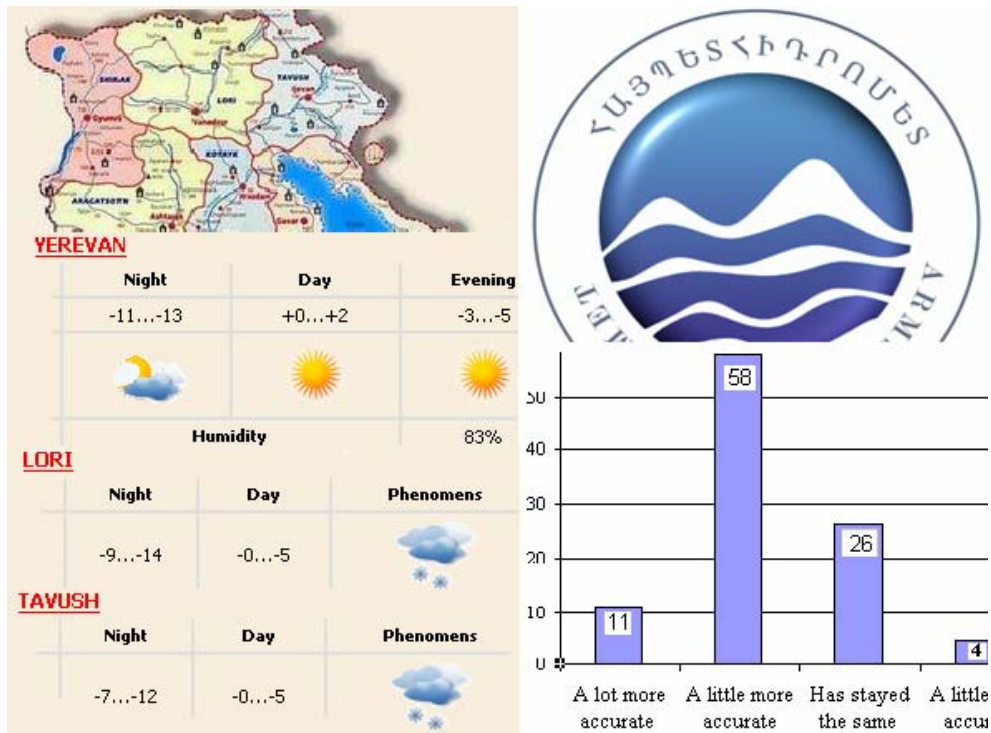


Severe Weather Warning Survey



Prepared for **THE WORLD BANK**



BY

International Center for Agribusiness Research and Education

Address: 74 Teryan St. Yerevan 0009 Armenia

Tel: (37410) 522839, 564177

Fax: (37410) 566221

E-mail: vardan@icare.am



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YEREVAN

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1. Background & Methodology

1.1 Background

Within the scope of a study of weather/climate services in Europe and Central Asia, the World Bank is undertaking a survey of dissemination of severe weather warnings in Armenia, with a focus on rural areas. The ICARE Foundation was commissioned to undertake a public opinion survey on Severe Weather Warnings in partnership with the Armenian State Hydrometeorological and Monitoring Service (Armstatehydromet) and in consultation with the World Bank Country Office in Armenia.

The aims of the survey were as follows:

- To measure the publics' awareness, knowledge and perceptions of the Armstatehydromet particularly in Yerevan and in rural areas.
- To explore the effectiveness of Armstatehydromet's services with concentration on Severe Weather Warnings.
- To understand how people access the weather forecast information as well as the severe weather warnings and how they react to the severe warnings.
- To reveal the differences between the forecasts transmitted by Armstatehydromet and the forecast information received and understood by citizens.
- To evaluate the reactions to new ways for presenting severe weather warnings.

The survey was carried out within 3 days after the Armstatehydromet issued a Severe Weather Warning and the Event itself occurred. The ICARE maintained a close cooperation with Armstatehydromet during overall study period. The following were the Severe Weather Warnings issued by Armstatehydromet during the study period, which covered the entire country:

DEC 27-29, 2006	JAN 4, 2007	JAN 29, 2007	FEB 7, 2007
Heavy Snowfall Strong Wind Icy-Roads	Heavy Fog Severe Frost Icy-Roads	Heavy Snowfall Strong Wind Severe Frost	Heavy Snowfall Strong Wind

1.2 Methodology

Sampling Plan

ICARE selected 12 settlements (4 sets with three settlements) plus Yerevan, the Capital, according to the TOR. The selection was done in close consultation with Armstatehydromet with a particular concentration on the areas which regularly are affected by the Severe Weather Warnings and Events. ICARE research team visited all settlements to find out more about their size, geography and economic sectors. The team leader met with the mayors, village mayors and deputy mayors who showed a great interest in the study. They confirmed that the weather, especially the severe weather, causes great losses to their agricultural activities. The mayors or responsible persons in turn offered their cooperation and support in the implementation of the study.

Together with Armstatehydromet a small report was developed on each marz and selected settlement climate characteristics with more concentration on severe weather phenomena. A small report on geography and economic sectors of each marz and settlement was also developed (See Appendix).

The following are the selected settlements.

	Population
Shirak Marz	
City of Maralik	5900
Village of Lanjik	924
V. Horom	1907
<i>Total</i>	<i>8731</i>
Lori Marz	
City of Tashir	7856
V. Lermontov	870
V. Gyulagarak	2124
<i>Total</i>	<i>10850</i>
Aragatsotn Marz	
City of Aparan	6600
V. Tsaghkahovit	1562
V. Aragats	3200
<i>Total</i>	<i>11362</i>
Gegharkunik Marz	
City of Martuni	11900
V. Lchashen	4212
V. Lichq	5037
<i>Total</i>	<i>21149</i>

Source: www.armstat.am, Census 2001.

As of October 1, 2006 the number of permanent population in Armenia is as follows:

	Total	Urban	Rural
Republic of Armenia (000)	3220.8	2062.8	1158
Yerevan (000)	1104.5	1104.5	-

Source: www.armstat.am

Thus, it can be seen that 36% of Armenia's population is **RURAL** and 64% is **URBAN**. Yerevan's population is about 34% of **TOTAL** (and 54% of urban).

To have representative samples for Armenia, the above proportions are used. Total number of people to be surveyed in Yerevan was 200, so it was decided to survey 588 people (88 additional respondents) in order to have about 34% representation in the total sample. The remaining 388 respondents have been surveyed in the rural towns and villages using appropriate proportions for rural and urban. Thus, 36% of 588 is 212 and it is the number of total rural people surveyed and 176 is the number of people surveyed in urban areas (rural towns).

Prior to the actual field work, the ICARE research team adapted the questionnaire with close cooperation with Armstatehydromet, WB Country Office and Bank task team experts (See Annexes).

To contribute to the national administration of the survey, the Armstatehydromet provided a 5-day weather forecast every day to ICARE research team to better plan the activities. The 5-

day forecast included all marzes where the selected 12 settlements were located plus Yerevan. There was no separate format to present severe weather warnings. The forecast announcement had the same format with only changed title: Attention!!! If there was no “attention”, the warning shouldn’t be considered as severe.

The ICARE research team maintained a close cooperation with village and town mayors or deputy mayors to check the weather situation locally. All team members/interviewers were trained and a pilot survey was implemented before the main survey.

Yerevan Survey

The survey in Yerevan was conducted using on-street interview method in 10 districts of Yerevan. Small districts were added to its neighbor districts (Nork Marash to Nor Nork and Nubarashen to Shengavit, in this case 29 people were surveyed in Nor Nork and 28 in Shengavit).

YEREVAN, Districts	1104.5	% in Total	Sample
Ajapnyak	106.8	0.10	19
Avan	50.5	0.05	9
Arabkir	131.4	0.12	24
Davitashen	40.4	0.04	7
Erebuni	119.7	0.11	22
Kentron	129.7	0.12	23
Malatia - Sebastia	140.6	0.13	25
Nor – Nork	143.7	0.13	26+3
Nork - Marash	11.5	0.01	0
Nubarashen	9.5	0.01	0
Shengavit	142.6	0.13	26+2
Qanaker - Zeytun	78.1	0.07	14
TOTAL			200

Rural Survey

The following is the actual sample for rural survey. The ICARE was able to conduct surveys in 3 marzes: Shirak (Sh), Aragatsotn (Ar) and Gegharkunik (Ge). The Severe Weather Warnings issued by Armstatehydromet actually covered all Armenia and it was decided to conduct the field work in 4 villages and 3 towns of 3 marzes to get as much coverage as possible.

Actual Sample

Sh / Ar / Ge - Villages	Population	% in subtotal	Survey Sample
V. Lanjik	1100	10	21
V. Horom	1907	16	35
V. Aragats	3200	28	59
V. Lichq	5200	46	97
Total	11407		212

Sh / Ar / Ge - Towns	Population	% in subtotal	Survey Sample
City of Maralik	5800	23	41
City of Aparan	7500	30	52
City of Martuni	11900	47	83
Total	25200		176

Source: www.armstat.am and interviews with village and town mayors.

The population numbers had some deviations compared to statistics information. The numbers have been corrected at each location and the actual sample size was developed based on actual population numbers.

The respondent under 18 have been excluded as traditionally youth under 18 live with their parents (especially in rural areas) and their behavior fully depends on parents' decision. Adults are in the lists of election voters and that lists (many times corrected and checked) were used by ICARE research team to randomly identify the rural respondents.

2. Findings

2.1 Background Information

A total of 588 interviews have been carried out. The demographic breakdown of the respondents is given below.

Figure 1: Respondents by age band.

Age band	Number of interviews	% of interviews
18-24	75	13%
25-44	254	43%
45-64	208	35%
65 years +	51	9%
<i>Total</i>	588	

Figure 2: Respondents by gender.

Gender	Number of respondents	% of respondents
Male	308	52%
Female	280	48%
<i>Total</i>	588	

The questionnaire aimed at finding out the ethnic background of the respondents and included all ethnic group categories existing in Armenia: Assyrians, Yezeds, Greeks, Russians, Ukrainians and Kurds. These categories were taken from State Statistics. However, according to the survey results, 100% of the respondents were Armenians.

Figure 3: Respondents by involved/employed main sectors.

Sector	Number of respondents	% of respondents
Industry	9	2%
Agriculture	91	16%
Construction	20	3%
Transport and Communication	15	2%
Trade and Services	76	13%
Education and Science	104	18%
Health and Social Sector	30	5%
State and Municipal Governance	59	10%
Other (please specify)	83	14%
Don't know/Refused to answer	101	17%
<i>Total</i>	588	

- The main involvement sectors of the people surveyed were Education and Science (18%), Agriculture (16%), Trade and Services (13%) and State and Municipal Governance (10%).
- Those who gave other responses (14%) were either unemployed looking for a job or unemployed not looking for a job.
- About 17% of the respondents refused to answer.

Figure 4: Agricultural activities of the respondents.

Agricultural Activity	Number of mentions
Plant Growing	70
Orchards	33
Animal Husbandry	69
Agricultural Services (machinery, chemicals. Etc)	9
Processing of agricultural produce (homemade)	3
Cultivating home garden	219
Other (please specify)	0
Not involved in any agricultural activity	294
Don't know/Refused to answer	0
<i>Total (multiple responses allowed)</i>	697

- Although only 16% of the respondents (91) stated that their main involvement was agriculture in Figure 3, there were about 403 responses from the respondents involved in some kind of agricultural activity.
- The most popular agricultural activity among the respondents was cultivating the home garden (219 mentions).

- The majority of those who were not involved in any agricultural activity were from Yerevan (200 respondents). The rural respondents who were not involved in any agricultural activity were either unemployed or were involved in the following sectors: Education and Science, Trade and Services, State and Municipal Governance, Transport and Communications.

Figure 5: Respondents by actual employment status.

Employment Status	Number of respondents	% of respondents
Employed in State Sector	186	32%
Employed in Private Sector	79	13%
Employed in Foreign/International Company	0	0%
Self-employed, Employer, Entrepreneur	33	6%
Lower supervisory and technical occupations in Agriculture	12	2%
Non paid routine occupations in Agriculture	40	7%
Student	29	5%
Pensioner	54	9%
Housewife	65	11%
Unemployed and looking for a job	74	13%
Not employed and not looking for a job	14	2%
Other	2	0%
<i>Total</i>	588	

- Almost two-thirds (32%) of the respondents were actually employed in state sector. These sectors were Education and Science, Health and Social Security, and State and Municipal Governance (See Figure 3).
- Fifteen percent of people surveyed were unemployed. This fact is indirectly visible from Figure 3.
- About 13% of the respondents were employed in the private sector.
- Housewives comprised about 11% of the sample and pensioners - 9%.

Figure 6: Education of the respondents.

Education	Number of interviews	% of interviews
No Elementary Education	1	0%
Elementary / Incomplete Secondary	42	7%
Secondary / Secondary – Tech./vocational	321	55%
Higher Education	221	38%
Graduate Education, Post Graduate	2	0%
Refused to Answer	1	0%
<i>Total</i>	588	

- More than half (55%) of the respondents had secondary or technical/vocational education.
- About 38% of the people surveyed had higher education.
- Only 7% of the respondents had elementary or incomplete secondary education.

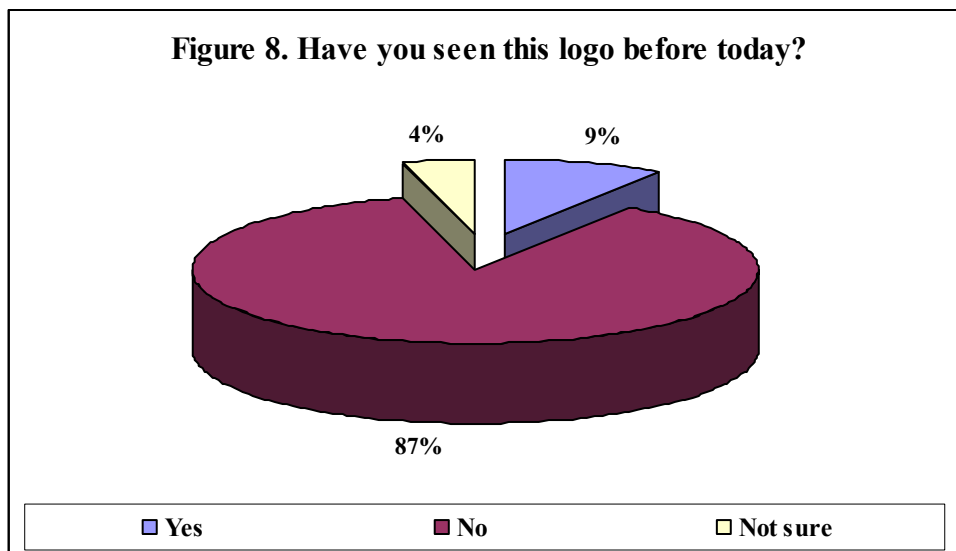
Figure 7: Household size of the respondents.

