Informing Residents to Natural Disasters: the Case Study Results from Northern Evros, Greece

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Abstract. Greece is a country which is often affected by catastrophic natural phenomena (especially forest fires, floods and earthquakes).The study aimed to identify the information provided to residents of Northern Evros, concerning natural disasters. Primarily, residents were asked to express their opinion about the importance of recording their views via questionnaire and to evaluate natural disasters depending on their risk degree. Moreover, it was investigated whether the residents were informed for the recovering actions from a natural disaster, if they were aware about the role and the responsibilities of the Civil Protection Service and which sources of information they used. They were also asked about the way the information about the real size of a natural disaster should be formed by the media and the reason why scientists talked to the media after a catastrophic natural disaster. Furthermore, the views of the residents were analyzed regarding operations that would be done temporally, after a catastrophic risk for recovery and from which shared state services in their region, for every kind of natural disaster separately.

Keywords: Natural hazards, risk perception, risk awareness, information, Media

1 Introduction

Natural disasters are the impact of oversized natural phenomena (Ye et al., 2012; Karanikola et al., 2014). A disaster refers to a relatively unexpected event which typically overwhelms existing resources and threatens life or property (Gasparotti and Rusu 2012; Georghiu et al., 2013). People are unequally affected by extreme natural events in terms of mortality, morbidity and financial losses (Teodorescu and Cristin, 2002; Werg et al., 2013).

When a region is vulnerable to natural disasters, the citizens should be sufficiently informed about the problem with the correct and adequate information (Singer and Endreny, 1994). In this way the consequences of the phenomenon will be reduced the

Proceedings of the 7th International Conference on Information and Communication Technologies in Agriculture, Food and Environment (HAICTA 2015), Kavala, Greece, 17-20 September, 2015.

number of victims or the injured (Papatheodorou et al., 2014). However, when a natural disaster happens the citizens should be informed about the actions they should take before, during, or after a natural disaster (Alesch et al., 2012). In such conditions the participation and the cooperation of all public and private entities are quite important providing citizens with information are of course essential, but it is not sufficient (Pearch, 2003; Mercer, 2010). Each incident in which emergency managers disseminate risk information to the news media should be followed by a thorough critique of performance (Lindell and Perry, 1992).

Information and communication present significant advances in disaster prevention and crisis management (Martin and Rice 2012). Knowledge about the citizens' expectations from the authorities and the community, it is important information for the management of natural disasters. This information can be used in the phase of the organization in order to develop the necessary structures in order to satisfy the people's needs. Disaster management and community planning via public participation have become top priority for authorities, organizations and stakeholders in many countries all over the world (Pearch, 2003; Mercer, 2010; Martin and Rice, 2012). In European Countries there are a few papers on this subject (Mansourian et al., 2006; Fleischauer et al., 2012; Wachinger, 2013).

The study focuses on the perceptions and knowledge of the residents of Northern Evros about natural disasters. In particular the citizens evaluate natural disasters proportionally with their hazard degree, the actions that residents should take in order to face a natural disaster, the role of stakeholders and specifically the role of the Civil Protection. Also, they evaluated the different sources of information about natural hazards and comment on the role of the broadcast media and scientific community.

2 Research Methodology

The research was carried out with the application of a face to face structured questionnaire. The research area of this paper was Northern Evros (967.5km^2) the northernmost regional unit of Greece that includes the city of Orestiada and the 33 around villages with total population 39,485 (under the national census of 2011). It borders with Turkey to the east, across the river Evros, and it borders with Bulgaria to the north and the northwest) (Municipality of Orestiada, 2015).

Random sampling was applied. The population ratio that is also the impartial evaluation of the real ratio of the population p and the assessment of the standard error of the population ratio of the s_p without correction of the finite population as the sampling fraction is small, has been calculated using the formulae of simple random sampling.

To calculate the size of the sample we thought it would be necessary to conduct pre-sampling with a sample size of 50 individuals. The size of this sample was calculated based on the formulae of simple random sampling (where t = 1.96 and e = 0.048) (Matis, 2001). Even though simple random sampling without off reset was used, the correction of the finite population can be omitted as the sample size n is small in relation to the population size N (Pagano et al., 2000). More specifically, the

sample size was determined to 400 individuals. The data collection was carried out during the second semester of 2014.

