	48	53	**60**	29	**36**	70	**71**
20 ï³ñÇ	56	55	61	**76**	32	**41**	82	81
30 ï³ñÇ	60	59	66	**86**	34	**45**	89	87
50 ï³ñÇ	66	64	73	**100**	36	**49**	97	95

ÀÝ¹·Í í³Í ÃíÝ»ñÁ óáõÛó »Ý ï³ÉÇë, áñ¿³Ï³Ý ï»ÕáõÙÝ»ñÁ ³í»ÉÇ Ù»Í »Ý ù³Ý ëáíáñ³Ï³Ý ï»ÕáõÙÝ»ñÁ.
ÎñÏÝí»Éáõ ÁÝÃ³óùÁ Ñ³ßí³ñÏí³Í¿ Hazen Plot Ù»ÃáÍáí, 1961Çó 2004Ã-Ç ï íÛ³ÉÝ»ñÁ û·ï³·áñÍí»É »Ý Ñ³ßí³ñÏÙ³Ý Ñ³Ù³ñ.
Hazen Plot: F (xi) = i/2N,
àñï»Õ,
F(xi): ³Ý·»ñ³½³Ýó»ÉÇáõÃÛ³Ý Ñ³í³Ý³Ï³ÝáõÃÛáõÝ
i: Ï³ÛáõÝ ÃÇíÁ Ñ³ßí³Í ÷áùñ³·áõÙÝÇó
N: ï íÛ³ÉÝ»ñÇ ÃÇíÁ (³Ûë áõëáõÙÝ³ëÇñáõÃÛ³Ý Ù»ç ¹³ ï³ñÇ¿)

The snow does not become underground or surface water, nor does it evaporate, until it has thawed. Therefore, an expression of substantial precipitation should be derived which would incorporate the contribution of snowfall and snow thawing to landslide activities.

An example such an expression derived from Japanese experience is:
SM=6*T(1/180)*P*T, (Consider expressing this as P=...)
where
-SM: thawing snow amount (mm)
-P: precipitation (mm)
-T: daily mean temperature (mm)

- When the daily mean temperature is 0 degrees or less, the snow does not thaw and it is not included in the practical precipitation.
- When the daily mean temperature exceeds 0 degrees, the amount of the thawing snow is calculated and is added to ordinary precipitation.

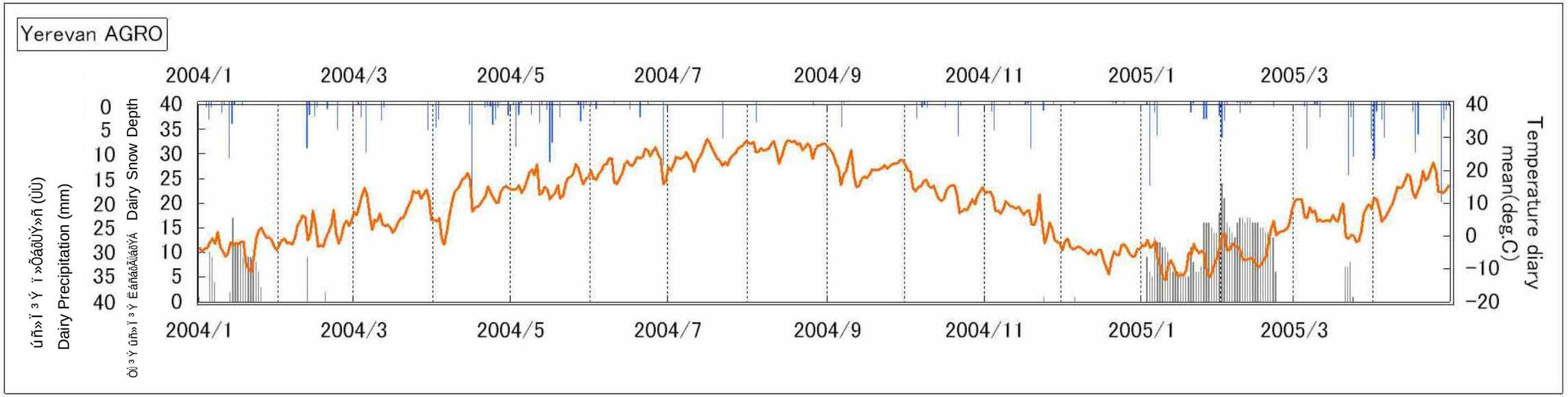
Figure 3.17 shows examples of substantial precipitation calculated by using the above-mentioned expression. There were heavy snows between January and February, 2005, and large substantial precipitation was generated in March 2005 with thawing.

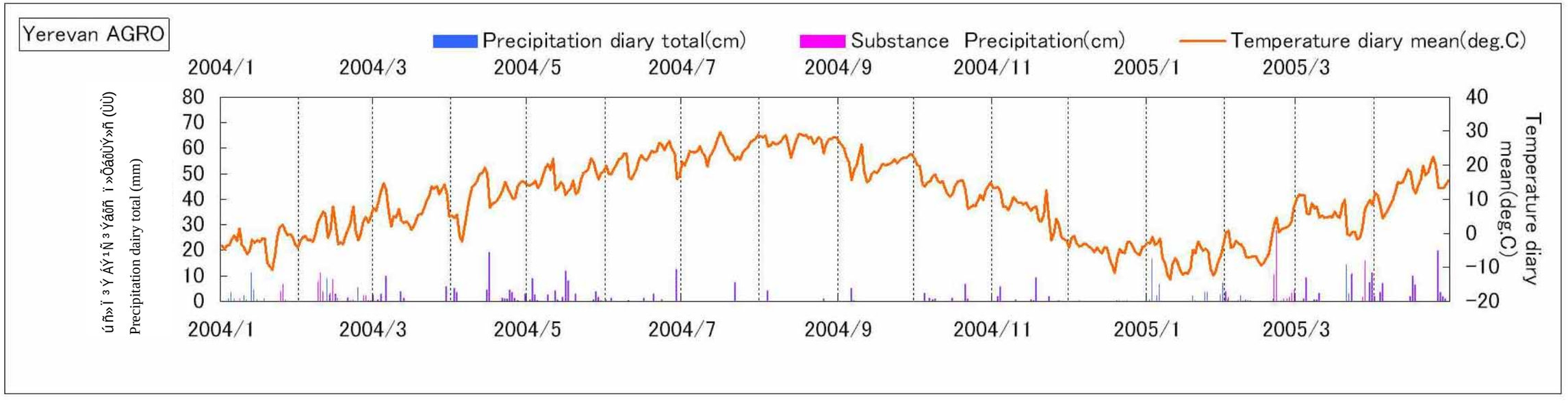
Table 3.11 is a comparison of substantial precipitation with snow thawing, with ordinary precipitation in four cities. In some regions, the substantial precipitation with snow thawing is more than ordinary precipitation. Snow thawing is expected to have a big impact not only on landslides but also on sediment disasters in such regions.

Table 3.11 Precipitation of Ordinary, and Substantial with thawing

Return Period	Daily Precipitation (mm) Dilijan ordinary	substantial	Chambarik ordinary	substantial	Yerevan Agro Site ordinary	substantial	Kapan ordinary	substantial
2 year	31	30	30	25	21	**23**	41	**44**
5 year	42	41	43	**46**	26	**31**	58	**60**
10 year	49	48	53	**60**	29	**36**	70	**71**
20 year	56	55	61	**76**	32	**41**	82	81
30 year	60	59	66	**86**	34	**45**	89	87
50 year	66	64	73	**100**	36	**49**	97	95

Bold figures show that substantial precipitation are bigger than ordinary precipitation.
Return period are calculate by Hazen Plot method, data from 1961 to 2004 are used for the calculation.
Hazen Plot: F (xi) = i/2N,
Where,
F(xi): non-exceedance probability,
i: stand number counted from small one
N: number of data (it is years in this examination.)





ÜÏ³ñ 3.17 êáíáñ³Ï³Ý¨¿³Ï³Ý ï»ÕáõÙÝ»ñÁ ÓÝÑ³Éáí ºñ¨³Ý ù³Õ³ùáõÙ

Figure 3.17 Ordinary and Substantial with Snow thawing Precipitation in Yerevan C

3.6.4 ¶»ï³ÛÇÝ ¿ñá½Ç³

êáÕ³ÝùÝ»ñÇ Ï»ëÁ` 2 Ñ³ Ï³Ù ³í»ÉÇÝ Ùáï»ÝáõÙ ¿ Ù»Í·»ïÇ, áñÁ óáõÛó ¿ ïñí³Í 1:200,000 Ù³ëßï³µ³ÛÇÝ ù³ñï»½Ý»ñáõÙ, 2Ñ³-Çó ÷áùñ ëáÕ³ÝùÁ Ùáï»ó³Íã¿ Ù»Í·»ïÇÝ, ÇÝãå»ë óáõÛó¿ ïñí³Í²ÕÛáõë³Ï 311-áõÙ:

²ÕÛáõë³Ï 3.11 êáÕ³ÝùÝ»ñÇ ù³Ý³ÏÁ ¶»ïÇ ÐáëùÇ Î»Ýïñá Ý³Ï³Ý·ÍÇó 100Ù Ñ»é³ íáñáõÃÛ³Ý íñ³ (1:200,000 Ù³ëßï³µáí)

Ï»ï/ÙÏ³ñ³·ñáõÃÛáõÝ	ø³Ý³ÏáõÃÛáõÝ	´áÉáñ ëáÕ³ÝùÝ»ñÇ ù³Ý³ÏÇ %-ÁÏ (2,504) (%)
êáÕ³ÝùÝ»ñÇ ù³Ý³ÏÁ·»ïÇ ÑáëùÇ Î»Ýïñá Ý³Ï³Ý·ÍÇó 100Ù Ñ»é³ íáñáõÃÛ³Ý íñ³	1,046	41.8
êáÕ³ÝùÝ»ñ. 2Ñ³-Çó ï³ñ³ÍùÇó ùÇã	8	3.2
êáÕ³ÝùÝ»ñ. 2Ñ³¨³í»É ï³ñ³ÍùÇó	1,038	46.0

ú·ï³·áñÍ»ÉáíÙ³ßï³ÛÇÝ ÆÝí»Ýï³ñÑ»ï³½áïáõÙÝ»ñÁ, ³ñÓ³Ý³·ñí³Í 145 ëáÕ³ÝùÝ»ñÇ íÝ³ëÇ¨·»ï»ñÇ ÙÇç¨Ï³åÁ áõëáõÙÝ³ëÇñí»É¿ñ¨³ñ¹ÛáõÝùÝ»ñÁ óáõÛó»Ý ïñí³Í²ÕÛáõë³Ï 3.12-áõÙ:

- ëáÕ³ÝùÝ»ñÇ 33 %-Á Ý»ñ·áñÍáõÙ Ï³Ù ³½¹íáõÙ ¿ ·»ïÇ ÑáëùÇ ÏáÕÙÇó¨·ïÝíáõÙ ¿ ¿ñá½³óí³Íí×³ÏáõÙ (1¨2²Õáõë³ÏáõÙ):
- 60 % ëáÕ³ÝùÝ»ñÇ ï»Õ³µ³ßËí³Í»Ý·»ï»ñÇÝ Ùáï (1, 2¨3³Õ Ûáõë³ÏáõÙ):
- Øáï 40% ëáÕ³ÝùÝ»ñáõÙ Ñëï³Ï Ï³å»ñã»Ý ÝÏ³ï í³Í:

²ÕÛáõë³Ï 3.12 145 êáÕ³ÝùÝ»ñÇ ¸³ßï³ÛÇÝ ÆÝí»Ýï³ñÑ»ï³½áïáõÙÝ»ñÇ¨¶»ï»ñÇ ÙÇç¨Ï³åÁ

Î³åÁ ëáÕ³ÝùÝ»ñÇ¨·»ï»ñÇ ÙÇç¨ (Î³ï»·áñÇ³)	êáÕ³ÝùÝ»ñÇ ÃÇíÁ	îáÏáëÁ
1 ¶»ïÁÑ³ïáõÙ¿ ëáÕ³ÝùÝ»ñÁ (»Ã» ëáÕ³ÝùÝ»ñÇ ½³Ý·í³ÍÝ»ñÁ Ëóí»Ý·»ïÁ, ¹ñ³Ýù ÏÝ»ñ³éí»Ý Ï³ï»·áñÇ³ 2-áõÙ):	33	23%
2 êáÕ³ÝùÝ»ñÁ ÷áËáõÙ »Ý·»ï»ñÇ áõÕáõÃÛáõÝÁ (·»ïÇ áõÕáõÃÛ³Ý ÷á÷áËÙ³Ý¹»åùáõÙ Ïïñíáõ Ù»Ý ëáÕ³Ýù³ÛÇÝ ½³Ý·í³ÍÝ»ñ, ¹ñ³Ýù Ý»ñ³éí³Í»Ý Ï³ï»·áñÇ³ 2-áõÙ):	15	10%
3 Î³å»ñÁ, áã ÷áË³¹³ñÓ ³½¹»óáõÃÛáõÝÝ»ñ	39	27%
4 Ð³ñ³µ»ñáõÃÛáõÝÝ»ñ ãÏ³Ý	58	40%

Î³ñ»ÉÇ¿ ³ë»É, áñ Ñ»ï¨Û³É ³ñ¹ÛáõÝùÝ»ñÇó·»ï³ÛÇÝ ¿ñá½Ç³Ý Ï³½¹Ç ëáÕ³ÝùÇ ³Ï ï ÇíáõÃÛ³Ý íñ³:

3.6.4 River Erosion

Half r of the landslide of 2 ha or more approach big rivers of 1:200,000 scale maps, while landslides under 2 ha do not approach large rivers, as shown in Table 311.

Table 3.11 Landslides within 100 m from River/Stream Centerlines (at 1:200,000-scale)

Item/Description	Quantity	Number percentage in all (2,504)landslides (%)
Number of landslides within a distance of 100 m from stream center-line	1,046	41.8
Landslides: under 2ha in area	8	3.2
Landslides: 2ha and over in area	1,038	46.0

Using the field inventory surveys, the relationship between the 145 landslides with reported damage and rivers was investigated. The results are shown in Table 3.12.

- 33 % of the landslides influence, or are influenced, by river flow, and are under erosion condition (1 and 2 in the table).
- 60 % of landslides are located close to rivers (1, 2 and 3 in the table3.12).
- No clear relationships were observed for about 40% of the landslides.

Table 3.12 Relation between Field Inventory Survey 145 Landslides and Rivers

Relation between landslides and rivers (Category)		Number of landslides	Percentage
1	River undercuts landslides (If landslide masses shift the river, they are included Category 2)	33	23%
2	Landslides shift the river course (In case of river shifting landslide masses are undercut, they are included this category 2).	15	10%
3	Contacts, no mutual influences	39	27%
4	No relationship	58	40%

It can be said that the erosion of the river will influence the activity of the landslide from these results.

3.6.5 ºñÏñ³ß³ñÅ

(1) ÀÝ¹Ñ³Ýáõñ

ºñÏñ³ß³ñÅÇ Ñ»ï¨³Ýùáí ³é³ç³ó³Í ëáÕ³ÝùÝ»ñÇ ëáÕùÇ ¹»åù»ñÁ Ñ³ÛïÝÇ »Ý ³ßË³ñÑáíÙ»Ï:

(2) ä³ï Ù³Ï³Ý ºñÏñ³ß³ñÅ»ñÇÁ å³ï×³é»Ý Ñ³Ý¹Çë³ó»É êáÕ³ÝùÝ»ñÇ:

- ¸»Ï ï»Ùµ»ñÇ 7-Ç êåÇï³ÏÇ »ñÏñ³ß³ñÅÇó Ñ»ïá ÙÇ³ÛÝ Ù»Ï ëáÕ³Ýù ¿ ³é³ç³ó»É: êåÇï³ÏÇ »ñÏñ³ß³ñÅÁ 7 µ³É³Ýáó ¿ñ ¨ »åÇÏ»Ýï ñáÝÁ ·ïÝíáõÙ ¿ñ êåÇï³Ï ù³Õ³ùÇó 10ÏÙ ÑÛáõëÇë-³ñ¨Ùáõï ù: 30ÏÙ »ñÏ³ñáõÃÛ³Ùµ »ñÏñ³ß³ñÅ³ÛÇÝ Ë³Ëïáõ Ù³é³ç³ó³í. êáÕ³ÝùÁ áõÝÇ 100Ù É³ÛÝáõÃÛáõÝ, 1,000Ù »ñÏ³ñáõÃÛáõÝ ¨ Ùáï³íáñ³å»ë 7-10Ù ËáñáõÃÛáõÝ, 20ÏÙ êåÇï³ÏÇó ÑÛáõëÇë-ÑÛáõëÇë³ñ¨Ùáõï ù ¨ ³Ûë »ñÏñ³ß³ñÅÇ íÝ³ëí³ÍùÁ »ñÏ³ñ³Ó·í»É ¿ ÙÇÝã¨ Î³ù³í³ë³ñ ·ÛáõÕ: Þ³ñÅÇ µ³Å³ÝáõÙÁ ÇçÍ³ÍùÇ í»ñÇÝ Ñ³ï í³ÍÇ Ñ»ï ¿: î»Õ³÷ËÍ³Í Ù³ëë³ÛÇ ÏáõïÏ³ÏÙ³Ý ï³ñ³ÍùÁ å³ï í³ñí³Í ¿ ÷áùñ ·»ïáí¨ ÷áùñ ëáÕ³ÝùÇÝ å³ï í³ñ¿ ·áÛ³ó³Í: ²Ûë ëáÕ³ÝùÇ Ùáï³Ï³Ûùáõù, ÷áùñ³Ù³ëßï³µ ÷ÉáõÍ³Í ½³éÇÃ³÷³ÛÇÝ ÷ÉáõÍáõÙÝ»ñ »Ý ³é³ç³ó»É ³Ûë 30ÏÙ-áó »ñÏñ³ß³ñÅÇ íÝ³ëí³ÍùÇ »ñÏ³ÛÝùáí:

²Ûë å³ïÙ³Ï³Ý »ñÏñ³ß³ñÅ»ñáí å³ÛÙ³Ý³íáñí³Í ëáÕ³ÝùÝ»ñÁ óÇïíáõÙ »Ý §UNDP/ GIORISK ¶Çï³-Ñ»ï³½áï³Ï³Ý Ð³Ù³ï»Õ ö³Ï ´³ÅÝ»ïÇñ³Ï³Ý ÀÝÏ»ñáõÃÛáõÝ 2000, êáÕ³ÝùÇ ì ï³Ý·¨ èÇëÏ 2000¦-Çó¨ÝÏ³ñ³·ñí³Í»Ý Ñ»ï¨Û³É Ï»ñåáí:

- 7352Ã.-ÇÝ áõÅ»Õ »ñÏñ³ß³ñÅ¿ ï»ÕÇ áõÝ»ó»É ²ñ÷³·»ïÇ Ñ³ñÃ³í³ÛñÇ í»ñÇÝ ë³ÑÙ³ÝÝ»ñáõÙ: ¸ñ³Ý Ñ»ï¨»óÇÝ ²ñ÷³ÛÇ ï íÛ³É ³í³½³ÝÇ »ñÏ³ÛÝùáí Ù»Í ëáÕ³ÝùÝ»ñ: ºñÏñ³ß³ñÅÇ Ñ»ï¨³Ýùáí ½áÑí»ó ³í»ÉÇ ù³Ý 15.000 Ù³ñ¹ ¨ ³é³ç³ó³í ëáÕ³Ýù: ²Ù»Ý³Ù»Í ÑëÏ³ ëáÕ³ÝùÝ»ñ »Ý Ó¨³íáñí»É²ñï³í³Ý. ê³ñ³í³Ý¨ î»ñå·ÛáõÕ»ñÇÝ Ùáï:
- ²Õ»ï³ÉÇ ¶³ÝÓ³ÏÇ »ñÏñ³ß³ñÅÁ (M= 7.5) ï»ÕÇ ¿ áõÝ»ó»É ê»åï»Ùµ»ñÇ 30-ÇÝ, 1139Ã.: ºñÏñ³ß³ñÅÁ ëå³Ý»É ¿ 250,000-300,000 Ù³ñ¹: ÊñáÝÇÏ ³ÕµÛáõñÝ»ñÁ Ñ³Õáñ¹áõÙ »Ý »ñÏñ³ß³ñÅÇ Ñ»ï¨³Ýùáí Í³ÍÏí³Í Ñëï³Ûï³Ý ï³ñ³ÍùÇ Ù³ëÇÝ (î³Ã¨Çó ÙÇÝã¨ Ð³Õ³Ã, ßñç³å³ï»Éáí ³ÙµáÕç ÐÛáõëÇë³ÛÇÝ ¨ ²ñ¨»ÉÛ³Ý Ð³Ûë³ï³ÝÁ) ¨ ÙÇ ß³ñù ëáÕ³ÝùÝ»ñ »Ý½³ñ·³ó»É: Ø»Í ëáÕ³ÝùÁ ·ïÝíáõÙ ¿ ²É³·³ñÇÏ (øÇ³å³½) É»é³Ý íñ³: ²É³·³ñÇÏ É»é³Ý ëáÕ³ÝùÁ ¹³ ³Ù»Ý³Ù»Í ëáÕ³ÝùÝ»ñÇó Ù»ÏÝ¿, áñÁ »ñµ¨¿ ï»ÕÇ¿ áõÝ»ó»É Ð³Ûë³ï³ÝáõÙ: È»é³Ý·³·³ÃÇ Ùáï³Ï³ÛùÇó åáÏíáõÙ¨ Ý»ñù¨ »Ý ·ÉáñíáõÙ Ù»Í Å³Ûé³ÑáÕ³ÛÇÝ ½³Ý·í³ÍÝ»ñÁ »ñÏáõ áõÕÕáõÃÛáõÝÝ»ñáí: ²ñ¨Ù³ïÛ³Ý ÷Éí³ÍùÁ 5ÏÙ¿, ÙÇÝã¹»é ³ñ¨»ÉÛ³ÝÁ áõÝÇ 10ÏÙ »ñÏ³ñáõÃÛáõÝ: ²ñ¨»ÉÛ³Ý ÷Éí³ÍùÁ Ù³ëÝ³ï³Í¿ ²Ïëáãõ ·»ïÇ Ñ³ñÃ³í³Ûñáí`Ó¨³íáñ»Éáí 2ÏÙ É³ÛÝáõÃÛ³Ùµ¨ 75Ù µ³ñÓñáõÃÛ³Ùµ å³ï³í³ñ³ÛÇÝ çñÁÝ¹áõÝÇã: Ô»Ï-¶»É ÉÇ×Á,áñÁ Ó¨³íáñí³Í ¿ñ áñå»ë ¹ñ³³ñ¹ÛáõÝù, ³é ³Ûëûñ ·áÛáõÃÛáõÝ áõÝÇ:

3.6.5 Earthquake

(1) General

The cases of the landslide slips due to the earthquake are known worldwide.

(2) A Landslide Caused by Historical Earthquake

- Only one landslide was generated by the Spitak earthquake on 7th December 1988. The Spitak earthquake was magnitude 7.0, and the epicenter was 10 km northwest from Spitak City. A 30 km long earthquake fault generated. The landslide was 100 m wide, 1,000 m long, and the depth presumption 7-10 m, 20 km north-northeast from Spitak, and at Kakavasar Village on the earthquake fault extension. The movement separation/ with of head depression was about 100 m. The accumulation zone of displaced mass dammed up a small river and a small landslide dam was formed. Besides this landslide, small-scale slope failures were generated along the 30 km long earthquake fault.

Information about other landslides caused by historical earthquakes are given here from the “UNDP/ GIORISK Science Research Closed Joint Stock Company 2000, Landslide Hazard and Risk 2000.”

- In 735, a strong earthquake (M>7.0) occurred in the upper reaches of the Arpa river valley. It was followed by large landslides across the entire basin of Arpa. More than 15,000 people died as a result of the earthquake and the landslide it produced. The largest giant-landslides formed near the villages of Aratavan, Saravan and Terp.
- The disastrous Ganzak earthquake (M= 7.5) took place on September 30, 1139. The earthquake killed 250,000-300,000 people. Chronicle source reports about a vast area covered by the earthquake (from Tatev to Haghat, encompassing the entirety of N. and E. Armenia) and numerous landslides were developed. The largest landslide was situated on Alagarik (Kiapaz) mountain. The Algarik mountain land-slide is one of the largest giant-landslides that have ever occurred in the territory of Armenia. The near-top part of the mountain split off and huge masses of rocky soils headed downward in two directions. The western fall is 5 km long, while the eastern one is 10 km long. The eastern fall partitioned the Aksou river valley forming a barrage 2 km wide and up to 75 m high. As a result, Ghek-Gel lake was formed.

(3) ²Ï ïÇí ÷Éáõ½áõÙÝ»ñÁ ¨ ëáÕ³ÝùÝ»ñÇ ï³ñ³Íí³ÍáõÃÛ³Ý Ë ïáõÃÛáõÝÁ öáËÏ³å³ÏóáõÃÛáõÝÁ ëáÕ³ÝùÝ»ñÇ ï³ñ³Íí³ÍáõÃÛ³Ý Ë ïáõÃÛ³Ý ¨ ëáÕ³ÝùÝ»ñÇó ³Ï ïÇí ÷Éáõ½áõÙÝ»ñÇ Ñ»é³íáñáõÃÛáõÝÝ»ñÇ áõëáõÙÝ³ëÇñí³Í ¿ ÇÝãå»ë óáõÛó ¿ ï ñí³Í ÜÏ³ñ 3.17-áõÙ: ëáÕ³ÝùÝ»ñÇó ³Ï ïÇí ÷Éáõ½áõÙÝ»ñ áñáÝù û·ï³·áñÍÝ»É »Ý ³Ûë áõëáõÙÝ³ëÇñáõÃÛ³Ý Ñ³Ù³ñ å³ï Ï»ñí³Í »Ý ÜÏ³ñ 3.10: ²Ûë í»ñÉáõÍ³Ï³Ý ³ñ¹ÛáõÝùáõÙ ëáÕ³ÝùÝ»ñÁ ï³ñ³Íí³Í »Ý Ñ³Ù»Ù³ ï³µ³ñ³ñÓñ Ë ïáõÃÛ³Ý ·áïáõÙ` ³Ï ïÇí ÷Éáõ½áõÙÝ»ñÇó Ñ»éáõ:

²Ûë »ñ¨áõÃÇ å³ï×³éÁ Ñ³Ù³ñíáõÙ ¿ ÇÝãå»ë Ý»ñÏ³Ûó í³Í» ÜÏ³ñ 3.10:

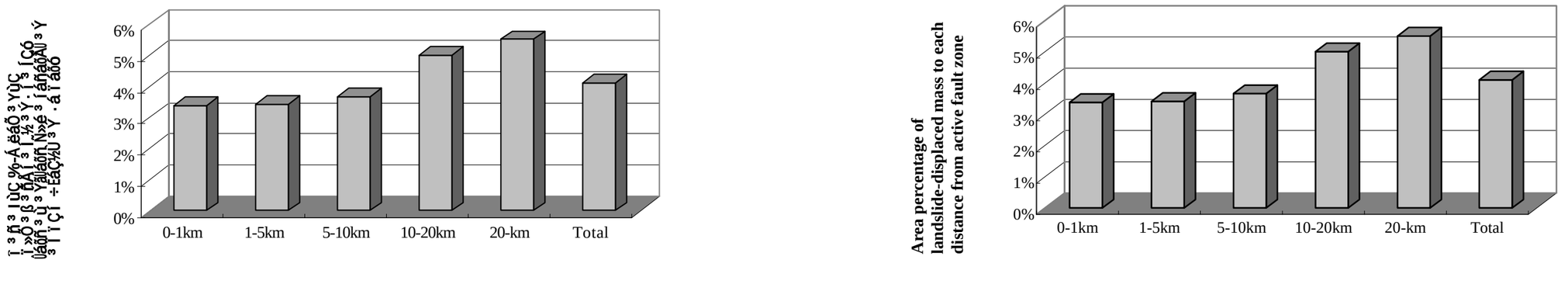
- Àëï ÑÇÝ ïáåá·ñ³ýÇ³ÛÇ ³Ï ïÇí ÷Éáõ½Ù³Ý ß³ñÅ»ñÇ ÙÇ ÏáÕÙÁ Ó¨³íáñáõÙ ¿ Ýáñ ½³éÇÃ³÷Ý»ñ ¨ Ý»Õ É³Ýç»ñ, áõ ³Ûï ·áïÇÝ»ñÁ ½³ñ·³ÝáõÙ »Ý áñå»ë Ñ³Ù»Ù³ ï ³µ³ñÙ»Í ëáÕ³ÝùÝ»ñ:
- Þ³ï Ñ³ï í³ÍÝ»ñ ÙÇ áõñÇß ÏáÕÙáõÙ Ñ³ñÃ³í³Ûñ¿¨ê¨³Ý³ ÉÇ×Ý¿, ³Ûï ëáÕ³ÝùÝ»ñÁ ã»Ý ½³ñ·³Ý³:

(3) Active faults and landslide distribution density

The relationship between landslides distribution density and distances from landslides to active faults is examined as shown in Figure 3.17. The active faults used for this examination are shown in Figure 3.10. The results show that landslides are distributed more densely in zones far from the active faults compared to zones nearer the faults..

The cause of this phenomenon is discussed as follows, and as shown in Figure 3.10.

- One side of the active fault has broken old topography, and has formed new steep and naslopesand these zones are comparatively underdeveloped for big landslides.
- Many parts on the other side of the active fault are plains, and the Sevan Lake, where landslides won't develop.



ÜÏ³ñ 3.17 êáÕ³ÝùÇ ï³ñ³ÍùÇ Ë ïáõÃÛáõÝÁ Ûáõñ³ù³Ýã Ûáõñ ·á ïáõ Ñ»é³íáñáõÃÛ³Ý ³Ï ïÇí ÷Éáõ½áõÙÝ»ñÇó

Figure 3.17 Landslide area density of each distance zone from active faults

ÐÇÝ ëáÕ³ÝùÇ í»ñ³·áñÍÙ³Ý ÑÇÙÝ³Ï³Ý å³ï×³éÝ ¿ »ñÏñ³ß³ñÅÁ: ²Ï ïÇí ÷Éáõ½Ù³Ý Ñ³ñ³ÏÇó ï³ñ³ÍùÝ»ñÁ Ã»ù É³Ýç»ñ »Ý Ï³Ù ³ÉÛáõíÇ³É plane Ï³Ù ÉÇ×, áñáÝù Ýáñ ³ßË³ñÑ³·ñ³Ï³Ý µÝáõÃ³·ñÇâÝ»ñ »Ý, ¨ ëáÕ³ÝùÁ Ñ³Ù»Ù³ ï³µ³ñó³Íñ Ù³ÏñÛ³ÏÇ½³ñ·³ó³Í ¿:

In conclusion, the re-activity of old landslides is the main effect of earthquakes. The areas within the vicinity of the active fault are steep slopes, alluvial planes, or a lake, all of which are new geographical features, upon which landslides are comparatively undeveloped.

3.6.6 Ø³ñ¹Ï³ÛÇÝ ¶áñÍáõÝ»áõÃÛáõÝÝ»ñÁ

Ø³ñ¹Ï³ÛÇÝ ·áñÍáõÝ»áõÃÛáõÝÁ (ûñ. çñÇ û·ï³·áñÍáõÙÁ Ï»Ýë³Ï³Ý¨ áéá·Ù³Ý Ýå³ï³Ïáí, ÑáÕÇ ï»Õ³ß³ñÅáõÙ¨ ¹³µ³íáñáõÙ) Ï³ñáÕ ¿ Ñ³×³Ë å³ï×³é Ñ³Ý¹Çë³Ý³É ëáÕ³ÝùÇ ·áñÍáõÝ»áõÃÛ³Ý: ²Ï ï Çí ëáÕ³Ýù³ÛÇÝ ï³ñ³Íùáõ Ù, ³Ûë áõëáõÙÝ³ëÇñÙ³Ý ¹³ßï³ÛÇÝ ÇÝí»Ýï³ñ Ñ»ï³½áï Ù³Ý ³ßË³ï³Ï³½ÙÁ ÝáõÝå»ë ¹Çï³ñÏ»É ¿ çñÇ µ³óÃáÕáõÙÁ:

úñÝ³ÏÝ»ñÁ î³íáõßÇ Ù³ñ½Ç ¸ÇÉÇç³Ý ù³Õ³ùáõÙ ³ÏÝ³éáõ ¿ÇÝ: æñ³Ù³ï³Ï³ñ³ñÙ³Ý ËáÕáí³ÏÝ»ñÁ ¸ÇÉÇç³Ý ù³Õ³ùáõÙ ÑÇÝ »Ý¨ çñÇ ÏáñáõëïÁ ·Ý³Ñ³ï íáõÙ ¿ ß³ï µ³ñÓñ¨ Ùáï 30% (2003Ã. ÁÝ¹Ñ³Ýáõñ çñ³Ù³ï³Ï³ñ³ñáõÙÁ 1.2 ÙÇÉÇáÝ Ù³ ¿ñ, áñÇó 0.4 ÙÇÉÇáÝ Ù³ ÏáñãÉ¿ Áëï ¸ÇÉÇç³Ý ù³Õ³ùáõÙ Ï³ï³ñí³ÍÑ»ï³½áïáõÃÛ³Ý): 1960-1990ÃÃ., »ñµ ëáÕ³ÝùÝ»ñÝ ³Ï ïÇí ¿ÇÝ, é³¹ÇáÛÇ ¹»ï³ÉÝ»ñÇ ·áñÍ³ñ³ÝÁ ï»Õ³Ï³ÛÍ³Í¿ñ ³Û¹ï³ñ³ÍùáõÙ¨ çñÇ ï³ñ»Ï³Ý Ù³ï³Ï³ñ³ñáõÙÁ 63,000Ù³: ¸ÇÉÇç³ÝÇ µÝ³ÏãáõÃÛáõÝÁ ³Ûëûñ Ùáï 30,000 ¿: Þ³ï ³Ý·³Ù çáõñÝ Çñ áÕç Í³í³Éáí Ù³ï³Ï³ñ³ñí»É ¿ Ï»Ýó³Õ³ÛÇÝ Ýå³ï³ÏÝ»ñáí: ²Û¹ Å³Ù³Ý³Ï çñÇ ÑÝ³ñ³íáñ Ù³ï³Ï³ñ³ñáõÙÁ Ñ»ï¨Û³ÉÝ¿.