Household size	Number of respondents	% of respondents
1-3	145	25%
4-6	366	62%
7+	77	13%
<i>Total</i>	588	

- About 62% of the respondents had households with 4-6 members.
- One in four respondents (25%) had small household size.
- Around 13% of the respondents had quite large household size with 7 and more members. Households with large size were mainly located in rural areas.

2.2 Awareness of ArmStateHydromet

The respondents were shown the Armstatehydromet logo.



- 87% or 509 respondents said that this was the first time they had seen the logo.
- Less than one in ten of respondents said that they had seen the Armstatehydromet logo before – 54 respondents. The awareness of the logo was a bit high in Yerevan (18 respondents). There were 15 respondents in Gegharkunik Marz and another 15 in Shirak Marz who had seen the logo before. There were only 6 people aware of the logo in Aragatsotn Marz.
- About 4% of the respondents were not sure whether they could recall the logo or not.

Figure 9: Where have you seen the logo before?

	Number of mentions
On weather forecasts	15
On TV	46
In newspapers	0
On the ArmStateHydromet website	1
On the Internet	0
Other	3
Not sure / don't know	8
<i>Total (multiple responses allowed)</i>	<i>73</i>

*Base all who had seen logo before (54 respondents)

- Forty-six respondents stated that they had seen the logo on TV, whereas 15 respondents recalled seeing the logo on weather forecasts.
- Eight respondents were unsure or did not know where they had seen the logo.
- Only one respondent had seen the logo on the on the ArmStateHydromet website.

Figure 10: Do you know what the logo stands for?

	% of respondents
The ArmStateHydromet	14%
Something to do with the weather	41%
Something to do with the environment	0%
Something to do with water	4%
Rescue Service Operation	0%
Other	1%
No / not sure	40%

- Forty-one percent of respondents who were familiar with the logo knew that it had something to do with the weather, whereas, only 14 % of the respondents recognized that the logo belonged to ArmStateHydromet.
- Forty percent of the respondents either did not know or simply were not sure what the logo stood for.

2.3 Knowledge of the ArmStateHydromet

Figure 11: What, if anything, do you know about the ArmStateHydromet?

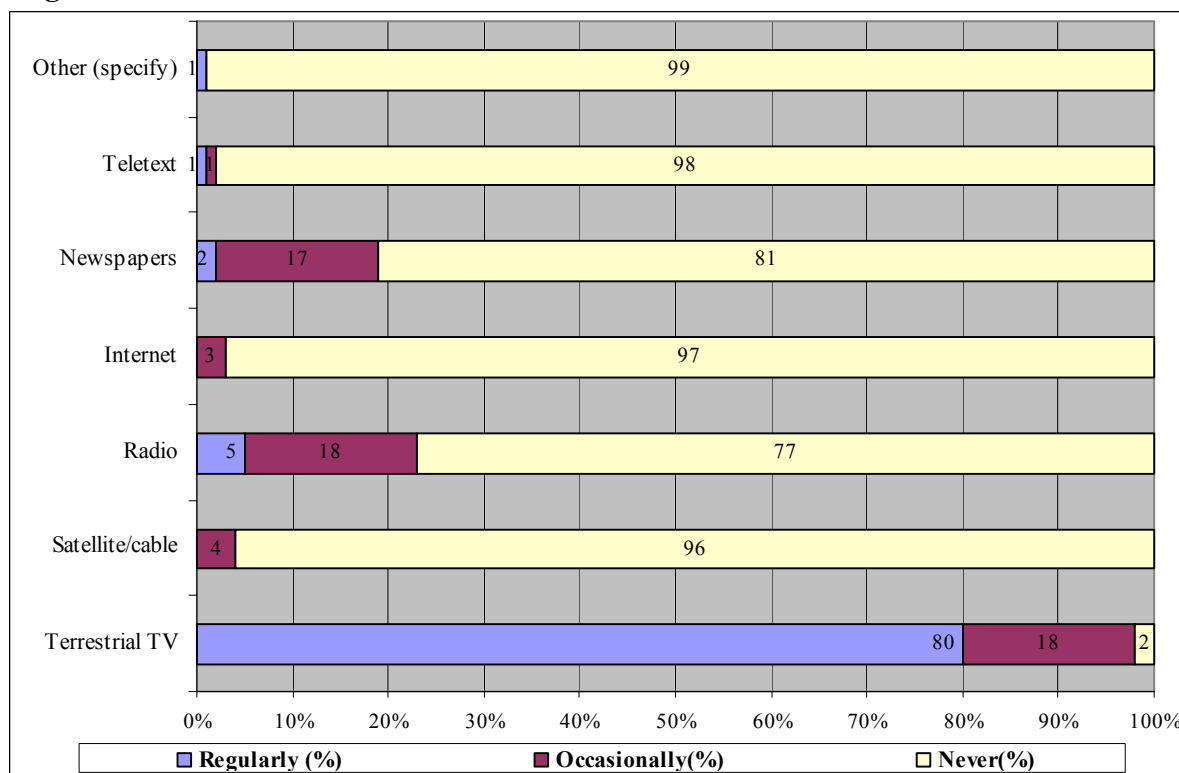
	Number of mentions	% of respondents
Weather organisation / issue weather forecasts	434	74%
Issues severe weather warnings	143	24%
Does research	86	15%
Part of the Government / Ministry of Nature Protection	19	3%
Academic Institution, provides degrees	1	0%
Reports on global warming / environmental change	69	12%
Part of the State TV <i>(inaccurate but may be a perception)</i>	14	2%
Part of Emergency Service Group <i>(inaccurate but may be a perception)</i>	11	2%
Other	0	0%
Nothing / not sure	105	18%
<i>Total (multiple responses are allowed)</i>	882	

- When asked what, if anything, they knew about ArmStateHydromet, almost 74% of the respondents stated that ArmStateHydromet was weather organization or issued weather forecasts. Almost every fourth respondent (24%) knew it issued severe weather warnings.
- Fifteen percent of respondents said ArmStateHydromet did research, and 12% said that ArmStateHydromet issued reports on global warming and environmental change.
- A little less than one in five respondents (18%) stated they knew nothing or were not sure about the ArmStateHydromet.

2.4 Sources of weather information

- Respondents were asked where they obtained information on weather forecast and if they used each source "regularly", "occasionally" or "never. The most popular source of weather forecasts information was terrestrial TV, which is used regularly by about 80% of the respondents. The next most popular source used regularly was radio (about 5%).
- Large majority of the respondents never used teletext, internet, and satellite/cable to learn information on weather forecast.
- It needs to be pointed out that only one percent of respondents regularly used other sources besides those listed in the figure. Those sources included phones, intuition, moon cycle, special tools and other.

Figure 12: Use of different sources for weather forecast information.



Asked which source they use most often, the following responses were given:

- Terrestrial TV: 95.6%
- Radio: 2.2%
- Internet: 0.4%
- Newspapers: 0.3%
- Other: 1.5%

A dominant majority of the respondents (about 96%) said that they used terrestrial TV most often. Next category is radio with only around 2%. Among other sources, which constitute approximately 1.5%, respondents mentioned telephone, conversations with other people, teletext, tools and other.

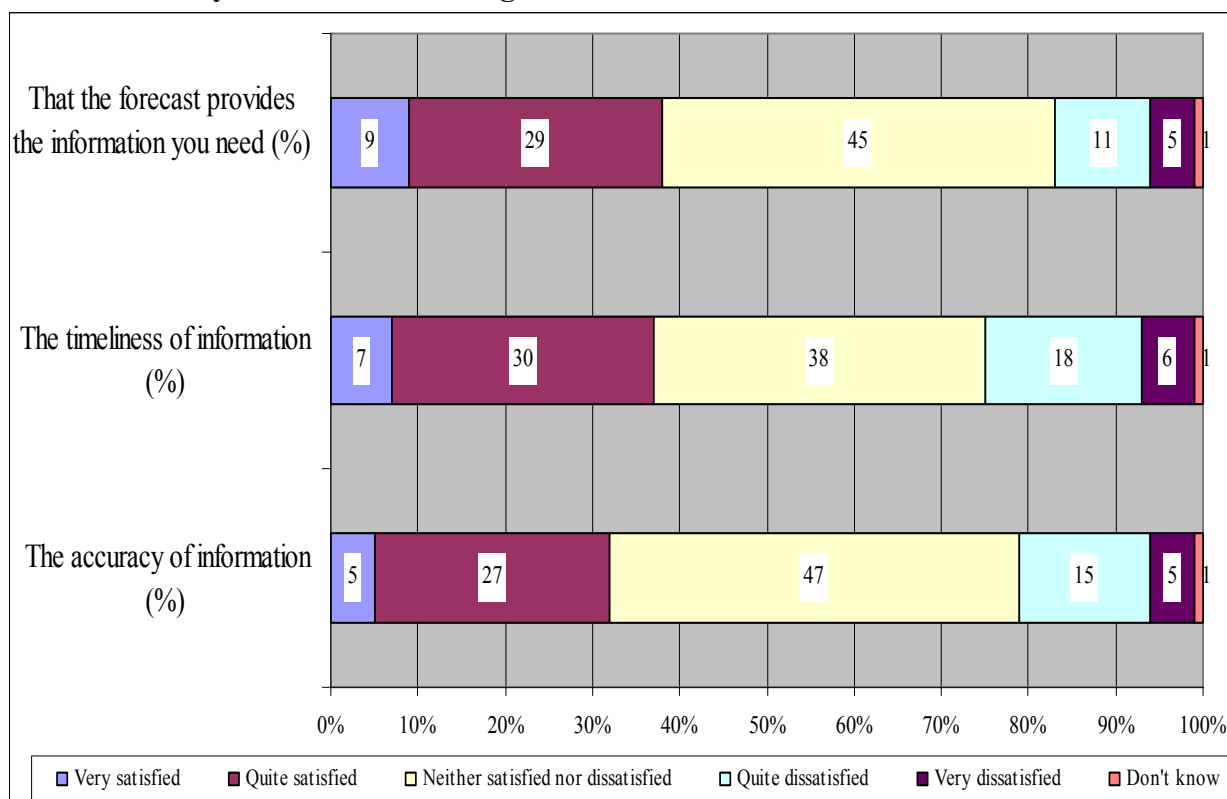
About 3% of the respondents (17) stated that they use Internet at least “occasionally” for weather information. Popular search engine sites were MSN / Yahoo / Google / CNN / Weather.com, where 8 respondents visited for weather information (See Figure 13).

Figure 13: Which website do you use most fore weather information?

Website	Number of Respondents
www.meto-tv.am	4
www.meteo.am	1
MSN / Yahoo / Google / CNN / Weather.com	8
www.rambler.ru / www.mail.ru / www.yandex.ru	4
Total	17

2.5 Satisfaction with aspects of weather information

Figure 14: Thinking about the weather forecast you use most often, how satisfied or dissatisfied are you with the following?

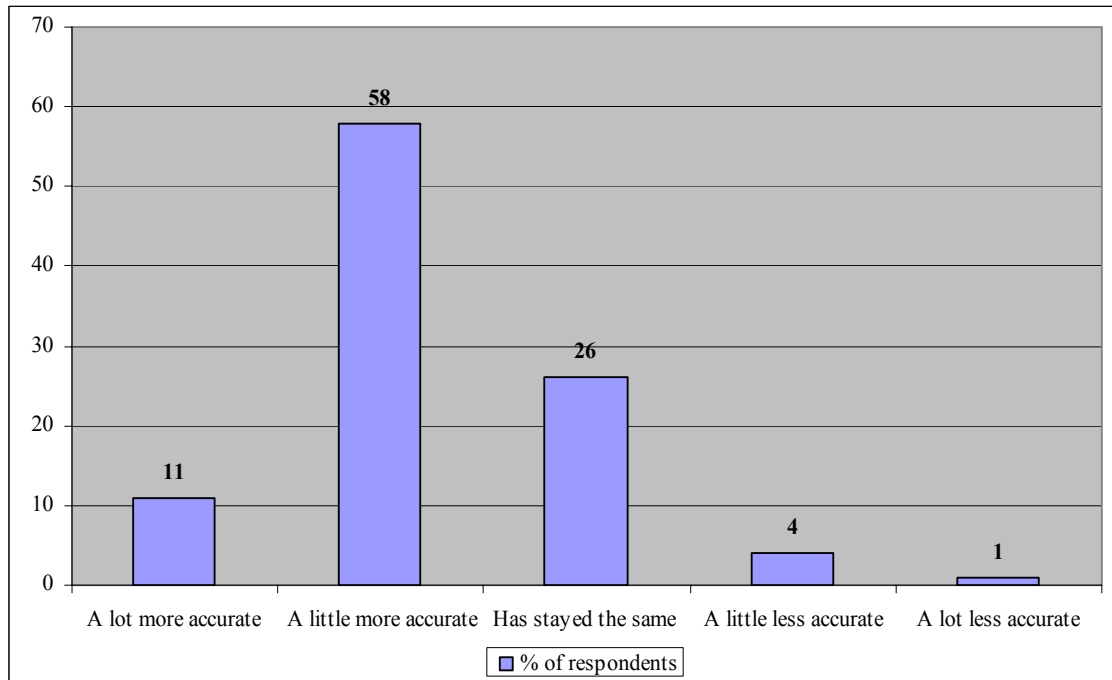


- Respondents were asked to assess how satisfied or dissatisfied they were with different features of the weather forecast they use most often.
- Thirty-eight percent were very satisfied or quite satisfied with the information provided by the forecast.
- Thirty-seven percent were very satisfied or quite satisfied with the timeliness of information provided by the forecast.
- Thirty-two percent were very satisfied or quite satisfied with the accuracy of information provided by the forecast.

Respondents were asked to assess the accuracy of information provided by weather forecast over the last five years or so.

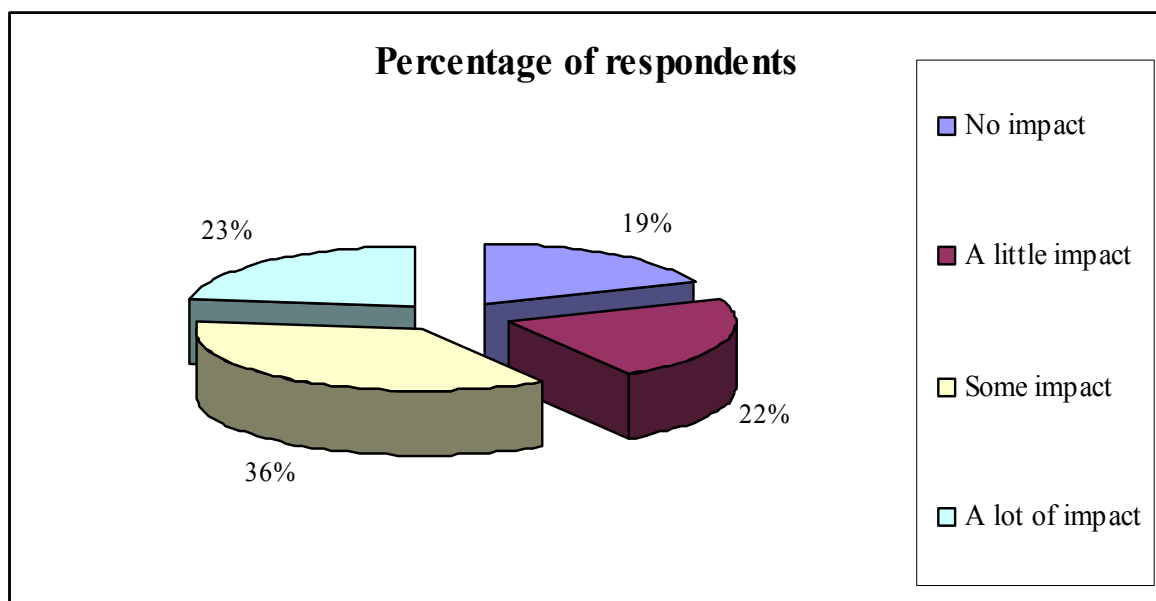
- About 69% of the respondents stated that the weather forecast in overall became a little more or a lot more accurate.
- A bit more than a quarter of the respondents (26%) think that the weather forecast stayed the same over five years.