The total of questions which were reported to the possible sources of information constitutes a multi-theme variable on which reliability analysis is applied. In particular, in order to find out the internal reliability of a questionnaire (Frangos 2004), i.e. if our data have the tendency to measure the same thing we used the alpha co-efficient (or reliability co-efficient a-Cronbach). If the alpha co-efficient is 0.70 or bigger it is regarded satisfactory (Howitt et al., 2003) and if it is bigger than 0.80 it is regarded very satisfactory. In practice, it is frequent that smaller reliability coefficients, that is with values no bigger than 0.60, are also accepted.

However, the checking must not only be reliable, it must also be credible and this is done through the application of factor analysis (Sharma, 1996). In particular, we used the method of principal components which is based on the spectral analysis of the variance table (correlation). Regarding the significance of the principal components, the criterion which was used was the one suggested by Guttman and Kaiser (Frangos, 2004), according to which, the limit for the collection of the appropriate number of the principal components is determined by the values of typical roots which are equal or higher to one. Furthermore, we also used the matrix rotation of the main factors applying the Kaiser's method of maximum variance rotation.

3 Results and Discussion

Primarily, the residents of Northern Evros were asked about how important it is to record their view about natural disasters through the questionnaire. The residents considered that it was important (35.8%), very important (27%) and most important (21%) their surveying through the questionnaire (Fig. 1).

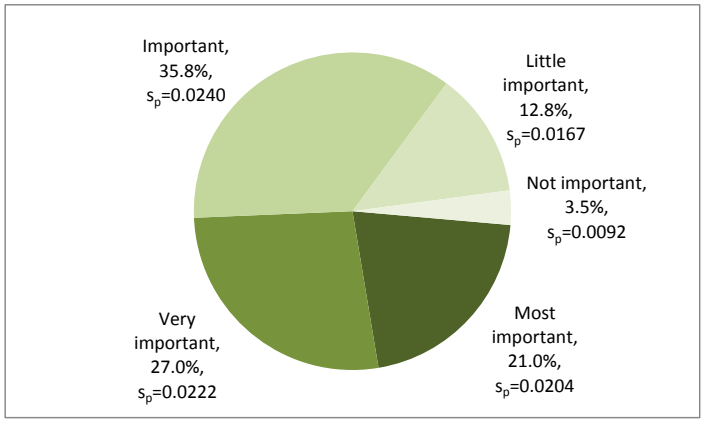

Fig. 1. Significance of surveying residents about natural disasters.

During the interviews residents were asked to evaluate natural disasters according to the degree of risk (Table 1). As very significant characterized from the citizens natural disasters as earthquakes (70.8%), tsunami (57.8%), forest fires (56%), the floods (44.8%) and the volcanic eruptions (45.2%). However, people characterize a natural disaster more dangerous, regardless of the probability of occurrence, unless the negative impact that poses, e.g. the possibility of tsunami in the region is too small, but the disaster that will be caused is huge.

Table 1. Evaluation of natural disasters depending on the hazard degree

		Highly significant	significant	Regular	Insignificant	Highly insignificant
Earthquakes	%	70.8%	19.8%	7.0%	2.0%	0.5%
	s_p	0.0225	0.0199	0.0128	0.0070	0.0035
Forest fires	%	56.0%	32.8%	7.8%	3.0%	0.5%
	s_p	0.0248	0.0235	0.0134	0.0085	0.0035
Floods	%	44.8%	43.8%	10.2%	1.2%	
	s_p	0.0249	0.0248	0.0152	0.0056	
Snow-frost -	%	18.8%	41.0%	34.5%	4.8%	1.0%
	s_p	0.0195	0.0246	0.0238	0.0106	0.0050
landslides	%	19.0%	39.2%	29.2%	9.0%	3.5%
	s_p	0.0196	0.0244	0.0227	0.0143	0.0092
Volcanic eruptions	%	45.2%	24.8%	11.5%	9.5%	9.0%
	s_p	0.0249	0.0216	0.0153	0.0147	0.0143
Tsunami	%	57.8%	14.8%	10.5%	6.5%	10.5%
	s_p	0.0247	0.0177	0.0153	0.0123	0.0153

Informing people plays an important role as it contributes to minimize the catastrophic effects that a natural disaster can bring about, and it can generally reduce human losses. Table 2 presents the degree of which residents of Northern Evros were informed of the actions they should take in case of natural disasters. It was found that the residents were not very informed about the relevant actions that should be taken in case of natural disasters.

