Hasmik Balyan, PhD.
Yerevan State University,
1 Alek Manookian St., 375025 Yerevan
Email: hbalyan@ysu.am

Geomorphological and geophysical methods of forecasting of actiization and the dynamics landslides (on the pattern of the Republic of Armenia)

Landslides have been noticed on 2% of Armenia's 29,8 thousand square kilometres of land. Landslides take place on a total of 65,000 ha of land, of which 35,000 ha are active.

Armenia has been and remains a region of landslide activity. However, there also exist regional differences in Armenia concerning landslides. In the mid-altitude mountains of Armenia, and in the humid northeast and southern regions, landslides are especially common. There are also individual occurrences of landslides throughout Armenia (Fig. 1).

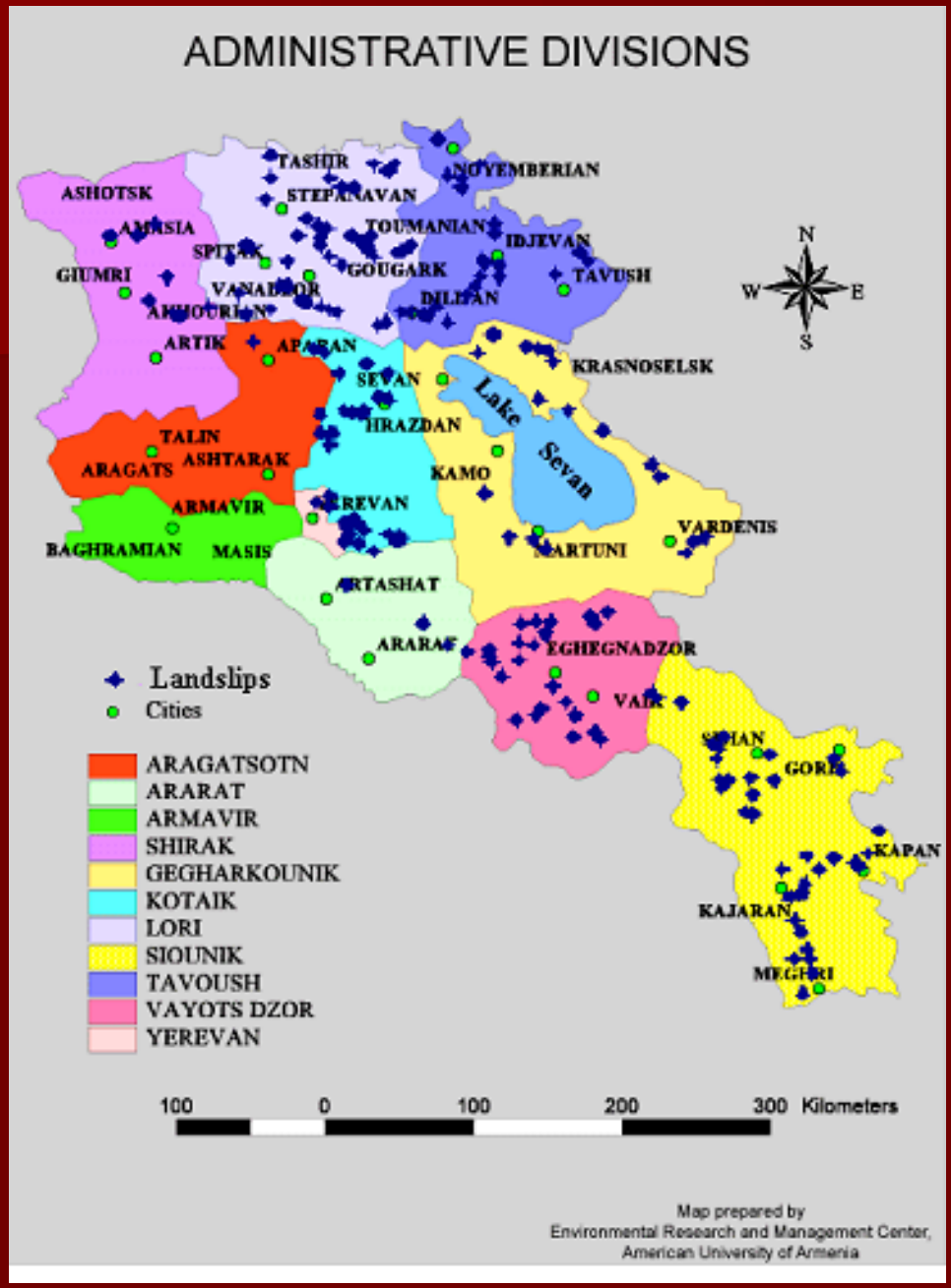

Fig . 1. Landslides distribution in the Republic of Armenia by Regions

The majority of landslides develop on the lower slopes of valleys. The majority of landslides are tied somehow or another with the above mentioned economic activities. The importance of predicting landslides and detecting groups of landslides, as well as developing defenses against them, is quite clear (Table 1).

Table 1

Destruction of territory of RA by landslip processes on the areas of separate regions

№№	Names of the regions	The total square of the region	Landslides, mud-streams, solifluctions,ga													
			Grandiose, over 400		Big 200-400		Very big 100-200		Medium 50-100		Small 5-50		Very small, < 5		Total	
			Active	Inactive	Active	Inactive	Active	Inactive	Active	Inactive	Active	Inactive	Active	Inactive	Active	Inactive
1	**Aragatzotn**	274.4	-	400							16	165	2	29	18	594
2	**Ararat**	207.7	2620	-	1755	570	1620	500	1675	30	617	2885	47	375	8334	4760
3	**Armavir**	123.3	-										150		150	
4	**Gegharqunik**	527.0	800	420	1070	300	110			220	259	1035	56	373	2225	2348
5	**Lori**	374.4							480	302	120	441	147	383	747	1126
6	**Kotayk**	207.2		1180		590		534		85	307	1426	50	175	257	3990
7	**Shirak**	254.8			400	370	345		1010	50	25	181	620	29	2400	630
8	**Syunik**	447.4					520	181	982	348	384	1412	27	549	1913	2490
9	**Vayots dzor**	230.6	3920	1200	2885	540	1710	1620	2077	800	325	4816	399	999	11816	9975
10	**Tavush**	269.4	300	480	1420	840	318		350	70	273	2395	98	640	5459	4425
11	**Yerevan**	73.8													1190	
	Total	2990	10340	3680	7530	3210	4623	283	6574	2305	2826	14756	1596	3552	34679	30338