Figure 15: Over the last five years or so, do you think the weather forecast overall has become...?



Respondents were asked the extent to which weather forecasts influence the activities they choose to participate. Around 36% of respondents said that weather forecasts had some impact and 23% said that they had a lot of impact. Twenty-two percent and 19% percent of respondents stated that weather forecasts had a little impact and no impact, respectively.

Figure 16: To what extent, do weather forecasts influence the activities you choose to take part in?



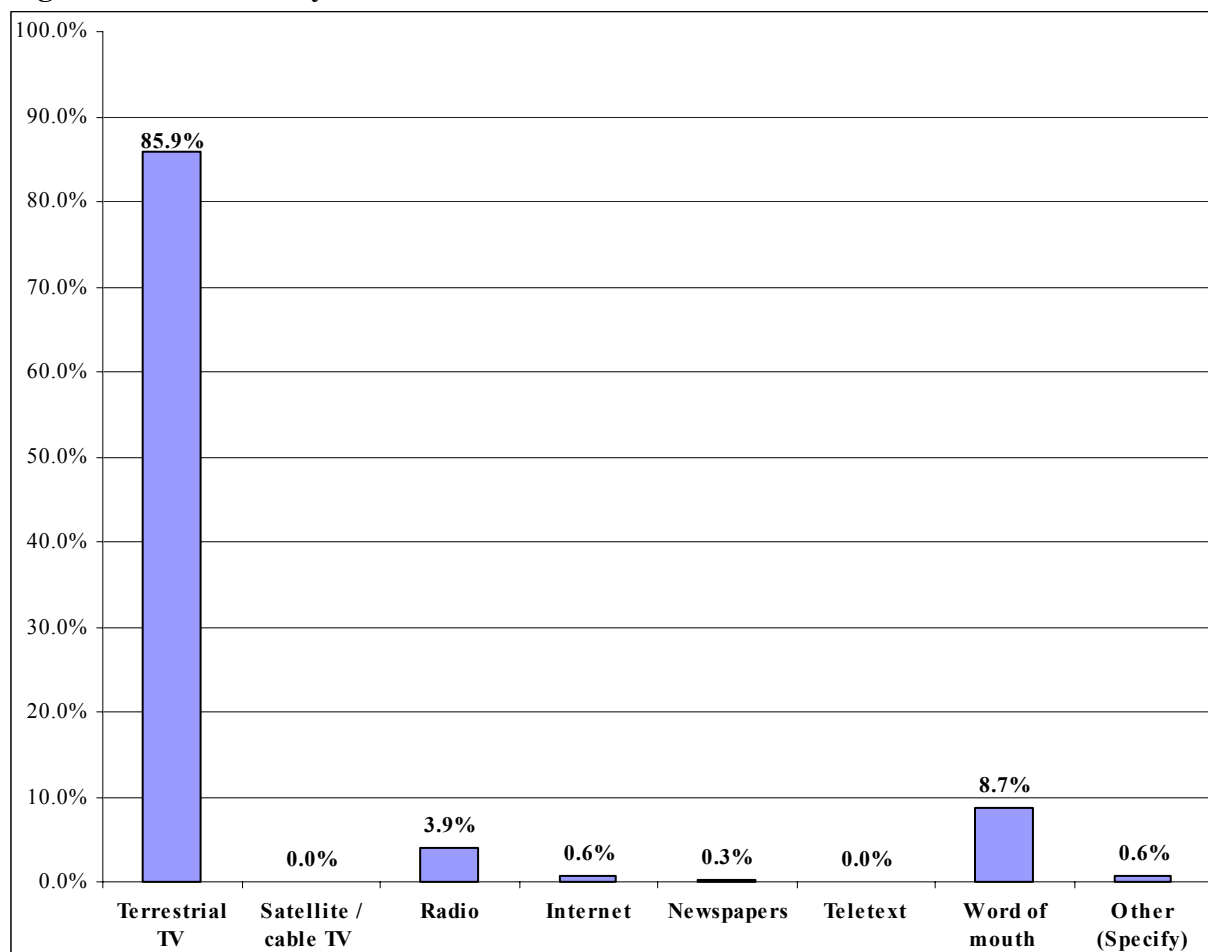
2.6 Severe Weather Warnings (SWWs)

Respondents were asked whether they are aware that a severe weather warning was recently issued for that area.

- More than half of the respondents (50.51% or 297 people) mentioned that they were aware about the severe weather warning announced for their area,
- 47.96% (or 282 people) of the respondents mentioned that they were not informed about the severe weather,
- Portion of respondents who were not sure whether they were informed or not about the recent severe weather warning constitutes 1.53% (or 9 people).

The chart below presents the distribution of the respondents (those who actually received a severe weather warning) according to where they found out about the severe weather warning.

Figure 17: Where did you find out about the SWW?



Base: respondents who were aware or were not sure about their awareness of SWW (306 respondents).

- This question was unprompted and respondents were asked to recall those different sources where they get information about severe weather warnings. Because the major information source both in city of Yerevan and especially in rural areas is Terrestrial TV, 85.9% of respondents mentioned this. Word of mouth was also popular comprising 8.7% of all answers.

The table below shows what respondents did in response to the recent severe weather warnings. In left column the answers for unprompted questions are presented and in the right column the answers for prompted questions are presented.

Figure 18: What did you do in response to the SWW?

	% of respondents UNPROMPTED	% of respondents PROMPTED
Took more notice of the weather forecast	9%	45%
Looked for further information / made an effort to access more weather forecasts	1%	8%
Changed plans	25%	52%
Took precautions to protect property (e.g. lagged pipes, secured fence)	20%	51%
Took precautions to avoid injury (e.g. gritted path)	4%	22%
Allowed more time for my journey	2%	9%
Stayed at home	28%	58%
Dressed in appropriate clothes / shoes	20%	51%
Took no notice / ignored it	10%	--
Other (<i>specify</i>)	1%	--
Don't know / nothing	17%	7%

Base: respondents who were aware or were not sure about their awareness of SWW (306 respondents).

- Approximately one out of four respondents (28%) in unprompted and more than half in prompted sections (58%) said that they preferred to stay at home when the severe weather actually happened.
- Some part of respondents – 25% in unprompted questions and 52% in prompted questions said they changed the plans as a response to severe weather warning.
- About half of all respondents in prompted section decided to take precautions to protect their property.
- One out of five respondents in unprompted and every second respondent in prompted sections dressed in appropriate clothes/shoes as a response to severe weather warning.
- Two respondents who gave other answer replied that they collected hay for stock, collected water, and didn't allow the child to go to school.

The table below shows what respondents did in response to the recent severe weather event. In left column the answers for unprompted questions are presented and in the right column the answers for prompted questions are presented.

Figure 19: What did you do in response to the recent Severe Weather in the area?

	% of respondents UNPROMPTED	% of respondents PROMPTED
Took more notice of the weather forecast	2%	27%
Looked for further information / made an effort to access more weather forecasts	1%	6%
Changed plans	17%	40%
Took precautions to protect property (e.g. lagged pipes, secured fence)	11%	34%
Took precautions to avoid injury (e.g. gritted path)	7%	23%
Allowed more time for my journey	2%	11%
Stayed at home	21%	44%
Dressed in appropriate clothes / shoes	20%	68%
Took no notice / ignored it	18%	--
Other (<i>specify</i>)	0%	--
Don't know / nothing	30%	12%

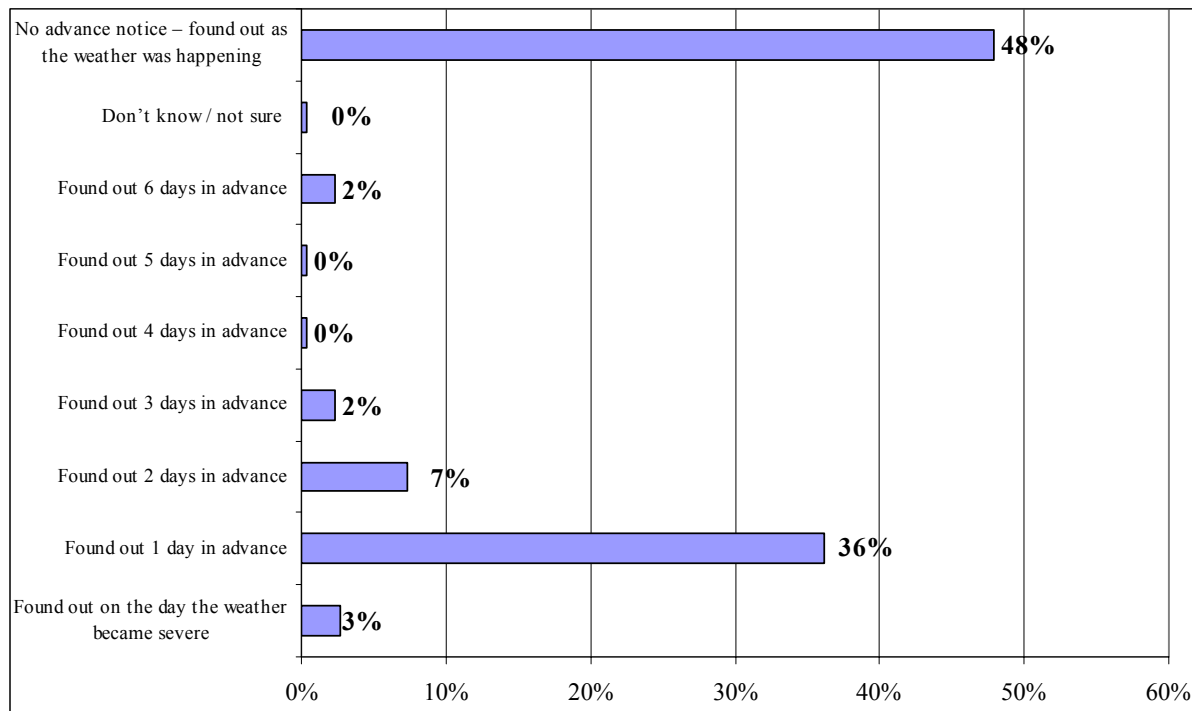
Base: respondents who were not aware of severe weather warning (282 respondents).

- As it is seen from the table almost one fifth (18%) of the respondents in unprompted questions did nothing as a response to the recent severe weather warning.
- About 17% of people in case of unprompted and 40% in prompted questions changed their plans.

The bar chart below presents how far in advance respondents found out that severe weather was expected.

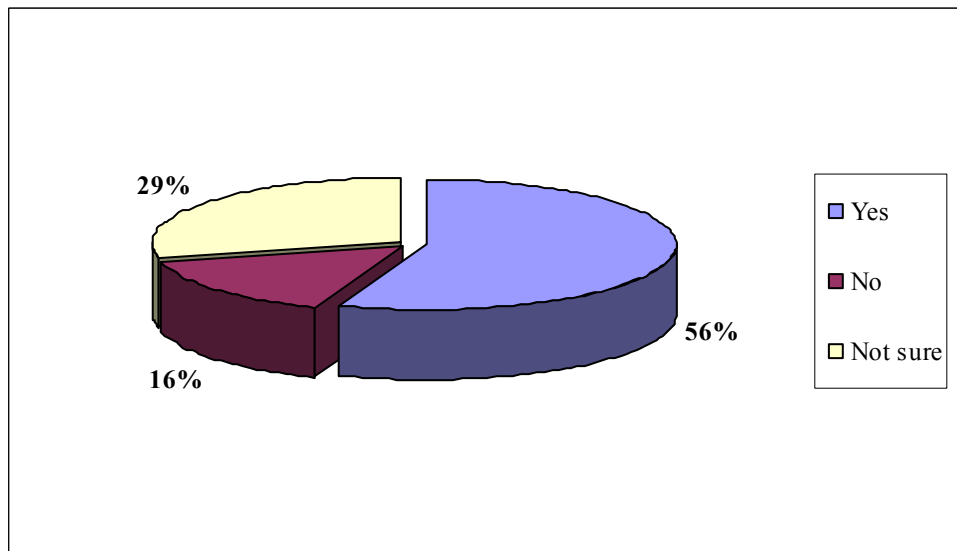
- As it can be noted from the chart, most of the respondents knew about the expected severe weather only one day in advance (36%) and almost half of the respondents (48%) did not receive any notice in advance.
- Only 3% of people said they found out only on the day the weather actually became severe.

Figure 20: How far in advance did you find out that severe weather was expected?



The pie chart below presents the distribution of respondents (according to completeness from received information) who actually found out in advance about the severe weather warning.

Figure 21: Did you have enough advance warning?

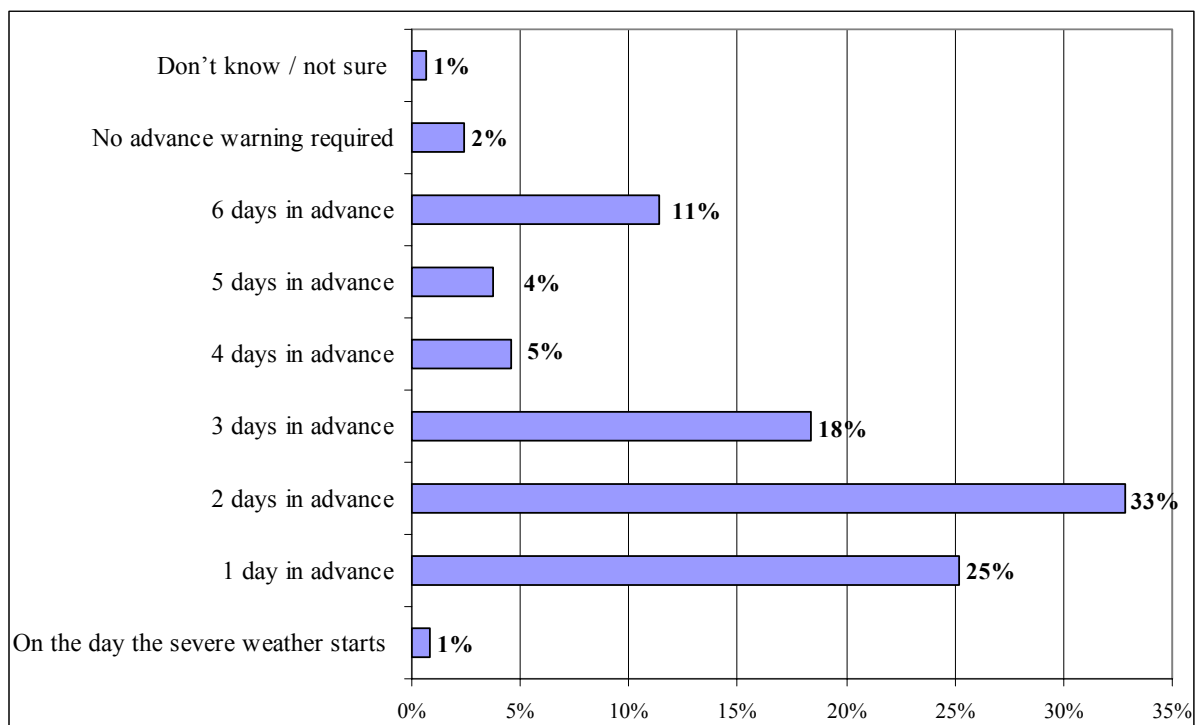


Base: respondents who undertook any action from severe weather forecast (306 respondents).