According to figure 2 the knowledge of the role and responsibilities of the Civil Protection Agency is rather mediocre.

Table 3 presents the sources of natural disaster information that residents consider as most important. It was found that the internet and education were the most important; however, the internet had a relatively large percentage of negative answers due to the fact that it was not used by older people.

In the above variables reliability analysis was applied, after the appropriate checks. Reliability co-efficient alfa is 0.750 and this result constitutes strong evidence that the grades of the scale are logically consistent, i.e. our data have the tendency to measure the same thing.

Moreover, before we moved on with the application of factor analysis the necessary checks were done. In Table 4 we can see that the factors that were

extracted were three and they all have a characteristic root bigger than 1. Additionally, the second column shows the percentage of variation that is attributed to every factor while the third column shows the percentage of variation that is attributed to every factor after rotation. The bigger the loading of a variable the more this factor is responsible for the total variation of the grades within the variable under consideration. The variables that 'belong' to every factor are those for which the loading (columns 1, 2, 3) is bigger (than 0.5) in this factor.

Table 2. Degree of informing residents of Northern Evros on the actions they should take in case of natural disasters.

		Highly significant	significant	Regular	Insignificant	Highly insignificant
Earthquakes	%	25.0%	30.0%	32.5%	9.8%	2.8%
	s_p	0.0217	0.0229	0.0234	0.0148	0.0082
Forest fires	%	18.0%	23.2%	24.8%	22.0%	12.0%
	s_p	0.0192	0.0211	0.0216	0.0207	0.0162
Floods	%	18.2%	18.5%	25.5%	23.5%	14.2%
	s_p	0.0193	0.0194	0.0218	0.0212	0.0175
Snow-frost -	%	18.5%	21.8%	30.2%	21.8%	7.8%
	s_p	0.0194	0.0206	0.0230	0.0206	0.0134
landslides	%	6.0%	10.0%	19.0%	34.0%	31.0%
	s_p	0.0119	0.0150	0.0196	0.0237	0.0231
Volcanic eruptions	%	6.0%	5.2%	11.8%	24.5%	52.5%
	s_p	0.0119	0.0112	0.0161	0.0215	0.0250
Tsunami	%	6.0%	5.5%	11.0%	26.0%	51.5%
	s_p	0.0119	0.0114	0.0156	0.0219	0.0250

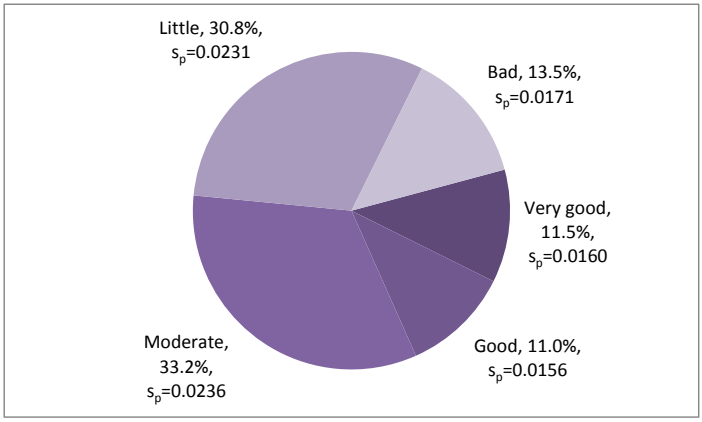

Fig. 2. Knowledge of the role and responsibilities of the Civil Protection Agency.

Table 3. Sources of natural disaster information.