- ¶áñÍ³ñ³Ý³ÛÇÝ û·ï³·áñÍÙ³Ý ù³Ý³ÏÁ 0.06 Ù³/ï³ñÇ (0.01Ù³/í)
- Î»Ýó³Õ³ÛÇÝ çáõñ` 2.19 ÙÇÉÇáÝ Ù³/ï³ñÇ (30000 Ù³ñ¹ 0.2Ù³/ûñáõÙ×365 ûñ»ñ)
- æñÇ Ïáñáõëï` 1.13 ÙÇÉÇáÝ Ù³/ï³ñÇ:

ø³ÝÇ áñ ¸ÇÉÇç³Ý ù³Õ³ùÇ Ù»Í³ëÁ Ñ³Ý¹Çë³ÝáõÙ ¿ ëáÕ³Ýù³ÛÇÝ ·áï Ç, çñÇ ÏáñëïÇ 10%-Á ï³ñáÕ ¿ Ý»ñÍÍ»É ëáÕ³Ýù³ÛÇÝ ·áï áõÙ: ¸ÇÉÇç³Ý ù³Õ³ùÁ Ïçñ³Ñ³·»óíÇ ï³ñ»Ï³Ý Ùáï 500ÙÙ ËáÝ³íáõÃÛ³Ùµ: ²Ûë·Ý³Ñ³ï í³Íçñ ï³ñ»Ï³Ý Ïáñáõëï Á ëáÕ³ÝùÝ»ñáõÙ Ñ³í³ë³ñí»É ¿ ï³ñ»Ï³Ý ï»Õáõ Ý»ñÇÝ, Ùáï 500 ÙÙ ã³÷á í: ²Û¹ ¹»åùáõÙ ÙáÝÇ ïáñ³óí³Í ëáÕ³ÝùÝ»ñÇ ³ñ³·áõÃÛ³Ý ÷áËÑ³ñ³µ»ñáõÃÛáõÝÁ ï»ÕáõÙÝ»ñÇ Ñ»ï ó³Íñ ¿ñ ÇÝãå»ë óáõÛó ¿ ïñí³Í ²ÕÛáõë³Ï 3.11-áõÙ: ò³Íñ ÷áËÑ³ñ³µ»ñáõÃÛ³Ý å³ï×³éÁ ÃáõÛÉ¿ ï³ÉçëÙï³Í»É, áñ ³í»ÉÇ ßáõï çñÇ ÏáñáõëïÝ ¿ Ñ³Ý¹Çë³ÝáõÙ ëáÕ³ÝùÇ ËÃ³ÝÁ, ù³Ý ï»ÕáõÙÝ»ñÁ: ²ÛÝ Ñ³Ý¹Çë³ÝáõÙ ¿ ¸ÇÉÇç³Ý ù³Õ³ùÇ ëáÕ³ÝùÝ»ñÇ ÑÇÙÝ³Ï³Ý å³ï×³éÁ: Ü»ñïÛáõÙë ëáÕ³ÝùÝ»ñÇ ß³ñÅÁ, ÇÝãå»ë ï»Õ»Ï³óí³Í¿, ³í»ÉÇ ùÇã ³ÏÝÑ³Ûï¿, ù³Ý³ËÏÇÝáõÙ, ÙÇ ·áõó» çñû·ï³·áñÍÙ³Ýí³½Ù³Ý å³ï×³éáí:

3.6.7 ²ÛÉ å³ï×³éÝ»ñáí å³ÛÙ³Ý³íáñí³Í íÝ³ëÝ»ñÁ ß÷áÃÙáõÝùáí Ï³å»É¿ ëáÕ³ÝùÝ»ñÇ Ñ» ï

162 ï»Õ³ÝùÝ»ñáõÙ, áñ ï»Õ³Ûë áõëáõÙÝ³ëÇñáõÃÛ³Ý ßñç³Ý³ÏÝ»ñáõÙ ¹³ßï³ÛÇÝ ÇÝí»Ýï³ñ Ñ» ï³½áï áõÃÛáõÝ¿ ³Ýóï³óí»É 2004Ã.-ÇÝ, Ï³Ý 34 ï»Õ³ÝùÝ»ñ, áñ ï»Õ Ñ» ï³½áï áõÃÛ³Ý ËÙµÇ ³Ý¹³ÙÝ»ñÇ ÏáÕÙÇó áã ÙÇ Ù³ùáõñ ëáÕ³ÝùÝ»ñ ã»Ý ³ñÓ³Ý³·ñí»É: Àë ï ³Û¹Ù`

- 17 ï»Õ³ÝùÝ»ñÁ ëáÕ³ÝùÝ»ñ ã»Ý¨ íÝ³ëÝ»ñÁ å³ï×³éí³Í »Ý ³ÛÉ ï ÇåÇ É³Ýç³ÛÇÝ ï»Õ³ß³ñÅ»ñáí Ï³Ù ë ï áñ·»ï Ý Û³ Ó¨³÷áËáõÃÛáõÝÝ»ñáí,
- àã ëáÕ³Ýù³ÛÇÝ 17 ï»Õ³ÝùÝ»ñÇ ß³ñùáõÙ »ñÏáõëÁ (2) ï»ÕáõÙÝ³ÛÇÝ ß³ñÅ»ñÇ ï³ñ³ÍùÝ»ñ »Ý, ÙÇ ï»Õ³ÝùÁ (1) Ñ³Ý¹Çë³ÝáõÙ¿ Ï ï ñáõÏ Ñáëù³ÛÇÝ ß³ñÅÇ ï³ñ³Íù:
- ØÝ³ó³Í 14 ï»Õ³ÝùÝ»ñÁ, áñ ï»Õ ß»Ýù»ñ ¨ Ï³éáõÛóÝ»ñ »Ý, áñáÝù, ãÝ³Û³Í Ï³éáõó³Í »Ý ß³ï Ñ³ñÃ·á ïÇÝ»ñáõÙ, íÝ³ëí³Í »Ý; ¸ñ³Ýù å³ñ½ ÑáÕ³ÛÇÝ Ó¨³÷áËáõÃÛáõÝÝ»ñÇ ï³ñ³ÍùÝ»ñ »Ý, áñáÝù Ñ³í³Ý³µ³ñ ÑáÕÇ åÝ¹³óáõÙ ¨/Ï³Ù Ë ï³óáõÙ »Ý` å³ÛÙ³Ý³íáñí³Í ËáÕáí³Ï³ß³ñ»ñáí, ÑáÕÇ áõéãÙ³Ùµ Ï³Ù »ñÏñ³ß³ñÅ»ñáí¨ ³ÛÉÝ: âÝ³Û³Í ÙÇ ·áõó» ³ÝÑñ³Å»ß ï »Ý Ñ» ï³½áï áõÃÛáõÝÝ»ñ Ï³éáõÛóÝ»ñÇ/ï Ý»ñÇ íÝ³ëÝ»ñÇ å³ï×³éÝ»ñÇ å³ñ½³µ³ÝÙ³Ý Ñ³Ù³ñ, ÝÙ³Ý íÝ³ëÝ»ñÁ Ï³ñÍ»ë ß÷áÃÙáõÝùáí Ï³å»É »Ý ëáÕ³ÝùÝ»ñÇ Ñ» ï: ²Û¹ Ï³éáõÛóÝ»ñÇ/ï Ý»ñÇ ÑÇÙù»ñÇó ß³ï »ñÁ ã»Ý Ñ³Ù³å³ï³ëË³ÝáõÙ ÃáõÛÉ ÑáÕ»ñÇ Ñ» ï: êáÕ³ÝùÝ»ñÇ í»ñ³µ»ñÛ³É å³ñ½ ë³ÑÙ³ÝáõÙÝ»ñÝ áõ Ñ³ëÏ³óáÕáõÃÛáõÝÝ»ñÁ ³ÝÑñ³Å»ß ¿ ï³ñ³Í»É í»ñáÝßÛ³ÉÝ»ñÇ ßñç³Ý³ÏÝ»ñáõÙ:

3.6.6 Human Activities

Human activity (for example, the use of water for living and irrigation, earth moving and embanking) may sometimes cause landslide activity. In active landslide areas, field inventory survey staff of this study also sometimes observed the discharging of water.

The example of Dilijan City in Tavush Martz is remarkable. Water supply pipes in Dilijan City are old and leakage rates are very high, at around 30% (total water supply in 2003 was 1.2 million m^3, and 0.4 million m^3 of water leaked out, according to the hearing investigation in Dilijan City.) From 1960-1990, when landslides were active, a radio parts plant was located in the area and 63,000$m^3$of water had been supplied yearly. The population of Dilijan at this time was around 30,000 people, requiring a large volume of domestic water. Presuming that water supply at that time was as follows.

- Amount of factory use: 0.06 m^3/year (0.01m^3/s) (Kindly ceck this figure, above it says 63,000)
- Domestic water：2.19 million m^3/year(30000 people of 0.2m^3/day ×365 days)
- Water leakage: 1.13 million m^3/year.

Because a large part of Dilijan City is landslide-land, 10% of the water leakage may infiltrate in the landslide land, or about 500 mm a year. This estimated annual water leakage may be considered equivalent to an annual precipitation of around 500 mm. The correlation of the monitored landslide speed with precipitation was low for these years as shown in Table 3.11. This may be explained when one considers that the leakage of water, rather than rainfall, was triggering the landslide, and was its main cause in Dilijan. At present, landslide movement is reported to be less evident than before, probably due to decreasing water use.

3.6.7 Damages by other causes confusingly claimed due to landslides

Among 162 sites where the field inventory survey was undertaken under this study in 2004, there were 34-sites where no clear landslides were observed by the study team as follows:

- 17 sites were not landslide areas and damages were caused by other types of slope movement or ground deformations,
- Among these 17 sites, two (2) sites were areas of fall-type movement, and one (1) site was an area of rapid-flow type movement
- The remaining 14 sites where buildings or housings - though constructed on very flat grounds - were damaged, were areas of simple land deformation, such as consolidation and/or compression land settlement, land settlement due to piping, frost heave, or earthquake and so on. Although researches may be necessary to clarify the causes of damages to buildings/houses, such damages seem to have been confusingly claimed due to landslides.Many bases of buildings/houses are not made to stand on weak ground. Clear definitions and understandings on landslide need to be disseminated among those concerned.

3.7 êáÕ³ÝùÇ ¸³ë³Ï³ñ·áõÙÁ Þ³ñÅÙ³Ùµ ¨ ÜÙáõÃ»ñÇ î»ë³ÏÝ»ñáí

¸³ßï³ÛÇÝ ÇÝí»Ýï³ñ Ñ»ï³½áïáõÃÛ³Ý 162 ï»Õ³ÝùÝ»ñ ¹³ë³Ï³ñ·í³Í »Ý ß³ñÅáí ¨ ÝÙáõÃ»ñÇ ï»ë³ÏÝ»ñáí, Ñ³Ù³å³ï³ëË³Ý ²Õ ÛáõË³Ï 3.12. î»ÕáõÙÝ»ñ, Ï ï ñáõÏ ÑáëùÙ³ÛÉ ï»ë³ÏÝ»ñÇ Ó¨³÷áËáõÃÛáõÝÝ»ñ (ûñ. »ñÏñ³ß³ñÅ, ·ñáõÝïÇ ï»Õ³ß³ñÅ) ã¿ÇÝ ¹Çï³ñÏ íáõÙ áñå»ë ëáÕ³ÝùÝ»ñ: î³ëÝÛáÃ (17) ï»Õ³ÝùÝ»ñ 162 ¹³ßï³ÛÇÝ ÇÝí»Ýï³ñ ï»Õ³ÝùÝ»ñÇó ã¿ÇÝ ¹³ë³Ï³ñ·íáõÙ áñå»ë ëáÕ³ÝùÝ»ñ: ØÛáõë 145 ï»Õ³ÝùÝ»ñÁ ¹Çï³ñíáõÙ ¿ÇÝ áñå»ë ëáÕ³ÝùÝ»ñ:

²ÕÛáõë³Ï 3.12-Ç ÝÛáõÃ»ñÇ ï»ë³ÏÝ»ñÁ ¹³ë³Ï³ñ·í³Í ¿ÇÝ ²ÕÛáõë³Ï 3.13-ÇÝ Ñ³Ù³å³ï³ëË³Ý: ²ÕÛáõë³Ï 3.14 óáõÛó ¿ ï³ÉÇë ß³ñÅÇ ï»ë³ÏÇ Ù³Ýñ³Ù³ëÝ µ³ó³ ïñáõÃÛáõÝÁ:

²ÕÛáõë³Ï 3.12 ÝáõÝå»ë óáõÛó ¿ ï³ÉÇë 162 ¹³ßï³ÛÇÝ ÇÝí»Ýï³ñ ï»Õ³ÝùÝ»ñÇ Ûáõñ³ù³ÝãÛáõñ ï»ë³ÏÇ ù³Ý³ÏÁ: 145 ëáÕ³ÝùÝ»ñÇ ÝÛáõÃ³Ï³Ý ¹³ë³Ï³ñ·áõÙÝ»ñÁ Ñ³ëï³ï³í³Í ¹³ßï³ÛÇÝ ÇÝí»Ýï³ñ Ñ»ï³½áïáõÃÛ³Ý ÏáÕÙÇó Ñ»ï¨Û³ÉÝ »Ý. (1) ²å³ñÝ»ñ 0%, (2) ÐáÕÙÝ³Ñ³ñí³Í ²å³ñ 30%, (3) ²å³ñÝ»ñÇ Ï ïáñÝ»ñ 41% and (4) ÑáÕ 29%. 145 ëáÕ³ÝùÝ»ñÇ ß³ñÅ»ñÇ ï»ë³ÏÝ»ñÝ »Ý` (1) éáï³óÇáÝ ëáÕù 15%, (2) Ð³ÙÁÝÃ³ó ëáÕù 9%, (3) Î³éáõó³Íù³ÛÇÝ ëáÕù 51%, (4) ÐáëáÕ ëáÕù 10% and (5) ¾ñá½Ç³ÛÇ ³ñ¹ÛáõÝùÇó ³á³ç³ó³Í ëáÕù 15%:

17 ï»Õ³ÝùÝ»ñÁ íÝ³ë³Í »Ý ëáÕ³ÝùÇó ï³ñµ»ñ ³ÛÉ å³ï×³éÝ»ñáí. ²Ûë 17-Ç ß³ñùáõÙ 2 ï»Õ³ÝùÝ»ñÁ §î»ÕáõÙÝ³ÛÇÝ ïÇåÇ¦ ¿ÇÝ, 1-Á` §Î ïñáõÏ Ñáëù³ÛÇÝ ïÇåÇ¦: ØÛáõë 14 ï»Õ³ÝùÝ»ñáõÙ íÝ³ëÝ»ñÁ å³ÛÙ³Ý³ íáñí³Í »Ý ·ñáõÝïÇ ï»Õ³ß³ñÅáí/³ÝÏáõÙáí, áõéãÙ³Ùµ, »ñÏñ³ß³ñÅ»ñáí ¨ ³ÛÉÝ: 3.15 ²ÕÛáõë³ÏÁ óáõÛó ¿ ï³ÉÇë ·ñáõÝïÇ ï»Õ³ß³ñÅáí/³ÝÏáõÙáí å³ÛÙ³Ý³ íáñí³Í íÝ³ëÇ Ù»Ë³ ÝÇ½ÙÇ ûñÇÝ³ ÏÝ»ñ:

3.7 Landslide Classification by Movement and Types of Materials

The 162 field inventory survey sites were classified by movement and material types as shown in Table 3.12. Falls, rapid flows, and other deformation types (ex. earthquake, land-settlement) were not regarded as landslides. Seventeen (17) out of the 162 field inventory sites were not classified as landslides. The other 145 sites were recognized as landslides.

The types of materials listed in Table 3.12 are characterized in Table 3.13. The material classifications of the 145 landslides confirmed by the field inventory survey are: (1) Rock 0%, (2) Weathered Rock 30%, (3) Debris 41% and (4) Earth 29%. The types of movement of the 145 landslides are: (1) Rotational slide 15%, (2) Translational slide 9%, (3) Compound slide 51%, (4) Flowslide 10% and (5) Creep 15%.

Table 3.14 shows a detailed explanation of the movement types.

Of the 17 sites which were damaged by causes other than landslide, 2 sites were ‘Fall type’, and 1 site was ‘Rapid Flow type’. The other 14 sites w damaged by land-settlement/subsidence, frozen heaving, earthquakes and so on. Table 3.15 shows examples of the mechanisms for damage by land-settlement/ subsidence.

²ÕÛáõë³Ï 3.13 êáÕ³ÝùÇ ÜÛáõÃ»ñÁ ¨ Þ³ñÅÙ³Ý ¸³ë³Ï³ñ·áõÙÁ

	ÜÛáõÃÇ î»ë³ÏÁ				
	²å³ñ	ÐáÕÙÝ³Ñ³ñ-í³Í²å³ñ	²å³ñÇ Î ïáñÝ»ñ	ÐáÕ	ÀÝ¹Ñ³Ýáõñ
		öÉÍ³Íù (²å³ñÝ»ñÇ ÷ÉÍ³Íù/Rapid Slope Failure)			
öÉÍ³Íù	**R-FALL** 1 ï»Õ³Ýù	**W-FALL** 0 ï»Õ³Ýù	**D-FALL** 0 ï»Õ³Ýù	**E-FALL** 1 ï»Õ³Ýù	2 ï»Õ³Ýù
		Î ï ñáõÏ Ñáëù (²å³ñÝ»ñÇ Ï ï áñÝ»ñÇ Ñáëù/ ò»ËÇ Ñáëù/ öÉáõ¼áõÙ)			
¼³éÇÃ³÷ Ñáëù	**R-RAFL** 1 ï»Õ³Ýù	**W-RAFL** 0 ï»Õ³Ýù	**D-RAFL** 0 ï»Õ³Ýù	**E-RAFL** 0 ï»Õ³Ýù	1 ï»Õ³Ýù
		êáÕ³Ýù			
èáï³óÇ³Ý êáÕù	**R-ROSL** 0 ëáÕ³ÝùÝ»ñ	**W-ROSL** 5 ëáÕ³ÝùÝ»ñ	**D-ROSL** 11 ëáÕ³ÝùÝ»ñ	**E-ROSL** 6 ëáÕ³ÝùÝ»ñ	22 ëáÕ³ÝùÝ»ñ
Ð³ÙÁÝÃ³ó êáÕù	**R-TRSL** 0 ëáÕ³ÝùÝ»ñ	**W-TRSL** 7 ëáÕ³ÝùÝ»ñ	**D-TRSL** 5 ëáÕ³ÝùÝ»ñ	**E-TRSL** 1 ëáÕ³ÝùÝ»ñ	13 ëáÕ³ÝùÝ»ñ
´³½Ù³ß»ñï êáÕù	**R-COSL** 0 ëáÕ³ÝùÝ»ñ	**W-COSL** 28 ëáÕ³ÝùÝ»ñ	**D-COSL** 31 ëáÕ³ÝùÝ»ñ	**E-COSL** 14 ëáÕ³ÝùÝ»ñ	73 ëáÕ³ÝùÝ»ñ
Ð»Õ»Õ³ÛÇÝ êáÕù	**R-FLSL** 0 ëáÕ³ÝùÝ»ñ	**W-FLSL** 0 ëáÕ³ÝùÝ»ñ	**D-FLSL** 8 ëáÕ³ÝùÝ»ñ	**E-FLSL** 7 ëáÕ³ÝùÝ»ñ	15 ëáÕ³ÝùÝ»ñ
¾ñá½Ç³ÛÇ ³ñ¹ÛáõÝùÇó ³á³ç³ó³Í ëáÕù (â³÷³½³Ýó¹³Ý¹³Õß³ñÅ, àã ï ïñí³Íù»ñ)	**R-CREE** 0 ëáÕ³ÝùÝ»ñ	**W-CREE** 4 ëáÕ³ÝùÝ»ñ	**D-CREE** 4 ëáÕ³ÝùÝ»ñ	**E-CREE** 14 ëáÕ³ÝùÝ»ñ	22 ëáÕ³ÝùÝ»ñ
ÀÝ¹Ñ³Ýáõñ	0 ëáÕ³ÝùÝ»ñ	44 ëáÕ³ÝùÝ»ñ	59 ëáÕ³ÝùÝ»ñ	42 ëáÕ³ÝùÝ»ñ	145 ëáÕ³ÝùÝ»ñ
		²ÛÉÒ¨³÷áËáõÃÛáõÝ			
²ÛÉÒ¨³÷áËáõÃÛáõÝ	**R-OTHE** 0 ï»Õ³Ýù	**W-OTHE** 0 ï»Õ³Ýù	**D-OTHE** 5 ï»Õ³Ýù	**E-OTHE** 9 ï»Õ³Ýù	14 ëáÕ³ÝùÝ»ñ

Table 3.13 Landslide Material and Movement

Type of Movement	Type of Material				
	Rock	Weathered Rock	Debris	Earth	Total
		Fall (Rock Fall/Rapid Slope Failure)			
Fall	**R-FALL** 1 site	**W-FALL** 0 site	**D-FALL** 0 site	**E-FALL** 1 site	2 sites
		Rapid Flow (Debris Flow/Mud Flow/Avalanche)			
Rapid Flow	**R-RAFL** 1 site	**W-RAFL** 0 site	**D-RAFL** 0 site	**E-RAFL** 0 site	1 sites
		Landslide			
Rotational Slide	**R-ROSL** 0 landslide	**W-ROSL** 5 landslides	**D-ROSL** 11 landslides	**E-ROSL** 6 landslides	22 landslides
Translational Slide	**R-TRSL** 0 landslide	**W-TRSL** 7 landslides	**D-TRSL** 5 landslides	**E-TRSL** 1 landslide	13 landslides
Compound Slide	**R-COSL** 0 landslide	**W-COSL** 28 landslides	**D-COSL** 31 landslides	**E-COSL** 14 landslides	73 landslides
Flow Slide	**R-FLSL** 0 landslide	**W-FLSL** 0 landslide	**D-FLSL** 8 landslides	**E-FLSL** 7 landslides	15 landslides
Creep (Extremely slow movement, no scarps)	**R-CREE** 0 landslide	**W-CREE** 4 landslides	**D-CREE** 4 landslides	**E-CREE** 14 landslides	22 landslides
Total	0 landslides	44 landslides	59 landslides	42 landslides	145 landslides
		Other Deformation			
Other Deformation	**R-OTHE** 0 site	**W-OTHE** 0 site	**D-OTHE** 5 site	**E-OTHE** 9 site	14 landslides

²ÕÛáõë³Ï 3.14 ÐáÕÙÝ³Ñ³ñÙ³Ý ³ë ï Ç×³ÝÁ

î»Õ³÷áËí³Í½³Ý·í³ÍÇ Ù³ï»ñÇ³ÉÇ Ó¨³íáñÙ³Ý ï ÇåÁ		ÜÏ³ñ³·ñáõÃÛáõÝ
²å³ñ	**àãÇÝã**	âï³ ³å³ñÇ ÑáÕÙÝ³Ñ³ñÙ³Ý ï»ë³Ý»ÉÇ Ýß³Ý
	âÝåÇÝ	ÀÝ¹Ñ³ï ·ÉËë³íáñ Ù³Ï»ñ»ëÇ ·áõÝ³½ñÏáõÙÁ, ³å³ñÇ Ù³ï»ñÇ³ÉÁ Ï³ñáÕ ¿ ·áõÝ³½ñÏí³Í ÉÇÝ»É ¨ áñáßÝ»ñÁ ³í»ÉÇ ÃáõÛË ù³Ý Ã³ñÙ³å³ñÁ:
ÐáÕÙÝ³Ñ³ñí³Í ³å³ñ	**â³÷³íáñ**	²å³ñÝ»ñÇ ÝÛáõÅ»ñÇ Ï»ëÇó ùÇãÁ Ý»ñÏ³ ¿ Ï³Ù áñå»ë ß³ñáõÝ³Ï³ÏÝ ßÇÝ³ñ³ñáõÃÛáõÝ Ï³Ù áñå»ë ÑÇÙÝ³Ï³Ý ù³ñ»ñ
	ËÇë ï	²å³ñÝ»ñÇ ÝÛáõÅ»ñÇ Ù»Í Ù³ëÁ ÷ã³ó³Í ¿, ¹»½ÇÝ ï»·ní³Í ÑáÕÇÝ, Ï³Ù»ñÏáõëÁ ÙÇ³ëÇÝ; Ù»Í Ñ³ní³Í ¿ µáõÝ½³Ý·í³ÍÇ Ï³éáõó í³ÍùÇÝ
ÐáÕ/²å³ñÇÏ ïáñÝ»ñ Ì»ñçÝ³Ï³Ý		´áÉáñ ³å³ñÝ»ñÇ ÝÛáõÅ»ñÁ í»ñ³÷áËí³Í »Ý ÑáÕÇ; ½³Ý·í³ÍÇ Ï³éáòóí³ÍùÁ ¨ ÝÛáõÅ»ñÁ áãÝã³óí³Í »Ý; Ù»Í ÷á÷áËáõÅÛáõÝ¿ Ï³ï³ñí»Éí³í³ÉÇ Ù»ç, µ³ÛóÑáÕÁ Ï³ïÇ·áñ»Ý ãÇ »Õ»É ï ñ³Ýëå áñï³íáñí³Í

Table 3.14 Degree of Weathering or Alternation

Displaced mass material composition type		Description
Rock	**None**	No visible sign of rock material weathering/Alternation
	Slight	Discoloration on major discontinuity surface; rock material may be discolored and somewhat weaker than fresh rock
Weathered Rock	**Moderate**	Less than half of the rock material is present either as a continuous framework or as core stones
	Severe	Most of rock material is decomposed, disintegrated to a soil, or both; original mass structure is largely intact
Earth/Debris	**Complete**	All rock material is converted to a soil; mass structure and material fabric are destroyed; a large change in volume has occurred , but soil has not been transported significantly

²ÕÛáõë³Ï 3.15 È³ÝçÇß³ñÅÇ ¹³ë³Ï³ñ·áõÙ 1/3

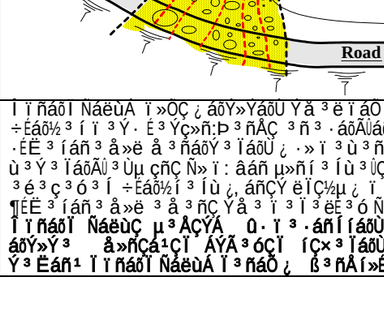
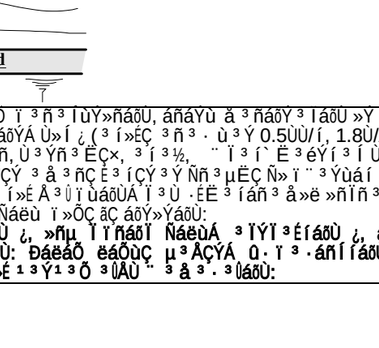
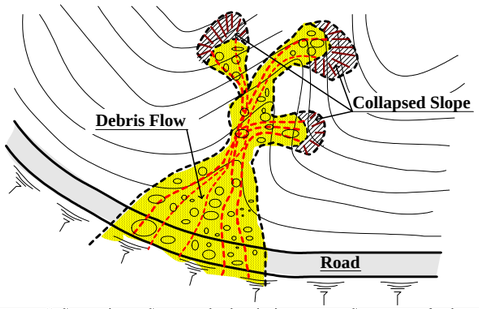
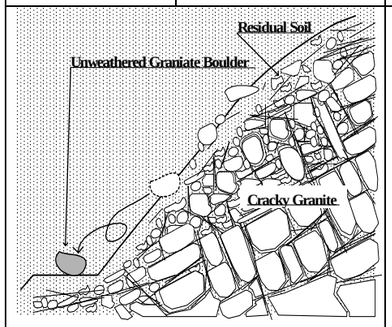
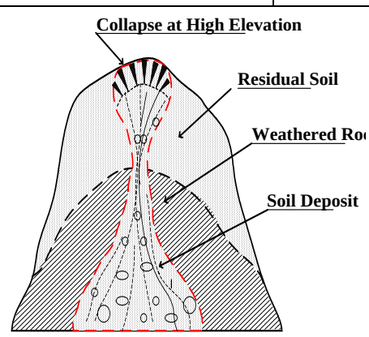
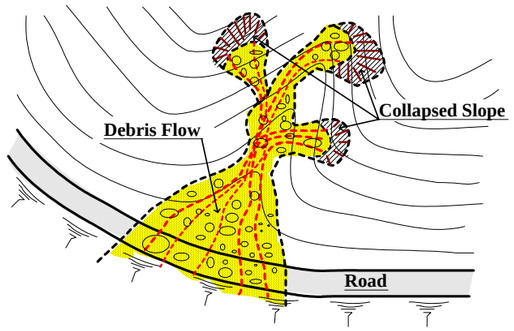
Þ³ñÅÇ ï»ë³ÏÁ	ÜÏáõÃÇ î»ë³ÏÁ			
	²å³ñ	ÐáÕÙÝ³Ñ³ñí³Í ²å³ñ	²å³Ý»ñÇ Î³ï áñÝ»ñ	ÐáÕ
öÉí³Íù	öÉí³Íù (Ã³ÏéÇ ÷Éí³Íù/¼³éÇÃ³÷É³ÝçÇ ÷Éáõ½áõÙ)			
	Ä³Ïé³µ»ÏáñÇ ÷Éí³Íù (ø³ñ³Ã³÷ Ð³ÏÏ³ë ï³ÝáõÙ)		¼³éÇÃ³÷É³ÝçÇ ÷Éáõ½áõÙ (öÉáõ½áõÙ Ð³ÏÏ³ë ï³ÝáõÙ)	
	Ä³Ïé³µ»ÏáñÇ ÷Éí³Íù	ÐáÕÙÝ³Ñ³ñí³Í ³å³ñ ÷Éí³Íù	²å³Ý»ñÇ Î³ï áñÝ»ñÇ ÷Éí³Íùl	ÐáÕÇ ÷Éí³Íù
				
	Î ïÕÇ ¿ áõÝ»ÝáõÙ áõÕÕ³ÓÇ·É³Ýç»ñáõÙ ¨ ³Ý¹åõÝ¹Ý»ñáõÙ: öÉí³ÍùÝ»ñÁ Î »ÕÇ »Ý áõÝ»ÝáõÙ Ó·áÕ³Ï³ÝáõÃÙ³Ý áõÅÇ Ñ» ï¨³Ýùáí ¨ Ó»Ï³í³ñíáõÙ »Ý×³ù»ñÇ ï»Õ³µ³ßËí³ÍáõÃÙ³Ùµ: â³÷Á ·ËË³Íáñ³å»ë å³Ï³ë¿2 Ù3-Çó: ø³ñ»ñÇ ÁÝÏÝ»ñÁ Ý»ñ³éí³Í¿ ³ÙëÏ »ï³ÍáõÙ:		ºÝÃ³Ï³ ¿ ï»ÕÇ áõÝ»Ý³Éáõ ËáßáñÉ³Ýç»ñÇ íñ³: Ø»Í³Ù³ëë³Ùµ ëÏÇ½µ ¿ ïñíáõÙ Ñ»ÕÓ»ÕÝ»ñÇ ÏáÕÙÇó: â³÷Á ·ËË³íáñ³å»ë å³Ï³ë ¿ 1,000Ù3-Çó:	
	¼³éÇÃ³÷ Ñáëù (²å³ñÝ»ñÇ Ï ïáñÝ»ñÇ Ñáëù/ ò»ËÇ Ñáëù/ öÉáõ½áõÙ) (ê»É³Í Ð³ÏÏ³ë³ï³ÝáõÙ)			
¼³éÇÃ³÷ Ñáëù	²å³ñÇ ½³éÇÃ³÷ Ñáëù	ÐáÕÙÝ³Ñ³ñí³Í ³å³ñÇ ½³éÇÃ³÷ Ñáëù	²å³ÑÝ»ñÇ Ï ïáñÝ»ñÇ ½³éÇÃ³÷ Ñáëù	ÐáÕÇ ½³éÇÃ³÷ Ñáëù
				