- Chart shows that more than half (56%) of people who actually received severe weather warning were satisfied and information was enough.
- About one third (29%) of people were not sure whether information was enough or not.
- About one out of six (16%) respondents assessed the received information as not enough.

The bar chart presents distribution of respondents according to how much advance warning they need for the severe weather event.

Figure 22: How much advance warning do you need of this type of severe weather event?



- Most of the respondents would prefer to receive the severe weather warning from 1 to 3 days in advance (total 76% of answers) and only 2% says they actually do not need any advance warnings.

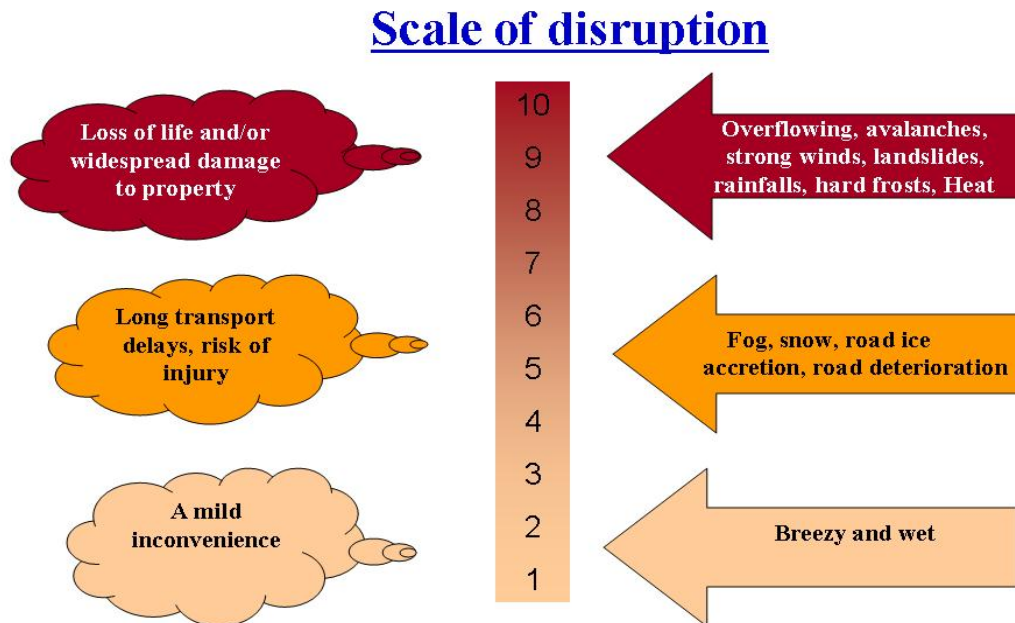
Figure 23: What additional information would you like when a severe weather warning is issued?

	Number of respondents	% of respondents
More accurate information	47	8%
Just more information	42	7%
How long the severe weather will last	15	3%
Advice on what to do	33	6%
Information on protection methods and other precautionary actions	46	8%
More detailed information	39	7%
Early warnings if possible	16	3%
Precise information about hails, snow storms, winds and other severe weather events	45	8%
Explanations of possible hazards	35	6%
Information on roads condition, traffic, etc.	11	2%
More local forecasts	4	1%
Not sure/nothing	71	12%
No answer	184	31%

2.7 New Method for presenting SWWs by ArmStateHydromet

All respondents were shown an idea for presenting severe weather warning information in the future, and were asked to rate how useful they found it.

This option shows the impact of severe weather using a scale of disruption.



The table below presents the usefulness of the method shown above assessed by the respondents.

Figure 24: How useful would you find this information?

	Number of respondents	% of respondents
Very useful	257	44%
Quite useful	208	35%
Neutral	62	11%
Not very useful	22	4%
Not at all useful	30	5%
Don't know	9	2%
Total	588	

- Results show that most of the respondents (79%) assess the new chart method of presenting the severe weather warnings as useful, out of which 44% think that it will be very useful.
- Only 5% of respondents consider the new method as absolutely useless.

2.8 Yerevan (non-rural) versus Rural Comparison

Below presented is the comparison of some parameters across rural and non rural areas. Non rural area is represented entirely by the capital of the Republic of Armenia, Yerevan, whereas the rural area is represented by three regions: Gegharqunik, Aragatsotn, and Shirak. The total number of respondents in Yerevan is 200, and the total number of respondents in non-rural area is 388.

For the sake of making the comparison more illustrative only extreme or somewhat extreme responses were used (Figures 28, 29).

Figure 25: What, if anything, do you know about the ArmStateHydromet?

	Yerevan, % in total	Rural, % in total
Weather organisation / issue weather forecasts	73	74
Issues severe weather warnings	31	21
Does research	9	18
Part of the Government / Ministry of Nature Protection	7	1
Academic Institution, provides degrees	0	0
Reports on global warming / environmental change	2	17
Part of the State TV <i>(inaccurate but may be a perception)</i>	0	4
Part of Emergency Service Group <i>(inaccurate but may be a perception)</i>	4	1
Other	0	0
Nothing / not sure	26	14

- Figure 25 shows that almost equal percents of respondents both in Yerevan and rural areas know that ArmStateHydromet is a weather organization or that it issues weather forecasts.
- Thirty-one percent of respondents in Yerevan know that ArmStateHydromet issues severe weather warning as opposed to 21% in rural areas.

Figure 26: Use of different sources for weather forecast information.

	Yerevan, % in total	Rural, % in total
Terrestrial TV	97	99
Satellite/cable TV	1	6
Radio	25	22
Newspapers	13	21
Teletext	3	0

- The major source of getting information on weather forecasts used regularly or occasionally in both Yerevan and rural area is the terrestrial TV with 97% of respondents in Yerevan and 99% of respondents in rural area.

- The second most popular source is the radio with 25% of respondents in Yerevan and 22% in rural areas.

Figure 27: Thinking about the weather forecast you use most often, how satisfied or dissatisfied are you with the following? (Percents include only those respondents who were either very satisfied or quite satisfied)

	Yerevan, % in total	Rural, % in total
The accuracy of information	32	32
The timeliness of information	48	32
That the forecast provides the information you need	42	35

- Figure 27 shows that 32% of respondents are either very satisfied or quite satisfied with the accuracy of information on weather forecast provided by ArmStateHydromet.
- Forty-eight percent of respondents in Yerevan are either very satisfied or quite satisfied with the timeliness of information on weather forecast provided by ArmStateHydromet as opposed to 32% of respondents in rural area.
- Forty-two percent of respondents are either very satisfied or quite satisfied with the information provided with this number being equal to 35% in rural area.

Figure 28: Over the last five years or so, do you think the weather forecast overall has become...?

	Yerevan, % in total	Rural, % in total
A lot more or a little more accurate	68	69
A lot less or a little less accurate	9	4

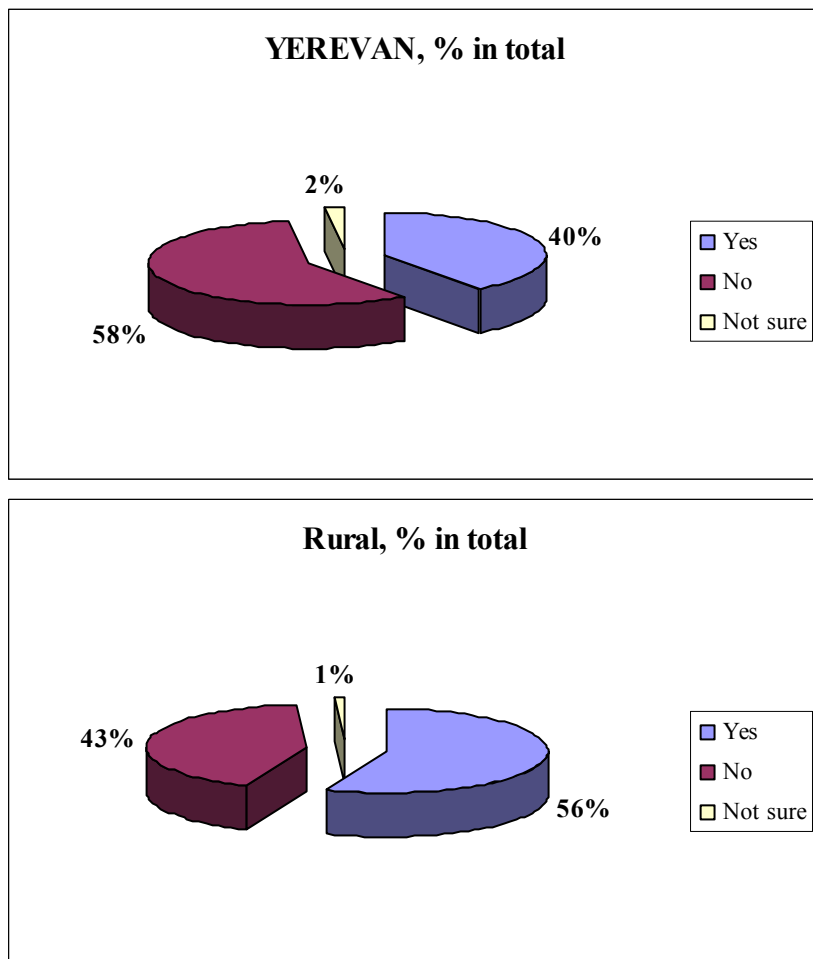
- According to Figure 28, ArmStateHydromet gains more and more trust with people. Almost equal percent of respondents both in Yerevan and rural area think that the weather forecasts provided by ArmStateHydromet has become a lot more or a little more accurate.

Figure 29: To what extent do weather forecasts influence the activities you choose to take part in?

	Yerevan, % in total	Rural, % in total
Weather forecasts have no impact on the activities I take part in	36	11
Weather forecasts have some impact on the activities I take part in	22	43

- Figure 29 shows that on 36% of Yerevan respondents weather forecasts have no impact and on 22% of Yerevan respondents they have some impact.
- In contrast, on 11% of rural respondents weather forecasts have no impact and on 43% of rural respondents they have some impact.

Figure 30: Are you aware that a severe weather warning was recently issued for this area?



- As diagrams above show, more respondents were unaware of the issuing of severe weather warning in Yerevan, in contrast to the situation in rural areas, where 56% of the respondents were aware of it.

Figure 31: Did you have enough advance warning?

	Yerevan, % in total	Rural, % in total
Yes	64	53
No	18	15
Not sure	18	32

- About 64% of Yerevan respondents and 53% of rural respondents had enough advance warning, when 18% of Yerevan respondents and 15% rural respondents did not have enough advance warning.

Figure 32: How much advance warning do you need of this type of Severe Weather Event?

	Yerevan, % in total	Rural, % in total
On the same day the weather starts	2	0
2 days in advance	35	32
4 days in advance	2	6
No advance warning required	5	1

- According to Figure 32, both Yerevan and rural respondents mainly need 2-day advance notice of severe weather warning.

3. Recommendations

- One of the most important recommendations for ArmStateHydromet will be more precise local forecasts especially for rural areas because the villagers were highly concerned that forecasts were being done in the scale of whole region (for example Aragatsotn region), while weather may highly differ in that region. This is important especially for organization of agricultural works and will enable people to undertake all necessary precaution measures against the severe weather to protect their property from damage and family members from injury.
- Better awareness about the functions of ArmStateHydromet and better communication should be established between this organization and population, which will increase the trust level towards this institution and as a result increase the effectiveness of the forecasts.
- Severe weather forecasts should not be only limited with information about temperature, wind speed and its direction, etc. More concrete suggestions and recommendations should be provided to the population for each severe weather warning concerning the actions that should be undertaken for people living in capital city and separately for people living in rural areas of the country (warmer clothes and shoes, whether it is worth to drive a car that day, which roads are closed because of snow storm, how to strengthen the roof and protect other property, etc).
- Large portion of population in rural areas are not so literate, and information provided by ArmStateHydromet should be as simple as possible, clear and without any professional terms to make it more understandable for all layers of population.
- One of the major information sources (also for severe weather forecasts) in rural areas is terrestrial TV. ArmStateHydromet should coordinate its actions, establish an effective monitoring system and provide timely, correct and the same information for all Meteo - TV channels not to confuse people who can sometimes see different and even contradictory weather forecasts by different channels.
- Since the research results show that terrestrial TV is the most followed source, then it is strongly recommended to disseminate any information about severe weather warning on TV. Also, it is suggested to have a regularly scheduled TV program that televises not only weather forecasts but also suggests possible ways of protection from the potential danger.

- Simple flyers informing about the upcoming severe weather warning and possible protection measures should be made freely available in public places, such as cafes, restaurants, theatres, cinemas, and entertainment parks. This gains an utmost importance for rural population because of relative shortage of such places in rural areas. However, places like local municipality could serve as a good public place.
- It is highly recommended that ArmStateHydromet sets up a separate department that would train highly qualified persons who could conduct training sessions or seminars on how to protect in case of severe weather in rural areas.
- With a developed telecommunication system, a free service should be put in place which would send out alert messages informing all the subscribed persons and institutions about upcoming severe weather warning.
- Also, speaking of developed telecommunications system, a free internet service should be established that would send out severe weather warnings to all the subscribed persons or organizations.
- Finally, a 24-hour hotline should be maintained in case somebody gets caught in severe weather and doesn't know how to contact emergency service groups.

4. Appendix

4.1 Brief reports of ICARE interviewers, YEREVAN SURVEY:

Yerevan survey brief report of interviewer 1 - Persons questioned included employees from various areas such as state government, specifically employees from community municipalities, state and private medical care, employees from hospitals and polyclinics, as well as pensioners. The vast majority of the surveyed rated the weather forecast information provided by Armstatehydromet as not completely accurate, particularly the information regarding severe weather forecast.