		Very important	important	Mediocre	Insignificant	Very insignificant
Family and friends	%	15.2%	34.2%	37.5%	10.8%	2.2%
	s_p	0.0180	0.0237	0.0242	0.0155	0.0074
Education	%	36.5%	31.2%	24.5%	5.5%	2.2%
	s_p	0.0241	0.0232	0.0215	0.0114	0.0074
Television-radio	%	33.0%	38.2%	23.0%	4.8%	1.0%
	s_p	0.0235	0.0243	0.0210	0.0106	0.0050
Newspapers - magazines	%	21.5%	31.0%	32.5%	11.2%	3.8%
	s_p	0.0205	0.0231	0.0234	0.0158	0.0095
Books-encyclopaedias	%	26.5%	30.8%	27.8%	11.2%	3.8%
	s_p	0.0221	0.0231	0.0224	0.0158	0.0095
Internet	%	55.2%	28.8%	12.2%	2.8%	1.0%
	s_p	0.0249	0.0226	0.0164	0.0082	0.0050
Brochures	%	15.0%	30.2%	33.5%	14.8%	6.5%
	s_p	0.0179	0.0230	0.0236	0.0177	0.0123
Voluntary organizations	%	17.2%	22.5%	32.2%	18.2%	9.8%
	s_p	0.0189	0.0209	0.0234	0.0193	0.0148

Table 4. Table of Factor Loadings, before and after rotation concerning the sources of information.

Variables	Factor burdens					
	before rotation			after rotation		
	1	2	3	1	2	3
Family and friends	0.418	0.305	0.615	0.031	0.160	**0.787**
Education	0.651	0.014	0.421	0.409	0.230	**0.618**
Television-radio	0.584	-0.635	0.210	**0.856**	-0.100	0.215
Newspapers -magazines	0.756	-0.393	0.030	**0.795**	0.241	0.193
Books- encyclopedias	0.674	0.061	-0.397	0.415	**0.661**	-0.079
Internet	0.473	-0.284	-0.481	**0.542**	0.365	-0.330
Brochures	0.661	0.407	-0.119	0.139	**0.727**	0.262
Voluntary organizations	0.573	0.622	-0.180	-0.078	**0.827**	0.239

The burdens are given in bold show which variables included to each factor.

Factor 1 includes the variables 'Television-radio', 'Newspapers -magazines' 'internet' and we can name it as 'typical sources of information'.

Factor 2 can be named as 'alternative sources of information' and includes the variables 'books- encyclopaedias', 'brochures' and 'Voluntary organizations' could also be included in this factor even if their figure is below 0.5. The second variable with a same figure is also included in Factor 1. Therefore the two variables can be considered to act as bridges between Factor 1 and Factor 2.

Factor 3 includes the variables 'Family and friends' and 'education' and we can name it as 'information from the close environment'.

The information provided to the public, after a natural disaster, should be immediate and accurate (Lekkas, 2000). Unless accurate information is provided, citizens will created the sense-perception that authorities are trying to conceal the truth, while in the opposite case, when the information is disseminated and difficult to understand. In this case, misunderstandings arise, that lead to influence of panic prevails.

The majority of the participants (61.0%) stated that the information concerning the size of a natural disaster should be given quickly and in the real size (Figure 3). In fact according to residents the information is given immediately but exaggerated in size (Figure 4).

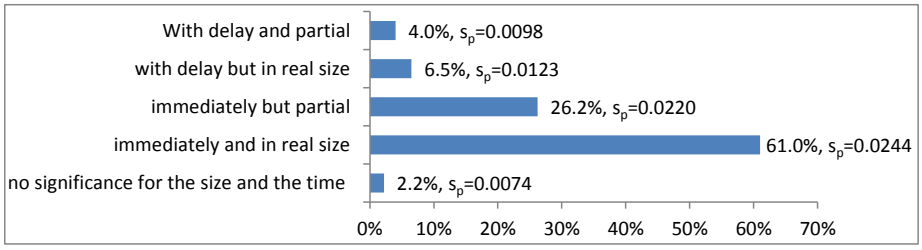

Fig. 3. Residents' opinion about how they want to informed about natural disasters