	Î ïñáõÏ ÑáëùÁ ï»ÕÇ ¿ áõÝ»ÝáõÙ Ýå³ëïáÕ ï³ñ³ÏùÝ»ñáõÙ, áñáÝù å³ñáõÝ³ÍáõÙ »Ý ÷Éáõ½³í ï³Ý·É³Ýç»ñ:Þ³ñÅÇ ³ñ³·áõÃÙáõÝÁ Ù»Í¿(³í»ÉÇ ³ñ³·ù³Ý 0.5ÙÙ/í, 1.8Ù/Å). ²ÛÝ ·ËË³íáñ³å»ë å³ñáõÝ³ÏáõÙ¿·»ï³ù³ñ, Ù³Ýñ³ËÇ×, ³í³½, ¨Ï³í`Ë³éÝí³Í Ù»Íù³Ý³ÍáõÃÙ³Ùµ çñÇ Ñ» ï:âáñ µ»ñí³Íù³ÛÇÝ ³å³ñÇ É³íÇÝ³Ý Ññ³µËÇ Ñ» ï¨³Ýùáí ³é³ç³ó³Í ÷Éáõ½Í³Íù¿, áñÇÝ ëÏÇ½µ¿ ï Í»É Å³Ûï ùáõÙÁ Ï³Ù·ÉË³íáñ³å»ë »ñÏñ³ß³ñÅÁ: ¶ÉË³íáñ³å»ë ³å³ñÇ Ýå³ï³Ï³ëË³ó Ñáëù ï»ÕÇ ãÇ áõÝ»ÝáõÙ: **Î ïñáõÏ ÑáëùÇ µ³ÅÇÝÁ Ù·ï³·áñÍíáõÙ¿, »ñµ Î ïñáõÏ ÑáëùÁ ³ÏÝÏ³Éíáõ Ù¿, áñ ï»ÕÇ áõÝ»Ý³ å»ñÇá¹ÇÏ ÁÝÃ³óÇÏ íÇ×³ÏáõÙ: ÐáëáÕ ëáÕÙÇ µ³ÅÇÝÁ Ù·ï³·áñÍíáõÙ¿, »ñµ Ý³Ëáñ¹ Ï ïñáõÏ ÑáëùÁ Ï³ñáÕ¿ ß³ñÅí»É¹³Ý¹³Õ ³ÛÅÙ¨³å³·³ÛáõÙ:**			

Table 3.15 Slope Movement Classification 1/3

Type of Movement	Type of Material			
	Rock	Weathered Rock	Debris	Earth
	Fall (Rock Fall/Rapid Slope Failure)			
Fall	***Rock Fall (Qaratap in Armenian)***		***Rapid Slope Failure (Pluzum in Armenian)***	
	Rock Fall	Weathered Rock Fall	Debris Fall	Earth Fall
				
	Prone to occur on steep slopes and cliffs. Falls occur due to gravity and are controlled by the distribution of joints. Size is generally less than 2 m^3. Block toppling is included in this type.		Prone to occur on steep slopes. Mostly triggered by rainfall. Size is generally less than 1,000 m^3	
	Rapid Flow (Debris Flow/Mud Flow/Avalanche) (Selav in Armenian)			
Rapid Flow	Rock Rapid Flow	Weathered Rock Rapid Flow	Debris Rapid Flow	Earth Rapid Flow
				
	Rapid flow occurs in contributory areas that contain collapsible slopes. The movement velocity is rapid (**faster than 0.5mm/sec, 1.8m/hr**). It generally contains boulders, gravel, sand, silt and clay mixed with a large amount of water. A dry debris avalanche is a collapse of a volcano triggered by eruption or earthquake generally. Generally, rock rapid flows have not occurred. **‘Rapid flow’ is used when rapid flow is expected to occur intermittently. ‘Flow-slide’ is used when a deposit of past rapid flow may move slowly in the future.**			

²ÕÛáõë³Ï 3.15 È³ÝçÇß³ñÅÇ ¹³ë³Ï³ñ·áõÙ 2/3

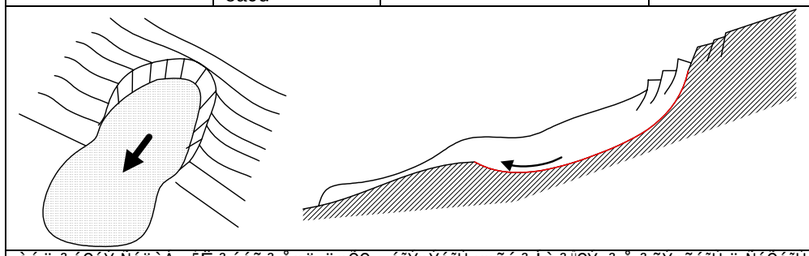
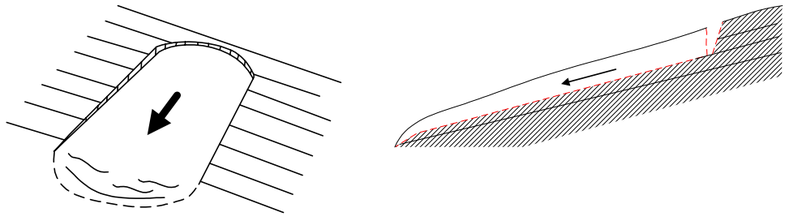
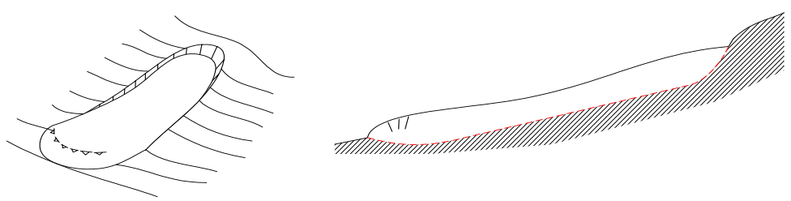
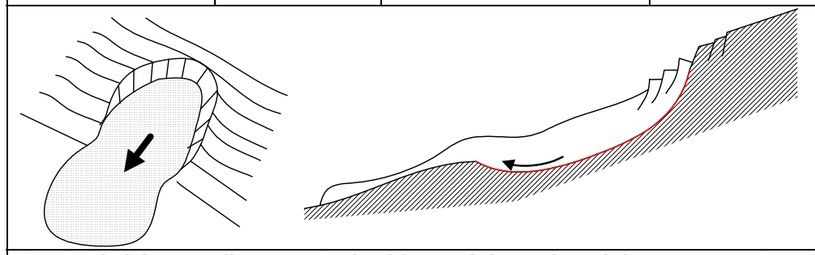
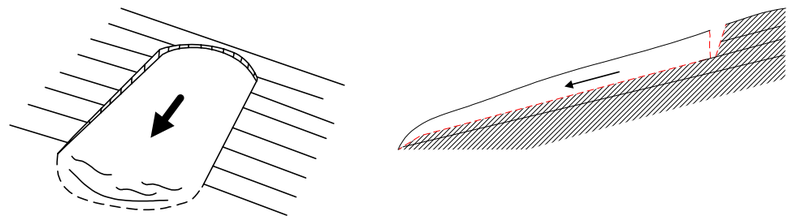
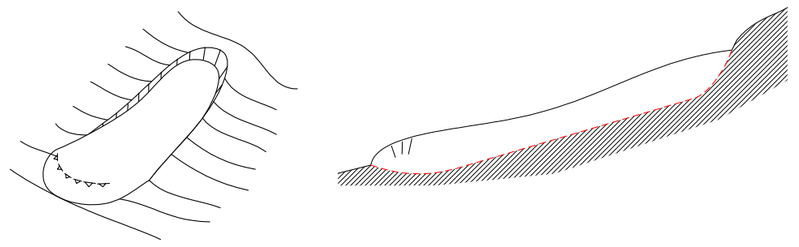
Þ³ñÅÇ ï»ë³ÏÁ	ÜÛáõÃÇ ï»ë³ÏÁ			
	²å³ñ	ÐáÕÙÝ³Ñ³ñí³Í ²å³ñ	²å³Ý»ñÇ Î³ï áñÝ»ñ	ÐáÕ
	êáÕ³Ýù (êáÕ³ÝùÁ Ð³Ûá³ë ï ³Ýáõù)			
èáï³óÇáÝ êáÕù	²å³ñÇ èáï³óÇáÝ êáÕù	ÐáÕÙÝ³Ñ³ñí³ Í ²å³ñÇ èáï³óÇáÝ êáÕù	²å³ñÝ»ñÇ Î ï áñÝ»ñÇ èáï³óÇáÝ êáÕù	ÐáÕÇ èáï³óÇáÝ êáÕù
				
	èáï³óÇáÝ NáëùÀ·ËË³íáñ³å»ë ï»ÕÇ¿áõÝ»ÝáõÙ µ»ñí³Íù³ÛÇÝ ³å³ñÝ»ñáõÙ ¨ NáÕáõÙ, ¨ ï»ÕÇ ãÇ áõÝ»ÝáõÙ ³å³ñáõÙ: èáï³óÇáÝ ëáÕùÁ ß³ñÅíáõÙ¿ÇçÍ³ÍùÇÙ³Ï»ñ»ëÇ »ñÏ³ÛÝùáí, áñÁ Ïáñ³ó³Í¿¨ ÷áë ÁÝÏ³Í: èáï³óÇáÝ ëáÕùÇ·³·³ÃÇ Ý»ñù¨áõÙ ·ï ÝíáÕ É³ÝçÁ Ï³ñáÕ¿ ÉÇÝ»É Ñ³Ù³ñÛ³ áõÕÕ³Ñ³Û³ó¨ã³ç³Ïói³Í: ÐáÕ»ñáõÙ èáï³óÇáÝ ëáÕù»ñÁ ·ËË³íáñ³å»ë ³ñï³Ñ³Û³ïáõÙ »Ý Ççí³ÍùÇ Ù³Ï»ñ»ëÇ ËáÑáõÃÛ³Ý ·áñÍ³ÏÇóÁ, áñÁ ·ï Ýíáõù¿0.15-0.33 ï ÇñáõÛÃáõÙ (êÏ»ÙåïáÙ¨ ÐáõãÇÝëáÝ 1969):			
Ð³ÙÁÝÃ³ó êáÕù	²å³ñÇ èáï³óÇáÝ êáÕù	ÐáÕÙÝ³Ñ³ñí³ Í ²å³ñÇ èáï³óÇáÝ êáÕù	²å³ñÝ»ñÇ Î ï áñÝ»ñÇ èáï³óÇáÝ êáÕù	ÐáÕÇ èáï³óÇáÝ êáÕù
				
	Ð³ÙÁÝÃ³ó ëáÕù»ñáõÙ½³Ý·í³ÍÁ ï»Õ³÷áËíáõÙ¿ÇçÍ³ÍùÇÑ³ñÃ¨ ³ÉÇù³íáñ Ù³Ï»ñ¨áõÛÃÇ »ñÏ³ÛÝùáí, ³ÝÝÏ³ï ¹áõñë ëáÕ³Éáíûñ Ç·ÇÝ³É ÑáÕÇ Ù³Ï»ñ¨áõÛÃÇó: ØÇ³ÛÝ ·ñ³µ»ÝÁ Ï³ñáÕ¿ ï»ÕÇ áõÝ»Ý³É í»ñ¨áõÙ, É³ÝçÁí³Õ ï³ñÇùáõÙ å³½âÇ »ñ¨áõÙ: Ð³ÙÁÝÃ³ó ëáÕù»ñÁ ÑáÕ»ñáõÙ ³ñï³Ñ³Û³ïáõÙ »Ý Ççí³ÍùÇ Ù³Ï»ñ»ëÇ ËáñáõÃÛ³Ý ·áñÍ³ÏÇóÁ, áñáÝù 0.1-Çó ó³Íñ»Ý (êÏ»Ùå ïáÙ¨ ÐáõãÇÝëáÝ 1969): Ð³ÙÁÝÃ³ó ëáÕùÁ Ñ³×³Ë óáõÛó¿ï³ÉÇë ÃáõÛÉß»ñï»ñÇ ³éÏ³ÛáõÃÛáõÝÁ Ï³Ù ë³ÑÙ³ÝÁ ÑáÕÙÝ³Ñ³ñí³Í¨ âÑáÕÙÝ³Ñ³ñí³Í Ý³ÛáõÃÇ:			
´³½Ù³ß»ñ ï ëáÕù (èáï³óÇáÝ¨ Ñ³ÙÁÝÃ³ó ëáÕùÇ ÙÇç¨ ÙÇçÝáñ¹)	²å³ñÇ ´³½Ù³ß»ñ ï ëáÕù	ÐáÕÙÝ³Ñ³ñí³ Í ²å³ñÇ ´³½Ù³ß»ñ ï ëáÕù	²å³ñÝ»ñÇ Î ï áñÝ»ñÇ ´³½Ù³ß»ñ ï êáÕù	ÐáÕÇ ´³½Ù³ß»ñ ï êáÕù
				
	´³½Ù³ß»ñ ï ëáÕùÁ ÙÇçÝáñ¹¿ éáï³óÇáÝ¨ Ñ³ÙÁÝÃ³ó ëáÕù»ñÇ ÙÇç¨: Æçí³ÍùÇ Ù³Ï»ñ¨áõÛÃÁ áõÝÇ Ëáßáñ·ÉË³íáñ É³Ýç»ñ: Æçí³ÍùÇ Ù³Ï»ñ¨áõÛÃÇ ë ï áñá ï Ý»ñÁ Ï³ñáÕ »Ý É³ÝçÇ í»ñ¨Ç Ù³ëÇó³ÝÏáõÙ³å»ñ»É:			

Table 3.15 Slope Movement Classification 2/3

Type of Movement	Type of Material			
	Rock	Weathered Rock	Debris	Earth
	Landslide (Sogank in Armenia)			
Rotational Slide	Rock Rotational Slide	Weathered Rock Rotational Slide	Debris Rotational Slide	Earth Rotational Slide
				
	Rotational slide generally occurs in the debris and the earth, and does not occur in rock. Rotational slides move along a slip surface that curves or is concave. The scarp below the crown of a rotational slide may be almost vertical and unsupported. Rotational slides in soils generally exhibit a ratio of depth/length between 0.15 and 0.33 (Skemptom and Hutchinson 1969).			
Translational Slide	Rock Rotational Slide	Weathered Rock Rotational Slide		Earth Rotational Slide
				
	In translational slides, the mass displaces along a planar or undulating surface of rupture, sliding out over the original ground surface. Only graben may occur in the head, scarp doesn't appear clearly at the early stage. Translational slides in soils exhibit a ratio of depth/length typically less than 0.1 (Skemptom and Hutchinson 1969). A translated slide often indicates the presence of a weak layer or the boundary between weathered and unweathered material.			
Compound slide (Intermediate between rotational and translational slide)	Rock Compound slide	Weathered Rock Compound slide	Debris Compound slide	Earth Compound slide
				
	Compound slide is intermediate between rotational and translational slide. The surface of rupture have steep main scarps. The toes of the surface of rupture may dip upslope.			

²ÕÛáõë³Ï 3.15 È³ÝçÇß³ñÅÇ ¹³ë³Ï³ñ·áõÙ 3/3

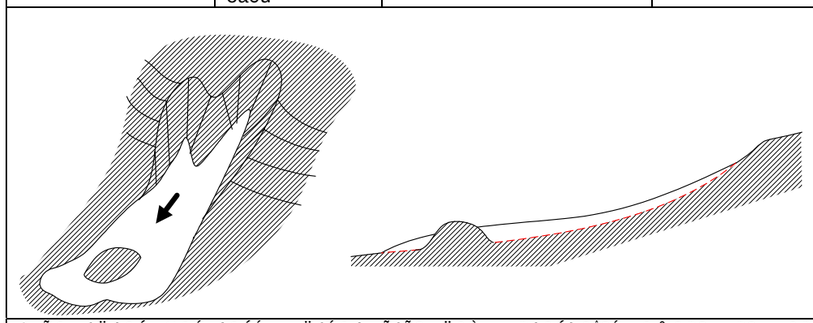
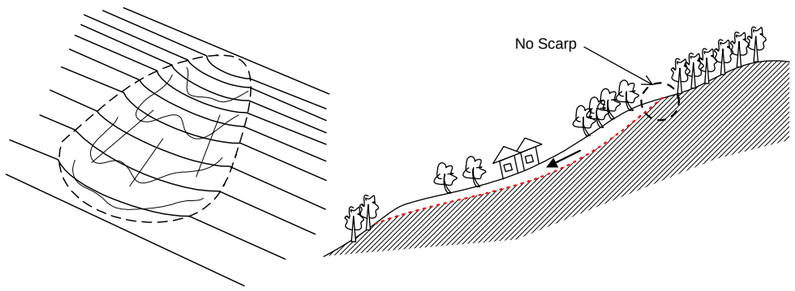
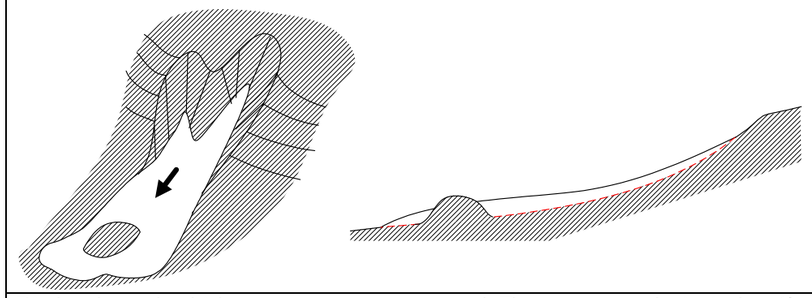
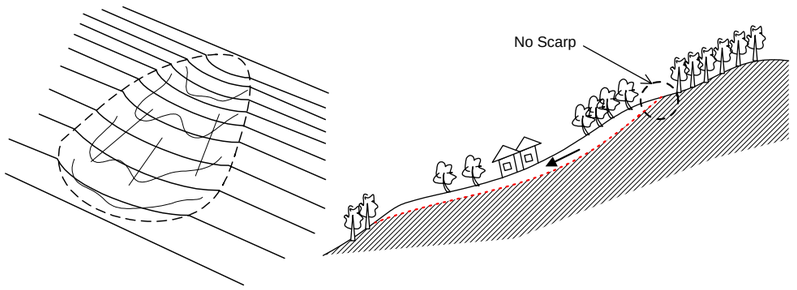
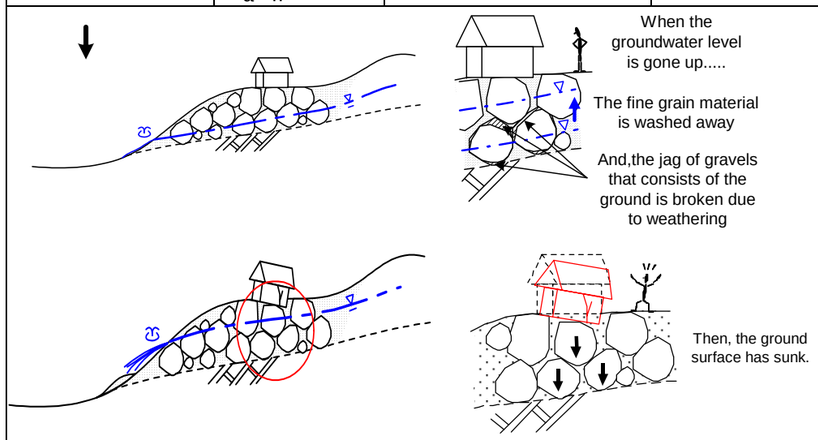
Þ³ñÅÇ ï»ë³ÏÁ	UÛáõÃÇ ï»ë³ÏA			
	²å³ñ	ÐáÕÙÝ³Ñ³ñí³Ï ²å³ñ	²å³Ýïñ Ï³ïáñÝ»ñ	ÐáÕ
	êáÕ³Ýù (êáÕ³ÝùÁ Ð³Ûë³ëï³Ýáõù)			
Ð»Õ»Õ³ÛÇÝ êáÕù	²ã³ñÇ Ð»Õ»Õ³ÛÇÝ êáÕù	ÐáÕÙÝ³Ñ³ñí³Ï ²å³ñÇ Ð»Õ»Õ³ÛÇÝ êáÕù	²ã³ñÝ»ñÇ Ï³áñÝ»ñÇ Ð»Õ»Õ³ÛÇÝ êáÕù	ÐáÕÇ ²ã³ñÝ»ñÇ Ï³áñÝ»ñÇ
				
	î»Õ³÷áËí³Í ½³Ý·í³ÍÁ ËáÝ³í ÑáÕÇ Ï³Ù µ»ñí³Íù³ÛÇÝ ³å³ñÇ çñÇ µ³ñÓñå³ñáõÝ³ÏáõÃÛáõÝÝ ¿: Þ³ñÅÇ ³ñ³·áõÃÛáõÝÁ ó³Íñ¿(³í»ÉÇ ³ñ³·ù³Ý 30ÙÙ/ï³ñÇ, ¹³Ý¹³Õù³Ý 0.5ÙÙ/í 1.8Ù/Å): Æçí³ÍùÇ Ù³Ï»ñ»ëÁ ë³ÑÙ³Ý³÷³Ïí³Í ¿ ÑÇÙÝ³Ï³Ý ³å³ñÇ Ù³Ï»ñ»ëáí: Þ³ï ëáÕ³ÝùÝ»ñáõÙ ï»Õ³÷áËí³Í ½³Ý·í³ÍÁ ëÏ½µÝ³Ï³Ý ë ï³¹Ç³ÛáõÙ µ³Å³Ýí³Í ¿ éáïï³óÇáÝ Ï³Ù Ñ³ÙÁÝÃ³ó ëáÕù»ñÇ` ëÏëí»Éáí Ñ»Õ»Õ³ÛÇÝ ëáÕù»ñÇ Ñ» ï¨³Ýùáí: àñ³ß Ýå³ï³Ï³ëÉ³ó ëáÕùÇ Ïáõï³ÏáõÙÝ»ñ ëÏëáõÙ »Ý Ñ»Õ»Õ³ÛÇÝ ëáÕùÇ Ñ» ï¨³Ýùáí:.			
¾ñá½Ç³ÛÇ ³ñ¹ÛáõÝùÇó ³á³ç³ó³Í ëáÕù	¾ñá½Ç³ÛÇ ³ñ¹ÛáõÝùÇó ³á³ç³ó³Í ³å³ñÇ ëáÕù	¾ñá½Ç³ÛÇ ³ñ¹ÛáõÝùÇó ³á³ç³ó³Í ÑáÕÙÝ³Ñ³ñí³Í ³å³ñÇ ëáÕù	¾ñá½Ç³ÛÇ ³ñ¹ÛáõÝùÇó ³á³ç³ó³Í ³åñÝ»ñÇ Ï ï áñÝ»ñÇ ëáÕù	¾ñá½Ç³ÛÇ ³ñ¹ÛáõÝùÇó ³á³ç³ó³Í ÑáÕÇ ëáÕù
				
	¾ñá½Ç³ÛÇ ³ñ¹ÛáõÝùÇó ³á³ç³ó³Í ëáÕù ï»ñÙÇÝÁ í»ñ³µ»ñí³íù³ÛÇÝ ³å³ñÇ çñÇ µ³ñÓñå³ñáõÝ³ÏáõÃÛáõÝÝ ¿: Þ³ñÅÇ ³ñ³·áõÃÛáõÝÁ ó³Íñ¿(³í»ÉÇ ³ñ³·ù³Ý 30ÙÙ/ï³ñÇ) ï»Õ³÷áËÙ³ÝÁ Ñ³Ù³Ó³ÛÝ î»ñ½³·ÇÇ Ó¨³Ï»ñåÙ³ÝÁ (1950) ³ÛëÑ»ï³½áïáõÃÛ³Ý Ù»ç: ²ÛÝ ãáõÝÇ ï»Õ³÷áËí³Í ½³Ý·í³ÍÇ ¨ ÇçÍ³ÍùÇ Ù³Ï»ñ»ëÇ Ñëï³Ï ë³ÑÙ³Ý³·ÇÍ: ºñµ ¾ñá½Ç³ÛÇ ³ñ¹ÛáõÝùÇó ³á³ç³ó³Í ëáÕù ½³ñ·³ÝáõÙ¿, ³ÛÝ ÷áË³Ï»ñåíáõÙ¿ ëáÕ³ÝùÇ: ²å³ñÇ×³ùÇ ³ÝÏáõÙÁ, áñÁ ãáõÝÇ Ççí³ÍùÇ Ñëï³Ï Ù³Ï»ñ¨áõÛÃ ÝáõÛÝå»ë ¾ñá½Ç³ÛÇ ³ñ¹ÛáõÝùÇó ³á³ç³ó³Í ëáÕù¿:			

Table 3.15 Slope Movement Classification 3/3

Type of Movement	Type of Material			
	Rock	Weathered Rock	Debris	Earth
	Landslide (Sogank in Armenia)			
Flowslide	Rock Flowslide	Weathered Rock Flowslide	Debris Flowslide	Earth Flowslide
				
	Displaced mass has high water content, even saturated. The movement velocity is slow (faster than 30 mm/year, slower than 0.5mm/sec: 1.8m/hr). The surface of rupture is confined by base rock surface. In many landslides, the displaced material, initially broken by rotational or translational slide, subsequently becomes a flowslide. Some accumulation by rapid flow subsequently becomes a flowslide.			
Creep	Rock Creep	Weathered Rock Creep	Debris Creep	Earth Creep
				
	The term **Creep** refers to extremely slow (slower than 30 mm/year) displacement of a mass according to the definition of Terzaghi (1950). The **Creep doesn't have the clear outline of displaced mass and surface of rupture**. When creep progresses, it is likely to shift to the slide. Topple of fine jointing rock, which has no clear surface of rupture, is also **Creep**.			

²ÕÛáõë ³ Ï 3.16 ¶ñáõÝ ï Ç î»Õ ³ß ³ ñÅÙ ³ Ý/²ÝÏÙ ³ Ý ìÝ ³ ëÇ Ø»Ë ³ ÝÇ½ÙÝ»ñÁ

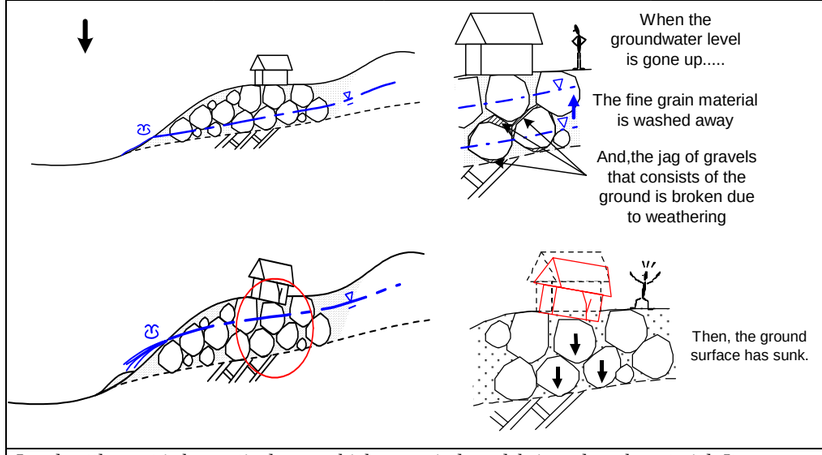
Þ ³ ñÅÇ ï»ë ³ ÏÁ	Ü ÛáõÃÇ î»ë ³ ÏÁ			
	² å ³ ñ	ÐáÕÙÝ ³ Ñ ³ ñ í ³ Í ³ å ³ ñ	² å ³ ñÇ Ï ï áñÝ»ñ	ÐáÕ
	¶ñáõÝ ï Ç î»Õ ³ ß ³ ñÅ			
¶ñáõÝ ï Ç î»Õ ³ ß ³ ñÅ	¶ñáõÝ ï Ç î»Õ ³ ß ³ ñÅÙ ³ Ý ² å ³ ñ	¶ñáõÝ ï Ç î»Õ ³ ß ³ ñÅÙ ³ Ý ÑáÕÙÝ ³ Ñ ³ ñ í ³ Í ³ å ³ ñ	¶ñáõÝ ï Ç î»Õ ³ ß ³ ñÅÙ ³ Ý ³ å ³ ñÇ Ï ï áñÝ»ñ	¶ñáõÝ ï Ç î»Õ ³ ß ³ ñÅÙ ³ Ý ÑáÕ



´Ý ³ Ï ³ í ³ ÛñÁ áõÕÕ ³ Ñ ³ Û ³ ó ¿, áñ ï »Õ ï »ÕÇ ¿ áõÝ»ÝáõÙ Ï ï áñ ï ³ ÝùÝ»ñÇ ¨ »ñÏñ ³ ÛÇÝ ÝÛáõÃÇ Ïáñáõë ï : ¸ ³ ï »ÕÇ ¿ áõÝ»ÝáõÙ áã ÙÇ ³ ÛÝ Ýë ï í ³ ÍùÝ»ñáõÙ, ³ ÛÉ Ý ³ ¨ µÝ ³ Ï ³ Ý Ïáñë ï Ç Ýë ï í ³ ÍùÝ»ñáõÙ: ´Ý ³ Í»óÙ ³ Ý Ý í ³½áõÙÁ Ï ³ å í ³ Í ¿ ë ï áñ»ñÏÛ ³ çñ»ñÇ ÏáÕÙÇó Ñ ³ ï ÇÏ ³ ÛÇÝ ÝÛáõÃ»ñÇ ï ³ ñÙ ³ Ý ¨ ³ å ³ ñÝ»ñÇ »½ñ»ñÇ ÷ Ëñ»óÙ ³ Ý Ñ» ï :.

Table 3.16 Mechanisms of Damage by Land-settlement/Subsidence

Type of Movement	Type of Material			
	Rock	Weathered Rock	Debris	Earth
	Land Settlement			
Land Settlement	Rock Land settlement	Weathered Rock Land settlement	Debris Land Settlement	Earth Land Settlement



Land-settlement is by vertical sags which occur in lose debris and earth material. It occurs not only in banking but also natural loose deposit. The land-settlement may be caused when angular parts of soft rock underground are crushed; or fine grained materials are washed out by ground water.

4. êáóÇ³É³ì îÜï»ë³Ï³Ý ä³ÛÙ³ÝÁ

4.1 Ð³Ûë³ï³ÝÇ êáóÇ³É³Ï³Ý ä³ÛÙ³ÝÝ»ñÇ Ð³Ù³éáï´ÝáõÃ³·ÇñÁ

Ð»ï¨Û³É áõëáõÙÝ³ëÇñáõÃÛáõÝÝ»ñÁ ³ñí³Í»Ý Ù»ï 2504 ëáÕ³ÝùÝ»ñáõÙ` Ñ³ÛïÝ³µ»ñí³Í 2004Ã. ÇÝí»Ýï³ñÑ»ï³½áïáõÃÛ³Ý ÏáÕÙÇó, û¹³ÛÇÝ Éáõë³ÝÏ³ñÝ»ñÇ¨ áõñí³·Í³ÛÇÝ ù³ñï»½Ý»ñÇ, ÙÇß³ñù¹³ßï³ÛÇÝ ÇÝí»Ýï³ñÑ»ï³½áïáõÃÛáõÝÝ»ñÇ, ·áÛáõÃÛáõÝ áõÝ»óáÕ ëáÕ³ÝùÝ»ñÇ ï»Õ³µ³ßËí³ÍáõÃÛ³Ý ù³ñï»½Ý»ñÇ ÙÇçáóáí: ÆÝãå»ëµ³ó³ïñí»ó 3.2 ê»ÏóÇ³ÛáõÙ, ã»Ý Ñ³ÛïÝ³µ»ñí»É 20Ñ³·Çó ùÇã ï³ñ³íù áõÝ»óáÕ áñáß/ß³ï ëáÕ³ÝùÝ»ñ¨³ñÓ³Ý³·ñí³Í íÝ³ë³ÍùÝ»ñ: ²Ûë 2504 ëáÕ³ÝùÝ»ñÁ áõëáõÙÝ³ëÇñí³Í»Ý³Ûë·ÉËáõÙ:

2504 ëáÕ³ÝùÝ»ñ ½µ³Õ»óÝáõÙ »Ý Ùáï 121,600Ñ³ (1,216 ÏÙ²) Ï³Ù ÐÐ ÁÝ¹Ñ³Ýáõñ ï³ñ³íùÇ **4.1%**: êáÕ³ÝùÇ ï»Õ³ß³ñÅí³Í ï³ñ³íÝ»ñáõÙ ï»Õ³µ³ßËí³Í µÝ³Ï»ÉÇ ï³ñ³íÝ»ñÁ1 Ï³½ÙáõÙ »Ý ÁÝ¹Ñ³Ýáõñ µÝ³Ï»ÉÇ ï³ñ³íùÇ Ùáï **5.4%**: êáÕ³ÝùÇ ï»Õ³ß³ñÅí³Í ï³ñ³íÝ»ñáõÙ ï»Õ³µ³ßËí³Í µÝ³Ï»ÉÇ ï³ñ³íÝ»ñÇ ù³Ý³ÏÁ Ï³½ÙáõÙ¿ ÁÝ¹Ñ³Ýáõñ µÝ³Ï»ÉÇ ï³ñ³íÝ»ñÇ ù³Ý³ÏÇ **24.2%**, ÇÝãå»ë óáõÛó¿ ï ñí³Í²ÕÛáõë³Ï 4.1.