All the survey participants approved the idea that in the future Armstatehydromet should provide the society with as accurate information as possible containing details regarding potential danger and impact of severe weather. Mainly there was no enthusiasm among the survey participants, they saw the logotype of ArmStateHydromet for the first time, and they were not inclined to trust that organization taking into consideration not entirely accurate weather forecast information provided by ArmStateHydromet.

Yerevan survey brief report of interviewer 2 - About 20-25% of people did not want to take part in survey because of cold weather. The vast majority of the surveyed (around 95%) saw the Armstatehydromet logotype for the first time. There were some who had seen it before but they could not remember where. The only information about Armstatehydromet they had was that it was engaged in providing weather forecast. People, who agreed to participate in survey, answered the questions with enthusiasm even though they were in a hurry and it was very cold. They wanted to get more information about weather. They wanted to know for how many days bad weather would last, what consequences it would have, what kind of protective measures could be taken and many other questions of the same type. About 85-90% of survey participants found the ahead-of-time display of the presented table to be very useful, but there were people who believed that ahead-of-time learning of consequences could create panic. Weather forecasts have a huge impact on activities of some people; hence they asked to be provided as correct information as possible. All this shows that people are interested in the activities of Armstatehydromet. The society obtains information about weather mainly by watching TV. Many do not believe the correctness of information, but nonetheless, they think that in the last five years it has become somewhat accurate. During the survey process the weather was very cold, which was interfering with making notes. It was very difficult to work in cold weather, even the pen was getting frozen and complicating my job. Despite this difficulty, the survey was done successfully.

Yerevan survey brief report of interviewer 3 - No incidence took place during the survey and I was able to finish my job within previously agreed timeframe. In spite of cold weather and celebratory hurriedness, survey participants spent about 10 minutes of their time in polite manner to answer the survey questions and they had big aspiration toward increasing their awareness. Many were surprised to know that besides weather forecasts Armstatehydromet is engaged in other research projects and that it was included in the Ministry of Nature Protection. Having talked with different people during the survey I can say that survey participants' awareness of severe weather reported by Armstatehydromet, in general, had an average level. In spite of that, the majority of the surveyed held an opinion that the correctness of the job done by Armstatehydromet had gotten better. Only few people were familiar with the Armstatehydromet logotype. It reminded them of various organizations but not ArmStateHydromet. Almost all the survey participants were enthusiastic about the presented table (show card 2), which, in their opinion, was going to make the weather forecast programs more effective. Some survey participants wanted to keep a copy of the table for a further detailed study of it.

Yerevan survey brief report of interviewer 4 - Mainly due to cold weather not many people were ready and willing to take part in the survey. However, there were people, who, ignoring bad weather conditions, showed interest and readiness to answer questions and voice their opinion. Mainly, survey participants stressed the importance and urgency of the topic and thought that the improvement of Armstatehydromet's activity will help increase people's awareness, which will result in the reduction of bad incidences. The surveyed said that the improvement in that area over years is evident; however, there are some omissions which deserve a lot of attention, such as not sufficient information regarding the consequences of high level of weather radioactive emission, as well as not completeness of explanations, advice and warnings of global warming. The trust level of the survey participants' toward the information provided by Armstatehydromet was very different, ranging from absolute distrust to relatively high trust levels, which was expressed by the occasional watching of weather forecast, or its impact when making plans for the day.

Yerevan survey brief report of interviewer 5 - A few problems arose during the survey with the weather being the most important. Because of cold weather many refused to answer and it was very difficult to persuade them, apart from that my hands were freezing and it was hard for me to even hold a pen which slowed down the survey process. The second problem was the New Year activities, the majority of people were busy shopping and the little time made them refuse to take part in the survey. The thickness of the questionnaire was yet another problem, at first 20-25% of people wanted to answer, but seeing the thickness of the questionnaire they said they had no time. In spite of that, some people were interested in the survey. Almost everyone surveyed had never seen the Armstatehydromet logotype, but two persons said that they had seen it but they were not sure where. In general, people were aware of Armstatehydromet and many approved of the scale presentation of the weather (show card 2). During the survey, some people complained that weather forecast was different on various TV stations and they did not know which one to believe. Many wished to know what kind of protective measures Armstatehydromet would suggest in similar weather conditions. Almost everyone agreed that weather forecast got more accurate.

4.2 Brief reports of ICARE interviewers, RURAL SURVEY:

Brief report of interviewer 1 - To learn about rural population's opinion on Armstatehydromet activities we were in villages of Lanjik, Horom, and in town of Maralik. Survey participants were showing readiness and were answering the questions willingly. Due to relatively low living standards and high unemployment rate, the interest among the surveyed population in Armstatehydromet's activities was not very strong. The ones who were engaged in agricultural activities or simply associated with agricultural sector showed more interest in valuing the significance of weather forecasting and Armstatehydromet's other functions. They also underlined the issues requiring additional attention, including low awareness of population about the possible consequences of bad weather and advice on how to behave in different weather conditions.

Another factor that was increasing the interest to follow the weather forecast mainly on TV was the road conditions. Since it was snowing heavily in the above indicated regions due to their geographical locations, rural population was concerned about the road conditions.

In many houses people had their own Celsius scale, on which they relied heavily in terms of learning the temperature.

Brief report of interviewer 2 - Overall, the survey process went well but there are few things I would like to mention. The first thing that caught my attention was the low level of knowledge which was very typical of the majority of the surveyed. Even though most of them had heard about the nation's only official state weather agency (Armstatehydromet), however, not many of them were able to say a couple of things more about it with the

exception of its weather forecast activity. Yet, it should be noted that Armstatehydromet does a lot more apart from weather forecast.

Another thing that was quite surprising to me was the lukewarm and rather incredible attitude that the respondents maintained with respect to Armstatehydromet. They were very skeptical and did not believe in the truthfulness of weather forecasts produced by Armstatehydromet.

I would also like to mention the poor and low quality of life of the rural population. It was very hard for them to believe that the survey was being done for their benefit and that the surveyors were not associated with any political power in the country trying to get the villagers to vote for a specific political party in the upcoming parliament elections ☺).

In summary, I would like to say that the survey in that region was completed successful in spite of a couple of minor technical problems such as cold weather and the poor conditions of the roads slightly slowing us down.

Brief report of interviewer 3 - In general the impression gained from conducting interviews can be assessed as positive, since all respondents have been identified and surveyed. Local municipalities assisted significantly in our activities.

Local population (town of Maralik, villages of Horom and Lanjik) showed willingness to answer the questions, as we had explained in detail to them the objective and the importance of the program for safety of the rural population as well as for organization of agricultural activities. However, in spite of abovementioned positive aspects, the respondents were taking advantage of the opportunity and were voicing their complaints about the wrong weather forecasts produced by Armstatehydromet. All the survey participants pointed out the necessity to make the weather forecast more correct and demanded that the epicentre of severe weather as well as its consequences on human health and life, animals, sown areas, and gardens be explained in detail during weather forecast on TV.

As the survey results reveal, TV is the major source for learning about weather forecast, however, it is often the case when different TV stations report different and contradictory weather forecasts which was unnerving and misleading for the survey participants. They claimed that it would be nice of Armstatehydromet to announce all those TV stations with which the agency cooperates and exchanges information. Only in this case the rural population would be able to take measures directed toward protection of their property and health. It should be noted that in order to raise rural population's confidence in Armstatehydromet pertinent steps must be undertaken.

The surveyed said that in foreign countries during the weather forecast they also announce the high-risk roads, concrete measures that need to be taken in order protect property, and the number for hotline for those in need. Survey participants emphasized the importance of having similar system in Armenia.

Even though in rural areas the level of knowledge was low, however, the questionnaires were designed clearly, and the arising issues were clarified on spot. As such, the low level of knowledge cannot serve as a factor for potential poor completion of the questionnaires.

Brief report of interviewer 4 – The surveys were conducted in Aparan town, as well as Aragats village located in Aragatsotn region, on February 9th, 2007. Overall, the survey process went well; however, the weather was not so friendly. One could easily see the consequence of severe weather which was a heavy snow cover all over the place. Sometimes, it was hard for the survey team to move from place to place because of frozen and icy roads. As for the survey process itself, I must say that almost all the survey participants seemed like they were used to having a severe and bad weather. They even were joking saying that having a nice weather in winter was somewhat troublesome for them since they were used to having a cold and snowy winters. Also, the survey participants mostly were very skeptical of Armstatehydromet forecast claiming that one should expect just the opposite of what is said on TV or radio. To sum up, I would like to say that the survey in that region was carried out successfully in spite of a couple of minor technical problems such as cold weather and the poor conditions of the roads.

Brief report of interviewer 5 - From Aragatsotn marz village Aragats and town of Aparan were the focus of our survey. Due to the sensitiveness of the region to climate changes, surveyed population was interested in weather forecast and related activities. Inhabitants of Aragatsotni marz, especially those, who were somehow involved in agricultural sector, considered weather as a significant factor affecting their daily life and working plans. Precise weather forecast was very important for them and most of the surveyed population was following Armstatehydromet forecast on a regular basis. Major source for learning about the weather was television; however, day-to-day interactions with employees working at Armstatehydromet station were not of less importance. Another factor, contributing to an increased public interest in weather forecast, was poor road conditions. Roads got inaccessible or closed whenever it snowed heavily.

Most of the surveyed population found Armstatehydromet as an official state weather forecast agency to be precise in most of their projections. Almost everyone responded positively to the question which asked how they valued the scale table. They all agreed that weather forecast and other activities related to it were of much importance and were increasing the public knowledge and awareness.

Brief report of interviewer 6 - I conducted surveys in the village of Aragats and the town of Aparan, located in Aragatsotn region. Identified respondents had different professions working in various areas, such as state regulation, specifically municipality employees, state and private service, specifically polyclinic and public school employees, farmers, and pensioners.

In general, the vast majority of survey participants rated the information on weather forecast produced by Armstatehydromet as not completely correct, especially the forecasts on severe weather. All respondents surveyed emphasized the importance of preciseness of weather forecast produced by Armstatehydromet to the society and noted that besides the warning of severe weather, possible consequences as well as protective measures should be provided by Armstatehydromet.

In summary, it should be pointed out that in spite of such technical problems as cold weather, bad conditions of rural roads, and relatively indifferent attitude of rural population toward Armstatehydromet, the survey process was successfully completed.

Brief report of interviewer 7 – I conducted surveys in **Martuni** on February 1st, 2007. During the survey the meaning and the purpose of the study was explained to the respondents. Even though the weather was not friendly to us and it was very cold, the survey participants were willingly answering our questions. No one of the survey participants had an idea about the logo of Armstatehydromet or what it meant. Most of them were seeing it for the first time. The meaning of the logo was explained to them. Despite cold weather the survey was done successfully.

Brief report of interviewer 8 - On January 30-31, 2007 I conducted surveys in the village of **Lichq**. I was very well accepted in the identified respondents' families and the completion of the questionnaires went in a friendly setting. Almost no one knew about the logotype of the Armstatehydromet. The survey participants suggested showing this logotype on TV during the weather forecast program, so that they would remember it. The only problem that I had to cope with during the survey process was the cold weather. Other than that, everything else was fine; I did my best to complete the survey before the deadline.

4.3 Report on Size, Geography and Economic Sectors of Each Settlement

Aragatsotn marz

RA Aragatsotn marz occupies the 9.3% of the territory of the Republic of Armenia. The population of the marz comprised the 4.3% of RA total population in 2005. While the 76.3% of population (as of January 1st, 2006) resides in the rural settlements (it is the highest percentage of rural population among RA marzes). Aragatsotn marz includes the territories of Ashtarak, Aparan, Aragats and Talin. Ashtarak, Aparan and Talin are towns of the marz and there are also 117 rural settlements. Three motor highways of republican importance- Yerevan- Ashtarak- Talin-Gyumri, Yerevan-Ashtarak- Spitak and Yerevan-Armavir-Karakert-Gyumri run through the territory of the marz.

The share of industry of Aragatsotn marz in 2006 in total volume of industrial production of the republic comprised 1.2%, in the volume of gross agricultural produce-7.2%, in retail turnover-0.9%. Industry and agriculture are developed in the marz. Industry is specialized in manufacture of food products and beverage, precious articles and exploiting of mines of building materials. The geographical position and climatic conditions of the marz are favorable for development of both plant growing (grain, potatoes, perennial grass, and forage crops) and cattle breeding. The center of the marz is Ashtarak with 20.7 thousand people at the end of 2005.

Agricultural lands in the marz in 2006 constituted 136,667 ha and the region provided 35.5 million AMD agricultural output in current prices in 2005. Retail turnover in marz in 2005 was 8141.2 million AMD with 362 retail outlets. Average nominal monthly salary is 39.295 AMD and 1,500 unemployed people in 2005. Consumer price index in 2005 was 97.6.

Town of Aparan, Aragatsotn marz

Deputy Mayor – Zhora Yeremyan, 093-52-43-58, (0252) 25601.

The population of Aparan is 6,600 people. The town is located at 2,060 meters above the sea level. Snow cover varies from 68cm to 82cm, the number of hail-days ranges from 10 to 15, and the vegetation period lasts from May through September. There are no main sell points selling chemicals and fertilizers. Of grain crops, wheat and barley are cultivated. Vegetable crops, homestead crops, fruits, newly established gardens, legumes, industrial crops are grown mostly in crofts. Of forage crops, alfalfa and melilot are grown. All land suitable for cultivation is farmed.

ACBA and ADSB banks provide loans for operation with an annual interest rate of 20-24%, taking equipment as collateral. Aregak, a micro financing organization, provides funding for 2% monthly interest rate with no collateral required.

Tsaghkahovit village, Aragatsotn marz

Village Mayor: Norik Hakobyan - 093 392611

Deputy Village Mayor: Hakob Nazaryan - 02570 2406

The population of the village is 1,562. The village is located at 2000 meters above the sea level. Snow cover ranges from 2 to 3 meters, the number of hail-days is 5 to 6 days, number of spring frosts is 10 to 15, number of fall frosts is 10-15 and the vegetation period lasts from May through September. Agricultural land of the community includes 819 ha of arable land that can be rented for 7,000 drams per hectare, orchards, grape fields, and 504 ha of pastures. There are no hayfields and reserved lands. There are no main sell points selling chemicals and fertilizers.

Of grains, wheat and barley (450 ha, non-irrigated) are grown. Vegetable plants include potato on 60 ha; fruits, newly established orchards, legumes and 50 ha of forage crops. Industrial crops are not grown.

There is no land that can be cultivated and is not. "VTB" bank finances operations by providing loans with 20-24% annual interest rate, taking equipment, homes and gold as collateral. There are credit clubs that provide funding for 15% annual interest rate. Aregak micro financing organization provides funding with 2% monthly interest rate.