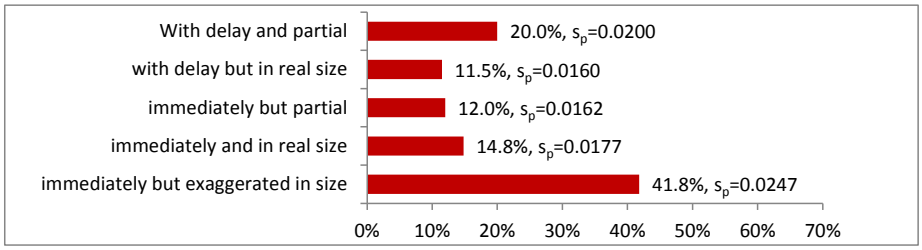

Fig. 4. Residents' opinion about how they really informed about natural disasters

Despite the importance of communication interaction between the media and the public, it often turns out to be inaccurate. The inhabitants of Northern Evros were asked to assess the information provided by the media. It is not coincidental, that they believe in a percentage of 41.8% that the information is given quickly and with exaggeration regarding the size and each reporter is trying to have the exclusivity of the news of a natural disaster. It should be mentioned that in extreme conditions after a catastrophic natural disaster is difficult to collect information, but this does not

justify the dramatization of the news. A way out in informing citizens is the specialists' involvement in the media. The scientist who deals with the mitigation and prediction of disasters is an excellent source of information which can be exploited from the journalists (Lekkas, 2000). Scientific community may tend to believe that individuals and organizations underestimate the risks to which they are exposed. On the other hand, many of these individuals and organizations believe that the scientific community overestimates the risks. Scientists are often questioned about their theories, as if scientific facts were no more than one group's beliefs (Alesch, 2012).

Finally, the inhabitants of Northern Evros were asked to assess the participation of scientists in the media after a natural disaster (Table 5). Generally, the residents believe that the scientists talk to the media after a natural disaster because they usually want to promote themselves as scientists (44.5%), while they believe that they often do so in order to inform the people (48%), to calm and support them (45.2%), to inform them what they were not able to support it earlier (37%) and in order to put the State under pressure for economic support during their research (43.5%).

Table 5. The views of residents in Northern Evros about the attitudes of natural disaster scientists in broadcasting media.

		Always	Often	Rarely	Never
to inform the people	%	36.8%	48.0%	11.5%	3.8%
	s_p	0.0241	0.0250	0.0153	0.0095
to calm and support citizens	%	24.5%	45.2%	23.8%	6.5%
	s_p	0.0215	0.0249	0.0213	0.0123
to promote themselves as scientists	%	44.5%	35.0%	18.2%	2.2%
	s_p	0.0248	0.0238	0.0193	0.0074
to pressure the state for economic support during their research	%	21.8%	43.5%	27.5%	7.2%
	s_p	0.0206	0.0248	0.0223	0.0130
to inform citizens what they were not able to support it earlier	%	33.5%	37.0%	23.0%	6.5%
	s_p	0.0236	0.0241	0.0210	0.0123

4 Conclusions

The current work describes how the public is informed and responds to warnings about natural disasters. According to the results of the research, residents consider natural disasters as very significant, depending on their degree of risk, the earthquakes, tsunamis, forest fires, floods and volcanic eruptions. Moreover, they are better informed for the natural disasters that affect their region more often, such as earthquakes and forest fires, snow and frost, while they are less informed on the role and the responsibilities of the Civil Protection. Concerning the sources from which they derive information on natural disasters, citizens consider the internet as the most important source of information today.

For the briefing on the size of a natural disaster, the majority of residents of Northern Evros considered that it should be done immediately and with accuracy regarding the size of the disaster. Unfortunately, the citizens affirmed that, although public information on the natural disaster size was fast, it was exaggerated, thereby causing confusion, stress and fear to the community. Even though scientists were the most reliable source of information, the citizens believe that their appearance is not only to calm, inform and support people but also to pressure the state for economic support of their relevant research programs on natural hazards.

Acknowledgments. This research has been co-financed by the European Union (European Social Fund – ESF) and Greek national funds through the Operational Program "Education and Lifelong Learning" of the National Strategic Reference Framework (NSRF) - Research Funding Program: Thales. Investing in knowledge society through the European Social Fund.