The use of modern geophysical technology and methods is necessary to receive a clearer picture of landslides. Regulated investigations will give s information concerning landslide progression and development. The following geophysical investigations were conducted in the northwest city of Dilijan. The landslide body is being studied on the southeast slopes of the Bazoom mountain range. The landslide body occupies an area of 4000 m2, and the slope of the relief is 50 degrees. It is an active landslide. During a period of one year noticeable movement took place. The landslide currently threatens the “Dilijan” mineral water factory.

Complex and methodological geophysical electromagnetic investigations were conducted in order to follow the separation of the landslide body, and to correct the borders in the outline of the body. The selections of these methods are determined by the sharp differentials in the physical attributes (magnetic perception and specific electronic resistance) of the rocks in the region under investigation. The magnetic investigation was conducted under a regime of highly precise field work and the electric investigation using vertical electronic zond methodology (VEZ). VEZ methodology was used in order to determine the construction of the landslide body, and in the determination of the locative elements of the slide, directly upon the landslide body, as well as on points located outside of it. AB, the largest space, was 370 m, which is enough to chart the area of the slide. According to VEZ data (Fig.2) five layers of different strengths and specific electronic resistance (ohms) were located in the geo-electric landslide profile. The first two layers are alluvial-proluvial sediments, the third layer (p3=20 ohm.m) destroyed, water saturated tufa-brekcha, the fourth layer, root tufa-brekcha, and the fifth layer, 22 ohm.m water tight layers, or the specific electro-resistance of clay. The two layers with low electro-resistance can become the surface area of the slide for any landslide. The third layer, which is located at a depth of 4 meters from the surface, already shows that it is a surface feature of the slides, representing active landslide processes. The fifth layer is located at a depth of 21 meters. Its activation will affect a much larger area and cause much greater surface movement.