²ÕÛáõë³Ï 4.1 êáÕ³ÝùÝ»ñÇ¨ ëáóÇ³É³Ï³Ý ä³ÛÙ³ÝÝ»ñÇ Ð³ÏÇñ×´ÝáõÃ³·ÇñÁ

	ÜÏ³ñ³·ñáõÃÛáõÝÝ»ñÁ	ÀÝ¹Ñ³Ýáõñ		(%)
A	ÐÐ-áõÙ ëáÕ³ÝùÝ»ñÇ ù³Ý³ÏÁ	2,504 ëáÕ³ÝùÝ»ñ	-	
B	´Ý³Ï»ÉÇ ï³ñ³íùÝ»ñÇ ù³Ý³ÏÁ	965 ï³ñ³íùÝ»ñ	-	
C	´Ý³Ï»óí³Í ï³ñ³íùÝ»ñÁ ½µ³Õ»óÝáÕ ëáÕ³ÝùÝ»ñÇ ù³Ý³ÏÁ	334 ëáÕ³ÝùÝ»ñ	C/A	13.3%
D	êáÕ³ÝùÇ ï»Õ³ß³ñÅí³Í ï³ñ³íùÝ»ñáõÙ ï»Õ³µ³ßËí³Í µÝ³Ï»ÉÇ ï³ñ³íùÝ»ñÇ ù³Ý³ÏÁ	234 ï³ñ³íùÝ»ñ	D/A D/ B	9.3% **24.2%**
E	Ðáëù Ï»Ýï ñáÝÇó 100Ù Ñ»é³íáñáõÃÛ³Ý íñ³ ·ï ÝíáÕ ëáÕ³ÝùÝ»ñÇ ù³Ý³ÏÁ	1,046 ëáÕ³ÝùÝ»ñ	E/A	41.8%
F	Ö³Ý³å³ñÑ³ÛÇÝ ó³ÝóÁ ½µ³Õ»óÝáÕ ëáÕ³ÝùÝ»ñÇ ù³Ý³ÏÁ 1:50,000 Ù³ëßï³µÇ ù³ñï»½áõÙ	399 ëáÕ³ÝùÝ»ñ	F/A	15.9%
êáÕ³ÝùÇ ï»Õ³ß³ñÅí³Í ½³Ý·Í³ÍÇ ÏáÕÙÇó Ï ï ñí³Í ×³Ý³å³ñÑÇ ÁÝ¹Ñ³Ýáõñ »ñÏ³ñáõÃÛáõÝÁ / ×³Ý³å³ñÑÇ ÁÝ¹Ñ³Ýáõñ »ñÏ³ñáõÃÛáõÝÁ			**F/A**	**3.9%**
G	ºñÏ³Ã·ÇÍÇ ó³ÝóÁ ½µ³Õ»óÝáÕ ëáÕ³ÝùÝ»ñÇ ù³Ý³ÏÁ 1:50,000 Ù³ëßï³µÇ ù³ñï»½áõÙ	14 ëáÕ³ÝùÝ»ñ	G/A	5.6%
êáÕ³ÝùÇ ï»Õ³ß³ñÅí³Í ½³Ý·Í³ÍÇ ÏáÕÙÇó Ï ï ñí³Í ×³Ý³å³ñÑÇ ÁÝ¹Ñ³Ýáõñ »ñÏ³ñáõÃÛáõÝÁ			**G/A**	**0.6%**
H	ä³ï Ù³Ï³Ý Ï³ñ¨áñ ï»Õ³ÝùÝ»ñÁ² ½µ³Õ»óÝáÕ ëáÕ³ÝùÝ»ñÇ ù³Ý³ÏÁ	6 ëáÕ³ÝùÝ»ñ	H/A	2.4%
êáÕ³ÝùÇ ï»Õ³ß³ñÅí³Í ½³Ý·Í³ÍÝ»ñÇÝ å³ï Ù³Ï³Ý Ï³ñ¨áñ ï»Õ³ÝùÝ»ñ /µáÉáñÁ 132 ³Ûë åÇëÇ ï»Õ³ÝùÝ»ñ				**4.5%**
I	ÐÐ ÁÝ¹Ñ³Ýáõñ ï³ñ³íùÁ	2,969,678 Ñ³	-	
J	ÐÐ-áõÙ µÝ³Ï»ÉÇ ï³ñ³íùÝ»ñÇ ÁÝ¹Ñ³Ýáõñ ï³ñ³íùÁ	32,032 Ñ³	I/J	10.8%
K	ÐÐ-áõÙ ëáÕ³ÝùÇ ï»Õ³ß³ñÅí³Í é»·ÇáÝáõÙ ÁÝ¹Ñ³Ýáõñ ï³ñ³íùÁ	121,328 Ñ³	H/G	**4.1%**
L	**êáÕ³ÝùÇ ï»Õ³ß³ñÅí³Í é»·ÇáÝáõÙ ï»Õ³µ³ßËí³Í µÝ³Ï»ÉÇ ï³ñ³íùÝ»ñÇ ÁÑ¹Ñ³Ýáõñ ï³ñ³íùÁ**	1,744 Ñ³	L/G L/J L/K	0.6% **5.4%** 1.4%

1 ²Ûë Ñ³ßí»ï íáõÃÛáõÝáõÙ “µÝ³Ï»ÉÇ ï³ñ³íùÝ»ñÁ” áñáßí³Í »Ý ³ÛÝåÇëÇ ï³ñ³íùÝ»ñ, áñÁ óáõÛó¿ ï ñí³Í ù³ñï»½Ý»ñáõÙ 1:100,000 Ù³ëßï³µáí:
2 ÆÝáñÙ³óÇ³Ý ï ñ³Ù³¹ñ»É¿ ÆÎúØúê ÐÎ-Ý¨ óáõÛó¿ ï ñí³Í ÝÏ³ñ 4.1

4. SOCIAL AND ECONOMIC CONDITIONS ON LANDSLIDES

4.1 Outline of Social Conditions on Landslides

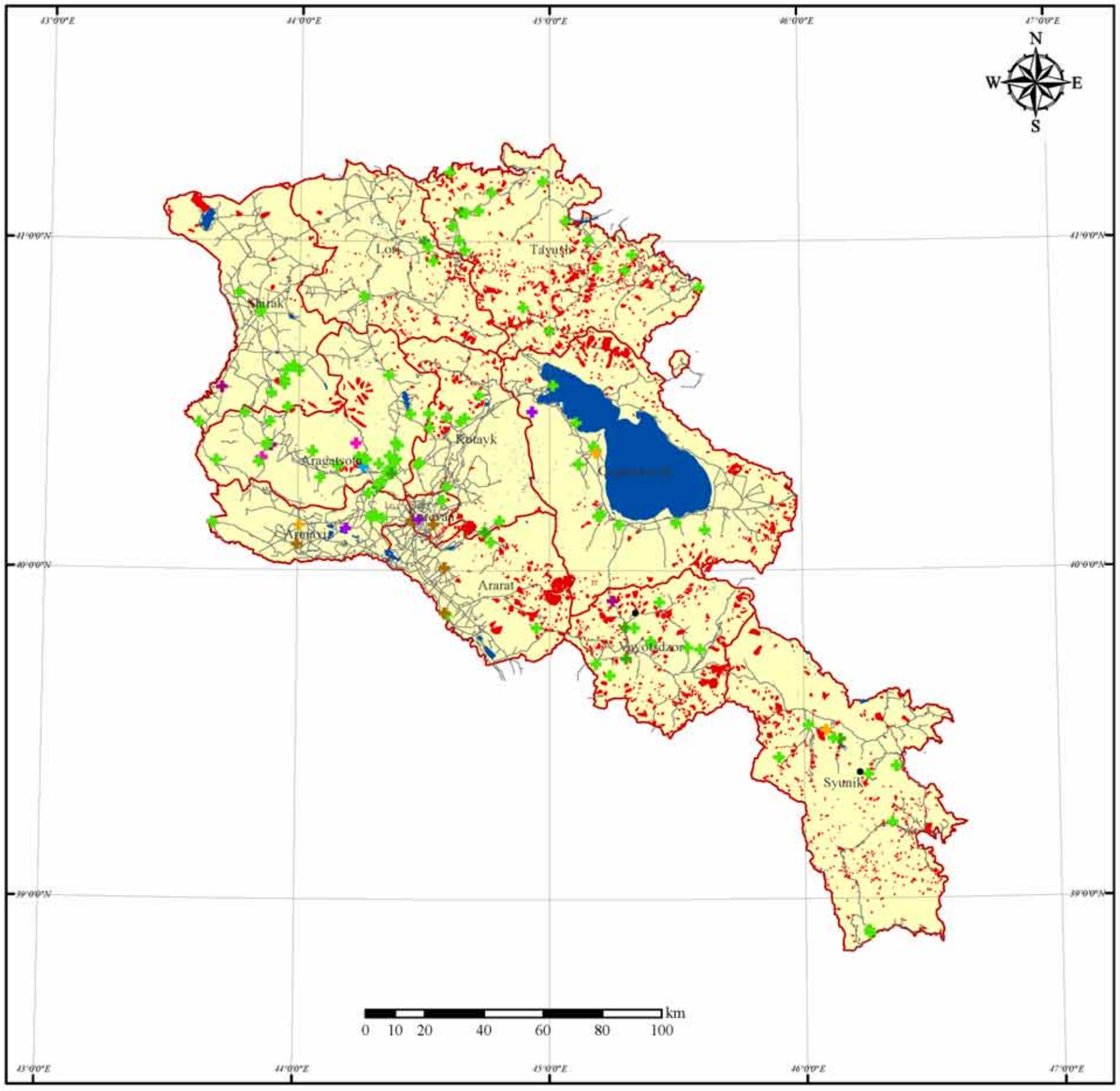
The following examinations are done on 2,504 landslides identified by the inventory survey in 2004 through interpretation of contour-maps and aerial photographs, and a series of field inventory surveys with reference to existing landslide location maps. As explained in Section 3.2, most of the landslides of areas less than 20 ha, for which no damage has been reported, are not identified.

The 2,504 landslides occupy approximately 121,600 ha (1,216 km^2) or **4.1%** of the total area of RA. The populated areas located on landslide-displaced areas is around **5.4%** of the total populated areas. The number populated places located on landslide-displaced areas is **24.2%** of the total number of the populated areas, as shown in Table 4.1.

Table 4.1 Outline of Landslides and Social Conditions

	Descriptions	Summing		(%)
A	Number of landslides in RA	2,504 landslides	-	
B	Number of populated places	965 places	-	
C	Number of landslides covering populated places	334 landslides	C/A	13.3%
D	Number of populated places located on landslide-displaced areas	234 places	D/A D/B	9.3% **24.2%**
E	Number of landslides within a distance of 100 m from stream center	1,046 landslides	E/A	41.8%
F	Number of landslides covering road network at 1:50,000-scale map	399 landslides	F/A	15.9%
Total length of road cut by landslide-displaced masses /total length of road			**F/A**	**3.9%**
G	Number of landslides covering railway network at 1:50,000-scale map	14 landslides	G/A	5.6%
Total length of road cut by landslide-displaced masses /total length of road			**G/A**	**0.6%**
H	Number of landslides covering historically important places[2]	6 Landslides	H/A	2.4%
Historically important places on landslide displaced masses /all 132 such places				**4.5%**
I	Total area of the RA	2,969,678 ha	-	
J	Total area of populated places in the RA	32,032 ha	I/J	10.8%
K	Total area of landslide-displaced regions in RA	121,328 ha	H/G	**4.1%**
L	**Total area of populated places located in landslide-displaced region**	1,744 ha	L/G L/J L/K	0.6% **5.4%** 1.4%

1 This report defined a ‘populated place’ as an area shown in maps at a scale of 1:100,000
2 Information form ICOMOS (NGO) and shown in Figure 4.1



Legend ä³ÛÙ³Ý³Ï³Ý ÝßÝ»ñ

Histric Site ä³ï³Ù³Ï³Ý î»Õ³Ýù

Type î»ë³Ï

- Church, monastery, temple, and religious place
  ºÌ»Õ»óÇ, Ï³Ýù, ï³×³ñ¨ÏñáÝ³Ï³Ý Ï»Õ³Ýù
- Old bridge
  ÐÇÝ Ï³Ùáõñç
- Old city
  ÐÇÝ ù³Õ³ù
- Old settlement
  ÐÇÝ ³í³Ý
- Old castle
  ÐÇÝ ³Ùñáó
- Old caravanserai
  ÐÇÝ ù³ñí³Ýë³ñ³
- Cemetery
  ¶»ñ»½Ù³Ýáó
- Mausoleum
  ³Ùµ³ñ³Ý
- Others
  ²ÌÉÝ

Landslide >= 2 ha.
êáÕ³Ýù >= 2Ñ³

Lake, pond
ÈÇ×, çñ³í³½³Ý

Roads
Ö³Ý³å³ñÑÝ»ñ

Administrative Boundary
²¹ÙÇÝÇë ï ñ³ ï Ç í ê³ÑÙ³Ý

Map Projection: UTM 38N (WGS1984)

Data Source:
Histric sites: ICOMOS (NGO)
Landslides: JICA Study Team for The Study on Landslide Management in The Republic of Armenia

ÜÏ³ñ 4.1 ä³ï³Ù³Ï³Ý î»Õ³ÝùÝ»ñÇ ¨ êáÕ³ÝùÇ î»Õ³µ³ßËí³ÍáõÃÛ³Ý ø³ñï»½Ý»ñ

Figure 4.1 Historic Sites and Landslide Location Maps

JICA STUDY TEAM ØÐÖ¶ Ð»ï³½áï³Ï³Ý ËáõÙµ
THE STUDY ON LANDSLIDE MANAGEMENT
IN THE REPUBLIC OF ARMENIA

êàÔ²ÜøÆ Î²è²ì²ðØ²Ü Ð°î²¼àîàôÂÚàôÜ
Ð²Ú²êî²ÜÆ Ð²Üõ²ä°îàôÂÚàôÜàôØ

4.2 ´Ý³Ï»ÉÇ î³ñ³ÍùÝ»ñÁ È»éÝ³ÛÇÝ Þñç³ÝÝ»ñáõÙ

Âí³ñïí³Í µáÉáñ µÝ³Ï»ÉÇ ï³ñ³ÍùÝ»ñÇ **44.4**%-Á ï»Õ³µ³ßËí³Í ¿ É³Ýç»ñÇÝ áã å³Ï³ë 5 ³ë ï Ç×³Ý Ã»ùáõÃÛ³Ý íñ³: È»éÝ³ÛÇÝ ßñç³ÝÝ»ñáõÙ µÝ³Ï»ÉÇ ï³ñ³ÍùÝ»ñÇó ¹áõñë Ùá ï **41.8** %-Á, áã å³Ï³ë 5 ³ë ï Ç×³Ý Ã»ùáõÃÛ³Ùµ, ëáÕ³Ýù³ÛÇÝ ï»Õ³ß³ñÅí³Í ï³ñ³ÍùÝ»ñ »Ý, ÇÝãå»ë óáõÛó ¿ ï ñí³Í ²ÕÛáõë³Ï 4.2-áõÙ: ²ÛÉ Ï»ñå ³ë³Í ÐÐ-áõÙ É»éÝ³ÛÇÝ ßñç³ÝÝ»ñÇ µÝ³Ï»ÉÇ ï³ñ³ÍùÝ»ñÇ**41.8**% -Á ï»Õ³µ³ßËí³Í »Ý ëáÕ³ÝùÇ ï»Õ³ß³ñÅí³Í ·á ï ÇÝ»ñáõÙ:

²ÕÛáõë³Ï 4.2 êáÕ³Ýù³ÛÇÝ ¶á ï ÇÝ»ñáõÙ ´Ý³Ï»ÉÇ î³ñ³ÍùÝ»ñÇ ÂÇíÁ

È³ÝçÇ Ã»ùáõÃÛáõÝÁ (²ë ï Ç×³Ý)	´Ý³Ï»ÉÇ î³ñ³ÍùÝ»ñÇ ÀÝ¹Ñ³Ýáõñ ÂÇíÁ (a)		êáÕ³Ýù³ÛÇÝ ¶á ï ÇÝ»ñáõÙ ´Ý³Ï»ÉÇ î³ñ³ÍùÝ»ñÇ ÂÇíÁ (b)		(b)/(a)	
0-4	538		53		10 %	
5-9	232	d=428	87	f=179	37 %	41.8 %
10-19	163	(d/c=44.4%)	80	(f/e=77.2%)	49 %	(f/d)
20-29	28		13		47 %	
30-39	4		0		0 %	
ÀÝ¹Ñ³Ýáõñ	c=965		e=232		24 %	

4.3 ÐáÕÇ ú·ï³·áñÍáõÙ ¨ êáÕ³ÝùÝ»ñ

ÐáÕÇ û·ï³·áñÍÙ³Ý Ï³ñ·»ñÁ Ç¹»Ý ï ÇÝÇÏ³óí³Í ¿ÇÝ ³ñµ³Ý۳ÏÇó Ó»éù µ»ñí³Í ÝÏ³ñÝ»ñáí 2000 ¨ 2003ÃÃ.¨ óáõÛó ¿ ï ñí³Í ÜÏ³ñ 4.2-áõÙ: Úáõñ³ù³Ýã۳ñ ÑáÕÇ û·ï³·áñÍÙ³Ý ·á ï áõÙ ëáÕ³ÝùÇ ÑáÕÇ ï³ñ³ÍùÇ Ë ï áõÃÛáõÝÁ áõëáõÙÝ³ëÇñí»É¿¨ ³ÛÝ óáõÛó ¿ ï í³Í ³Õ۳ëë³Ï 4.3-áõÙ:

êáÕ³ÝùÇ ï³ñ³ÍùÇ Ë ï áõÃÛáõÝÁ áõÝÇ É»éÝ³ÛÇÝ ßñç³ÝÝ»ñáõÙ Ñ³Ù³Ù»³ï³µ³ñ É³ÛÝáñ»Ý ï³ñ³Íí³Í ÇÝ ï»Ýëçí³Ýï³é³ÛÇÝ ï³ñ³Íù¨ ï»ñ¨³Ã³÷ ³Ýï³é: È»ñï ÑáÕ»ñÁ¨ ³ñáï³í³ÛñÁ ÝáõÛÝå»ë ï³ñ³Íí³Í »Ý É»éÝ³ÛÇÝ ßñç³ÝÝ»ñáõÙ, µ³ÛÓ ëáÕ³ÝùÇ ï³ñ³ÍùÇ Ë ï áõÃÛáõÝÁ Ñ³Ù»³ï³µ³ñ Ýáëñ ¿: àñáíÑ»ï¨ ³Û¹ ï³ñ³ÍùÝ»ñÁ Ï³ñáÕ »Ý ÉÇÝ»É ÏáñÓ³Í ¨ çáõñÁ Ñ»ßï âÇ Ñ³í³ùíÇ ³Û¹ï»Õ: êáÕ³ÝùÇ ï³ñ³ÍùÇ Ë ï áõÃÛáõÝÁ Ñ³Ù»³ï³µ³ñ Ýáëñ ¿: àñáíÑ»ï¨ ³Û¹ ï³ñ³ÍùÝ»ñÁ Ï³ñáÕ »Ý ÉÇÝ»É ÏáñÓ³Í ¨ çáõñÁ Ñ»ßï âÇ Ñ³í³ùíÇ ³Û¹ï»Õ: êáÕ³ÝùÇ ï³ñ³ÍùÇ Ë ï áõÃÛáõÝÁ Ñ³Ù»³ï³µ³ñ Ýáëñ ¿: àñáíÑ»ï¨ ³ÛÝ·ÉË³ÍáñÓ³åë ï³ñ³Íí³Í¿Ñ³ñÃ³í³Ûñ»ñáõÙ, ÇÝãåÇëÇù »Ý ²ñ³ñ³ï³Ý Ð³ñÃ³í³ÛñÁ¨ ³ÛÉÝ:

²ÕÛáõë³Ï 4.3 Úáõñ³ù³ÝãÛáõñ ÐáÕÛ·ï³·áñÍÙ³Ý Î³ñ·Ç ¶á ï áõÙ êáÕ³ÝùÇ Ê ï áõÃÛ³Ý î³ñ³ÍùÁ

êáÕ³ÝùÇ Ï³ñ·	Ð»ï³½á ï áõÃÛ³Ý ï³ñ³ÍùÇ Ù³Ï»ñ»ëÁ (Ñ³)		Ð»ï³½á ï áõÃÛ³Ý ï³ñ³ÍùÇ Ù³Ï»ñ»ëÁ ï á ÏáëÝ»ñáí (%)	²éÝãíáÕ ëáÕ³ÝùÝ»ñÇ ÃÇíÁ	´áÉáñ ëáÕ³ÝùÝ»ñÇ ÃÇíÁ ï á ÏáëÝ»ñáí (%)	êáÕ³ÝùÇ Ù³Ï»ñ»ëÁ (Ñ³.)	´áÉáñ ëáÕ³ÝùÝ»ñÇ Ù³Ï»ñ»ëÁ ï á ÏáëÝ»ñáí (%)	ÐáÕÛ·ï³·áñÍÙ³Ý ï³ñ³ÍùÇ ëáÕ³Ýùáí ï»Õ³ß³ñÅí³Í ½³Ý·í³ÍÇ Ù³Ï»ñ»ëÁ ï á ÏáëÝ»ñáí (%)
1: æáõñ	132,829	4.5	1	0	62	0.1	0.0
2: Ö³ÑÇ×	3,908	0.1	0	0	0	0	0.0
3: ø³Õ³ù	106,933	3.6	127	5.1	3,928	3.2	3.7
4: ÆÝï»ÝëÇí ÏáõÉï áõñ³Ý»ñ	95,704	3.2	3	0.1	322	0.3	0.3
5:¾ùë ï»ÝëÇí ÏáõÉï áõñ³Ý»ñ	255,151	8.6	21	0.8	2,535	2.1	1.0
6: È»ñÏ	119,486	4	117	4.7	4,312	3.5	3.6
7: ²ñá ï³í³ÛñÙ	1,669,022	56.2	1,336	53.4	72,540	59.7	4.3
8:²Ý ï³é³ÛÇÝ ï³ñ³Íù	91,808	3.1	136	5.4	6,232	5.1	6.8
9: öß³ï»ñ¨ ³Ý ï³é	1,771	0.1	0	0	0	0	0.0
10:î»ñ¨³Ã³÷ ³Ý ï³é	428,060	14.4	690	27.6	27,605	22.7	6.4
11: ÖÛáõÝ	513	0	0	0	2	0	0.4
12: ²Ùå	36,858	1.2	35	1.4	2,359	1.9	6.4
13: ê ï í»ñ	23,200	0.8	32	1.3	1,579	1.3	6.8
14: ²ÛÉÝ	4,415	0.1	6	0.2	99	0.1	2.2
ÀÝ¹Ñ³Ýáõñ	2,969,658	100	2,504	100	121,575	100	4.1

4.2 Populated Area in Hilly-Mountainous Area

Among all the populated areas, 44% are located on hilly-mountainous area (slopes gradient is steeper than 5 degrees). In the hilly-mountainous area 93% of the populated areas is located on gentle slope (slopes gradient is gentler than 20 degrees), and 42% of the populated areas are located on landslides.

The landslides form gentle slopes. Many populated areas are located on landslides because it easier to live on these gentle slopes.

Table 4.2 The Number of Populated Areas on Landslides

Slope Gradient (degrees)	The Total Number of Populated areas (a)		The Number of Populated Areas on Landslide Areas (b)		(b)/(a)	
0-4	538		53		10 %	
5-9	232	d=428 (d/c=44.4%)	87	f=179 (f/e=77.2%)	37 %	41.8 % (f/d)
10-19	163		80		49 %	
20-29	28		13		47 %	
30-39	4		0		0 %	
Total	c=965		e=232		24 %	

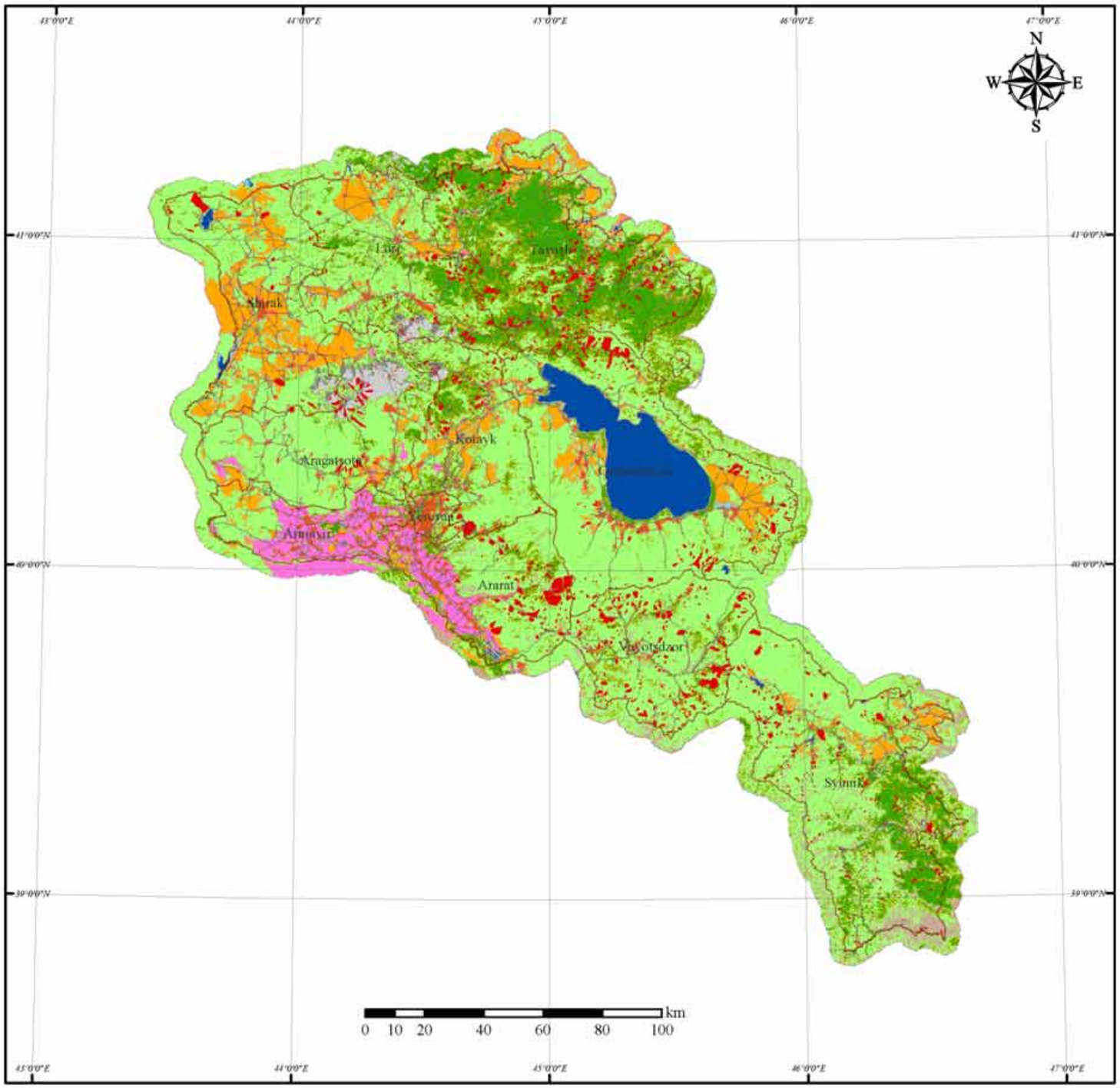
4.3 Land Use and Landslides

Land use classes were identified by interpretation LANDSAT image acquired in 2000 and 2003 and shown in Figure 4.2. The area density of the landslide in each land use zone is examined and shown in table 4.3.

The area density of landslide is comparatively intense in shrub land and deciduous forest which are widely distributed in hilly-mountainous areas. The bare land and the grassland also distributed hilly-mountain area, but the area density of landslide is comparatively sparse. This may be because these areas have convex ground and water doesn't gather easily. The cropland’s area density of the landslide is low because it is mainly distributed on plains such as Ararat Plain etc.

Table 4.3 Area Density of Landslide in Each Landuse Class Zone

Land use Class	Study Area		Landslide Displaced Mass				Area percentage of landslide-displaced mass to each land use class area
	Area in the study area	Area percentage in the study area		Number percentage in all landslides	Area in landslides	Area percentage in all landslides	
	(ha)	(%)		(%)	(ha.)	(%)	(%)
1: Water	132,829	4.5	1	0	62	0.1	0.0
2: Wetland	3,908	0.1	0	0	0	0	0.0
3: Urban	106,933	3.6	127	5.1	3,928	3.2	3.7
4: Intensive crops	95,704	3.2	3	0.1	322	0.3	0.3
5: Extensive crops	255,151	8.6	21	0.8	2,535	2.1	1.0
6: Bare	119,486	4	117	4.7	4,312	3.5	3.6
7: Grassland	1,669,022	56.2	1,336	53.4	72,540	59.7	4.3
8: Shrub land	91,808	3.1	136	5.4	6,232	5.1	6.8
9: Coniferous forest	1,771	0.1	0	0	0	0	0.0
10: Deciduous forest	428,060	14.4	690	27.6	27,605	22.7	6.4
11: Snow	513	0	0	0	2	0	0.4
12: Cloud	36,858	1.2	35	1.4	2,359	1.9	6.4
13: Shadow	23,200	0.8	32	1.3	1,579	1.3	6.8
14: Others	4,415	0.1	6	0.2	99	0.1	2.2
Total	2,969,658	100	2,504	100	121,575	100	4.1



Legend ä³ÛÙ³Ý³Ï³Ý ÝßÝ»ñ

Landcover ÐáÕ³Í³Í ÏáõÛÃ

Class Î³ñ·

- 1: Water æáõñ
- 2: Wetland Ö³ÑÇ×
- 3: Urban ø³Õ³ù³ÛÇÝ
- 4: Intensive crops ÆÝï»ÝëÇí ÏáõÉïáõñ³
- 5: Extensive crops ¾ùëï»ÝëÇí ÏáõÉïáõñ³
- 6: Bare È»ñÏ
- 7: Grassland ²ñáï³í³Ûñ
- 8: Shrubland ²Ýï³é³ÛÇÝ ï³ñ³Íù
- 9: Coniferous forest öß³ï»ñ¨ ³Ýï³é
- 10: Deciduous forest î»ñ¨³Ã³÷ ³Ýï³é
- 11: Snow ÒÙáõÝ
- 12: Cloud ²Ùå
- 13: Shadow ê ï í»ñ
- 14: Others ²ÛÉÝ
- Landslide >= 2 ha. êáÕ³Ýù >= 2 Ñ³
- Roads Õ³Ý³å³ñÑÝ»ñ
- Administrative Boundary ²¹ÙÇÝÇë ï ñ³ ï Çí ë³ÑÙ³Ý

Map Projection: UTM 38N (WGS1984)
Landcover classes were identified
by interpreting LANDSAT images acquired in 2000 and 2003.