Aragats village, Aragatsotn marz

Deputy Village Mayor: Spartak Beybutyan (093) 361636 Artashes

The population of the village is 3,200. The village is located at 2200 meters above the sea level. Snow cover ranges from 1 to 2 meters, the number of hail-days is 7 to 10 days, number of spring frosts is 3 to 5, number of fall frosts is 2-3 and the vegetation period lasts from end of May through beginning of September. Agricultural land of the community includes 764 ha of arable land that can be rented for 20,000 drams per hectare, 123 ha of hayfields, 247 household land, and 1,173 ha of pastures. About 30% of arable land is not irrigable. Around 902 ha are irrigable out of all agricultural land of the village. There are permanent sell points selling chemicals, fertilizers and fuel.

The main cultures cultivated are potato, cabbage, apple, cherries, etc. Of grains, wheat and barley are grown. The realization of agricultural produce is being conducted in Yerevan.

The village has 1870 cattle, of which 800 are dairy cows. The average milking yield is about 20l per day in summer and 4-5l per day in winter season. There is one milk collecting center gathering milk from farmers and supplying to Ashtarak Kat CJSC. The price varies from 100 AMD per liter in summer up to 140 AMD in winter season.

ACBA-Credit Agricole bank finances operations by providing loans at 16% annual interest rate with collateral requirement and at 20% without collateral requirement but with the existence of group guarantee. Aregak micro financing organization provides funding at 2% monthly interest rate to groups of rural woman.

Gegharkuniq marz

RA Gegharkunik marz is situated in the East of the territory of the Republic of Armenia, surrounding the Lake Sevan. It borders Azerbaijan from the East and occupies the 18% of RA territory (the largest marz by its territory). The marz includes the territories of Gavar, Tchambarak (former Krasnoselsk), Martuni, Sevan and Vardenis. The population of the marz comprised the 7.4% of total population of the republic as of 2005. The 66.7% of population resides in the rural settlements. The marz includes 5 towns such as Gavar, Tchambarak, Martuni, Sevan, Vardenis and 93 rural settlements. The share of industry of the marz in 2005 in total volume of industrial production of the republic comprised 2.3%, in the volume of gross agricultural produce -14.1%, in retail turnover- 1.0%. The leading branch of economy of the marz is agriculture, particularly productions of grain, potato, vegetable and animal husbandry product. The marz of Gegharkunik is the main supplier of fresh fish to the population of the republic. Mining industry is the main trend of industry of the marz. Manufacturing is also of great importance, in which the following branches of industry have bigger share: machinery, building materials and food industry. The center of the marz is Gavar with 21.6 thousand people at the end of 2005. Agricultural lands in the marz in 2006 constituted 240,033 ha and the region provided 69.5 million AMD agricultural output in current prices in 2005.

Town of Martuni, Gegharkunik marz

Mayor – Bagrat Harutyunyan, (0262) 4-00-05, 4-00-55

The population of Martuni is 11,900. The town is located at 1908-2300 meters above sea level. The winter lasts for 183 days, and the summer lasts for 95 days. Precipitation equals

350-540 mm. Snow cover is about 20-90 cm, number of hail-days is 7, number of spring frosts is from 15 to 20, number of fall frosts is 19-23, and the duration of the vegetation period is 150-210 days. The agricultural land of the community includes 2,247 ha of non-irrigated land, 250 ha of irrigated land, 112 ha of which are virtually irrigated, and 138 ha are not irrigated. This land can be rented for 10,000-25,000 drams per hectare depending on type of land category. Sales of chemicals are lacking; there are no counters selling fertilizers.

Grain fields include 50 ha of irrigated and 260 ha of non-irrigated land. There are 30 ha (irrigated) of water-melons, 130 ha (irrigated) of homestead crops; 36 ha (irrigated) of fruits, 0.9 ha of legumes and 15 ha (irrigated) of forage crops. There are no newly established gardens. Industrial crops are not cultivated. Land area that can be cultivated but are not cultivated comprise about 894 ha, which is not used due to the lack of seeds and financial resources.

There are no banks and credit clubs providing loans for operations. Aregak and Kamurj micro financing organizations provide funding with 4% monthly interest rate, taking business plan and human promise as collateral.

Ltchashen village, Gegharkunik marz

Garnik Khachatryan, land constructor 093 247620

The population of the village is 4,212. The altitude above sea level is 1937m, snow cover, number of hail-days, number of spring and fall frosts, and duration of vegetation period.

Agricultural land of the community includes 1,616 ha of arable land (irrigable), 120 ha non-irrigated arable land, of which 80 ha are actually irrigated, and 40 hectares are virtually not irrigated. Half of the harvest is given for rent. There are no orchards and grapevines fields. There are 610 ha of hayfields that can be rented for 5,000 AMD/ha as well as 780 ha of pastures and 200 ha of reserved land that costs 7,000-8,000 AMD/ha to rent.

There are no main counters selling chemicals and fertilizers.

Wheat, barley and spelt (emmer wheat) are cultivated on 490 ha (non-irrigated) of grain fields. There are 77 ha of watermelons, fruits, newly established orchards, legumes. Industrial crops are also grown. Forage crops comprise an area of 783 ha (not irrigable). There are no land areas that can be cultivated but are not, although at higher altitudes costs of cultivation are very high.

Among organizations that finance operations, there is ACBA bank that provides funding for 16-24% annual interest rate, taking equipment as collateral. Aregak micro financing organization provides funding with 25% annual interest rate with the group guarantee.

Lichk village, Gegharqunik marz

Responsible person – Artashes Khachatryan, 093-342538

The population of the village is 5,037. The village is located at the altitude of 1900-2020 meters above seal level. Duration of winter is 180 days and the summer last for 92 days. The annual precipitations are 325-450 mm. The snow cover is within 20-67 cm. The number of hail days is 5, the number of spring frosts is 8, the number of fall frosts is 6, and the duration of vegetation period is 153 days.

Arable lands without irrigation and arable lands under irrigation account for 996 and 441 hectares, respectively in the amount of agricultural land of the village, whereas out of 441 hectares of irrigated arable lands only 337 hectares are virtually irrigated and 104 hectares are not. The latter portion is leased at the price of 13,000 AMD/ha. Thirty-five hectares of fruit orchards are virtually irrigated. There are no grape yards. Hayfields constitute 257 hectares (non-irrigated), pastures constitute 1586 hectares (non-irrigated), and there are no reserve lands.

There are no major sell points for selling chemicals and fertilizers. One hundred and fifty hectares of grain are under irrigation, and 170 hectares are not. There are twenty-five hectares of vegetables are under irrigation, 320 hectares of watermelons are under irrigation, 35

hectares of fruits are under irrigation, 28 hectares of newly established orchards and there are no legumes, industrial crops, and forage crops. Plots of arable lands that are not actually used due to lack of financial means, technical equipment and seeds, account for 468 hectares. There are no credit clubs or banks financing the activities. Operating micro financing organizations are Aregak and Kamurj, which provide loans at 4% monthly interest rate accepting business plan and personal promise as collateral.

Shirak marz

RA Shirak marz is situated in the north-west of the republic. Borders with Turkey and Georgia. Marz covers Artik, Akhuryan, Ani, Amasia and Ashotsk regions. It includes 3 towns -Gyumri, Artik, Maralik and 128 rural settlements. Marz occupies 9% of RA territory. The population of the marz comprised 9.1% of RA total population in 2005, including 60.9% urban. RA Shirak marz inherited its name from the Shirak province of Ayrarat land of historical Armenia. Being at the height of 1500-2000 m above sea level (52 villages of the marz are at the height of 1500-1700 m above sea level and 55 – 2000 m), the marz is the coldest region of Armenia, where the air temperature sometimes reaches -46°C in winter.

The main railway and automobile highway connecting Armenia with Georgia pass through the marz territory. The railway and motor-road networks of Armenia and Turkey are connected here.

The airport is situated in the RA Shirak marz that provides air connection with CIS countries and has a facility to receive any type plane. On the Akhuryan River frontier with Turkey the Akhuryan reservoir was built that is the biggest of the country by its volume of 526 mln.m³. Spitak destructive earthquake of 7 December 1988, besides taking away thousands human victims, has caused big destructions of Shirak marz economy and, particularly, Gyumri town. To earthquake the marz took the second place in the republic by its development level and economic capacity, yielding only to Yerevan city. However, after the earthquake the marz economy endured a deep drop (earthquake consequences were destructive: in seconds powerful factories have been turned into ruins, thousands dwelling houses, schools, hospitals have been destroyed). A big number of cattle were remained under the ruins in villages. In 1989-1991 by the assistance of almost all soviet republics, many foreign countries and international organizations a big reconstruction work has been conducted with a purpose to liquidate ruins. In the past period the marz economy and industrial capacities are slowly reconstructed.

The share of industry of Shirak marz in total volume of republican industrial production comprised 2.1% in 2005, in volume of gross agricultural output - 10.0%, in retail turnover – 1.9%. The leading branches of industry of RA Shirak marz are production of food, including beverages and production of other non-metal mineral products. Tufa and pumice of Artik and Ani are well-known. The grain farming and cattle-breeding are also developed in the marz. The center of the marz is Gyumri with 148.3 thousand people at the end of 2005.

Agricultural lands in the marz in 2006 constituted 165737 ha and the region provided 49.3 million AMD agricultural output in current prices in 2005. Retail turnover in marz in 2005 was 13978.9 million AMD with 747 retail outlets. Average nominal monthly salary is 41.222 AMD and 26.900 unemployed people in 2005. Consumer price index in year 2005 was 99.2.

Town of Maralik, Shirak Marz

Mayor – Artak Gevorgyan, 093 880030

The population of Maralik is 5,900. The town is located at 1,650 meters above the sea level. The winter lasts for 155 days, and the summer lasts for 92 days. The snow cover is about 45 cm, the number of hail-days is 8, the number of spring frosts is 35, the number of fall frosts is

48, and the vegetation period lasts 105 days. Agricultural land of the community includes 1,581 ha of non-irrigated and 230 ha of irrigated arable land. There are 923.5 ha of pastures (non-irrigated), 135 ha of reserved land (non-irrigated), 18 ha (irrigated), which costs 10,000 AMD/ha to rent.

There are no main sell points selling chemicals and fertilizers.

There are 52 ha of irrigated and 1,250 ha of non-irrigated grain fields. Watermelons, homestead crops, fruits, newly established gardens, legumes, and industrial crops are not grown. There are 30 ha of irrigated and 180 ha of non-irrigated forage crops.

Land area that can be cultivated, but is not, comprises 20 ha, which are not used due to relief conditions.

There are no banks, credit clubs, and micro financing organizations to provide funding.

Horom village, Shirak marz

Village Mayor: Davtyan Sargis - 093 311352

Deputy Village Mayor- Norik 093 308734

The population is 1,907. The village is located at 1,550 meters above sea level. The winter lasts 140 for days, while the summer lasts for 122 days. The snow cover is about 50 cm, the number of hail-days is 8, the number of spring frosts is 25, the number of fall frosts is 33, and the vegetation period lasts for 120 days.

Agricultural land of the community comprises 2,677 hectares of non- irrigated land, 305 hectares of irrigated land that costs 3,000 AMD/ha to rent. There are also 1,147 ha of irrigated arable land, and 305 ha of irrigated arable land, of which 117 ha are virtually irrigated, and 188 ha are not irrigated. There are orchards and grapevine fields. There are no hayfields. There are 1,126 ha (non-irrigated) of pastures, 45 ha (non-irrigated) of reserved land, 36 ha of non-irrigated reserved land that can be rented for 1,500 AMD/ha.

There are no main sell points selling chemicals and fertilizers. Grain fields comprise 1,000 ha (non-irrigated). There are 16 ha (irrigated) watermelons, 30 ha (irrigated) of homestead crops, 56 ha (non-irrigated) of forage crops and fruits. There are no newly established orchards. No legumes and industrial crops are grown. Land area that can be cultivated, but is not, comprises about 20 ha, which is not used due to lack of financial resources and fear of hail damage.

There are no banks and credit clubs providing loans. Kamurj micro financing organization provides loans for 3% monthly interest rate, taking livestock and equipment as collateral.

Lanjik village, Shirak marz

Village Mayor: Seto Hovhannisyan - 093 635635

The population is 924. The village is located at 1,960 meters above sea level. The winter lasts for 155 days, the summer lasts for 65 days. The snow cover is about 65 cm, the number of days with hails is 16 days, the number of spring frosts is 40, the number of fall frosts is 35, and the vegetation period lasts for 120 days. Agricultural lands of the community comprise 1,365 ha of non-irrigated land. This includes 576.4 ha of non-irrigated arable land. There are no orchards, grape vineyards or hayfields. There are 660 ha of (non-irrigated) pasture lands, 92.6 ha (non-irrigated) of reserved lands that can be rented for 17,500 AMD/ha.

There are no sell points selling chemicals and fertilizers.

There are 500 ha of non-irrigated grain fields. No watermelons, homestead crops, newly established gardens, legumes, and industrial crops grown. Forage crops comprise an area of 68 ha (irrigated).

There are no land areas that can be cultivated and are not. ACBA bank provides financing with 18% annual interest rate, accepting equipment as collateral. There are no micro financing organizations.

Lori marz

RA Lori marz is the third largest marz by its territory in the republic (it occupies the 12.7 % of RA territory) and the second by its population number (after Yerevan city). It is situated in the North of the republic and borders with Georgia. RA general railway runs through the central part of the marz. RA Lori marz includes the regions of Spitak, Stepanavan, Tashir, Tumanyan, Gugark and the towns of Vanadzor, Spitak, Stepanavan, Alaverdi, Tashir, Akhtala, Tumanyan, Shamlugh. The population number of the marz comprised the 8.8 % of total population of the republic as of year 2005. About 58.8 % of population is a town dweller. The 1998 Earthquake, the epicenter of which was a little bit North from Spitak, covered the large part of the present day territory of the marz. Earthquake measured 9-10 in Spitak town and in Kirovakan –8 on the Richter scale. Shocks lasted 40 seconds razed all constructions of Spitak to the ground, 8000 dwellings tumbled down in Kirovakan, 30 buildings and 2500 houses – in Stepanavan, the regions of Gugark, Tumanyan and Tashir suffered greatly. The reconstruction works started with the help of financial and physical assistance received from a number of countries of the world and numerous tenderhearted people immediately after the earthquake have being continued by now. During last 15 years, every now and then new dwellings, schools, industrial constructions, cultural centers were built in the marz.

The share of industry of RA Lori marz for 2005 in total volume of industrial production of the republic comprised 5.5%, in the volume of gross agricultural produce -10.5%, in retail turnover - 2.2%. The center of the marz is Vanadzor with 105.5 thousand people at the end of 2005. Agricultural lands in the marz in 2006 constituted 213,797 ha and the region provided 51.8 million AMD agricultural output in current prices in 2005. Retail turnover in marz in 2005 was 19585.1 million AMD with 900 retail outlets. Average nominal monthly salary is 42.818 AMD and 21.800 unemployed people in 2005. Consumer price index in year 2005 was 99.5.