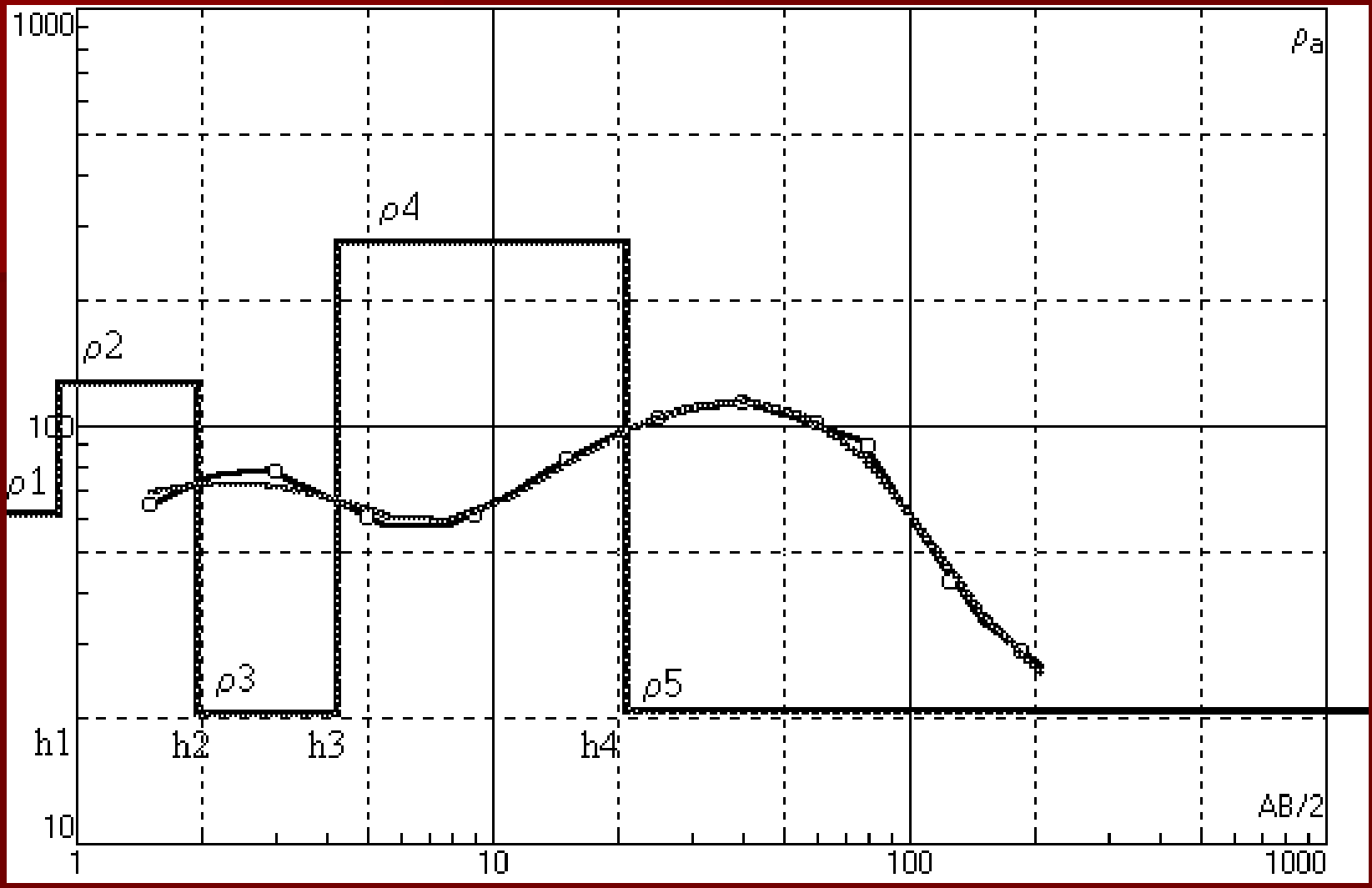

Fig.2. VEZ. Slope 3 is explained according to IPI2 win program

These geologic-geophysical, methods of landslide studying combined with satellite photos, as well as with landscape geomorphologic studies will allow stopping of undesired natural disasters in time, which is very actual in mountainous countries (in the Republic of Armenia) where slope processes are very active and dynamic.