Landsat Image Data Information

Path and Row	Acquisition Date
168-32	23 August 2000
168-33	8 September 2000
169-31	10 October 2003
169-32	10 October 2003
169-33	10 October 2003
170-31	21 August 2000
170-32	21 August 2000
170-33	21 August 2000

ØÐÕ¶ Ð»ï³½áï³Ï³Ý ËáõÙµ
êàÔ²ÜøÆ Î²è²ì²ðØ²Ü
Ð°î²¼àîàôÂÚàôÜ
Ð²Ú²êî²ÛÆ
Ð²Üð²ä°îàôÂÚàôÜàôØ

Landslides: identified by the JICA Study Team

ÜÏ³ñ 4.2 ÐáÕÇ Ú·ï³·áñÍÙ³Ý¨ êáÕ³ÝùÇ
î»Õ³µ³ßËí³ÍáõÃÛ³Ý ø³ñïª»½Ý»ñ

JICA

Figure 4.2 Land Use and Landslide Maps

JICA STUDY TEAM

THE STUDY ON LANDSLIDE MANAGEMENT
IN THE REPUBLIC OF ARMENIA

4.3 ìÝ³ëÇ ¶Ý³Ñ³ïáõÙ

4.3.1 Ø»Ãá¹áÉá·Ç³

êáÕ³ÝùÇ íÝ³ëÁ ·Ý³Ñ³ïí»É ¿ Ñ»ï¨Û³É Ï»ñå. 2004Ã. ÆÝí»ï³ñ Ñ»ï³½áïáõÃÛáõÝÁ ØÐÖ¶-Ç áõëáõÙÝ³ëÇñáõÃÛ³Ý ËÙµÇ ÏáÕÙÇó ·Ý³Ñ³ïí»É ¿ Ñ³Ûïñ³Ï³Ý 145 ëáÕ³ÝùÝ»ñáõÙ, áñáÝù ³ñÓ³Ý³·ñí»É ¿ÇÝ Ø³Õ³ù³ßÇÝáõÃÛ³Ý Ý³Ë³ñ³ñáõÃÛ³Ý ¨ íÝ³ëÇ »ÝÃ³Ï³éáõóí³Í »ÝÃ³Ï³éáõóí³ÍùÝ»ñÇÝ í»ñ³µ»ñáÕ Ï³½Ù³Ï»ñåáõÃÛáõÝÝ»ñÇ ÏáÕÙÇó: ²Ûë Ï»ïáõÙ` §íÝ³ëÇ ·Ý³Ñ³ïáõÙÁ¦, ÇÝã³Ï³Ý³óíáõÙ ¿ ù³Ý³Ï³Ï³Ý ÇÙ³ëïáí: ²Û¹ å³ï×³éáí ¹Åµ³Ëï å³ï³Ñ³ñÁ, Ñá·»µ³Ý³Ï³Ý óÝóáõÙÁ ¨ Ñáõß³ñÓ³ÝÝ»ñÁ ¨ ³ÛÉÝ Ý»ñ³éí³Í ã»Ý íÝ³ëÇ ·Ý³Ñ³ïÙ³Ý Ù»ç: ¶Ý³Ñ³ïáõÙÁ ÑÇÙÝí³Í ¿ Ñ³Ù³ÛÝùÝ»ñÇ, Ñ³Ù³ÛÝùÇ Õ»Ï³í³ñÝ»ñÇ ¨ »ÝÃ³Ï³éáõóí³ÍùÝ»ñÇ í»ñ³µ»ñáÕ Ï³½Ù³Ï»ñåáõÃÛáõÝÝ»ñÇó ëï³óí³Í Ñ³ñó³½ñáõÛóÝ»ñÇ íñ³:

ìÝ³ëÁ ¹³ë³Ï³ñ·í³Í ¿ ÇÝãå»ë 4.3 êË»Ù³ÛáõÙ:

ê»Ïïáñ	àõÕÕ³ÏÇ íÝ³ë	²ÝáõÕÕ³ÏÇ íÝ³ë	àõÕÕ³ÏÇ íÝ³ë	²ÝáõÕÕ³ÏÇ íÝ³ë
Î³éáõÛóÝ»ñ îñ³Ýëåáñï æáõñ, ¿É»Ïïñ³¿Ý»ñ·Ç³ ¨ Ñ³Õáñ¹³ÏóáõÃÛáõÝ ¶ÛáõÕ³ïÝï»ëáõÃÛáõÝ ²ÛÉÝ	²éÏ³ ìÝ³ë		äáï»ÝóÇ³É íÝ³ë/ äáï»ÝóÇ³É û·áõï	

êË»Ù³ 4.3 êáÕ³ÝùÇ íÝ³ëÇ Ï³ï»·áñÇ³

2004Ã. ØÐÖ¶ ëáÕ³ÝùÇ íÝ³ëÇ ·Ý³Ñ³ïáõÙÁ Ï³ñáÕ ¿ Ùáï³íáñ å³ïÏ»ñ³óáõÙ ï³É ëáÕ³ÝùÇ íÝ³ëÇ Ï³éáõóí³ÍùÇ: ØÐÖ¶-Ç ·Ý³Ñ³ïÙ³Ý Ï³ñ¨áñ Ï»ïÝ ¿ ÷áñÓ»É ·Ý³Ñ³ï»É áã ÙÇ³ÛÝ ³éÏ³ íÝ³ëÁ, ³Ûë¨ Ý³¨ åáï»ÝóÇ³É íÝ³ëÁ, áñÇó Ï³ñ»ÉÇ ¿ Ëáõë³÷»É ³å³·³ÛáõÙ ¨ Ý»ñÏ³Û³óÝáõÙ ¿ ëáÕ³ÝùÇ Ï³é³í³ñÙ³Ý åáï»ÝóÇ³É û·áõïÁ:

êË»Ù³ 4.3-Á óáõÛó ¿ ï³ÉÇë ï³ñµ»ñáõÃÛáõÝÁ Ñ»ï¨Û³ÉÝ»ñÇ ÙÇç¨`

- ²éÏ³ íÝ³ë, ³ÛÝ ¿, áñÁ ³Ýó»É ¿ Ý»ñÏ³ÛÇë ·áÛáõÃÛáõÝ áõÝ»óáÕ ëáÕ³ÝùÇ ·áïáí;
- äáï»ÝóÇ³É íÝ³ë, áñÁ ï»ÕÇ Ïáõ»Ý³ ³å³·³ÛáõÙ, »Ã» ãÇñ³Ï³Ý³óí»Ý áã ÙÇ Ï³ÝË³Ý ÙÇçáó³éáõÙÝ»ñ §³éÏ³ ëáÕ³Ýù³ÛÇÝ ·áïáõÙ¦, §Ý³Ë³ï»ëí³Í Ñ»ï³·³ Ïáõï³ÏÙ³Ý ·áïáõÙ¦, §ëáÕ³ÝùÇ Ý³Ë³ï»ëí³Í ³Ùµ³ñÇ å³ïí³ñÇ ï³ñ³ÍùáõÙ¦, ¨ §Ñ»Õ»ÕÇ ï³ñ³ÍùáõÙ ëáÕ³ÝùÇ å³ïí³ñÇ ÷Éáõ½áõÙÁ¦ áñáßí³Í 2004Ã. ëáÕ³ÝùÇ ÆÝí»ï³ñ Ñ»ï³½áïÙ³Ý ÏáÕÙÇó:

äáï»ÝóÇ³É íÝ³ëÁ Ï³ñáÕ ¿ Í³é³Û»É áñå»ë íñ³·ñÇ ·Ý³Ñ³ïÙ³Ý û·áõïÝ»ñÇ Ý»ñÏ³Û³óáõóÇã:

ìÝ³ëÁ Ý³¨ ¹³ë³Ï³ñ·í³Í ¿ Áëï Ñ»ï¨Û³É Ñ³ïí³ÍÝ»ñÇ.

Î³éáõÛóÝ»ñ (i) µÝ³Ï»ÉÇ ï³ñ³ÍùÝ»ñ, (ii) ¹åñáóÝ»ñ, (iii) ÑÇí³Ý¹³ÝáóÝ»ñ, (iv) ³ÛÉ Ñ³ë³ñ³Ï³Ï³Ý Ï³éáõÛóÝ»ñ, (v) ³ñ¹ÛáõÝ³µ»ñáõÃÛ³Ý Ñ³Ù³ñ Ï³éáõÛóÝ»ñ, (vi) Í³é³ÛáõÃÛáõÝÝ»ñÇ Ñ³Ù³ñ Ï³éáõÛóÝ»ñ:

îñ³Ýëåáñï, Ý»ñ³éáõÙ ¿ (i) ·ñ³íÇ» ×³Ý³å³ñÑÝ»ñ, (ii) ³ëý³ÉïÇ» ÙÇ³ÏáÕÙ³ÝÇ ×³Ý³å³ñÑÝ»ñ, (iii) ³ëý³Éï» »ñÏÏáÕÙ³ÝÇ ×³Ý³å³ñÑÝ»ñ, (iv) Ï³ÙáõñçÝ»ñ, (v) »ñÏ³ÃáõÕÇ:

æáõñ, ¿É»Ïïñ³¿Ý»ñ·Ç³ ¨ Ñ³Õáñ¹³ÏóáõÃÛáõÝ Ý»ñ³éáõÙ ¿ (i) ·³½Ç Ñ³Ù³Ï³ñ·, (ii) ËÙ»Éáõ çñÇ ¨ Ïáé³ÕÇëÙ³Ý Ñ³Ù³Ï³ñ·, (iii) áéá·Ù³Ý ¨ ¹ñ»Ý³Å³ÛÇÝ Ñ³Ù³Ï³ñ·, (iv) ·»ï»ñ, (v) ¿É»Ïïñ³¿Ý»ñ·Ç³, (vi) Ñ»é³Ñ³Õáñ¹³ÏóáõÃÛáõÝ:

¶ÛáõÕ³ïÝï»ëáõÃÛáõÝ, Ý»ñ³éáõÙ ¿ (i) Ùß³Ï»ÉÇ Ñáղ»ñ, (ii) ³ñáï³í³Ûñ»ñ, (iii) ³Ýï³éÝ³ÛÇÝ ³ñï³¹ñáõÃÛáõÝ:

²ÛÉÝ, Ý»ñ³éáõÙ ¿ (i) ³ñï³Ï³ñ· ÇñáíÇ×³ÏÝ»ñÇ Í³Ëë»ñ, (ii) ù³Ý¹»É ï»Õ³÷áËáõÙ, (iii) Ñáõß³ñÓ³ÝÝ»ñ, (iv) ÙÝ³óáñ¹Ý»ñ:

4.3 Damage Assessment

4.3.1 Methodology

Landslide damage was assessed in the following manner: An Inventory Survey in 2004 by the JICA study team assessed the quantities of risk objects within 145 identified landslides; these were reported by the Ministry of Urban Development and infrastructure-related organizations to have been damaged. In this clause, "damage assessment" is undertaken in quantitative terms. Therefore casualty, psychological trauma, and monuments, etc. are not included in the damage assessment. The assessment relied on interviews with the communities, community leaders and infrastructure- related organizations.

The damage was categorized as shown in Figure 4.3:

Sector	Direct Damage	Indirect Damage	Direct Damage	Indirect Damage
Buildings Transport Water, energy, and communication Agriculture Others	**Existing Damage**		**Potential Damage/ Potential Benefit**	

Figure 4.3 Landslide Damage Category

The JICA landslide JICA damage assessment in 2004 can serve as an approximation for the scale and structure of landslide damage. The strong point of the JICA assessment is the attempt to estimate not only the existing damage but also the potential damage – that which can be avoided in the future and which represents potential benefits of landslide management.

Figure 4.3 shows the distinction between:

- Existing damage – that which has occurred in existing landslide zones, and
- Potential damage – that which will occur in the future, if no prevention measures are implemented within "existing landslide zones", "assumed further accumulation zone", "reservoir zone of landslide dam, and "flood area" as defined by the landslide inventory survey in 2004.

Potential damage might serve as a proxy for the benefits in the project evaluation.

The damage was also categorized into the following sectors:

Buildings, including (i) dwellings, (ii) schools, (iii) hospitals, (iv) other public buildings, (v) buildings for industry, (vi) buildings for services.

Transport, including (i) gravel roads, (ii) asphalt 1 lane roads, (iii) asphalt 2 lanes roads, (iv) bridges, (v) railways.

Water, energy, and communication including (i) gas system, (ii) drinking water & sewerage system, (iii) irrigation & drainage system, (iv) rivers, (v) energy & electricity, (vi) telecommunication.

Agriculture, including (i) crop land, (ii) grazing land, (iii) timber production.

Others, including (i) emergency expenditure, (ii) demolition removal, (iii) monuments, (iv) remaining.

The damage in each sector was valued as described in the table 4.4:

Úáõñ³ù³ÝãÛáõñ ëÉïáñáõÙ íÝ³ëÁ ³ñÅ¨áñí³Í ¿ñ ÇÝãå»ë ÝÏ³ñ³·ñí³Í ¿ ³ÕÛáõë³Ï 4.4-áõÙ:

²ÕÛáõë³Ï 4.4 êáÕ³ÝùÇ íÝ³ëÇ ·Ý³Ñ³ïáõÙ – ºÝÃ³¹ñáõÃÛáõÝÝ»ñ Ýß³Ý³Ïí³Í ³ñÅ»ùÝ»ñÇ Ñ³Ù³ñ

ê»Ïïáñ	àõÕÕ³ÏÇ íÝ³ë	²ÝáõÕÕ³ÏÇ íÝ³ë
Î³éáõÛóÝ»ñ	²ñÅ»ùÇ ÷áËÑ³ïáõóáõÙ – ï»Õ³÷áËáõÙ Ï³Ù í»ñ³Ï³Ý·ÝáõÙ[1] Î»Õ³÷áËÙ³Ý ³ñÅ»ùÁ Ñ³í³ë³ñ ¿ (1) ï³ñ³ÍùáõÙ[2] Ï³éáõÛóÝ»ñÇ ÙÇçÇÝ ßáõÏ³Û³Ï³Ý ·ÝÇÝ Ï³Ù (2) Ï³éáõóÙ³Ý ³ñÅ»ùÇÝ[3] ì»ñ³Ï³Ý·ÝÙ³Ý (í»ñ³Ýáñá·Ù³Ý) ³ñÅ»ùÁ Ñ³í³ë³ñ ¿ ï»Õ³÷áËÙ³Ý ³ñÅ»ùÇ ïáÏáë³¹ñáõÛùÇÝ Î³éáõÛóÝ»ñÁ ¹³ë³Ï³ñ·í³Í »Ý 6 íÝ³ëÇ Ï³ï»·áñÇ³Ý»ñÇ[4]	Î³éáõÛóÝ»ñÇ Ý»ñëáõÙ ï»Õ³¹ñí³Í ÝÛáõÃ³Ï³Ý ÙÇçáóÝ»ñÇ ³ñÅ»ùÝ»ñÁ (ë³ñù³íáñáõÙÝ»ñ, ³ñï³¹ñ³Ýù, Ï³Ñáõ³Ûù, ¨ ³ÛÉÝ) – Ùáï³íáñ³å»ë íÝ³ëí³Í Ï³éáõÛóÝ»ñÇ[5] ³ñÅ»ùÇ 20%-Á:
îñ³Ýëåáñï	²ñÅ»ùÇ ÷áËÑ³ïáõóáõÙ – ïñ³Ýëåáñï³ÛÇÝ »ÝÃ³Ï³éáõóí³ÍùÇ í»ñ³Ï³Ý·ÝáõÙ Ï³Ù í»ñ³Ï³éáõóáõÙ	(1) ìÝ³ëí³Í×³Ý³å³ñÑÝ»ñÇÝ ïñ³Ýëåáñï³ÛÇÝ ÙÇçáóÝ»ñÇ û·ï³·áñÍÙ³Ý Ñ³Ù³ñ ß³Ñ³·áñÍÙ³Ý µ³ñÓñ ³ñÅ»ùÝ»ñ: (2) Ä³Ù³Ý³ÏÇ ³ñÅ»ùÁ ßñç³ÝóÙ³Ý Ñ»ï¨³Ýùáí: Ðñ³å³ñ³Ïí³Í Ëóó³ÝÙ³Ý Í³í³ÉÝ»ñÁ, ß³Ñ³·áñÍÙ³Ý ÙÇ³íáñ ³ñÅ»ùÝ»ñÁ ¨ Å³Ù³Ý³ÏÇ ÙÇ³íáñ ³ñÅ»ùÝ»ñÁ ·Ý³Ñ³ïí³Í »Ý ÐÐ ïñ³Ýëåáñïǃ ¨ Ï³åÇ Ý³Ë³ñ³ñáõÃÛ³Ý ÏáÕÙÇó:
æáõñ, ¿Ý»ñ·»ïÇÏ³, Ï³å	²ñÅ»ùÇ ÷áËÑ³ïáõóáõÙ – í»ñ³Ï³Ý·ÝáõÙ Ï³Ù í»ñ³Ï³éáõóáõÙ	(1) öáËÑ³ïáõÙ³Ý Å³Ù³Ý³Ï³ßñç³ÝáõÙ å³Ñ³ÝçÇÝ ³ñÓ³·³Ý»Éáõ ³ñÅ»ùÝ»ñÁ (2) ºÝÃ³Ï³éáõóí³ÍùÇ ïÇñáç »Ï³ÙáõïÇ Ïñ×³ïáõÙ (3) ²×³Í ÁÝÃ³óÇÏ ·Ý»ñ ²ñÅ»ùÝ»ñÁ ëï³óí³Í »Ý Ñ³Ù³å³ï³ëË³Ý »ÝÃ³Ï³éáõóí³ÍùÇ ïÇñ»ñÇó:
¶ÛáõÕ³ïÝï»ëáõÃÛáõÝ	¶ÛáõÕ³ïÝï»ë³Ï³Ý ÑáÕÇ ³ñÅ»ùÁ, ³ÝÑÝ³ñ ¿ û·ï³·áñÍ»É ëáÕ³ÝùÝ»ñÇ å³ï×³éáí	Ðñ³Å³ñí»É ·ÛáõÕ³ïÝï»ë³Ï³Ý ³ñï³¹ñ³ÝùÇó:
²ÛÉ	àñ³Ï³Ï³Ý ·Ý³Ñ³ï³Í[6]	

´áÉáñ ·Ý»ñÇ Ï»ï»ñÁ ¨ ³ÛÉ ïíÛ³ÉÝ»ñÁ Ñ³ßí³ñÏí³Í »Ý áõÕÕ³ÏÇ ¨ ³ÝáõÕÕ³ÏÇ íÝ³ëÇ ·Ý³Ñ³ïÙ³Ý Ñ³Ù³ñ ¨ Ý»ñÏ³Û³óí³Í »Ý Ñ³í»Éí³Í V ²ÕÛáõë³Ï A5.2, A5.3.¨ A5.4-áõÙ:

[1] Ø»Ýù ·Ý³Ñ³ï»É »Ýù í»ñ³Ï³Ý·ÝÙ³Ý/ï»Õ³÷áËÙ³Ý ·ÇÝÁ ³í»ÉÇ ù³Ý ù³Ý¹í³Í ë»÷³Ï³ÝáõÃÛ³Ý ³Ï ïáõ³É ·ÇÝÁ, ³ÛÝ Ùáï ¿ Ð³Û³ëï³ÝáõÙ Ý»ñÏ³ÛÇë ÇñÇ³Ï³ÝáõÃÛ³ÝÁ ...
[2] Î³ñµ»ñ ßñç³ÝÝ»ñáõÙ ³Ýß³ñÅ ·áõÛùÇ ÙÇçÇÝ ßáõÏ³Û³Ï³Ý ·ÝÇ í»ñ³µ»ñÛ³É ïíÛ³ÉÝ»ñ Î³¹³ëïñÇ í³ñãáõÃÛáõÝ, Ð³í»Éí³Í V ²ÕÛáõë³Ï A5.2:
[3] ÞÇÝ³ñ³ñ³Ï³Ý ³ñÅ»ùÝ»ñÇ ïíÛ³ÉÝ»ñ` ²ðØä ðàÚ, Ð³í»Éí³Í V ²ÕÛáõë³Ï A5.2:
[4] Ð³Ù³Ô³ÙÝ µáÉáñ ØÇáõÃ³Ý ä»ï³Ï³Ý ëï³Ý¹³ñï 6249-52-ÇÝ, - Ð³í»Éí³Í V ²ÕÛáõë³Ï A5.3
[5] ²Ýß³ñÅ ·áõÛùÇ ³ñÅ»ùÇ Ïáñáõëï ...
[6] ä³ïÙ³Ñ³Ï³Ý ¹»åù»ñ ...

The damage in each sector was valued as described in the table 4.4:

Table 4.4 Landslide Damage Assessment – Assumptions for Assigned Values

Sector	Direct damage	Indirect damage
Buildings	Cost of recovery – replacement or restoration.[1] Cost of replacement equals (1) average market price of buildings in the area[2] or (2) construction cost[3] Cost of restoration (repairs) equals a percentage of replacement cost. Buildings are classified into 6 damage categories[4]	Cost of wealth located inside building (equipment, production, furniture, etc.) – approximated as 20% of value of damaged buildings.[5]
Transport	Cost of recovery - rehabilitation or reconstruction of transport infrastructure.	(1) Higher exploitation costs for vehicles using damaged roads. (2) Time value due to detours. Applied traffic volumes, exploitation unit costs and time unit values estimated by Ministry of Transportation .and communication.
Water, energy, and communication	Cost of recovery – rehabilitation or reconstruction.	(1) Cost of responding to demand during recovery period (2) Reduced income of infrastructure owner (3) Increased operating costs Values obtained from respective infrastructure owners.
Agriculture	Value of agricultural land which are impossible to use due to landslides.	Forgone agricultural production.
Others	Estimated qualitatively[6]	

All unit costs and other data applied for the estimation of direct and indirect damage are presented in the appendix V Table A5.2, A5.3.and A5.4

[1]. We estimated the restoration/replacement cost rather than the actual cost of destroyed asset; that is closer to reality in Armenia at present (very often, if we took into account the amortization, the value of damaged object would be close to zero; still, the necessary replacement must take place).
[2] Data on the average market prices of real estate in different regions from Cadastral Service, Appendix V Table A5.2
[3] Data on construction costs from ARMPROY, Appendix V Table A5.2
[4] According to all-Union State Standard 6249-52 - Appendix V Table A5.3
[5] The loss of value of real estate due to damage is another indirect loss; however it was difficult to quantify (comparison impossible due to undeveloped real estate markets).
[6] Causalities due to landslides are not included in damages, because it is very rare, and it is difficult to estimate the possibility. Kapan city informed the Study Team that three (3) persons died in the Kapan Harutyunyan street landslide in August 1994.

4.3.2 ì Ý³ëÇ ¶Ý³Ñ³ ïÙ³Ý Ñ³ ÏÇñ× µÝáõÃ³·ÇñÁ

(1) ÀÝ¹Ñ³Ýáõñ

Ð»ï¨Ûë³É ·Ý³Ñ³ïÙ³Ý ³ñ¹ÛáõÝùÝ»ñÁ Ñ»ï¨³Ýù »Ý 2004Ã.-ÇÝ ØÐÖ¶ ÆÝí»Ýï³ñ Ñ»ï³½áïÙ³Ý ³ÛÝù³Ý Å³Ù³Ý³Ï, áñ Ýñ³Ýù Ù³ëÝ³íáñ³å»ë ã»Ý ÉÇÝÇ Ýß³Í:

²ñ¹ÛáõÝùÝ»ñÁ óáõÛó »Ý ï³ÉÇë, áñ Ïáõï³Ïí³Í áõÕÕ³ÏÇ íÝ³ëÁ ³é³ç³ó»É ¿ ëáÕ³ÝùÝ»ñÇ Ñ»ï¨³Ýùáí, ³é³ÛëûñÏ³½ÙáõÙ ¿ 43 ÙÇÉÇáÝ ²ØÜ ¹áÉ³ñ: ²í»ÉÇÝ, Ûáõñ³ù³ÝãÛáõñ ï³ñÇ Ð³Ûë³ï³ÝÁ Ïñ»É ¿ 4 ÙÇÉÇáÝ ²ØÜ ¹áÉ³ñÇ ³ÝáõÕÕ³ÏÇ íÝ³ëÝ»ñ (ÙÇ³ÛÝ ÑÝ³ñ³íáñ Ï»ï»ñÝ »Ý Ñ³ßí³Í):

ÆÝã í»ñ³µ»ñíáõÙ ¿ ëáÕ³ÝùÇ åáï»ÝóÇ³É íÝ³ëÇÝ, ³å³ ¹ñ³ áñáß Í³í³ÉÇó Ï³ñ»ÉÇ ¿ ³å³·³ÛáõÙ Ëáõë³÷»É, áõÕÕ³ÏÇ íÝ³ëÇ ·áõÙ³ñ³ÛÇÝ ³ñÅ»ùÁ ·Ý³Ñ³ï í³Í ¿ 54 ÙÇÉÇáÝ ²ØÜ ¹áÉ³ñ: Æ Ñ³í»ÉáõÙÝ, Ûáõñ³ù³ÝãÛáõñ ï³ñÇ 5 ÙÇÉÇáÝ ²ØÜ ¹áÉ³ñ ³ñÅáÕáõÃÛ³Ùµ ³ÝáõÕÕ³ÏÇ íÝ³ëÇó Ï³ñ»ÉÇ ¿ Ëáõë³÷»É:

²ÝáõÕÕ³ÏÇ íÝ³ëÁ Ñ³ßí³ñÏí»É ¿ ÙÇ³ÛÝ ³ÛÝ Ï»ï»ñáí, áñáÝù Ï³ñáÕ »Ý Ñ³ßí³ñÏí»É: ì Ý³ëÇ ·Ý³Ñ³ïÙ³Ý Ñ³ÏÇñ× µÝáõÃ³·ÇñÁ óáõÛó ¿ ïñí³Í ³ÕÛáõë³Ï 4.5-áõÙ:

²Õ Ûáõë³Ï 4.5 êáÕ³ÝùÇ ì Ý³ëÇ ¶Ý³Ñ³ïáõÙ– ²ñ¹ÛáõÝùÝ»ñ

	²éÏ³		ä áï»ÝóÇ³É	
	àõÕÕ³ÏÇ ¶áõÙ³ñ³ÛÇÝ ²ñÅ»ùÝ»ñ ØÇÉÇáÝ ²Ø¸	ì Ý³ë ²ÝáõÕÕ³ÏÇ î³ñ»Ï³Ý²ñÅ»ùÝ»ñ ØÇÉÇáÝ ²Ø¸/ï³ñÇ	àõÕÕ³ÏÇ ¶áõÙ³ñ³ÛÇÝ ²ñÅ»ùÝ»ñ ØÇÉÇáÝ ²Ø¸	²ÝáõÕÕ³ÏÇ î³ñ»Ï³Ý²ñÅ»ùÝ»ñ ØÇÉÇáÝ ²Ø¸/ï³ñÇ
Î³éáõÛóÝ»ñ	8.0	1.1	30.9	2.4
Îñ³Ýë åáñ ï æáõñ, ¿É»Ï ï ñ³Ñ³ï³¿Ý»ñ·Ç³¨Ñ³ÕáñÑ³Ï³ÝáõÃÛáõÝ	18.6 4.3	2.4 0.2	19.1 2.6	2.9 0.1
¶ÛáõÕ³ï Ý ï »ëáõÃÛáõÝ	12.2	0.0	1.0	0.0
ÀÝ¹Ñ³Ýáõñ	**43.1**	**3.7**	**53.3**	**5.4**

(2) àõÕÕ³ÏÇ ì Ý³ë

àñáíÑ»ï¨ å³ï³ëË³Ý³ï áõ ëáõµÛ»Ï ï Ý»ñÇ Ï³ï»·áñÇ³ÛÇ ¹³ë³Ï³ñ·áõÙÁ éÇëÏÇ ûµÛ»Ï ï Ý»ñÇ Ñ³Ù³ñ ¹Åí³ñ¿: ²Ûë ·Ý³Ñ³ïÙ³Ý Ù»ç ÏáåÇï ¹³ïáÕáõÃÛáõÝÝ»ñÁ ³ñí»É »Ý ¨ µ³Å³Ýí»É »Ý éÇëÏÇ ûµÛ»Ï ï Ý»ñÇ Ñ³Ù³ñ »ñ»ù å³ï³ëË³Ý³ï áõ Ï³ï»·áñÇ³Ý»ñÇ, ÇÝãå»ë óáõÛó ¿ ïñí³Í ²Õ Ûáõë³Ï 4.6-áõÙ:

²Õ Ûáõë³Ï 4.6 èÇëÏÇ ûµÛ»Ï ï Ý»ñÇ Ñ³Ù³ñ å³ï³ëË³Ý³ï áõ ëáõµÛ»Ï ï Ý»ñ

ê»Ï ï áñ	Ð³Ù³ÛÝù/µÝ³ÏÇãÝ»ñ	Ø³ëÝ³íáñ Ó»éÝ³ñÏáõÃÛáõÝ	Î³é³í³ñáõÃÛáõÝ
Î³éáõÛóÝ»ñ	100%	0%	0%
îñ³Ýëåáñ ï	¶ñ³íÇÉ» ×³Ý³å³ñÑ, ³ëý³É ï»×³Ý³å³ñÑ (Ý»ñ³éí³Í »Ý Ù³ÛñáõÕÇÝ»ñÁ)	0%	²ëý³É ï»Ù³ÛñáõÕÇ (»ñÏ ïáÕÙ³ÝÇ ×³Ý³å³ñÑÝ»ñ)
æáõñ, ¾É»Ï ï ñ³¿Ý»ñ·Ç³¨Ñ³ÕáñÑ³Ï³ÝáõÃÛáõÝ	0%	¶³½ÇÑ³Ù³Ï³ñ·, ¾É»Ï ï ñ³¿Ý»ñ·Ç³¨Ñ»é³Ëáë³Ï³å	àéá·Ù³Ý·ÉË³íáñ çñ³·ÇÍ (æñ³ÛÇÝ ïáÙÇ ï»)
	(³Ù»Ý³ß³ï çñ³·ÍÇ ×ÛáõÕ»ñÁ, ¨ ¹ñ³Ýù å³Ñå³Ýíáõ Ù »Ý Ñ³Ù³ÛÝùÝ»ñÇ ïáÕÙÇó, µ³Ûó ³Ûë áõëáõÙÝ³ëÇñáõÃÛáõÝÝ»ñáõÙ, áñáíÑ»ï¨ å³ï³ëË³Ý³ï áõ Ï³½Ù³Ï»ñåáõÃÛáõÝÝ»ñÇ ×ß·ñÇï ¹³ë³Ï³ñ·áõÙÁ ³ÝÑÝ³ñ¿, µáÉáñ çñÇ å³ï³ëË³Ý³ï áõ ÏáÕÙ»ñÁ Ý»ñ³éí³Í »Ý §Î³é³í³ñáõÃÛáõÝ¦ ëÛáõÝÛ³ÏáõÙ)		
¶ÛáõÕ³ï Ý ï »ëáõÃÛáõÝ	100%	0%	0%

4.3.2 Outline of Damage Assessment

(1) General

The following assessment results are due to the JICA inventory survey in 2004 .

The results revealed that the cumulated direct damage caused by landslides up-to-date is USD 43 million. Moreover, each year Armenia suffers from USD 4 million in indirect damages (only a number of possible items are calculated.)

As for the potential landslide damage – that which can be to some extent avoided in the future – the cumulated value of direct damage is estimated at USD 54 million. In addition, each year USD 5 million of indirect damage can be avoided.

Indirect damage includes only items that can be calculated. Outline of damage assessments results are shown in table 4.5.

Table 4.5 Landslide Damage Assessment – Results

	Existing		**Potential**	
	Direct Damage Cumulated Values Million USD	Indirect Damages Annual Values Million USD/ year	Direct Cumulated Values Million USD	Indirect Annual Values Million USD/ year
Buildings	8.0	1.1	30.9	2.4
Transport	18.6	2.4	19.1	2.9
Water, energy, and communication	4.3	0.2	2.6	0.1
Agriculture	12.2	0.0	1.0	0.0
Total	**43.1**	**3.7**	**53.3**	**5.4**

(2) Direct Damage

Because exact classification of responsible subject category for risk objects is difficult, rough judgments were done, and these were divided into three responsibility categories for risk objects as shown in Table 4.6.

Table 4.6 Responsibility Subjects for Risk Objects

Sector	Community/inhabitants	Private Company	Government
Building	100%	0%	0%
Transport	Gravel road, asphalt road (highways are excluded)	0%	Asphalt highways (more than two lanes)
Water, Energy and communication	0%	Gas system, energy & electrics and telephone line	Trunk line of irrigation (Water committee)
	(most branch water lines, and their facilities are maintenance by communities, but in this study, because exact classification of responsible organization is impossible, all of water responsible were included to “Government”.)		
Agriculture	100%	0%	0%

êáÕ³ÝùÇ Ñ»ï¨³Ýùáí ³é³ç³ó³Í áõÕÕ³ÏÇ ³éÏ³ íÝ³ëÁ óáõÙó¿ ïñí³Í ²ÕÙáõë³Ï4.7-áõÙ ¨ ÜÏ³ñ 4.4-áõÙ, Ñ³Ù³Ó³ÛÝ ²ÕÙáõë³Ï 4.6-Ç ·áñÍ³¹Çñ ëáõµÛ»ï ïÇ µ³ÅÝÇ:

Direct existing damage due to landslides are show in Table 4.7 and Figure 4.4, according to the execution subject division of Table 4.6.

²ÕÙáõë³Ï 4.7 êáÕ³ÝùÝ»ñÇ Ñ»ï¨³Ýùáí ³é³ç³ó³Í áõÕÕ³ÏÇ ³éÏ³ íÝ³ë

	²éÏ³ íÝ³ë,·áõÙ³ñ³ÛÇÝ ³ñÅ»ùÝ»ñ èÇëÏÇ ûµÛ»Ï ïÝ»ñÇ å³ï³ëË³Ý³ïáõ ëáõµÛ»Ï ïÝ»ñÁ				
	ÀÝ¹Ñ³Ýáõñ		Ð³Ù³ÛÝù/ µÝ³ÏÇã	Ø³ëÝ³íáñ Ô»éÝ³ñÏáõÃÛáõÝ	Ð³Ûë³ï³ÝÇ Î³é³í³ñáõÃÛáõÝ
	²Ø¸ ÙÇÉÇáÝ	%	²Ø¸ ÙÇÉÇáÝ	²Ø¸ ÙÇÉÇáÝ	²Ø¸ ÙÇÉÇáÝ
Î³éáõÛóÝ»ñ	8.0	19 %	8.0	0.0	0.0
Îñ³Ýëåáñï	18.6	43 %	15.1	0.0	3.5
æáõñ, ¾É»Ïïñ³¿Ý»ñ·Ç³ ¨ Ñ³Õáñ¹³ÏóáõÃÛáõÝ	4.3	10 %	0.0	2.2	2.1
¶ÛáõÕ³ ï Ý ï »ëáõÃÛáõÝ	12.2	28 %	12.2	0.0	0.0
ÀÝ¹Ñ³Ýáõñ	**43.1**	**100 %**	**35.3**	**2.2**	**5.6**

.