Town of Tashir Lori Marz

Mayor – Nshan Soghoyan, 091-421761, (0254) 2-2241

Tashir's population is 7,856 people. The town is located at 1500 meters above sea level. The duration of winter is 170-190 days, the duration of summer is 40-60 days. The annual precipitation is 340-380 mm. The snow cover is about 100-120 cm., the number of hail days is 17, the number of spring frosts is 10-15, the number of fall frosts is 17-21, and the vegetation period lasts for 90 days. The rent price for agricultural lands in the town ranges from 12,400 -3200 AMD/ha depending on the type of the soil. There are no fruit orchards or grape vineyards. Hayfields are 2,500 hectares costing 6,900-1,900 AMD/ha to rent, pastures are 1,469 hectares costing 2,300 AMD/ha to rent, and there are no reserve lands.

There are no major sell points for selling chemicals and fertilizers. Grain fields are 150-160 hectares of non-irrigated land. Vegetables are 15-20 hectares without irrigation. There is no information available on watermelons, fruits, newly established orchards, legumes, industrial crops, and forage crops. Plots of lands usable for farming but not actually used account for about 600 hectares. These plots of land have not been utilized since the privatization in 1990 and they are not irrigated.

There is one credit club established with the support of USDA Marketing Assistance project.

Lori Marz, village Lermontov

Mayor – Takhalyan Edik, 091-912640, (0322) 9-6411

The population of the village is 870. The village is located at 1810 meters above sea level. The duration of winter is 170 days and the duration of summer is 80 days. The annual precipitation is 700 mm. The snow cover is within 30 cm., the number of hail days is 20, the number of spring frosts is 10, the number of fall frosts is 25, and the vegetation period is 150 days. Arable lands account for 250 hectares in the amount of agricultural land of the village

with the lease price of 7000 AMD/ha. There are no fruit orchards and grape yards, hayfields constitute 500 hectares with the lease price of 7400 AMD/ha, pastures comprise 800 hectares, and reserve lands account for 220 hectares. There are no major sell points for selling pesticides and fertilizers.

One hundred and fifty hectares of vegetables are not irrigated; six hectares of water-melons are not irrigated as well. Thirty hectares of forage crops are not irrigated. All lands usable for farming are used. Among banks financing activities is ACBA Bank at 2 percent monthly rate with no requirement for collateral. There are no credit clubs. Of microfinancing organizations there is Aregak.

Lori Marz, village Gyulagarak

Village Mayor – Alexandr Grigoryan, 091-211621, (0256) 9-32-66

The population of Gyulagark village is 2,124. The village is located at the altitude of 2450 meters above the sea level. The duration of winter is about 80-90 days and the duration of summer is 80 days. The snow cover is within 30-40 cm. the number of hailstone days is 30, the number of spring frosts is 30. The duration of vegetation period is 160 days. Arable lands account for 1,000 hectares in the amount of agricultural land of the village, out of which 200 is irrigated, 800 is not irrigated, with the lease price of 11,000 AMD/ha. There are no fruit orchards and grape yards, hayfields constitute 300 hectares, not irrigated, pastures comprise 50 hectares, and reserve lands account for 130 hectares, again with the lease price of 11,000 AMD/ha. There are no major sell points for selling pesticides and fertilizers.

Grain-crops constitute 800 ha, 200 ha of forage crops, mainly potato, 20 ha of vegetables. All lands usable for farming are used. Among banks only ACBA Bank provides agricultural credits at 2 percent monthly rate with no requirement for collateral. There are no credit clubs. Of microfinancing organizations there is Aregak and Kamurj.

4.4 Dangerous Natural Hydrometeorologic Phenomena

Dangerous Natural Hydrometeorologic Phenomena (DP) can cause victims among humans and a considerable loss in different fields of economy.

Hydrometeorologic Phenomena are considered dangerous, when hydrometeorologic values (criteria) achieve to a critical point or acquire a critical nature. Listed below in Appendix 1 are typical DP-s.

Based on Appendix 1, DP lists are developed (clarified) by marzes, taking into account the local natural-climatic and economic peculiarities.

While clarifying a DP list and criteria, one should take into account that the critical values or intensiveness of hydrometeorology phenomena should be not typical (rare) for a particular area or particular time of the year, and iteration of climatic phenomena should make no more than 10% and that they are a threat to human security and can considerably damage different fields of economy.

Gegharkunik Marz

Gegharkunik marz occupies the areas in the basin of Lake Sevan and the valley of River Getik. Sevan Basin is located in the eastern part of Armenia and is a large tectonic lowland edged by Geghama volcanic mountain-shield in the west, Vardenis volcanic mountain-shield in the south, Areguni mountain range in the north-east, and Sevan mountain range in the east. The height of the mountain ranges stripping the lowland exceeds the latter by 500-1000 meters, with some alps exceeding by 1,800m.

By its size, Lake Sevan is the fourth largest high-mountain lakes in the world. It consists of two basins: Greater Sevan and Sevan Minor, which are connected with each other by the strait between Noratus and Artanish capes. The maximum natural depth of Greater Sevan and Sevan Minor used to be 98.7 and 58.7 meters respectively. In the north-west part of Sevan Minor is the Sevan Island with 0.3km² surface, which has become a peninsula after the lowering of the water surface. Sevan is a freshwater lake. Prior to the lowering of the waters of the centuries-old lake, its natural surface was 1416 km², the elevation of the lake's mirror against the level of Baltic Sea was 1915.57m, and the volume of the water was 58.5km³. The total surface of the lake's basin makes 4,891km².

Twenty-six rivers and creeks are falling into Sevan, and only River Hrazdan starts from the lake.

For the coastal areas of Lake Sevan, mountain-plain landscapes and moderately cold climate are typical. During most of the year, the radiation balance is positive. The annual sunshine duration is 2,600-2,700 hours, and the number of days without sun is insignificant – only 16-18 days on coasts and up to 25 days on mountain slopes. The annual temperature in coastal areas is 4-6⁰C, the average July temperature is 15-17⁰C, with the absolute maximum reaching 33-34⁰. January is the coldest month of the year; the average temperature is -5...-6⁰ (-8⁰C in the area of Sevan and Vardenis towns), with the absolute minimum reaching as low as -33...-38⁰C. The winter regime in coastal regions (Sevan, Martuni) is established in late November, at elevations above 2,000m – in the 2-nd decade of November, and in Shorzha and Artanish bay – in first days of December. Respectively, the heating season also is shorter in this area, 200-210 days, with an average temperature of -0,1...-0,4⁰C. In the mountainous areas and in mountain passes, the longest heating period is 232-236 days (Semyonovka,

Yanegh). In the coastal area, the annual average soil temperature ranges between 6 and 9 degrees: -6...-9⁰C in winter and up to 60-68⁰C in summer. The absolute minimum temperature on earth surface in winter drops as low as -40...-44⁰C, which is supported by the snow cover formed. In coastal areas, the snow cover is formed on November 12-13 and disappears in mid April. In warm springs, the snow cover disappears earlier – in the first decade of March. However in certain years, it may snow even in late May or early June. The first snow rarely survives during the entire winter. Stable snow cover is usually formed 30-40 days following the first snow. The number of days with snow cover in coastal areas ranges between 75 days (in Shorzha) and 140 days (Sevan) and 160 days in mountain passes. The maximum average snow cover during a decade makes 13-20cm, (55-65cm in passes and only 6-7cm on Areguni bank). In certain years, the height of the snow cover exceeds the norm by two-three times. Depending on the height of the snow cover and its nature, appropriate conditions are created for wintering of areas seeded with winter wheat as well as for freezing of the soil. During winters with scarce snow, the soil freezes up to 100cm-114cm deep, and in winters with abundant snow – only 8cm-13cm. However, these extreme values are observed only once in 50 years. Normally, the soil freezes up to 50cm-60cm deep.

In the mountain-plain zone, precipitation and humidity are distributed unequally. The southern slopes of Areguni and Sevan mountain ranges are much drier than the rest of the area of this zone; supplementary irrigation is needed here then. The humidity coefficient here is 0.4, and in the rest of the area, it is 0.6-0.9. The relative humidity is also the lowest, especially in September: 60-65%, with the maximum relative humidity observed in February: 69-77%. In daytime hours, humidity decreases up to 40-50%, and reaches to its maximum in early morning it. The number of dry days (with no more than 30% relative humidity) in Areguni coastal area is the largest, 31 days in a year, and the number of humid days (with no less than 80% relative humidity) is 19-20. The number of humid days in the south coast reaches respectively 18 and 30. Semyonovka area is the most humid; for 137 days during a year, the humidity is not less than 80%. The description (cartography) peculiarities of the lake's basin are having an intense impact on the distribution of precipitation. Overland, average of 638mm precipitation is observed; in the coastal area, this value decreases up to 487mm, in the north-eastern and eastern parts being 440-460mm. There is little precipitation also in the south coast of the lake: from 414mm (in Tsovak) to 467mm (in Karchaghbyur). The maximum precipitation is observed in the northern and western areas of the basin: 647mm in Tsovagyooch and 550mm in Sarukhan.

The lowest temperatures by months

1. Lowest average minimum temperature,
2. Lowest absolute minimum temperature,
3. H- Elevation above sea level-m

	H	1			2		
		I	II	XII	I	II	XII
Martouni	1943	-9.5	-10.1	-6.6	-28	-32	-27
Lichk	1950	-9.2	-10.0	-6.3	-29	-33	-27
Lchashen	1937	-12.2	-11.7	-9.2	-29	-33	-27

Heating period

	start	end	duration	Avg. temp. during the period
Martouni	13/10	7/5	207	-0.4
Lichk	12/10	8/5	209	-0.4
Lchashen	8/10	8/5	213	-2.0

Precipitation (mm)

	I	II	XII
Martouni	23	28	24
Lichk	24	29	23
Lchashen	25	30	25

Daily maximum precipitation (mm)

	I	II	XII
Martouni	25	34	41
Lichk	26	33	40
Lchashen	13	24	16

Number of days with snow cover; time of occurrence and disappearance

	Number of days			Time of occurrence			Time of disappearance		
	Avg.	min.	max.	Avg.	earliest	latest	Avg.	earliest	latest
Martouni	103	39	163	12/11	2/10	21/12	15/4	4/3	29/5
Lichk	103	39	163	12/11	2/10	21/12	15/4	4/3	29/5
Lchashen	136	178	66	9/11	28/9	26/1	19/4	26/3	5/6

Maximum (M) wind speed and Gusts (G)

	I		II		XII	
	M	G	M	G	M	G
Martouni	22	36	34	37	24	38
Lichk	22	36	34	37	24	38
Lchashen	23	28	22	27	25	28

Average (A) and maximum (M) number of days with storm

		XI	XII	I	II	III	IV
		Martouni	A	0.5	2.1	4.1	3.4
	M	7	10	18	17	8	4
Lichk	A	0.5	2.1	4.1	3.4	2.3	0.3
	M	7	10	18	17	8	4
Lchashen	A	1.3	4.0	5.9	5.9	4.9	0.7
	M	8	15	16	16	13	5

Lori Marz

Lori marz is in the north of Armenia and occupies the largest natural/historic area. The marz is edged by Virahayots Mountains in the north, Javakhk mountain shield in the west, Pambak mountain range in the south, and Gugarats Mountains in the east. Between these mountains, is the basin of River Debed with two main sub-regions: Lori lowland and Pambak valley divided by Bazum mountain ridge. The area of Lori marz is at 1600m -1700m above sea level, the maximum elevation being 3196m.

The climate in Javakhk mountain-meadow sub-region is moderate with short and cool summers and cold winters. The average January temperature is -12°C , and absolute minimum temperature reaches -37°C ... -38°C . The average temperature in summer ranges between 10-14

degrees. Precipitation is abundant, 900mm-1000mm. Winters are abundant with snow, and the snow cover survives in highland areas during the entire year.

The plain and meadow-plain sub-region of Lori occupies the foundation of Lori lowland with average of 1,300m-1,700m elevation. The north-western part of the lowland, being located between Javakhk mountain shield and Virahayots mountains, is protected from intrusion of cold air in winter so that it is much warmer here than at the same elevations in Shirak marz; the average winter temperature in Metsavan is -2.6° , while in Gyumri it is -7.4° C.

Lori valley is rather humid; the annual precipitation makes 600mm-700mm and more. Winters are long-lasting and with abundant snow. The absolute minimum temperature reaches as low as -34° (in Tashir). Summers are cool; the average temperature in July-August is $21-22^{\circ}$ C (in Tashir), however the maximum temperature can reach $34-35^{\circ}$. The climate in this subregion is rather mild. The annual temperature can vary by 21° C. Summers are cool: 7° C. The absolute maximum temperatures reach $34^{\circ}-35^{\circ}$, however there are not many days with such temperatures, and the average maximum is $22^{\circ}-23^{\circ}$. Winters are mild, with average temperature of $-2...-3$ degrees (Stepanavan, Gyulagarak); the average minimum is $-6...-8^{\circ}$, while the absolute minimum can reach as low as $-28...-31^{\circ}$ C. The duration of winter is 3-3.5 months. Period without frosts lasts for 150-160 days. There is a rather abundant annual precipitation, about 700mm. However, the height of the snow cover is insignificant; the average decade snow cover is only 9cm -10cm high, with the highest cover being 63cm (in Stepanavan).

The Debed basin has a dense and branched out system of water resources; the average flow of the river makes $1,100,000,000\text{m}^3$.

This subregion is attributed by moderate and mild winter climate. Even the average January temperature does not go lower than 0° , with that of $1.8^{\circ}-5.0^{\circ}$ in Alaverdi. The absolute minimum reaches -17° . The average summer temperature is 23° , and the maximum summer temperature reaches $37-38^{\circ}$ C. No stable lowering of the temperature below 0° - is observed in this subregion. On higher elevations (Odzun), lowering is observed in late December, and in the third decade of February the temperature goes above 0° -. The precipitation is mainly in the form of rain, the annual amount being 400 mm -500mm. The maximum precipitation (110mm) and the largest number of days with rain (16-20 days) are observed during May-June. The snow cover is very unstable and insignificant, only 1-3cm.

The mountain-valley region of Bazum-Pambak covers Pambak valley and the slopes of the adjacent mountain ranges of Bazum, Pambak, and Shirak. Plain-meadow landscape is typical for this area. The climate in Pambak valley is moderate. Winters are mild, with average January temperature of $-4...-5^{\circ}$ and minimum temperature of $-25...-30^{\circ}$ C. Winters last for three months. The snow cover is unstable and insignificant. In Vanadzor area, the average decade height of the snow cover is 4-9cm, with the maximum being 24-38cm, and respectively 16-19cm and 74cm in Lermontovo.

Directions of wind in the marz are typically towards the valleys of Pambak and Debed rivers and their feeders. The average annual wind speed ranges between 1.4m/sec. (in Shnogh) to 3.4m/sec. (in Spitak). The windiest section of the marz is Pushkin Pass, where south winds prevail during the winter months, and north winds prevail during the summer months. The average annual wind speed is rather high and makes 6.3m/sec., reaching up to 10.3m/sec. in January. The maximum speed in the Pass is 43m/sec, and 53m/sec during gusts. Snow storms are often observed: 13 days on average, with the maximum being 28 days. The maximum number of days with storms in the territory of Lori marz is 30 days (in Tashir). There is a considerable number of cloudy days, the maximum general cloudiness being observed in Tashir (164 days during the year), and the lower cloudiness being observed in Odzun (85 days). The maximum general cloudiness data has been observed in Tashir - 6.2 points, and that of the lowest cloudiness – in Vanadzor, 5.1 points.