References

1. Alesch, D.J., Arendt, L.A. and Petak, W.J. (2012). Natural hazard mitigation policy: Implementation, organization choice and contextual dynamics, London: Springer.
2. Gasparotti, C. and Rusu, E. (2012). Methods for the risk assessment in maritime transportation in the Black Sea Basin. J. of Environmental Protection and Ecology, 13 (3A), p. 1751-1759.
3. Georghiu, A.-D., Torok, Z. and Ozunu, A. (2013). How can existing risk assessment methodologies be used in a systematic manner, in the extractive mining industry? J. of Environmental Protection and Ecology, 14 (4), p. 1597-1607.
4. Fleischauer, M., Greiving, S., Flex, F., Scheibel, M., Sticker, T., Serenig, Koboltscnig, N., Malvati, P., Vitale, V., Grifoni, P., Firus, K. (2012). Improving the active involvement of stakeholders and the public in flood risk management – tools of an involvement strategy and case study results from Austria, Germany and Italy. Natural Hazards and Earth System Science, 12, p. 2785-2798.
5. Frangos, C. K. (2004). Market Research Methodology and Data Analysis with the Application of the Statistical Package SPSS for Windows. Athens, Interbooks Publications.
6. Howitt, D. & Gramer, D. (2003). Statistics with SPSS 11 and Windows. Athens, Klidarithmos.
7. Karanikola, P., Panagopoulos, T., Tampakis, S., Karantoni M.I. and Tsantopoulos, G.(2014). Facing and managing natural disasters in the Sporades Islands, Greece. Natural Hazards and Earth System Science, 14, p. 995–1005.
8. Lekkas, E, (2014). Natural and human affected hazards, 2nd Edition, Athens. In: http://labtect.geol.uoa.gr/pages/lekkase/PDF%20Files/fysikes_katastrofes.pdf
9. [Accessed 10 March 2014].

10. Lindell, M. and Perry, R.W. (1992). Behavioral foundations of community emergency planning. Washington, D.C.: Hemisphere.
11. Mansourian, A., Rajabifard, A., Valadan Zoej, M., Willamson, I. (2006). Using SDI and web-based system to facilitate disaster management. Computers & Geosciences, 32, p. 303–15.
12. Martin, N. and Rice, J. (2012). Emergency communications and warning systems: Determining critical capacities in the Australian context. Disaster Prevention and Management, 21, p. 529-540.
13. Matis, K. (2001). Forest Sampling, Democritus University of Thrace, Xanthi (In Greek).
14. Mercer, J. (2010). Disaster risk reduction or climate change adaptation: Are we reinventing the wheel? J. of International Development, 22, p. 247–264
15. Municipality of Orestiada (2015). Available from: http://orestiadaonline.blogspot.gr/p/blog-page.html [Accessed 20 March 2015].
16. Pagano, M. &Gauvreau, K., 2000. Biostastic Principals ,Helin Editions.
17. Papatheodorou, K., Klimis, N., Margaris, B., Ntouros, K., Evangelidis, K., Konstantinidis, A. (2014). An overview of the EU actions towards natural hazard prevention and management: current status and future trends. J. of Environmental Protection and Ecology, 15 (2), p. 433-444.
18. Pearch, L. (2003). Disaster management and community planning, and public participation: how to achieve sustainable hazard mitigation. Natural Hazards, 28, p. 211-228
19. Singer, E. and Endreny, P.M. (1994). Reporting on risk: how the mass media portray accidents, diseases, disasters and other hazards. Risk: Health, Safety & Environment, 5, p. 261-270.
20. Teodorescu, M.E. and Cristin, B. (2002). Environmental risk assessment of pesticide using adaptive equilibrium criterion model. J. of Environmental Protection and Ecology, 3 (1), p. 107-119.
21. Ye, M.W., Wang, J., Huang, J., Xu, S., Chen, Z. (2012). Methodology and its application for community scale evacuation planning against earthquake disaster. Natural Hazards, 61, p. 881-892.
22. Wachinger, G., Renn, O., Begg, C., Kuhlicke, C. (2013). The risk perception paradox implications for governance and communication of natural hazards. Risk Analysis, 33, p. 1049-1065.
23. Werg, J., Grothmann, T. and Schmidt, P. (2013). Assessing social capacity and vulnerability of private households to natural hazards-integrating psychological and governance factors. Natural Hazards and Earth System Science, 13, p. 1613-1628.