Table 4.7 Direct Existing Damage Due to Landslides

	Existing Damage, cumulative values Responsibility Subjects for Risk Objects				
	Total		Community/ inhabitants	Private Company	Government of Armenia
	USD million	%	USD million	USD million	USD million
Buildings	8.0	19 %	8.0	0.0	0.0
Transport	18.6	43 %	15.1	0.0	3.5
Water, Energy and communication	4.3	10 %	0.0	2.2	2.1
Agriculture	12.2	28 %	12.2	0.0	0.0
Total	**43.1**	**100 %**	**35.3**	**2.2**	**5.6**

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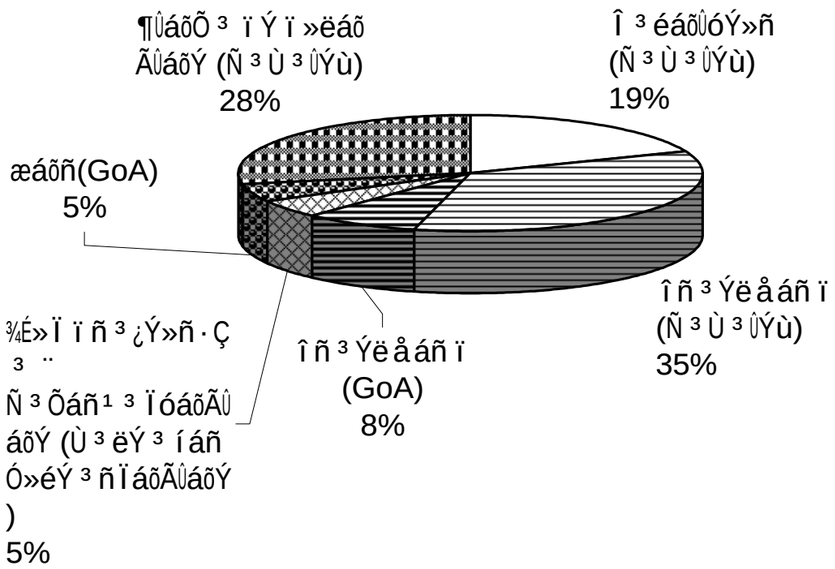
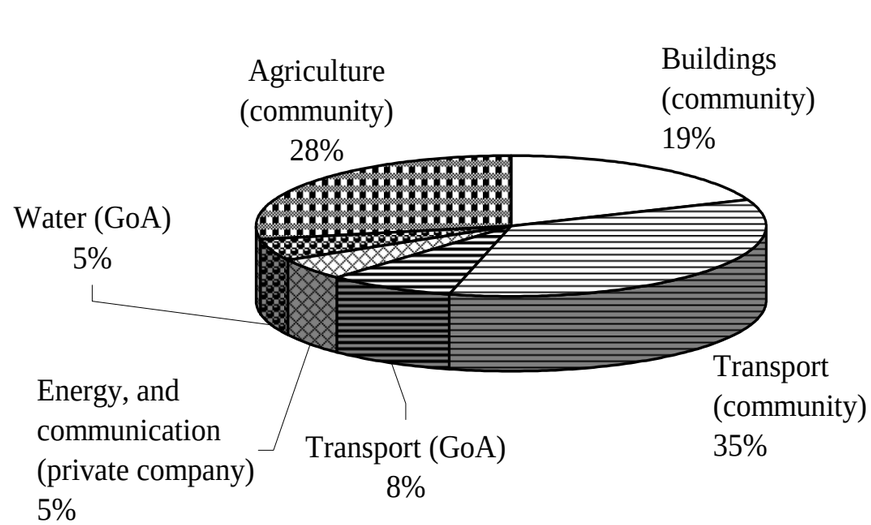




ÜÏ³ñ 4.4 êáÕ³ÝùÝ»ñÇ ³éÏ³ áõÕÕ³ÏÇ íÝ³ëÝ»ñ

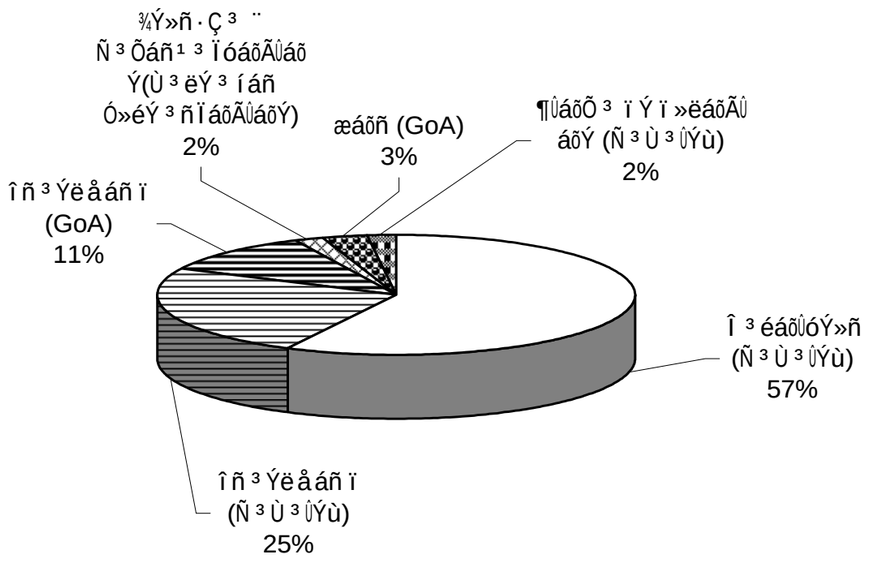
Figure 4.4 Existing Direct Damages of Landslides

êáÕ³ÝùÇ Ñ»ï¨³Ýùáí ³é³ç³ó³Í áõÕÕ³ÏÇ ³éÏ³ íÝ³ëÁ óáõÛó¿ ïñí³Í ²ÕÛáõë³Ï4.8-áõÙ ¨ ÜÏ³ñ 4.5-áõÙ, Ñ³Ù³Ó³ÛÝ ²ÕÛáõë³Ï 4.6-Ç ·áñÍ³¹Çñ ëáõµÛ»ï ïÇ µ³ÅÝÇ:

²ÕÛáõë³Ï 4.8 êáÕ³ÝùÝ»ñÇ Ñ»ï¨³Ýùáí àõÕÕ³ÏÇ äáï»ÝóÇ³É ì Ý³ë

	²éÏ³ íÝ³ë, ·áõÙ³ñ³ÛÇÝ ³ñÅ»ùÝ»ñ èÇëÏÇ ûµÛ»Ï ïÝ»ñÇ å³ï³ëË³Ý³ ïáõ ëáõµÛ»Ï ïÝ»ñÁ				
	ÀÝ¹Ñ³Ýáõñ		Ð³Ù³ÛÝù/ µÝ³ÏÇã	Ø³ëÝ³ íáñ Ò»éÝ³ñÏáõÃÛáõÝ	Ð³Ïë³ï³ÝÇ Î³é³í³ñáõÃÛ áõÝ
	²Ø¸ÙÇÉÇáÝ	%	²Ø¸ÙÇÉÇáÝ	²Ø¸ÙÇÉÇáÝ	²Ø¸ÙÇÉÇáÝ
Î³éáõÛóÝ»ñ	30.9	19 %	30.9	0.0	0.0
Îñ³Ýëåáñï	19.1	43 %	13.4	0.0	5.7
æáõñ, ¾É»ïï ñ³¿Ý»ñ·Ç³¨ Ñ³Õáñ¹³ÏóáõÃÛáõÝ	2.6	10 %	0.0	1.1	1.5
¶ÛáõÕ³ï Ý ï »ëáõÃÛáõÝ	1.0	28 %	1.0	0.0	0.0
ÀÝ¹Ñ³Ýáõñ	**53.6**	**100 %**	**45.3**	**1.1**	**7.2**

²ÕÛáõñ: êáÕ³ÝùÇ ÆÝí»Ý ï³ñÇ Ñ»ï³½áï áõÃÛáõÝ, ØÐÜ¶ Ñ»ï³½áï³Ï³Ý ËáõÙµ, ÐáõÝÇë-ê»åï»ÙµñÅ 2004; ÁÝ¹Ñ³Ýáõñ ³ñÅ»ùÝ»ñ:



ÜÏ³ñ 4.5 êáÕ³ÝùÝ»ñÇ åáï»ÝóÇ³É áõÕÕ³ÏÇ íÝ³ëÝ»ñ

Direct potential damage due to landslides are show in Table 4.8 and Figure 4.5, according to the execution subject division of Table 4.6.

Table 4.8 Direct Potential Damage Due to Landslides

	Existing Damage, cumulative values Responsibility Subjects for Risk Objects				
	Total		Community/ inhabitants	Private Company	Government of Armenia
	USD million	%	USD million	USD million	USD million
Buildings	30.9	19 %	30.9	0.0	0.0
Transport	19.1	43 %	13.4	0.0	5.7
Water, Energy and communication	2.6	10 %	0.0	1.1	1.5
Agriculture	1.0	28 %	1.0	0.0	0.0
Total	**53.6**	**100 %**	**45.3**	**1.1**	**7.2**

Source: Landslide Inventory survey , JICA Study Team, June-September 2004; cumulative values.

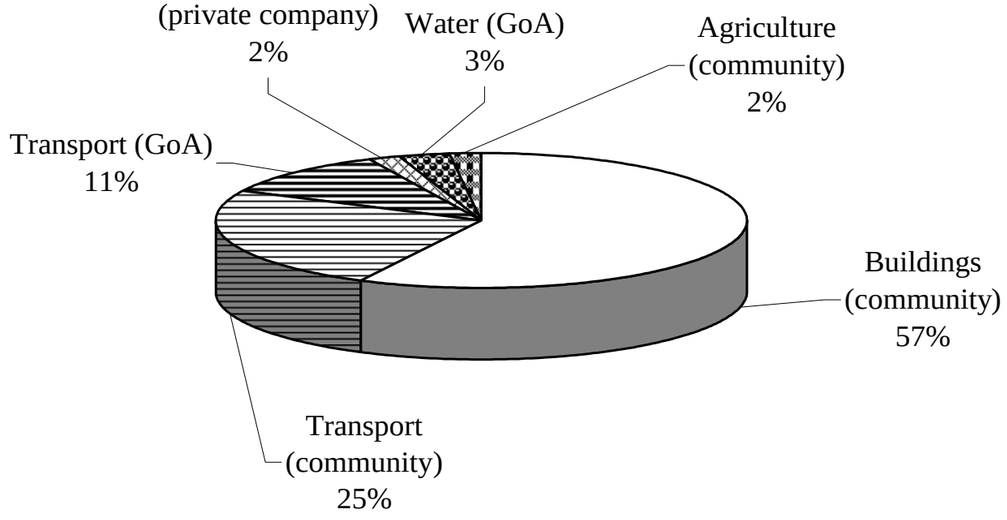


Figure 4.5 Potential Direct Damages of Landslides

4.3.2 îÝï»ëáõÃÛ³Ý ë»Ï ïáñÇ ìÝ³ëÇ ¶Ý³Ñ³ ïÙ³Ý ²ñ¹ÛáõÝùÝ»ñ

(1) Î³éáõÛóÝ»ñ

êáÕ³ÝùÝ»ñÇó å³ï×³éí³Í ÁÝ¹Ñ³Ýáõñ ³éÏ³ áõÕÕ³ÏÇ íÝ³ëÇ 19%-Á Ï³½ÙáõÙ »Ý Ï³éáõÛóÝ»ñÁ (8.0 ÙÇÉÇáÝ ²ØÜ ¹áÉ³ñ): ²Ûë ³ñÅ»ùÁ Ñ³Ù»Ù³ï³µ³ñ ÷áùñ ¿` Ñ³Ï³é³Ï ÇÝãå»ë ëáíáñ³µ³ñ ÁÝ¹áõÝí³Í ¿, áñ Ï³éáõÛóÝ»ñÇ ë»Ï ïáñÁ Ïñáõù ¿ ³Ù»Ý³Ù»Í íÝ³ëÝ»ñÁ: ìÝ³ëÝ»ñÇ Ñ³Ù»Ù³ï³µ³ñ ÷áùñ ³ñÅ»ùÁ Ð³Ûë ï ³ÝÇ ³Ýß³ñÅ ·áõÛùÇ ßáõÏ³ÛÇ íÇ×³ÏÇ ³ñ¹ÛáõÝù ¿:

Ð³Ûë ï ³ÝÇ µÝ³Ï³ñ³ÝÇ ³å³ÑáíÙ³Ý ßáõÏ³Ý µÝáõÃ³·ñíáõÙ ¿ ³å³Ñáíí³ÍáõÃÛ³Ý µ³ñÓñ Ù³Ï³ñ¹³Ïáí` Ñ³Ù»Ù³ï³Í ÷³ëï³óÇ å³Ñ³Ýç³ñÏÇ Ñ»ï: ²éÏ³ µÝ³Ï»ÉÇ ï³ñ³íÙÇ ÙÇ³íáñÝ»ñÁ ÝÏ³ï»ÉÇ ¿Å³Ý »Ý, ù³Ý Ñ³Ù»Ù³ï³µ³ñ Ýáñ»ñÁ[1]: àñå»ë½Ç ·Ý³Ñ³ï»É íÝ³ëí³Í Ï³éáõÛóÝ»ñÇ ÃíÇ ³ñÅ»ùÁ, áñÁ Ç¹»ÝïÇýÇÏ³óí³Í ¿ÆÝí»Ýï³ñÐ»ï³½áïÙ³Ý ÏáÕÙÇó, Ù»Ýù áõÝ»Ýù »ñÏáõ Ï³ñÍÇù Ý»ñ. (1) û·ï³·áñÍ»É Ï³éáõÛóÝ»ñÇ ßáõÏ³Û³Ï³Ý ÙÇçÇÝ ·ÇÝÁ` ÁëïÏ³Õ³µ³ßËí³ÍáõÃÛ³Ý[2], Ï³Ù (2) û·ï³·áñÍ»É Ýáñ Ï³éáõÛóÝ»ñÇ[3] ßÇÝ³ñ³ñ³Ï³Ý ·Ý»ñÁ. ÁÝïñáõÃÛ³Ý Ñ³Ù³ñ (1) Ï³ñÍÇùÇ í»ñ³µ»ñÛ³É` ßáõÏ³Û³Ï³Ý ·Ý»ñ, Ù»Ýù ÏÇñ³é»É »Ýù íÝ³ëÝ»ñÇ ³ñÅ»ùÁ 8.0 ÙÇÉÇáÝ ²ØÜ ¹áÉ³ñ: (2)-ñ¹ Ï³ñÍÇùÁ` ßÇÝ³ñ³ñ³Ï³Ý ·Ý»ñÁ, ³å³ Ï³éáõÛóÝ»ñÇ ë»Ï ïáñáõÙ ÁÝ¹Ñ³Ýáõñ ³éÏ³ íÝ³ëÝ»ñÁ Ï³×»ñ 109 ÙÇÉÇáÝ ²ØÜ ¹áÉ³ñÇ:

Ø»Ýù ·»ñ³¹³ë»É »Ýù û·ï³·áñÍ»É ßáõÏ³Û³Ï³Ý ·Ý»ñÁ: ²ÛÝ ÃíáõÙ ¿ Çñ³Ï³ÝáõÃÛ³ÝÁ ³í»ÉÇ Ùáï; ÐÐ ù³Õ³ù³ßÇÝáõÃÛ³Ý Ý³Ë³ñ³ñáõÃÛáõÝÁ ÝáõÛÝå»ë û·ï³·áñÍáõÙ ¿ ßáõÏ³Û³Ï³Ý ·Ý»ñÁ íÝ³ëí³Í ï»ñÇ ÷áËÑ³ï áõóÙ³Ý Ù»ÍáõÃÛ³Ý ·Ý³Ñ³ï Ù³Ý ³ñ³ÏÙ³ñ:

àñå»ë½Ç óáõÛó ï³Ýù ëáÕ³ÝùÝ»ñÇ íÝ³ëÝ»ñÇ ³½¹»óáõÃÛáõÝÁ ³ÙµáÕç ï³éáõóáÕÏ³Ý ë»Ï ïáñÇ íñ³, Ù»Ýù Ñ»ï¨»É »Ýù Ð³Ûë ï³ÝÇ µÝ³Ï»ÉÇ ýáÝ¹ÇÝÇÝ: Ð³Ûë ï³ÝÇ µÝ³Ï»ÉÇ ýáÝ¹ÇÝÇ ÁÝ¹Ñ³Ýáõñ Ù³Ï»ñ»ëÁ Ï³½ÙáõÙ ¿ 67,242,700Ù[2], áñÇ 60%-Á ·ïÝíáõÙ ¿ ù³Õ³ù³ÛÇÝ ï³ñ³ÍùÝ»ñáõÙ ¨ 40%-Á ·ÛáõÕ³Ï³Ý ï³ñ³ÍùÝ»ñáõÙ: Ð³Ù³Ó³ÛÝ ÆÝí»Ýï³ñ Ð»ï³½áïÙ³ÝÁ, µÝ³Ï»ÉÇ ýáÝ¹Ç 1.2%-Á ï»Õ³µ³ßËí³Í ¿ ëáÕ³Ýù³ÛÇÝ ï³ñ³ÍùÝ»ñáõÙ, ëáÕ³ÝùÝ»ñÇ ÏáÕÙÇó ³é ³Ûëûñ íÝ³ëí³Í ¿ 0.3%, ¨ 0.8%-Á Ï³ñáÕ ¿ åáï»ÝóÇ³É íÝ³ëí»É:

²ÕÛáõë³Ï 4.9 ´Ý³Ï»ÉÇ ýáÝ¹. êáÕ³ÝùÝ»ñÇó ìÝ³ëí³Í ¨ ÀÝ¹Ñ³Ýáõñ

	ÀÝ¹Ñ³Ýáõñ µÝ³Ï»ÉÇ áÝ¹Á Ð³Ûë ï³ÝáõÙ	î»Õ³¹ñí³Í ëáÕ³Ýù³ÛÇÝ ï³ñ³ÍùÝ»ñáõÙ		êáÕ³ÝùÝ»ñÇ ÏáÕÙÇó íÝ³ëí³Í		êáÕ³ÝùÝ»ñÇ ÏáÕÙÇó åáï»ÝóÇ³É íÝ³ëí³Í	
	Ù²	Ù²	% ÁÝ¹Ñ³-ÝáõñÇó	Ù²	% ÁÝ¹Ñ³-ÝáõñÇó	Ù²	% ÁÝ¹Ñ³ÝáõñÇó
ÀÝ¹Ñ³Ýáõñ	67,241,700	795,100	1.2%	198,900	0.3%	540,900	0.8%
ø³Õ³ù³ÛÇÝ	59.9%						
¶ÛáõÕ³Ï³Ý	40.1%						

²ÕµÛáõñ (1) ÀÝ¹Ñ³Ýáõñ µÝ³Ï»ÉÇ ýáÝ¹Á Ð³Ûë ï³ÝáõÙ`§Ð³Ûë ï³Ý-ºñÏñÇ ´Ý³Ï»ÉÇ üáÝ¹»ñÇ äñáýÇÉÝ»ñÁ, Ø²Î, 2004¦ ¨ ÐÐ øÜ ´Ý³Ï³ñ³ÝÇ ²å³ÑáíÙ³Ý ¨ ÎáÙáõÝ³É ø³Õ³ù³Ï³ÝáõÃÛ³Ý ´³ÅÇÝ, (2) ´Ý³Ï»ÉÇ üáÝ¹Á ëáÕ³ÝùÇ ³½¹»óáõÃÛáõÝÇó` “ÆÝí»Ýï³ñÐ»ï³½áïáõÃÛáõÝ, ØØÐ¶ Ð»ï³½áï³Ï³Ý ÊáõÙµ, ê»åï»Ù»ñ 2004”

[1] ºñ¨³ÝÇ ¹»åùáõÙ ï³ñµ»ñáõÃÛáõÝÁ »ñ»ù³Ý·³Ù¿. 1Ù² µÝ³Ï»ÉÇ ï³ñ³íÙÇ ßáõÏ³Û³Ï³Ý ·ÇÝÁ · ïÝíáõÙ ¿ 80-90²ØÜ ¹áÉáñÇ ÙÇç¨, ¨ Ýáñ Ï³éáõóÙ³Ý ·Ý»ñÁ 250²ØÜ ¹áÉ³ñ ¨ ³í»É:ØÛáõë ÏáÕÙÇó Ð³Ûë ï³ÝÇ Ñ³Ù³ñ ³Û¹ ï³ñµ»ñáõÃÛáõÝÝ»ñÁ ß³ï ³í»ÉÇ Ù»Í »Ý: Ø»Ýù ï³ÉÇë »Ýù ×ß·ñÇ ï ·Ý»ñÁ Ð³í»É³Í V ²ÕÛáõë³Ï A5.2-áõÙ:

[2] Î³ÁÝÏñ» ï ï»Õ³ÝùÇ ßáõÏ³Û³ÏÝ ·Ý»ñÁ ë ï³óí»É »Ý Î³¹³ë ï³ñ³ÙÇÝ Ì³é³ÛáõÃÛáõÝÇó, ÐáõÝÇë 2004 – Ð³í»É³Í V ²ÕÛáõë³Ï A5.2:

[3] Î³éáõóÙ³Ý·Ý»ñÁ ë ï³óí³Í»Ý ArmProy-Çó, ÐáõÝÇë 2004 – Ð³í»É³Í V ²ÕÛáõë³Ï A5.3.

4.3.2 Damage Assessment Results by Economic Sector

(1) Buildings

The buildings constitute 19% of the total existing direct damage caused by landslides (USD 8.0 million). That value is relatively small – contrary to the usual perception that the building sector suffers the most damages. The relatively small value of damages is the result of the situation in the real estate market in Armenia.

Armenia’s housing market is characterized by high level of supply compared to effective demand. Existing housing units are considerably cheaper than comparable new units[1]. To assess the value of a number of damaged buildings identified by the inventory survey we had two options: (1) to use the average market price of buildings in the given location[2], or (2) to use the construction prices of new buildings[3]. For the option (1), market prices, we obtained the value of damages of USD 8.0 million. Should we apply option (2), the construction prices, the total existing damages in building sector would increase to USD 109 million.

We opted to use market prices. It seems to be much closer to the reality; the Ministry of Urban Development is also using the market prices for the estimation of the amount of compensation for the damaged houses.

To show the impact of landslide damages on the whole building sector we looked at the housing stock in Armenia. The total surface of Armenia’s housing stock amounts to 67,242,700 m^2, of which 60% is in urban areas and 40% is in rural areas. According to the Inventory Survey, 1.2% of the housing stock is located within the landslide areas, 0.3% is damaged up-to-date by landslides, and 0.8% can be potentially damaged.

Table 4.9 Housing Stock: Total and Damaged by Landslides

	Total housing stock in Armenia	Located within landslides		Damaged by landslides		Potentially damaged by landslides	
	m^2	m^2	% of total	m^2	% of total	m^2	% of total
Total	67,241,700	795,100	1.2%	198,900	0.3%	540,900	0.8%
Urban	59.9%						
Rural	40.1%						

Source: (1) Total housing stock in Armenia from “Armenia – Country Profiles on the Housing Sector, UN, 2004” and MoUD Housing and Communal Policy Dept.; (2) Housing stock affected by landslides from “Inventory Survey, JICA Study September 2004”

[1] In case of Yerevan the difference is about three times: the market price of 1m^2 of residential area averages between USD 80-90, and new construction costs USD 250 or more. In other parts of Armenia those differences are much greater. We give the exact prices in the Appendix V Table A5.2.

[2] The market prices for exact locations provided by the Cadastral Service, June 2004 – Appendix V Table A5.2.

[3] The construction prices provided by ArmProy, June 2004 – Appendix V Table A5.3.

Ð³Ù³ë ï ³ÝÇ µÝ³Ï³ñ³ÝÝ»ñÇ ³å³ÑáíÙ³Ý ë»Ï ïáñÁ Ë³÷³Ýí»É ¿ êáí»ï³Ï³Ý ØÇáõÃÙ³Ý ÷Éáõ½áõÙÇó, ³ÝóáõÙ³ÙÇÝ ßñç³ÝÁ áõÕ»ÏóáÕ ë»÷³Ï³Ý³ßÝáñÑáõÙÇó, 1988Ã.-ÇÝ êåÇï³ÏÇ »ñÏñ³ß³ñÅÇó ¨ Ù»Íù³Ý³ÏáõÃÙ³Ùµ ÷³Ëë ï³Ï³ÝÝ»ñÇ Ý»ñ·³ÕÃÇó: ²í»ÉÇ ù³Ý 15 ï³ñÇ ÐÐ Ï³é³í³ñáõÃÙáõÝÁ Ï»Ýï ñáÝ³ó³Í ¿ Ù³ñ¹Ï³Ýó ³é³ÝÓÇÝ ËÙµ»ñÇ íñ³` 500.000 Ù³ñ¹ÇÏ, áñáÝù Ïáñóñ»É ¿ÇÝ Çñ»Ýó µÝ³Ï³ñ³ÝÝ»ñÁ êåÇï³ÏÇ »ñÏñ³ß³ñÅÇ Å³Ù³Ý³Ï¨360.000 ¿ÃÝÇÏ Ñ³Ù÷³Ëë ï³Ï³ÝÝ»ñ, áñáÝù í»ñ³¹³ñÓ»É ¿ÇÝ »ñÏÇñ 1988-Çó 1992-Á ÁÝÏ³Í Å³Ù³Ý³Ï³Ñ³ ï í³ÍáõÙ: ´Ý³Ï³ñ³ÝÝ»ñÇ ³å³ÑáíÙ³Ý ó³Íñ áñ³ÏÁ Ñ³Ý¹Çë³ÝáõÙ ¿ ï³ëÝ³Ù³ÏÇ ÁÝÃ³óùáõÙ å³Ñå³ÝÙ³Ý ¨ í»ñ³Ýáñá·Ù³Ý Ñ³Ù³ñ Ý³Ë³ï»ëí³Í Ý»ñ¹ñáõÙÝ»ñÇ ·ñ»Ã» µ³ó³Ï³ÙáõÃÙ³Ý ³ñ¹ÙáõÝù: ²ÙëûñµÝ³Ï»ÉÇ ýáÝ¹Ç ÑÇÙÝ³Ï³Ý Ï³åÇï³ÉÇ 96%-Á ·ïÝíáõÙ ¿ Ù³ëÝ³íáñ ë»÷³Ï³Ý³ï»ñ»ñ Ó»éùáõÙ, ÙÝ³ó³Í 4%-Á ï»Õ³÷áËí³Í¿ ï»Õ³Ï³Ý Ï³é³í³ñáõÃÙ³ÝÁ:

ÀÝ¹Ñ³Ýáõñ ³éÙ³Ùµ Ý³Ù»Éáí µÝ³Ï³ñ³ÝÝ»ñÇ ³å³ÑáíÙ³Ý ë»Ï ïáñÇÝ, ëáÕ³ÝùÝ»ñÇ íÝ³ëÝ»ñÁ ÃíáõÙ »Ý ÷áùñ åñáµÉ»ÙÝ»ñ: ²é³ÝÓÇÝ ·ÙáõÕ³Ï³Ý Ñ³Ù³ÙÝùÝ»ñÇ ï»ë³Ï»ïÇó ¹»é¨ë ³ÙÝ Ù»Í åñáµÉ»Ù¿:

(2) î ñ ³ Ýëå áñ ï

Ð³Ù³Ó³ÛÝ Ð»ï³½áïáõÃÙ³Ý ·Ý³Ñ³ï³Ï³ÝÇ ïñ³Ýëåáñ ïÇ ë»Ï ïáñÁ Ý»ñÏ³ÙáõÙë ï³é³åáõÙ ¿ 18.6 ÙÇÉÇáÝ ²ØÜ ¹áÉ³ñÇ áõÕÕ³ÏÇ íÝ³ëÝ»ñÇó (ÁÝ¹Ñ³Ýáõñ ³ñÅ»ù) ¨ 2.4 ÙÇÉÇáÝ ²ØÜ ¹áÉ³ñÇ ³ÝáõÕÕ³ÏÇ íÝ³ëÝ»ñÇó (ï³ñ»Ï³Ý³ñÅ»ù):

ÆÝã í»ñ³µ»ñíáõÙ¿ åáïÝóÇ³É íÝ³ëÝ»ñÇÝ` ï ñ³Ýëåáñ ïÇ ë»Ï ïáñÇ áõÕÕ³ÏÇ ÏáñáõëïÝ»ñÁ ³å³·³ÛáõÙ Ï³ñáÕ »Ý ÉÇÝ»É 19.1 ÙÇÉÇáÝ ²ØÜ ¹áÉ³ñ (ÁÝ¹Ñ³Ýáõñ ³ñÅ»ù) ¨ ³ÝáõÕÕ³ÏÇ ÏáñáõëïÝ»ñÁ 2.9 ÙÇÉÇáÝ ²ØÜ ¹áÉ³ñ (ï³ñ»Ï³Ý):

ì»ñ¨áõÙ Ýßí³Í·Ý³Ñ³ïáõÙÁ ³å³Ñáí»É ¿ñ ÐÐ ïñ³Ýëåáñ ïÇ ¨ Ï³åÇ Ý³Ë³ñ³ñáõÃÙ³Ý ÏáÕÙÇó (îÎÜ), áñÁ ³å³Ñáíí»É ¿ ³ñÅ»ùÝ»ñÇ ÙÇ³íáñÁ áõÕÕ³ÏÇ íÝ³ëÝ»ñÇ Ñ³Ù³ñ ¨ ï íÛ³ÉÝ»ñ ³ÝáõÕÕ³ÏÇ íÝ³ëÝ»ñÇ Ñ³Ù³ñ (Ëó³ÝÙ³Ý Í³í³ÉÁ, ³ñÅ»ùÝ»ñÇ û·ï³·áñÍáõÙÁ ¨ Å³Ù³Ý³ÏÇ Í³í³ÉÁ):

îñ³Ýëåáñ ï³ÛÇÝ Ñ³ïí³ÍáõÙ Ý»ñ³éí³Í »Ý ³íï áÙ³ÛñáõÕÇÝ»ñÁ, Ï³ÙáõñçÝ»ñÁ ¨ »ñÏ³Ã·Í»ñÁ: ²íï áÙ³ÛñáõÕÇÝ»ñÁ Ïñ»É »Ý ³Ù»Ý³Ù»Í íÝ³ëÝ»ñÁ (91%) Ñ³Ù³Ó³ÛÝ Ù»ñ ¹³ ïáÕáõÃÙáõÝÝ»ñÇ: ÐÐ ·ÉË³íáñ û·ï³·áñÍÙ³Ý Ù³ÛñáõÕÇÝ»ñÇ ó³ÝóÇ ÁÝ¹Ñ³Ýáõñ »ñÏ³ñáõÃÙáõÝÁ 7,800 ÏÙ ¿, áñÇó ÇÝã å»ë óáõÙó ¿ ï ñí³Í³ÕÙáõë³Ï 4.10-áõÙ` ÁÝ¹Ñ³Ýáõñ Ù³ÛñáõÕÇÝ»ñÇ 3.1%-Á ·ïÝíáõÙ ¿ ëáÕ³ÝùÝ»ñÇ ï³ñ³ÍùÝ»ñáõÙ, ÁÝ¹Ñ³Ýáõñ Ç 1.3%-Á íÝ³ëí»É ¨ 1.2%-Á Ñ³í³Ý³Ï³ÝáõÃÙáõÝ áõÝ»Ý íÝ³ëí»Éáõ:

²ÕÛáõë³Ï 4.10 êáÕ³ÝùÝ»ñÇ ÏáÕÙÇó íÝ³ë³Í³í ïáÙ³ÛñáõÕÇÝ»ñ

	ÀÝ¹Ñ³Ýáõñ ³íïáÙ³Ûñáõ ÕÇÝ»ñÇ ó³ÝóÁ Ð³Ù³ëï³ÝáõÙ ÏÙ	ïÙ	ÀÝ¹³ÝáõñÇ %	êáÕ³ÝùÝ»ñÇ ï³ñ³ÍùáõÙ ï»Õ³¹ñí³Í ³íïáÙ³ÛñáõÕÇÝ»ñ ïÙ	ÀÝ¹³ÝáõñÇ %	êáÕ³ÝùÝ»ñÇ ÏáÕÙÇó íÝ³ë³Í ïÙ	ÀÝ¹³ÝáõñÇ %
ÀÝ¹Ñ³Ýáõñ	7,800	238	3.1%	99	1.3%	93	1.2%
ØÇçå»ï³Ï³Ý¨ ÙÇçÙ³ñ½³ÛÇÝ ×³Ý³å³ñÑÝ»ñÁ	3,360			9	0.3%	14	0.4%
î»Õ³Ï³Ý¨ Ñ³Ù³ÛÝù³ÛÇÝ	4,440			90	2.0%	79	1.8%

²ÕÛáõñ (1) ÀÝ¹Ñ³Ýáõñ ³íïáÙ³ÛñáõÕÇÝ»ñÇ óÝ³óÁ Ð³Ù³ëï³ÝáõÙ` ëï³ó³í³Í “MTEF 2004 –2006-Çó, îÎÜ.” (2) êáÕ³ÝùÝ»ñÇ ï³ñ³ÍùÝ»ñáõÙ ï»Õ³¹ñí³Í`ëï³ó³Í §GIS áõëáõÙÝ³ëÇñáõÃÙáõÝÇó, ØÐÖ¶ Ð» ï³½áïáõÃÙáõÝ, ê»å ï»Ùµ»ñ 2004”, (3)êáÕ³ÝùÝ»ñÇ Ñ» ï¨³ÝùáíÍÝ³ëí³Í³íïáÙ³ÛñáõÕÇÝ»ñ` ëï³ó³í³Í §ÆÝí»Ýï³ñ Ð» ï³½áïáõÙÇó¦ §ÆÝí»Ýï³ñ Ð» ï³½áïáõÙ¦y, ØÐÖ¶ Ð» ï³½áïáõÃÙáõÝ ê»å ï»Ùµ»ñ 2004:

The situation of Armenia’s housing sector was severely affected by the break-up of the Soviet Union, the transition process along with the privatization, the 1988 Spitak earthquake and the influx of a large number of refugees. Over the last 15 years the GoA concentrates on the particular groups of population – 500,000 people who lost their homes during the Spitak earthquake and the 360,000 ethnic Armenian refugees who came into the country between 1988 and 1992. The quality of housing is poor as a result of a decade of almost no investment in maintenance and repairs. Today, 96% of the housing stock is in private ownership; the remaining 4% was transferred to local governments.