Fogs occur primarily in the cold months of the year. They are most frequently observed in Pushkin Pass, with the annual average indicator being 139 days and the maximum of 203 days.

Another atmospheric phenomenon frequently observed in the marz are thunders. The number of days with thunder is 50-70 days, with the maximum number being 108 days (in Tashir). Thunders are sometimes combined with hail damage that causes serious losses in agriculture.

Minimum air temperatures by months

1. Minimum air temperatures
2. Absolute minimum air temperatures
3. H- Elevation above sea level-m

	H	1			2		
		I	II	XII	I	II	XII
Tashir	1506	-10.4	-9.1	-7.8	-32	-32	-34
Lermontovo	1798	-8.5	-8.1	-5.6	-23	-23	-19
Gyulagarak	1297	-6.7	-6.4	-5.3	-23	-22	-20

Heating period

	start	end	duration	Average temperature during the period
Tashir	13.10	27.04	197	-0.1
Lermontovo	11.10	04.05	206	-0.1
Gyulagarak	17.10	23.04	189	0.6

Precipitation (mm)

	I	II	XII	XI-III
Tashir	20	30	19	143
Lermontovo	26	32	26	178
Gyulagarak	26	38	27	188

Maximum daily precipitation (mm/number of days)

	I	II	XII
Tashir	26/7	31/9	23/7
Lermontovo	34/8	34/9	30/8
Gyulagarak	36/7	54/8	35/7

Number of days with snow cover, time of occurrence and disappearance

	Number of days			Time of occurrence			Time of disappearance		
	Avg	min.	max.	Avg.	earliest	latest	Avg.	earliest	Latest
Tashir	73	17	126	09.11	01.10	07.01	10.04	07.03	08.05
Lermontovo	104	46	163	05.11	23.09	07.01	18.04	12.03	21.06
Gyulagarak	73	20	135	13.11	02.10	22.12	05.04	21.02	01.05

Maximum (M) wind speed and gusts (G)

	I		II		XII	
	M	G	M	G	M	G
Tashir	24	34	24	30	28	30
Lermontovo	24		18		24	
Gyulagarak	40	40	34	40	22	31

Average (A) and maximum (M) number of days with storms

		XI	XII	I	II	III	IV
		Tashir	A	0.2	0.6	2	1
	M	0.4	5	17	8	6	3
Lermontovo	A	0.2	1	4	2	2	0.2
	M	2	6	12	6	6	2
Gyulagarak	A		0.3	0.8	0.3	0.2	
	m		3	7	2	2	

Shirak marz

Shirak marz is located in the north-east of Armenia. The most part of the region is Shirak Valley with elevation of 1524m above sea level. To the north of the valley is Ashotsk basin, with the elevation of its foundation being 2000m. The dominating landscape are plains. meadows are in the northern and north-eastern slopes of Mount Aragats, on elevations of 2300-2600m. Alpine meadows are even higher.

Shirak marz has a moderate climate. The average annual temperature of the area is about 5⁰C, with the average January temperature being -9⁰C. The average annual precipitation is 555mm. Due to the rectilinear zoning, 4 types of climate are available in the marz:

1. moderate climate with warm summers and moderate cold winters,
2. mild summers and cold winters,
3. moderate cold climate with short and cool summers and cold winters,
4. cold mountainous tundra climate.

1. The first climate type is common for the southern and south-eastern areas of the marz. The average annual temperature in these areas is 6.0-6.5⁰C. January is the coldest month with average temperature of -6,-7⁰C and with absolute minimum temperature of -26,-27⁰C. The annual precipitation is 400-450mm. The minimum precipitation in January is 10-12.

Snow cover is formed in early November and survives until late March. There is no stable snow cover in 10%-15% of winters. In winter, quiet weather is prevailing, with 4-5 days of storms on average during the entire winter season. There are frequent fogs, 28-30 days on average, during the cold period of the year, October-March.

2. The second type is typical for the central area of the marz, Shirak Valley. The average annual temperature here is 5-6⁰C, January being the coldest month. In Artik area, where inversion is observed in winter time, the average monthly temperature is -7.5⁰C, in Gyumri it is -9.5⁰C, and the absolute minimum temperature is -26⁰ and -36⁰ respectively. The average annual precipitation is 500mm, with the January minimum being 20-25mm. The snow cover is not very high; the maximum average height is 25-30mm. The snow cover is formed in the middle of the last decade of November and survives until early April. There is no stable snow cover in 10%-15% of winters. However, in Gyumri, the snow cover is available every year. Quiet weather is prevailing (80%) in winter in Shirak Valley. The average wind speed is 1.0-

1.5m/sec. However, storms lasting up to 10-12 days also are observed. Fogs are rather frequent.

3. The northern areas of the marz are attributed with the third type of climate. The average temperature is the lowest in this are, 2.0⁰C. The average temperature in January-February is -11⁰C,-12⁰C, and the absolute minimum is as low as low as -31⁰C to -42⁰C. Annual precipitation is 600-700mm with average January precipitation being 20-30mm. Snow cover is formed already in early November and disappears only in the third decade of April. Stable snow cover survives during December to mid April. The maximum decade height of the snow cover on average is 60sm, and the absolute maximum is 140sm. The average monthly wind speed is 3-5 m/sec. The number of storm days in winter is 25 on average and reaches to 40-45 days in certain years. The wind speed during storms is 6-9m/sec in 45% of the cases and up to 18-20m/sec in 5% of the cases. Fogs are frequent in winter: average of 15 days in Pushkino and 30 days in Ashotsk.

4. The forth type of the climate is typical for the high mountainous areas (over 3000m). Winter in these areas is severe and long-lasting (up to 6 months). The snow cover, reaching 2 meters and more, survives here and there during the entire year. The average annual temperature is negative, and during the winter month it is lower than -10⁰C. The average annual precipitation is 800-950mm. The wind speed during the entire year is rather high, 5-7m/sec on average. Strong winds (over 15m/sec) are frequent.

Minimum temperature by months

1. Average minimum temperature
2. Absolute minimum temperature
3. H- elevation above sea level - m

	H	1			2		
		I	II	XII	I	II	III
Maralik	1556	-14.8	-13.0	-10.1	-36	-35	-31
Horom	1580	-12.8	-11.3	-8.9	-31	-30	-28
Azatan	1495	-14.0	-12.0	-9.2	-34	-32	-30

Heating period

	start	end	duration	average temperature during the period
Maralik	15.10	21.04	189	-2.1
Horom	15.10	24.04	192	-1.2
Azatan	15.10	23.04	190	-1.6

Precipitation (mm)

	I	II	XII	XI-III
Maralik	24	26	24	132
Horom	22	38	22	148
Azatan	23	30	23	38

Maximum daily precipitation (mm/number of days with precip.)

	I	II	XII
Maralik	17/12	26/10	32/10
Horom	22/11	20/10	50/9
Azatan	18/12	22/10	40/9

Number of days with snow cover, formation and disappearing times

	Number of days			Formation time			Disappearing time		
	average	Min.	Max.	average	Min.	Max.	average	Min.	Max.
Maralik	94	22	154	24.11	5.10	23.12	01.04	19.02	23.04
Horom	100	57	145	13.11	5.10	17.12	9.04	13.03	04.05
Azatan	95	30	150	22.11	5.10	18.12	3.04	25.02	28.04

Maximum wind speed (M) and blasts (B)

	I		II		XII	
	M	B	M	B	M	B
Maralik	25	28	24	-	25	-
Horom	20	28	24	34	18	24
Azatan	24	28	24	30	20	25

The average (A) and maximum (M) numbers of days with storm

		XI	XII	I	II	III	IV
		Maralik	A	0.3	0.6	1	2
	M	4	3	6	6	6	3
Horom	A	0.3	1	2	2	1	0.3
	M	3	3	8	7	6	4
Azatan	A	0.3	0.7	1	2	1	0.3
	M	4	3	6	6	6	3

Aragatsotn marz

The Karbi, Aparan, and Tsaghkahovit area of Aragatsotn marz extends from south to north in the basin of River Kasakh in the east part of the marz. The elevation is as follows: Karbi – 1327m, Aparan -1889m, and Tsaghkahovit – 2000m.

Simultaneously with the growth in the height of a locality, the temperature drops off; the gradient in winter months makes less than 0.4⁰C for every 100m. In pre-mountainous regions of the marz (up to 1500m), the annual average temperature is 8-11⁰C, in mountainous regions (up to 2000m) - 4-6⁰C, at 2700m and above – lower than 0⁰C, and at 3229m (Mount Aragats) the average annual temperature is -2.6⁰C. January is the coldest month of the year; the average January temperature in the pre-mountainous areas of the southern slopes of Aragats massive is -4⁰ -6⁰C, in mountainous areas: -7 -9⁰C, and in high mountainous areas it is -10⁰C. The lowest temperatures range between -22⁰C and -34⁰C (Mount Aragats). In the marz, the winter starts in early November. Distribution of precipitation in Aragatsotn marz is conditional not only upon elevation but also upon the direction, position, angle of slopes, relief, etc. of mountain ranges. Precipitation in Aragatsotn ranges between 350mm (in Ashtarak) and 1000mm (Mount Aragats).

Thunders are frequent in this marz. Frequency of thunders grows in accordance with the elevation, their origin being conditional mainly upon thermal convection as well as upon intrusion of cold air. Thunders are mainly observed in May-June.

Fog is mainly observed in the cold time of the year, being often conditional upon freezing of the earth surface or the movement of warm air over the cold surface. Fog is observed for 60-160 days during the year.

Icicles and ice-crusts on ground, being dangerous weather phenomena, can cause a considerable damage to telephone and electric wires. Occurrence of Icicles and ice-crusts on ground is conditional upon a number of atmospheric phenomena: fog, rain, and sleet. Ice-crusts on ground forms at temperatures of 0-5°C, icicle - at -10°C to -20,5°C. In Ashtarak, icicle is observed for 30 days during the year and 64 days in Mt. Aragats. The number of days with ice-crusts on ground is 0.1 in Astarak and 3 days in Mt. Aragats. Snowstorm is the concurrent impact of wind and snow and can disturb the activities of automobile and railway transportation. There are three types of snowstorms: *general*, when a considerably heavy wind is combined with snowfall; *inner-storm*, when there is no snowfall, however the snow cover on the earth surface rises 1-2m; and *ground-storm (surface storm)*, when even a weak wind can move the snow from place to place thus causing blockage on roads. During the year, 6 days with snowstorm are observed in Talin, 17 days in Aparan and 80 days in Mt. Aragats.

	Average monthly temperature			Average minimum temperature		
	I	II	XII	I	II	XII
Karbi	-5.2	-2.3	-1.5	-8.2	-6.0	-4.4
Aparan	-8.8	-7.6	-5.7	-13.9	-12.8	-10.3
Tsaghkahovit	-10.2	-8.5	-7.0	-14.5	-13.2	-10.8

The absolute minimum temperature observed

	I	II	XII
Karbi	-25,5	-22.8	-22.0
Aparan	-34.2	-33.5	-31.9
Tsaghkahovit	-28.0	-29.0	-26.2

The average (A) and maximum (M) number of days with the mentioned temperatures during the cold period of the year.

	T ⁰ C							
	≤ -15		≤ -20		≤ -25		≤ -30	
	A	M	A	M	A	M	A	M
Karbi								
XII	0,6	7	0,07	2				
I	1,7	23	0,3	5				
II	0,2	5	0,02	1				
Aparan								
XII	7.5	22	2.6	14	0.6	5	0.01	1
I	13.9	30	6.2	16	1.3	8	0.1	2
II	10.6	21	4.9	17	1.1	8	0.1	2
Tsaghkahovit								
XII	8.0	17	2.2	9	0.1	1		
I	11.9	19	3.3	9	0.1	1		
II	9.4	15	2.9	8	0.9	4		

First and last frost times

	First frost			Last frost		
	average	earliest	latest	average	earliest	latest
Karbi	10 XI	1 X	10 XII	1 IV	12 III	27 IV
Aparan	27 IX	27 VIII	22 X	14 V	12 IV	13 VI
Tsaghkahovit	22IX	27 VIII	22 X	28 V	3 V	25 VI

Data of end of heating period ($\leq 8^{\circ}\text{C}$)

	start	end	Duration, days	Avg. temp. of the period
average	7 XI	2 IV	147	0,4
average	8 X	7 V	213	-1,9
average	2 X	15 V	226	-2,0

Precipitation and snow cover

	I	II	XII
average	30	32	33
average	40	49	46
average	16	26	17

Height of snow cover (cm) during the decade with the highest cover during winter

	Average	Maximum	Minimum
Karbi	23	70	0
Aparan	58	121	10
Tsaghkahovit	21	65	4

Time of forming and disappearance of snow cover

	Days with snow cover			Formation time			Disappearance time		
	Avg.	Max.	Min	Avg.	Max.	Min	Avg.	Max.	Min
Karbi	50	135	0	12XII	26 X	6 II	11 III	1 II	30 IV
Aparan	126	176	82	11 XI	3 X	15 XII	15 IV	15 III	20 V
Tsaghkahovit	122	174	95	8 XI	3 X	21 XII	12 IV	28 II	20 V

4.5 Meteorologic phenomena

	Meteorologic phenomena								
Strong wind (including gust)	The wind speed (including gusts) at least 25m/sec, in mountainous areas, no less than 35m/sec								
Gust	Strong gust, in the shape of column or funnel directed from clouds to the earth level								
Heavy snowfall	Precipitation is at least 20mm during a period of maximum 12 hours Precipitation is at least 30mm during a period of maximum 1 hour								
Heavy storm	General or near-ground storm with average wind speed of at least 15m/sec and with at least 500m visibility								
Ice-crusts/ Icicle accumulations on wires	Accumulated on the wires of an ice cover machine: at least with 20mm radius for ice-crusts on ground, at least 35mm for complex accumulations and sleet, and 50mm for granular or crystal icicles. Visibility during fog is no more than 50m								
Heavy fog	Anticipated minimum temperature during the period of November to March reaches to the criteria levels specified by ArmHydromet								
Severe frost	<table border="0"> <thead> <tr> <th>Regions</th> <th>SEVERE COLD</th> </tr> </thead> <tbody> <tr> <td>valley</td> <td>20 degrees and lower</td> </tr> <tr> <td>pre-mountain</td> <td>32 degrees and lower</td> </tr> <tr> <td>mountain</td> <td>35 degrees and lower</td> </tr> </tbody> </table>	Regions	SEVERE COLD	valley	20 degrees and lower	pre-mountain	32 degrees and lower	mountain	35 degrees and lower
Regions	SEVERE COLD								
valley	20 degrees and lower								
pre-mountain	32 degrees and lower								
mountain	35 degrees and lower								
Snow slide	Big snowslide causing a severe damage to buildings or damage to settlements.								