Looking at the housing sector as a whole – landslide damages seem to be minor problem. Still, it is a considerable problem from the point of view of individual rural communities.

(2) Transport

According to the Study estimationthe transport sector suffered up-to-date from USD 18.6 million direct damages (cumulated value) and USD 2.4 million indirect damages (annual value).

As for the potential damages – the direct losses in transport sector in the future might be of USD 19.1 million (cumulated value) and indirect losses of USD 2.9 million (annually).

Above-mentioned assessment was provided by the Ministry of Transportation and Communication (MoTC), which provided the unit costs for the direct damages and data for indirect damages (traffic volumes, exploitation costs and time value).

The transport sector included motor-roads, bridges and railways. The motor-roads suffer the biggest share of the damages (91%) according to our estimations. The total length of general use motor-road network of the Republic of Armenia is 7,800 km, out of which, as shown in the table 4.10, 3.1% is located within the landslides: 1.3% has been damaged; and 1.2% might potentially be damaged.

Table 4.10 Motor-roads and Damaged by Landslides

	Total motor-road network in Armenia km	Motor-road located within landslides km	Motor-road located within landslides % of total	Damaged by landslides km	Damaged by landslides % of total	Potentially damaged by landslides km	Potentially damaged by landslides % of total
Total	7,800	238	3.1%	99	1.3%	93	1.2%
Interstate& interregional	3,360			9	0.3%	14	0.4%
Local& community	4,440			90	2.0%	79	1.8%

Source: (1) Total motor-road network in Armenia from “MTEF 2004 –2006, MoTC.” (2) Motor-road located within landslides from “GIS Survey, JICA Study, September 2004”, (3) Motor roads damaged by landslides from “Inventory Survey, JICA Study September 2004”.

ä³ßïáÝ³å»ë, ÙÇçå»ï³Ï³Ý¨ ÙÇçÙ³ñ½³ÛÇÝ ×³Ý³å³ñÑ³ÛÇÝ ó³ÝóÇ å³Ñå³ÝáõÃÛáõÝÁ (ÁÝ¹Ñ³Ýáõñ 3,360ÏÙ) ·ïÝíáõÙ¿ îÐÜ[1] –Ç ÑëÏáÕáõÃÛ³Ý ï³Ï; îÐÜ -Ý³¨ ÷áñÓÝ³Ï³Ýáñ»Ý Ï³é³í³ñáõÙ¿ ï»Õ³Ï³Ý×³Ý³å³ñÑÝ»ñÁ (Ñ³Ù³ÛÝùÝ»ñÇ ó³ÝóÇ ÙÇ Ù³ëÇ ÙÇç¨)[2]; Ñ³Ù³ÛÝù³ÛÇÝ ×³Ý³å³ñÑÝ»ñÁ å»ïù¿ Ï³é³í³ñí»Ý ï»Õ³Ï³Ý ÇÝùÝ³Ï³é³í³ñÙ³ÝÙ³ñÙÇÝÝ»ñÇ ÏáÕÙÇó:

Ð³Ù³ßË³ñÑ³ÛÇÝ µ³ÝÏÁ ã³÷³íáñ ·Ý³Ñ³ï»É¿ ÙÇ³ÛÝ ×³Ý³å³ñÑÝ»ñÇ å³Ñå³ÝáõÃÛ³Ý Ñ³Ù³ñ ýÇÝ³Ýë³íáñáõÙÁ, áñÁ ï³ñ»Ï³Ý Ï³½ÙáõÙ¿ ÁÝ¹³Ýáõñ 30 ÙÇÉÇáÝ ²ØÜ ¹áÉ³ñ: îÐÜ -Ç 2004Ã.-Ç ÁÝ¹Ñ³Ýáõñ µÛáõç»Ý ×³Ý³å³ñÑÝ»ñÇ í»ñ³Ï³Ý·ÝÙ³Ý ¨ å³Ñå³ÝáõÃÛ³Ý Ñ³Ù³ñ Ï³½Ù»É¿ 14.3 ÙÇÉÇáÝ ²ØÜ ¹áÉ³ñ (Ð³í»É³Í V-3.1.3):

ì»ñçÇÝ ÑÇÝ· ï³ñÇÝ»ñÇ ÁÝÃ³óùáõÙ ÙÇçå»ï³Ï³Ý¨ ÙÇçÙ³ñ½³ÛÇÝ ×³Ý³å³ñÑÝ»ñÁ û·ï í»É »Ý ³ñï³ë³ÑÙ³ÝÙ³Ý û·ÝáõÃÛ³Ý ýáÝ»ñÇ Ýß³Ý³Ï³ÉÇó Ý»ñ³ñïáõÙÝ»ñÇó: ÆÝãÇó¿, ï»Õ³Ï³Ý¨ Ñ³Ù³ÛÝù³ÛÇÝ ×³Ý³å³ñÑÝ»ñÁ (·ÛáõÕ³Ï³Ý ï³ñ³ÍùÝ»ñÁ ·ÉËåíáñ ³ñï³¹ñ³Ï³Ý Ï»Ýï ñáÝÝ»ñÇ Ñ» ï Ï³åáÕ) ·ïÝíáõÙ »Ý ¿ùëï ñ»Ù³É ³Õù³ï å³ÛÙ³ÝÝ»ñáõÙ, ã»Ý ëï³ó»É áã ÙÇ ýÇÝ³ÝëÏ³Ý ³ç³ÏóáõÃÛáõÝ í»ñçÇÝ ï³ë ï³ñÇÝ»ñÇ ÁÝÃ³óùáõÙ:

ÆÝã í»ñ³µ»ñáõÙ ¿ »ñÏ³Ã·Í»ñÇÝ, ³å³ ×³Ý³å³ñÑ³ÛÇÝ Ë³÷³ÝáõÙÝ»ñÇ Ù»Í³óÙ³Ý¨ Âáõñ ùÇ³ÛÇ áõ²¹ñµ»ç³ÝÇ Ñ»ï ë³ÑÙ³ÝÝ»ñÇ ÷³Ï í³ÍáõÃÛ³Ý Ñ»ï¨³Ýùáí ë³ÑÙ³ÝÇ Ñ»ï Ï³å í³Í ·áñÍáõÝ»áõÃÛáõÝÝ»ñÁ ë³ÑÙ³Ý³÷³Ï í³Í »Ý` Ù»Ï ·Íáí ºñ¨³ÝÇó ìñ³ë ï³ÝÇ ë³ÑÙ³Ý, ·áõÙ³ñ³Í ÙÇ ù³ÝÇ áõÕ¨áñ³ÛÇÝ ·Í»ñ: Ð» ï¨»Éáí ØÐÖ¶ ÆÝí»Ý ï³ñ Ñ» ï³½áï Ù³ÝÁ 2004Ã.-ÇÝ, »ñÏ³Ã·Í»ñÇ 1.850Ù íÝ³ëí³Í »Ý »Õ»É³é³Ûëûñ¨ Ñ» ï³·³ÛáõÙ 2.200Ù »ÝÃ³Ï³¿ íÝ³ëí»Éáõ:

ÀÝ¹Ñ³Ýáõñ ³éÙ³Ùµ Ý³Û»Éáí ïñ³Ýëåáñï Ç ë»Ï ïáñÇÝ, ëáÕ³ÝùÝ»ñÇ íÝ³ëÝ»ñÁ ÃíáõÙ »Ý ÷áùñ åñáµÉ»Ù: ²é³ÝÓÇÝ ·ÛáõÕ³Ï³Ý Ñ³Ù³ÛÝùÝ»ñÇ ï»ë³Ï»ïÇó ¹»é¨ë ³ÛÝ Ù»Í åñáµÉ»Ù¿:

[1] ÐÐ ïñ³Ýëåáñï Ç ¨ Ï³åÇ Ý³Ë³ñ³ñáõÃÛáõÝÁ Ý³¨ å³ï³ëË³Ý³ïáõ¿ 2,711 ×³Ý³å³ñÑÝ»ñÇ Ï³Ùáõñç Ý»ñÇ Ñ³Ù³ñ (ÁÝ¹Ñ³Ýáõñ »ñÏ³ñáõÃÛáõÝÁ 22.6ÏÙ) ¨ 95 »ñÏ³ÃáõÕ³ÛÇÝ Ï³ÙáõñçÝ»ñÇ Ñ³Ù³ñ:

[2] êïë³Í 2002Ã.-Çó, ë³ÑÙ³Ý÷³Ï µÛáõç»Ç Ýå³ï³Ï³ÛÇÝ û·ï³·áñÍÙ³Ý Ñ³Ù³ñ; Ñ³Ù³ÛÝùÝ»ñÇ ÙÇç¨ ï»Õ³Ï³Ý×³Ý³å³ñÑÝ»ñÇ å³Ñå³ÝáõÃÛáõÝÁ Ù³ñ½å»ï³ñ³ÝÝ»ñÇ å³ßïáÝ³Ï³Ý å³ñï³Ï³ÝáõÃÛáõÝÝ¿:

[3] Ü»ñ³éáõÙ¿ 20 ÙÇÉÇáÝ ²ØÜ ¹áÉ³ñ ³½·³ÛÇÝ ×³Ý³å³ñÑ³ÛÇÝ ó³ÝóÇ Ñ³Ù³ñ, 5 ÙÇÉÇáÝ ²ØÜ ¹áÉ³ñ ï»Õ³Ï³Ý·ÛáõÕ³Ï³Ý×³Ý³å³ñÑÝ»ñÇ Ñ³Ù³ñ ¨ 5 ÙÇÉÇáÝ ²ØÜ ¹áÉ³ñ ù³Õ³ù³ÛÇÝ ÷áÕáóÝ»ñÇ Ñ³Ù³ñ; Ð³ë³ñ³Ï³Ý Í³Ëë»ñÇ ¹Ç ï³ñÏáõÙÝ»ñÇó, Ð³Ûë ï³Ý, WB, 2003.

(3) ¶ÛáõÕ³ ï Ý ï »ëáõÃÛáõÝ

(³) ÀÝ¹Ñ³Ýáõñ

¶ÛáõÕ³ï Ý ï »ëáõÃÛ³Ý ë»Ï ïáñÇ Ñ³Ù³ñ ³éÏ³ íÝ³ëÝ»ñÁ ·Ý³Ñ³ï í³Í »Ý 12.2 ÙÇÉÇáÝ ²ØÜ ¹áÉ³ñ (Ïáõ ï³Ï í³Í), áñÁ Ï³½ÙáõÙ¿ ÁÝ¹Ñ³Ýáõñ ëáÕ³ÝùÝ»ñÇ íÝ³ëÝ»ñÇ 28%-Á:

²ÕÛáõë³Ï 4.11 êáÕ³ÝùÝ»ñÇ ³éÏ³ áõÕÕ³ÏÇ íÝ³ëÝ»ñÁ ¶ÛáõÕ³ï Ý ï »ëáõÃÛ³Ý ë»Ï ïáñáõÙ

	¶ÛáõÕ³ï Ý ï »ëáõÃÛ³Ý ë»Ï ïáñáõÙ ³éÏ³ áõÕÕ³ÏÇ íÝ³ëÝ»ñ ÀÝ¹Ñ³Ýáõñ ³ñÅ»ùÝ»ñ		
	Ñ³	²ØÜ ÙÇÉÇáÝ	% ÁÝ¹Ñ³ÝáõñÇó
ÀÝ¹Ñ³Ýáõñ		12.2	
Øß³Ï»ÉÇ ÑáÕ	9,294	10.2	84%
²ñáï³í³Ûñ	1,400	1.7	14%
²Ýï³é³ÝÛáõÃ	125	0.2	2%

Formally, the maintenance of the network of interstate and interregional roads (total 3,360 km) is under the MoTC[1]; the MoTC is also practically managing the local roads (part of network between communities)[2]; community roads should be managed by the local self-governments.

A conservative World Bank estimate[3] of the cost of the roads' maintenance is a total of USD 30 million annually. The total 2004 budget of MoTC for road rehabilitation and maintenance is USD 14.3 million (Appendix V-3.1.3).

The interstate and interregional roads have benefited from a significant infusion of foreign assistance funds during the past five years. However, the local and community roads (connecting the rural areas to the main commercial centers) are in extremely poor conditions, having received almost no maintenance funding for the past ten years.

As for the railways - due to the increase of road traffic and closed borders with Turkey and Azerbaijan, rail operations are now restricted to a single line running from Yerevan to the Georgian border plus some short commuter lines. Following the JICA Inventory Survey in 2004, 1,850 m of railways has been damaged up-to-date and further 2,200 m can be potentially damaged.

Looking at the transport sector as a whole – landslide damages seem to be minor problem. Still, it is a considerable problem from the point of view of individual rural communities.

[1] The MoTC also has responsibility for 2,711 road bridges (total length of 22.6km) and 95 railway bridges.

[2] Since 2002, for the sake of efficiency to use extremely limited budget; maintenance of local roads between communities is formal obligation of marzpetarans.

[3] Including USD 20 million for the national road network, USD 5 million for the local rural roads, and USD 5 million for the city streets; after the Public Expenditure Review, Armenia, WB, 2003.

(3) Agriculture

(a) General

The direct existing damages for the agriculture sector are estimated of USD 12.2 million (cumulated), which is 28% of total landslide damages.

Table 4.11 Landslide Direct Existing Damages in Agriculture Sector

	Direct existing damages in agriculture sector Cumulative values		
	ha	USD million	% of total
Total		12.2	
Crop land	9,294	10.2	84%
Grazing land	1,400	1.7	14%
Timber	125	0.2	2%

(µ) ¶ÛáõÕ³ ï Ý ï »ë³Ï³Ý ÑáÕ»ñÇ Þáõ Ï³Û³Ï³Ý ¶ÝÇ ²ñÅ»ùÝ»ñÁ

¶ÛáõÕ³ ï Ý ï »ë³Ï³Ý ÑáÕ»ñÇ ßáõÏ³Û³Ï³Ý ·ÝÇ ³ñÅ»ùÝ»ñÁ Î³¹³ë ï ñ³ÛÇÝ Ì³éáõÃÛáõÝÇó, ÐáõÝÇë 2004 (Ð³í»É í³Í V-3.2.2):

êáÕ³ÝùÝ»ñÇ ³½¹»óáõÃÛ³Ý ï ³Ï ·ï ÝíáÕ ·ÛáõÕ³ï Ý ï »ë³Ï³Ý ÑáÕ»ñÇ Ñ»Ï ï ³ñÝ»ñÇ ÃÇíÁ (Ç¹»Ý ï ÇýÇÏ³óí³Í ÆÝí»Ý ï ³ñ Ñ» ï ³½á ï Ù³Ý ÙÇçáóáí), áñáßí³Í ¿ ·ÛáõÕ³ ï Ý ï »ë³Ï³Ý ÑáÕÇ ßáõÏ³Û³Ï³Ý ·Ý»ñáí (³å³ÑáíÍ³Í Î³¹³ë ï ñ³ÛÇÝ Ì³éáõÃÛ³Ý ÏáÕÙÇó Áë ï ï »Õ³µ³ßËí³ÍáõÃÛ³Ý, Ð³í»É í³Í V-3.2.2). ¸»é¨ë ³ñÅ»ùÁ ë ï ³óí³Í ¿, ³Ûë ×³Ý³å³ñÑÁ Ñ³Ù³Ù³ ï ³µ³ñ Ù»Í ¿, »ñµ»ÙÝ ³ÝáõÕÕ³ÏÇ íÝ³ëÝ»ñÁ Ùá ï ³íáñ »Ý: ¶ÛáõÕ³ ï Ý ï »ëáõÃÛ³Ý ë»Ï ï áñáõÙ ëáÕ³ÝùÝ»ñÇ ³½¹»óáõÃÛáõÝÁ ÏÉÇÝÇ Ñ» ï ³ · ³ áõëáõÙÝ³ëÇñáõÃÛ³Ý Ã»Ù³Ý:

¸Ç ï »Éáí ³ÙµáÕç ³·ñá-ëÝÝ¹³ÛÇÝ ë»Ï ï áñÁ` ¹³ Ð³Û³ë ï ³ÝÇ Ð³Ý³ñ³å» ï áõÃÛ³Ý ï Ý ï »ëáõÃÛ³Ý ³Ù»Ý³Ï³ñ¨áñ ë»Ï ï áñÝ»ñÇó Ù»ÏÝ ¿, Ýå³ë ï áõÙ ¿ ³í»ÉÇ ù³Ý 35% Ð³Ù³Ë³éÝ ²½·³ÛÇÝ ²ñ¹ÛáõÝùÇÝ:. Ü»ñÏ³ÛáõÙë ·ÛáõÕ³ï Ý ï »ëáõÃÛ³Ý Ñ³Ù³Ë³éÝ ³ñ ï ³¹ñ³ÝùÇ 98%-Á ÃáÕ³ñÏíáõÙ ¿ Ù³ëÝ³íáñ ë»Ï ï áñÇ ÏáÕÙÇó, Ñ³Ù³Ó³ÛÝ §¶ÛáõÕ³ï Ý ï »ëáõÃÛ³Ý Ï³ÛáõÝ ½³ñ·³óÙ³Ý é³½Ù³í³ñáõÃÛ³ÝÁ¦ ÐÐ ·ÛáõÕÝ³Ë., 2004:

´Ý³ÏãáõÃÛ³Ý ³Õù³ï ·ÝáÕáõÝ³ÏáõÃÛáõÝÁ, ³é¨ï ñ³-ï Ý ï »ë³Ï³Ý Ý³ËÏÇÝ Ñ³ñ³µ»ñáõÃÛáõÝÝ»ñÇ ÷ÉáõáõÙÁ ¨³ñ ï ³ùÇÝ Ñ³Ù³·áñÍ³ÏóáõÃÛ³Ý ßñç³÷³ÏáõÙÁ µ»ñ»óÇÝ ·ÛáõÕ³óÇ³Ï³Ý ï Ý ï »ëáõÃÛáõÝÝ»ñÇ É³ÛÝ ë å³éÙ³Ý ³åñ³ÝùÝ»ñÇ Ù³ëÇ Ù³Ï³ñ¹³ÏÇ Ïñ×³ï Ù³ÝÁ, ÇÝãå»ë ³ñ ï ³¹ñáÕ³Ï³Ý ÝáõÃÛ³Ý Ïñ×³ï áõÙÁ: Èáõñç åñáµÉ»ÙÝ»ñ ¿ÇÝ ³é³ç³ó»É ·ÛáõÕ³ï Ý ï »ë³Ï³Ý ¨ ³·ñá-í»ñ³Ùß³ÏíÍ³ñï ³¹ñ³ÝùÇ í³×³éùÇ Ñ» ï Ï³å í³Í: ØÇ¨ÝáõÙÝ Å³Ù³Ý³Ï ÑáÕÇó ³Õù³ï Ð³Û³ë ï ³Ýáõù Ùß³Ï»ÉÇ ÑáÕ³ï ³ñ³ÍùÝ»ñÇ 36%-Á ÇÝãå»ë Ñ³ñÏÝ ¿ ãÇ û·ï ³·áñÍíáõÙ: î³ñ³ÍùÝ»ñÁ, áñáÝù ·ï Ýíáõù »Ý ·ÛáõÕ³ï Ý ï »ë³Ï³Ý Ñ³ï ÇÏ³ÛÇÝ ÏáõÉï áõñ³Ý»ñÇ, Ë³ÕáÕÇ ï ÝÏ³ñÏÝ»ñÇ ¨ Ùñ·³ï áõ ³Û·ÇÝ»ñÇ ï ³Ï, é³¹ÇÏ³É Ï»ñåáí Ïñ×³ï í³Í »Ý: ¶áõÛáõÃÛáõÝ ãáõÝÇ ³å³Ñáí³·ñáõÃÛáõÝ µÝ³Ï³Ý ³Õ»ï Ý»ñÇ Ñ» ï ¨³Ýùáí ·ÛáõÕ³óÇ³Ï³Ý ï Ý ï »ëáõÃÛáõÝÝ»ñÇÝ å³ï ×³é³Í ÏáñáõëïÝ»ñÇ ÝÏ³ï Ù³Ùµ:

(4) æáõñ, ¾É»Ï ï ñ³¿Ý»ñ·Ç³¨Ð³Õáñ¹³ÏóáõÃÛáõÝ

æñÇ, ¿É»Ï ï ñ³¿Ý»ñ·Ç³ÛÇ ¨ Ñ³Õáñ¹³ÏóáõÃÛáõÝÁ, ÖØÐ¶ Ð» ï ³½á ï áõÃÛáõÝ, ÖØÐ¶ Ð» ï ³½á ï ³Ï³Ý Êáõ㵻å ï »Ù㻳ñ 2004¦, (2) ²ñÅ»ùÇ ·Ý³Ñ³ï Ù³Ý ³ñÅ»ùÝ»ñ`¶³½åñáÙ, ÐÐ øÜ, ¨ ²ñÙ»Ý ï »É. (Ð³í»É í³Í V. ²Õ¦áõë³Ï A5.4):

ÖØÐ¶-Á ßÝáñÑ³Ï³É¿ÙÇ ù³ÝÇ »ÝÃ³Ï³éáõóí³íù³ÛÇÝ Ï³½Ù³Ï»ñåáõÃÛáõÝÝ»ñÇÝ û·ÝáõÃÛ³Ý Ñ³Ù³ñ (¶³½åñáÙ, ²ñÙ»Ý ï »É, º ñ¨³Ý æñÙáõÕ): ÆÝáñÙ³óÇ³Ý ë ï ³óí³Í¿ ³Û¹ »ÝÃ³Ï³éáõóí³íùÝ»ñÇ ï »ñ»ñÇó ¨ ÐÐ øÜ-Ý û·Ý»É¿ ·Ý³Ñ³ï »É íÝ³ëÝ»ñÁ; Ï³ñ¨áñ ï íÛ³ÉÝ»ñÁ Ý»ñ³éí³Í »Ý Ð³í»Éí³Í V ²Õ¦áõë³ÏA5.4-áõÙ):

æñÇ, ¾É»Ï ï ñ³¿Ý»ñ·Ç³ÛÇ ¨ Ñ³Õáñ¹³ÏóáõÃÛáõÝÝ»ñÇ ë»Ï ï áñÝ»ñÇ »ÝÃ³Ï³éáõóí³íùÝ»ñÁ Ý³Ëáñ¹ ï ³ëÝ³ÙÛ³ÏÇ ÁÝÃ³óùáõÙ ß³ï Ñ³×³Ë »Ý í³ï ³ó»É ýÇÝ³Ýë³íáñíáÕ ËéáÝÇÏ µÛáõç»Ç Ñ» ï ¨³Ýùáí, ß³ï ë»Ï ï áñÝ»ñáõÙ ³ÝÑ³Ù³å³ï ³ëË³Ý ë³Ï³·Ý»ñÇ ¨ Ï³é³í³ñÙ³Ý åñáµÉ»ÙÝ»ñÇ Ñ» ï ¨³Ýùáí:

(b) Values for Market Price of Agriculture Lands

Values for market price of agriculture lands from Cadastral Service, June 2004 (Appendix V-3.2.2).
The number of hectares of agriculture land affected by landslides (identified by the Inventory Survey) was assigned with the market prices of agriculture land (provided by the Cadastral Service for given locations, Appendix V-3.2.2).

Still the value obtained this way is comparatively big, even if the indirect damages were not estimated. The impact of landslides on the agriculture sector will be a subject of further study.
The whole agro-food sector is one of the most important sectors in the economy of the Republic of Armenia, contributing more than 35% to GDP. At present more than 98% of the agricultural gross production is carried out by the private sector according to the “Agricultural Sustainable Development Strategy” MoA, 2004.
The poor purchasing ability of the population, the collapse of former trade-economic relations, and blockage of the external communication, brought a decrease in the level of commodity share of farms, as well as a reduction in production capacities. Serious problems were encountered in the selling of agricultural and agro-processing produce, as well as to the inputs supply. At the same time, in a land-hungry Armenia 36% of arable land is not properly used. Areas under agricultural crops, vineyard and orchard areas were drastically reduced. There is no insurance for losses caused by natural disasters.

(4) Water, Energy and Communication

The water, energy and communication sector (including gas system, drinking & sewerage system, irrigation & drainage system, energy & electricity, and telecommunication) suffered from USD 4.3 million direct damage (accumulated value) and about USD 0.2 million of indirect damages (annual value). As for the potential damages – infrastructure can be exposed at USD 2.6 million of direct and USD 0.1 million of indirect damages. Table 4.12 gives the details of the estimation:

²Õ¦áõë³Ï 4.12 êáÕ³ÝùÝ»ñÇ áõÕÕ³ÏÇ íÝ³ëÝ»ñÁ æðÆ, ¾É»Ï ï ñ³¿Ý»ñ·Ç³ÛÇ ¨ Ð³Õáñ¹³ÏóáõÃÛ³Ý ë»Ï ï áñáõÙ

	²éÏ³ íÝ³ëÝ»ñ Ù	²ØÜ ¹áÉ³ñ	äáï »ÝóÇ³É íÝ³ëÝ»ñ Ù	²ØÜ ¹áÉ³ñ
ÀÝ¹Ñ³Ýáõñ		4.305		2.616
¶³½Ç Ñ³Ù³Ï³ñ·	4,860	0.181	3,750	0.031
ÊÙ»Éáõ ¨ Ïá¦áõÕÇ	74,575	1.790	36,600	0.889
Àéá·áõÙ ¨ ¹ñ»Ý³Å	71,002	2.130	50,400	1.512
¾É»Ï ï ñ³¿Ý»ñ·Ç³	13,720	0.137	17,970	0.181
Ð»é³Ñ³Õáñ¹³ÏóáõÃÛáõÝ	40,300	0.067	10,000	0.003

²Õµ¦áõñ (1) ì Ý³ëÝ»ñ [Ù] `§ÆÝí»Ý ï ³ñ Ð» ï ³½á ï áõÃÛáõÝ, ÖØÐ¶ Ð» ï ³½á ï ³Ï³Ý Êáõ㵻å ï »Ù㻳ñ 2004¦, (2) ²ñÅ»ùÇ ·Ý³Ñ³ï Ù³Ý ³ñÅ»ùÝ»ñ`¶³½åñáÙ, ÐÐ øÜ, ¨ ²ñÙ»Ý ï »É. (Ð³í»É í³Í V. ²Õ¦áõë³Ï A5.4):
ÖØÐ¶-Á ßÝáñÑ³Ï³É¿ÙÇ ù³ÝÇ »ÝÃ³Ï³éáõóí³íù³ÛÇÝ Ï³½Ù³Ï»ñåáõÃÛáõÝÝ»ñÇÝ û·ÝáõÃÛ³Ý Ñ³Ù³ñ (¶³½åñáÙ, ²ñÙ»Ý ï »É, º ñ¨³Ý æñÙáõÕ): ÆÝáñÙ³óÇ³Ý ë ï ³óí³Í¿ ³Û¹ »ÝÃ³Ï³éáõóí³íùÝ»ñÇ ï »ñ»ñÇó ¨ ÐÐ øÜ-Ý û·Ý»É¿ ·Ý³Ñ³ï »É íÝ³ëÝ»ñÁ; Ï³ñ¨áñ ï íÛ³ÉÝ»ñÁ Ý»ñ³éí³Í »Ý Ð³í»Éí³Í V ²Õ¦áõë³ÏA5.4-áõÙ):
æñÇ, ¾É»Ï ï ñ³¿Ý»ñ·Ç³ÛÇ ¨ Ñ³Õáñ¹³ÏóáõÃÛáõÝÝ»ñÇ ë»Ï ï áñÝ»ñÇ »ÝÃ³Ï³éáõóí³íùÝ»ñÁ Ý³ËáñÙ ï ³ëÝ³ÙÛ³ÏÇ ÁÝÃ³óùáõÙ ß³ï Ñ³×³Ë »Ý í³ï ³ó»É ýÇÝ³Ýë³íáñíáÕ ËéáÝÇÏ µÛáõç»Ç Ñ» ï ¨³Ýùáí, ß³ï ë»Ï ï áñÝ»ñáõÙ ³ÝÑ³Ù³å³ï ³ëË³Ý ë³Ï³·Ý»ñÇ ¨ Ï³é³í³ñÙ³Ý åñáµÉ»ÙÝ»ñÇ Ñ» ï ¨³Ýùáí:

Table 4.12 Landslide Direct Damages in Water, Energy and Communication Sector

	Existing damages m	USD million	Potential damages m	USD million
Total		4.305		2.616
Gas system	4,860	0.181	3,750	0.031
Drinking& sewerage	74,575	1.790	36,600	0.889
Irrigation& drainage	71,002	2.130	50,400	1.512
Energy& electricity	13,720	0.137	17,970	0.181
Telecommunication	40,300	0.067	10,000	0.003

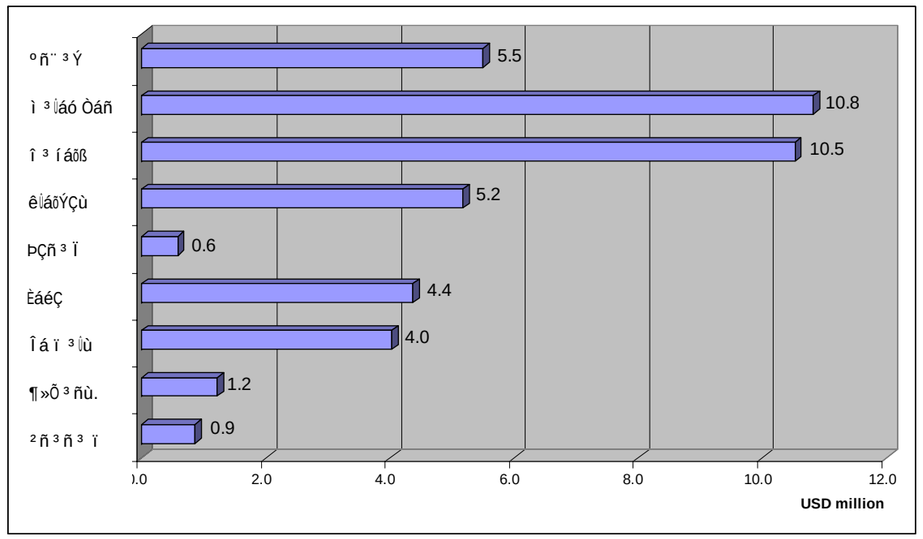
Source: (1) Damages [m] from “Inventory Survey, JICA Study September 2004”, (2) Values for value assessment from: Gazprom, MoUD, and Armentel. (Appendix V. Table A5.4)
JICA study team appreciate the assistance of some of the infrastructure companies (Gazprom, Armentel, Yerevan Water Company). The information obtained from those owners of infrastructure and MoUD helped to assess the damages; relevant data is included in the Appendix V Table A5.4).

Infrastructures of water, energy and the communication sectors have been deteriorating quite rapidly over the previous decade due to chronic budget under-financing, insufficient tariffs in most sectors and governance problems. The results of the Inventory Survey reflect this problem.

4.3.4 È»éÝ³ÛÇÝ ßñç³ÝÝ»ñ

(1) êáÕ³ÝùÇ ì Ý³ëÝ»ñÇ ²ßË³ñÑ³·ñ³Ï³Ý µ³ßËáõÙ

Ü³Ëáñ¹ Ñ³ï í³Íáõù (4.3.2, 4.3.3) óáõÛó ¿ ï ñí³Í, áñ ëáÕ³ÝùÇ íÝ³ëÇ ³½¹»óáõÃÛáõÝÁ Ñ³Ù³ï³µ³ñ ÷áùñ ¿ ³ÙµáÕç Ð³Ûë³ï³ÝÇ ïÝï»ëáõÃÛ³Ý Ñ³ï í³Íáõù: ØÇ¨Ýáõ۝ Å³Ù³Ý³Ï ³ñ¹ÛáõÝùÝ»ñÁ óáõÛó »Ý ï³ÉÇë, áñ Ç¹»Ýï ÇýÇÏ³óí³Í íÝ³ëÝ»ñÁ ³½¹áõÙ »Ý ·ÛáõÕ³Ï³Ý ï³ñ³ÍùÝ»ñáõÙ` íÝ³ë»Éáí ¿ µÝ³Ï»ÉÇ ýáÝ¹»ñÁ, ³½¹áõÙ ¿ ï»Õ³ÛÇÝ ¨ Ñ³Ù³ÛÝù³ÛÇÝ ×³Ý³å³ñÑÝ»ñÇ ¨ Ï³Ùáõñç Ý»ñÇ íñ³ (ï ñ³Ýëåáñï Ç Ñ³ï í³Íáõù ³éÏ³ ÁÝ¹Ñ³Ýáõñ áõÕÕ³ÏÇ íÝ³ëÝ»ñÇ 80%-Á Ï»Ýï ñáÝ³ó³Í ¿ ·ÛáõÕ³Ï³Ý ï³ñ³ÍùÝ»ñáõÙ), Ñ»ï³·³ÛáõÙ í³ï³óÝ»Éáí çñ³Ù³ï³Ï³ñ³ñáõÙÁ ¨ áéá·Ù³Ý Ñ³Ù³Ï³ñ·Á (Ñ³Ù³å³ï³ëË³Ý³µ³ñ ÁÝ¹Ñ³Ýáõñ ëáÕ³ÝùÝ»ñÇ 43% ¨ 52%-áõÙ ³éÏ³ »Ý áõÕÕ³ÏÇ íÝ³ëÝ»ñ çñÇ, ¿É»Ïï ñ³¿Ý»ñ·Ç³ÛÇ ¨ Ñ³Õáñ¹³ÏóáõÃÛ³Ý ë»Ïï áñÇ Ñ³Ù³ñ): ²ÛÝ Ï³ñáÕ¿ áõÝ»Ý³É¿³Ï³Ý µ³ó³ë³Ï³Ý ³½¹»óáõÃÛáõÝ Ù³ëÝ³íáñ ï»Õ³Ï³Ý Ñ³Ù³ÛÝùÝ»ñÇ½³ñ·³óÙ³Ý íñ³: ØÛáõë ÏáÕÙÇó, ëáÕ³Ýù³ÛÇÝ ï³ñ³ÍùÝ»ñÁ É»éÝ³ÛÇÝ ßñç³ÝÝ»ñáõÙ Ý»ñÏ³Ûë³ÝáõÙ »Ý ³í»ÉÇ Ù»ÕÙ É³Ýç»ñáí, ³í»ÉÇ Ñ³ñáõë ï çáõñ ¨ ³í»ÉÇ ËáñÁ ÑáÕ, áñÁ µ³ó³ï ñáõÙ ¿, Ã» ÇÝãáõ »Ý Ñ³Ù³ÛÝùÝ»ñÁ ß³Ñ³·ñ·éí³Í µÝ³Ïí»Éáõ ³ÛÝï»Õ: Ð³Ù³Ó³ÛÝ GIS áõëáõÙÝ³ëÇñáõÃÛ³ÝÁ, Ùáï³íáñ³å»ë 234 (22.9%)-Á 1,023 ÁÝ¹Ñ³Ýáõñ µÝ³Ï»ÉÇ ï³ñ³ÍùÝ»ñÇó Ð³Ûë³ï³ÝáõÙ ï»Õ³íáñí³Í »Ý ëáÕ³Ýù³ÛÇÝ ï³ñ³ÍùÝ»ñáõÙ:



ÜÏ³ñ 4.6 êáÕ³ÝùÇ Ñ»ï¨³Ýùáí ³é³ç³ó³Í ³éÏ³ áõÕÕ³ÏÇ íÝ³ëÝ»ñÇ ³ßË³ñÑ³·ñ³Ï³Ý µ³ßËáõÙ

ÜÏ³ñ 4.6-Á óáõÛó ¿ ï³ÉÇë, áñ ³é³í»É³å»ë ëáÕ³ÝùÝ»ñÇó íÝ³ëí³Í ï³ñ³ÍùÝ»ñÝ/Ù³ñ½»ñÝ »Ý ì³Ûáó ÒáñÁ, î íáõßÁ ¨ êÛáõÝÇùÁ: ²Ûë ßñç³ÝÝ»ñÁ Ð³Ûë³ï³ÝÇ ³é³í»É É»é³ÛÇÝ ßñç³ÝÝ»ñÝ »Ý: Ð³í»É³Í V ²ÕÛáõë³Ï A5.5-Á ï³ÉÇë ¿ íÝ³ëÇ ·Ý³Ñ³ï áõÙÝ»ñ ÛáõñÙ³ù³ÝâÛáõñ 145 ÆÝí»Ýï³ñÇ Ñ»ï³½á ïÙ³Ý ï»Õ³ÝùÝ»ñÇó:

4.3.4 Mountainous Regions

(1) Geographical Distribution of Landslide Damages

The previous section (4.3.2, 4.3.3) shows that the impact of landslide damages on the whole sectors of the Armenian economy is relatively small. At the same time, the results show that the identified damages affect the rural areas – damaging housing stock, affecting local and community roads and bridges (80% of total existing direct damages in transport sector concentrate in the rural areas), further deteriorating water supply and irrigation systems (respectively 43% and 52% of the total landslide existing direct damages for water, energy and communication sector) that can have considerable adverse effects on the development of particular local communities.

On the other hand, landslide areas offer gentler slopes, richer water and deeper soil in mountainous areas, which explains why communities are eager to settle there. According to the GIS Survey, about 234 (22.9%) out of 1,023 of the total residential areas in Armenia are located in landslide areas.

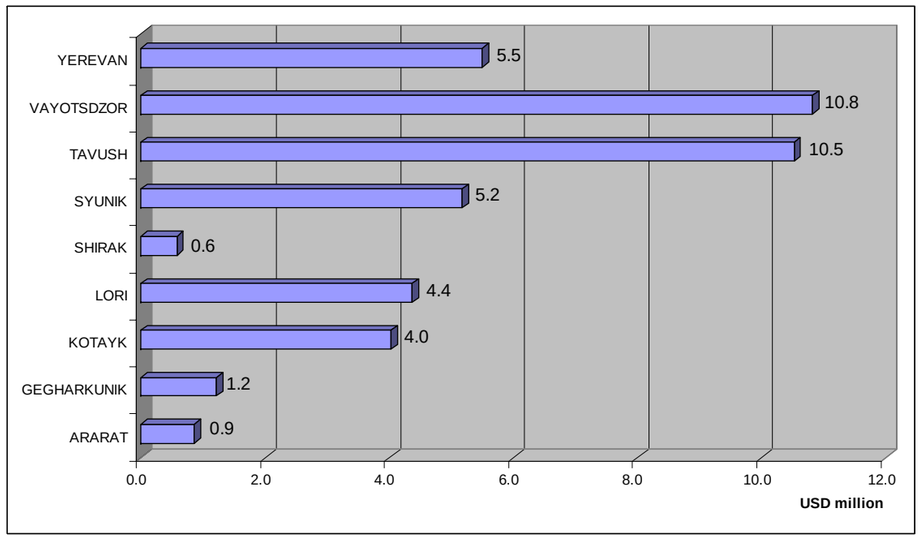


Figure 4.6 Geographical Distributions of Existing Direct Damages Caused by Landslides

Figure 4.6 shows that the most landslide damaged region/marts are Vayotsdzor, Tavush and Syunik. These regions are the most mountainous areas in Armenia. Appendix V Table A5.5 gives damage estimations for each one of 145 Inventory Survey sites.

(2) ²Õù³ï áõÃÛáõÝÁ É»éÝ³ÛÇÝ ßñç³ÝÝ»ñáõÙ

²Õù³ÃáõÃÛ³Ý Üí³½»óÙ³Ý è³½Ù³í³ñ³Ï³Ý ö³ëï³ÃáõÕÃÁ ³å³ÑáíáõÙ ¿ ³Õù³ï áõÃÛ³Ý ¨ É»éÝ³ÛÇÝ ßñç³ÝÝ»ñÇ ÙÇç¨ ³ÏÝÑ³Ûï Ï³å, ÇÝãå»ë óáõÛó¿ ï ñí³Í³Õ¦áõë³Ï 4.13-áõÙ:

²Õ¦áõë³Ï4.13 ²Õù³ï áõÃÛáõÝ¨ë³ñ³Ñ³ñÃ»ñ

ÆÝ¹ÇÏ³ï áñÝ»ñ	Ø³Ï³ñ¹³Ï1: 1300Ù íáíÇ Ù³Ï³ñ¹³ÏÇó µ³ñÓñ	Ø³Ï³ñ¹³Ï 2: 1301 ÙÇÝã¨ 1700Ù	Ø³Ï³ñ¹³Ï 3: 1701 ¨ µ³ñÓñ	ÀÝ¹Ñ³Ýáõñ ·ÛáõÕ³Ï³Ý Á³ñ³ÍùÝ»ñ
´Ý³ÏãáõÃÛ³Ý µ³Å³ÝáõÙÁ, %	39.00	26.00	35.00	100.00
²Õù³ï, %	42.35	54.93	57.99	50.76
Ü»ñ³éí³Í³Ûñ³Ñ»Õ ³Õù³ï»ñÁ, %	16.37	24.86	28.28	22.55

²Õµ¦áõñ: ISLC 1998/99, PRSP 2003 Ñ»ï á.

²ÏÝÑ³Ûï ¿, áñ Ñ³Ù³ÛÝùÝ»ñÁ, áñáÝù û·ïíáõÙ »Ý é»ëáõñëÝ»ñÇó ëáÕ³Ýù³ÛÇÝ ï³ñ³ÍùÝ»ñÇ, ÝáõÝå»ë ß³ï Ëáó»ÉÇ »Ý ³Õù³ï áõÃÛ³Ý¨ ëáÕ³ÝùÝ»ñÇ íÝ³ëÝ»ñÇ ï»ë³Ï»ïÇó:

Ð³Ûë³ï ³ÝáõÙ ëáóÇ³É³Ï³Ý å³Ûù³ÝÁ ÙÝáõÙ ¿ ¹Åí³ñÇÝ ¨ ³Õù³ï áõÃÛáõÝÁ ÑÇÙÝ³Ï³Ý Ëáó»ÉÇ ý³Ï ïáñÝ ¿ Ð³Ûë³ï ³ÝÇ µÝ³Ïãáõà Û³Ý[1] Ñ³Ù³ñ: âÝ³Ûí ù³Õ³ù³ÛÇÝ ¨ ·ÛáõÕ³Ï³Ý ³Õù³ï áõÃÛ³Ý óáõó³ÝÇßÝ»ñÁ ß³ï Ùáï »Ý, ·ÛáõÕ³Ï³Ý µÝ³ÏãáõÃÛ³Ý éÇëÏÁ Ñ³ÛïÝí»Éáõ ³Õù³ï áõÃÛ³Ý óáõó³ÝÇßÇó Ý»ñù¨, µ³ñÓñ[2] ¿: ¶ÛáõÕ³Ï³Ý ï³ñ³ÍùÝ»ñÁ óáõÛó »Ý ï³ÉÇë ³Õù³ï áõÃÛ³Ý Ýí³½Ù³Ý ³ÙÝ»ó³Íñ ³ë ï Ç×³ÝÁ ¨ ï³ñµ»ñáõÃÛáõÝÁ` ³Õù³ï áõÃÛ³Ý Ýí³½Ù³Ý ã÷³µ³ÅÇÝÁ ÙÇ³ÛÝ 4.18% ¿ (ÁÝ¹¹»Ù ³½·³ÛÇÝ ÙÇçÇÝÇ` 9.23%):

¶ÛáõÕ³Ï³Ý ï³ñ³ÍùÝ»ñáõÙ »Ï³Ùáõï Á ³í»É µ³ñÓñ¿, ù³Ý ù³Õ³ùÝ»ñáõÙ: ÐÇÙÝ³Ï³Ý å³ï×³éÁ ·ÛáõÕ³ïÝï»ë³Ï³Ý ³ñï³¹ñ³ÝùÇ í³×³éùÇó ëï³óí³Í »Ï³Ùáõï Ç ³ÝÑ³í³ë³ñ³ã³÷ µ³ßËí³ÍáõÃÛáõÝÝ¿ (»Ï³Ùáõï Ç ÑÇÙÝ³Ï³Ý ³ÕµÛáõñÁ ïÝ»ñÇ í³ñÓáíï³ÉÝ¿):

²Ù»Ý³µ³ñÓñ ³Õù³ï áõÃÛ³Ý Ù³Ï³ñ¹³ÏÁ Ð³Ûë³ï ³ÝáõÙ ·ñ³ÝÓí»É ¿ ¶»Õ³ñùáõÝÇùÇ, î³íáõßÇ ¨ ÞÇñ³ÏÇ Ù³ñ½ñáõÙ (62.2%, 59.7% ¨ 57.8% Ñ³Ù³å³ï³ëË³Ý³µ³ñ, ³½·³ÛÇÝ ÙÇçÇÝÁ` 51.9%)[3] – áñÁ ÝáõÛÝå»ë ³é³ç³ó»É ¿ ëáÕ³ÝùÝ»ñÇ å³ï×³é³Í ÏáñáõëïÝ»ñÇ ÏáÝÏñ»ï Ù³Ï³ñ¹³ÏÇó:

î»Õ³Ï³Ý×³Ý³å³ñÑÝ»ñÇ ó³ÝóÇ (Ù³ëÝ³íáñ³å»ë Ñ³Ù³ÛÝùÝ»ñÇ ×³Ý³å³ñÝ»ñÁ) Ñ»ï³·³ í³ïÃ³ñ³óáõÙÁ ÏË³÷³ÝÇ ·ÛáõÕ³óÇ³Ï³Ý ïÝï»ëáõÃÛáõÝÝ»ñÇÝ í³×³é»É ·ÛáõÕ³ïÝï»ë³Ï³Ý ³ñï³¹ñ³ÝùÝ»ñÁ ¨ ÏÑ³Ý·»óÝÇ »Ï³Ùáõï Ý»ñÇ Ù»Í ï³ñµ»ñáõÃÛ³Ý: ²í»ÉÇÝ, ï»Õ³Ï³Ý ×³Ý³å³ñÑÝ»ñÁ ËáãÁÝ¹á¹ ÏÑ³Ý¹Çë³Ý³Ý Ù³ßïíáÕ ÑáÕ»ñÇ, ÇÝãå»ë Ý³¨ ëáóÇ³É³Ï³Ý Í³é³ÛáõÃÛáõÝÝ»ñÇ (ÏñÃáõÃÛáõÝ, ³éáÕç³å³ÑáõÃÛáõÝ ¨ ³ÛÉÝ) Ñ»ï³·³ÛáõÙ ë³ÑÙ³Ý³÷³Ï»Éáí »Ï³Ùáõï Ý»ñÇ ·áñÍÁÝÃ³óÝ»ñÁ ¨ Ï»Ýë³Ï³Ý å³ÛÙ³ÝÝ»ñÁ:

Î³ áõÕÕ³ÏÇ ÷áËï³å í³ÍáõÃÛáõÝ ·ÛáõÕ³Ï³Ý ³Õù³ï áõÃÛ³Ý[4] (Ñ³ï Ï³å»ë Ñ³Ù³ÛÝùÝ»ñÇ ýÇ½ÇÏ³Ï³Ý Ù»Ïáõë³óáõÙÁ) ¨ ×³Ý³å³ñÑ³ÛÇÝ ó³ÝóÇ å³ÛÙ³ÝÝ»ñÇ ÙÇç¨: ÆÝí»Ý ï³ñ Ñ»ï³½áï áõÃÛáõÝÁ óáõÛó¿ ³ï ÉÇë, áñ ï ñ³Ýëå áñ ï Ç Ñ³ï í³ÍáõÙ ·áÛáõÃÛáõÝ áõÝ»óáÕ ÁÝ¹Ñ³Ýáõñ ëáÕ³ÝùÝ»ñÇó áõÕÕ³ÏÇ íÝ³ëÝ»ñÇ 80%[5] Ï»Ý ï ñáÝ³óí³Í »Ý Ñ³Ù³ÛÝù³ÛÇÝ¨ ï»Õ³Ï³Ý×³Ý³å³ñÑÝ»ñÇÝ:

1 ö³ë ï áñ»Ý í»ñçÇÝ Ý»ñ¹ñáõÙÝ»ñÁ ã¿ÇÝ Ýí³½»óÝáõÙ ³ÕÙ³ï áõÃÛáõÝÁ, µ³ó»Ï³Ùáõï Ý»ñÁ ³ÝÑ³í³ë³ñ»Ý:
2 ²Õù³ï áõÃÛ³Ý Ýí³½Ù³Ý é³½Ù³Ý é³½Ù³í³ñáõÃÛ³Ý ÷³ë ï ³ÃáõÕÃ, 2003Ã.:
3 20% µ³ñÓñ »í³Ùáõï áõÝ»óáÕ µÝ³Ïãáõà Û³Ý¨ 20% ó³Íñ »Ï³Ùáõï áõÝ»óáÕ µÝ³ïãáõÃÛ³Ý ÙÇç¨ ï³ñµ»ñáõÃÛáõÝÁ 32 ³Ý·³Ù¿` µÝ³Ïãáõà Û³Ý Ú³ÛñÑ»ÕµÛáõé³óáõÙÁ ³ÏÝÑ³Ûï¿:
4 ²Õù³ï áõÃÛ³Ý Ýí³½Ù³Ý é³½Ù³Í³ñáõÃÛ³Ý÷³ë ï ³ÃáõÕÃ, 2003Ã.:
5 °Í³Ùáõï Ý»ñÇ ³ÝÑ³í³ë³ñáõÃÛáõÝÁ ·ÛáõÕ»ñáõÙ ³í»ÉÇ µ³ñÓñ¿, ù³Ý ù³Õ³ùÝ»ñáõÙ, »Ï³Ùáõï Ý»ñÇ ³ÝÑ³í³ë³ñ µ³ßËí³ÍáõÃÛ³Ý å³ï×³éÁ ·³ÉÇë¿ ·ÛáõÕ³ïÝï»ë³Ï³Ý ³ñï³¹ñ³ÝùÇ í³×³éùÇó: Ð³Ù³ÛÝùÇ ×³Ý³å³ñÑÝ»ñÇ íÇ×³ÏÁ Ïµ³ñ»É³íÇ ¨ å³ÛÙ³ÝÝ»ñ Ïë ï»ÕÍÇ ·ÛáõÕ³ïÝï»áõÃÛ³Ý ³ñï³¹ñ³ÝùÇ í³Í³éùÇ Ñ³Ù³ñ:

(2) Poverty in Mountainous Regions

The PRSP provides data on the link between poverty and mountainous areas as shown in Table 4.13.

Table4.13 Poverty and uplands

Indicators	Level 1: up to 1300 m above sea level	Level 2: from 1301 to 1700 m	Level 3: from 1701 and higher	Total rural areas
Share of population, %	39.00	26.00	35.00	100.00
Poor, %	42.35	54.93	57.99	50.76
Including extremely poor, %	16.37	24.86	28.28	22.55

Source: ISLC 1998/99, after PRSP 2003.

Apparently, the communities that enjoy the resources offered by the landslide areas are also the most vulnerable to poverty and landslide damages.

The social condition in Armenia remains difficult and poverty is the main vulnerability factor for the Armenian population[1]. Although the urban and rural poverty indicators are very close, the risk of the rural population to appear below the poverty line is higher[2]. Rural areas show the lowest degree of reduction of poverty and inequality – the proportion of the poor decreased by only 4.18% (against the national average of 9.23%).

Income inequality[2] in rural areas is much higher than in cities. The main reason is the extremely unequal distribution of the gains from the sales of agricultural produce (the major source of income for rural households).

The highest poverty levels in Armenia were recorded in Gegharkunik, Tavush and Shirak (62.2%, 59.7%, and 57.8% respectively; national average 51.9%)[3] – which also suffer from a certain level of losses caused by the landslides.

Damage to local road networks (particularly community roads) is further worsening the opportunities of rural households to sell their agricultural produce, leading to deepening income inequality. Moreover, damage to local roads cut the access to farming lands as well as to social services (education, health, etc.) – further limiting income-generating activities and living standards.

There is a direct correlation between rural poverty[4] (especially physical isolation of the communities) and the condition of road network. The Inventory Survey shows that 80%[5] of total existing landslide direct damages in the transport sector is concentrated on local and community roads.

[1] In fact, the recent growth did not contribute to poverty reduction, but to income inequality.
[2] Poverty Reduction Strategy Paper, 2003.
[3] The ratio between the 20% of the highest income population and 20% of the lowest income population is 32 times – clear evidence of extreme polarization of the population.
[4] Poverty Reduction Strategy Paper, 2003.
[5] Income inequality in rural areas is much higher than in the cities; the reason is unequal distribution of the gains from sales of agricultural production. Improvement of the community roads condition will increase opportunities for selling agricultural production.

(4) Ð³ë³ñ³ÏáõÃÛ³Ý Ù³ëÝ³ÏóáõÃÛáõÝÁ È»éÝ³ÛÇÝ ßñç³ÝÝ»ñáõÙ

Ü³Ëáñ¹ Ñ³ï³í³ÍÁ óáõÛó ¿ ï³ÉÇë, áñ Ñ³Ù³ÛÝùÝ»ñÁ ï»Õ³µ³ßËí³Í »Ý ëáÕ³Ý³ù³ÛÇÝ ¨ É»éÝ³ÛÇÝ ï³ñ³ÍùÝ»ñáõÙ, áñáÝù ï³ñµ»ñíáõÙ »Ý µ³ñ»Ýå³ëï å³ÛÙ³ÝÝ»ñáí (Ù»ÕÙ É³Ýç, çáõñ, É³í ÑáÕ»ñ), µ³Ûó ÙÇ¨ÝáõÛÝ Å³Ù³Ý³Ï ß³ï Ëáó»ÉÇ »Ý ³Õù³ïáõÃÛ³Ý ï»ë³Ï»ïÇó: ÆÝã¨Çó¿, Ù»Ýù ïÏ³ñáÕ³Ý³Ýù ·ïÝ»É ÙÇ ù³ÝÇ Ñ³ë³ñ³Ï³Ï³Ý ù³Õ³ù³Ï³ÝáõÃÛ³Ý/Ý»ñ¹ñáõÙ³ÛÇÝ Íñ³·ñ»ñ, áñÁ ïû·ÝÇ ³Ûë Ñ³Ù³ÛÝùÝ»ñÇÝ ³ÙµáÕç Í³í³Éáí û·ï³·áñÍ»É Ù³ïã»ÉÇ é»ëáõñëÝ»ñÁ:

àñå»ë½Ç Ýå³ëï»É ·ÛáõÕ³ïÝï»ë³Ï³Ý ³ñï³¹ñáõÃÛ³ÝÁ, ·ÛáõÕ³Ï³Ý µÝ³ÏãáõÃÛáõÝÁ ÑÇÝ· ï³ñáí ³½³ïí»É¿ Ñ³ñÏ»ñÇó` ÙÇÝã¨ 01.01.2009.[1]: Ð³Ù³Ó³ÛÝ §²í»É³óí³Í ²ñÅ»ùÇ Ð³ñÏÇ¦ Ð³Ûë³ï³ÝÇ Ð³Ýñ³å»ïáõÃÛ³Ý úñ»ÝùÇ, ·ÛáõÕ³ïÝï»ë³Ï³Ý ³ñï³¹ñ³ÝùÇ í³×³éùÁ Ð³Ûë³ï³ÝáõÙ ³½³ïí»É¿ ²²Ð-Çó: Þ³ÑáõÃ³Ñ³ñÏÇ¨ »Ï³Ù³ï³Ñ³ñÏÇ ÷áË³ñ»Ý ·ÛáõÕ³óÇÝ»ñÁ(¨ Ïáå»ñ³ïÇí ý»ñÙ³Ý»ñÁ) í×³ñáõÙ »Ý ÑáÕÇ Ñ³ñÏ Ï³¹³ë³ïñÇ ³ñÅ»ùÇ 15%-Ç ã³÷áí:

àéá·Ù³Ý çñÇ ëáõµëÇ¹Ç³Ý»ñÁ å»ïù¿ í»ñç³Ý³Ý ÙÇÝã¨ 2007²Ã.-Á: àñå»ë½Ç Ýí³½»óÝ»É áéá·Ù³Ý çñÇ ¨ ¿É»Ï³ï ñ³¿Ý»ñ·Ç³ÛÇ ë³Ï³·ÝÇ ³×Ç ³½¹»óáõÃÛáõÝÁ, ùÝÝ³ñÏí»É¿ §Ð³ë³ñ³Ï³Ï³Ý Í³é³ÛáõÃÛáõÝÝ»ñÇ ýÇÝ³Ýë³Ï³Ý í»ñ³Ï³Ý·ÝÙ³Ý¦ Íñ³·ÇñÁ, ³ÛÝå»ë ÇÝãå»ë ³í»É³óí³Í ³ñÅ»ùÇ Ñ³ñÏÁ ·ÛáõÕ³ïÝï»ë³Ï³Ý ³ñï³¹ñ³ÝùÝ»ñÇ ÍñáÍ»ÙÝ»ñÇ ÉáõÍÙ³Ý Ñ³Ù³ñ: ºñµ ùÝÝ³ñÏíáõÙ ¿ å»ï³Ï³Ý µÛáõç»Çó Ñ³ïáõÏ Ýß³Ý³ÏáõÃÛ³Ý µ³ßËáõÙÁ, ³é³çÝ³Ñ»ñÃáõÃÛáõÝÁ Ïïñí Ý»ñÑ³Ù³ÛÝù³ÛÇÝ ³ëáóÇ³óÇ³Ý»ñÇÝ ¨ Ýñ³Ýó »ÝÃ³Ï³éáõóí³íù³ÛÇÝ ó³Ýó»ñÇ[5] ½³ñ·³Ý³ÉáõÝ: ¶ÛáõÕ³ïÝï»ëáõÃÛ³Ý é³½Ù³í³ñáõÃÛáõÝÁ[6] ÝßáõÙ ¿ ³é³ÝÓÇÝ ¨ ë³ÑÙ³Ý³ÛÇÝ ßñç³ÝÝ»ñáõÙ Ñ³Ù³ÛÝùÝ»ñÇ Ù³ëÝ³ÏóáõÃÛáõÝÁ ³é³çÝ³Ñ»ñÃ ·ÛáõÕ³Ï³Ý ×³Ý³å³ñÑÝ»ñÇ í»ñ³Ï³Ý·ÝáõÙÁ ¨ ëå³ë³ñÏáõÙÁ; ³é³çÝ³ÛÇÝÁ ¨ ·ÉË³íáñÁ í»ñ³Ýáñá·»É ë³ÑÙ³Ý³Ù»ñÓ ¨ É»éÝ³ÛÇÝ ßñç³ÝÝ»ñÇ ×³Ý³å³ñÑÝ»ñÁ: Ð³Ù³ßË³ñÑ³ÛÇÝ µ³ÝÏÇ §´Ý³Ï³Ý é»ëáõñëÝ»ñÇ Ï³é³í³ñÙ³Ý ¨ ³Õù³ïáõÃÛ³Ý Ýí³½»óÙ³Ý Íñ³·ÇñÁ¦ ÏÇñ³Ï³Ý³óíÇ 2004-2006ÃÃ. µÝáõÃÛ³Ý ¨ ßñç³Ï³ ÙÇç³í³ÛñÇ å³Ñå³ÝáõÃÛ³Ý ßñç³Ý³ÏÝ»ñáõÙ: Ì³ñ³·ñÇ Ýå³ï³ÏÝ»ñÝ »Ý µ³ñ»É³íí»É µÝ³Ï³Ý é»ëáõñëÝ»ñÇ Ï³é³í³ñáõÙÁ ³¹ÙÇÝÇë ïñ³ïÇí Ñ³Ù³Ï³ñ·Ç µ³ñ»÷áËáõÙÝ»ñÇ ÙÇçáóáí, ÇÝãå»ë î³íáõßÇ ¨ ¶Õ³ñùáõÝÇùÇ Ù³ñ½»ñÇ É»éÝ³ÛÇÝ ßñç³ÝÝ»ñÇ ·ÛáõÕ³Ï³Ý ³Õù³ïáõÃÛ³Ý Ïñ×³ïáõÙÁ:

[1] ¶ñ³ÍÇë»×³Ý³å³ñÑÝ»ñÁ Ï³½Ùáõù »Ý ïñ³Ýëåáñïç ë»Ïïáñç ÁÝ¹Ñ³Ýáõñ íÝ³ë í³ÍùÝ»ñÇ 46%-Á, ï»Õ³Ï³Ý ³ë³Éïª»×³Ý³å³ñÑÝ»ñ – 25% ¨ Ï³Ùáõñç Ý»ñ 9% - Áë ï ÆÝíª»Ýï³ñÐ»ï³½á ïáõÃÛ³Ý:

[2] È³ÛÝ Ñ³ñÏ³ÛÇÝ µ³½³Ý²í»É³óí³Í²ñÅ»ùÇ Ð³ñÏÇ(20%) Ñ³Ù³ñ` ÑÇÙÝí³Í Ð³Ûë³ï³ÝáõÙ: ¶ÁÛáõÃÛáõÝ áõÝ»óáÕ ³½³ïáõÙÝ»ñÁ ë³ÑÙ³Ý³÷³Ï »Ý (·ÉË³íáñ³å»ë ýÇÝ³Ýë³Ï³Ý Í³é³ÛáõÃÛáõÝÝ»ñÁ, µ³ñ»·áñÍáõÃÛáõÝ, ¨ ï»Õ³Ï³Ý ·ÛáõÕ³ïÝï»ë³Ï³Ý³ñï³¹ñ³ÝùÝ): ÜáõÛÝ ·áñÁÝÃ³óÝ»ñÁ ÏÇñ³éíáõÙ »Ý ï»Õ³Ï³Ý Ï³Ù³Ï³ñ¨áñ ³ñï³¹ñ³ÝùÝ»ñÁ Ñ³ñÏ»Éáõ Ñ³Ù³ñ:

[3] ÐÐ Ï³é³í³ñáõÃÛ³Ý µÛáõç»Ý ÏËÇÝÇ ³ÝÏ³ñáÕ å³ßï å³Ý»É Ý»ñÏ³ çñ³ÛÇÝ Ñ³Ù³Ï³ñ·Ç ¹á ï³óÇ³Ý»ñÁ, »ñµ »ÝÃ³Ï³éáõÙóí³ÍùÝ»ñÇ µ³ñÓñ³óáÕ ³ñÅ»ùÝ»ñÁ Éñ³óí³Í »Ý ÁÝÃ³óÇÏ ¨ å³Ñå³ÝÙ³Ý ³ñÅ»ùÝ»ñáí:

[4] GTZ-Ç ÏáÕÙÇó Ý»ñÏ³ÛáõÙë Ýáñ³óí³Í ¨ ³Ùñ³óí³Í, ÑÇÙÝ³Ï³ÝáõÙ ëÛáõÝÇùÇ ¨ î³íáõßÇ Ù³ñ½»ñ:

[5] ÆÝã¨¿, Ù»Ýù ¹»é¨ë ãÏ³ñáÕ³ó³Ýù ï»Õ³Ï³Ý ÇÝù³Ï³é³í³ñÙ³Ý Ù³ñÙÇÝÝ»ñáõÙ ·ïÝ»É ³ÏÝÑ³ÛïáõÃÛáõÝ: àñÁ ³í»ÉÇ Ù³Ýñ³Ù³ëÝ Ïí»ñÉáõÍíÇ Ñ³çáñ¹ ÷áõÉáõÙ:

[6] ¶ÛáõÕ³ïÝï»ëáõÃÛ³Ý Ï³ÛáõÝ ½³ñ·³óÙ³Ý é³½Ù³í³ñáõÃÛáõÝ; ¶Ü, 2004

(4) Public Assistance for Mountainous Regions

The previous sections show that communities located in landslide and mountainous areas enjoy favorable conditions (gentle slope, water, good soils) but are the most vulnerable to poverty at the same time. However, we could find only a few public policy/ investment programs, which would help those communities to make the full use of available resources.

To promote the agricultural production the rural population was exempted from taxes for five years, until 01.01.2009.[1] According to the Law of the Republic of Armenia on the Value Added Tax, the sale of the agricultural products produced in Armenia is exempted from VAT. Instead of the profit tax and income tax, the peasants (and cooperative farms) pay a land tax in the amount of 15% of the net cadastre value of land. The subsidies on irrigation water will end by 2007[2]. In order to mitigate the influence of increase of tariffs on irrigation water and electricity envisaged in the “Program on Financial Rehabilitation of Public services” as well as value added taxation on sales of agricultural products starting from 2009, it is planned to: (i) develop a concept on “regulations on trends and mechanisms of subsidizing agriculture in the RA” by 2007, (ii) assist in replenishment of financial resources and provide targeted support to the vulnerable groups of rural population within the framework of the “village and agriculture development fund” program.

Ministry for Coordination of Territorial Administration and Infrastructure Operation (MoTA) plans to implement a state policy differentiated according to communities 2004-2006. Actions will be taken for supporting establishment of inter-community associations[3], designated for solution of the basic problems of small communities. When envisaging special-purpose allocations from the state budget, priority will be given to inter-community associations and to the development of their infrastructure networks[5]. The agriculture strategy[6] mentions primary renovation of rural roads in the remote regions and bordering areas; emphasizes expansion of participation of communities in rural road construction and maintenance; first and foremost reconstruction of roads in the settlements located on the borders and in mountainous regions.

The World Bank finance “The Natural Resource Management and Poverty Reduction Program” will be implemented in the sector of natural and environment protection over 2004-2006. The program aims to improve natural resource management through reforms of the administrative system, as well as reduction of rural poverty in the mountainous areas of the Tavush and Gegharkunik Marzes.

[1] Gravel roads constitute 46% of total damages in transport sector, local asphalt roads – 25% and bridges 9% - based on Inventory Survey.

[2] A wide tax base for value added tax has been established in Armenia with a unified 20% rate. Existing exemptions are extremely limited (mainly financial services, charity, and local agricultural produce). The same procedures apply to the taxation of domestic or imported products.

[3] The GoA budget will be unable to sustain the present system of water subsidies when the costs of upgrading infrastructure are added to the operating and maintenance costs.

[4] Initiated and strengthened at present by the GTZ, mostly Syunik and Tavush marz.

[5] However, we could not find the hard evidence of those transfers to local-self governments yet. That will be analyzed more in detail in the next phase.

[6] Agricultural Sustainable Development Strategy; MoA, 2004.