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# The European Union Solidarity Fund: An Important Tool in the Recovery After Large-Scale Natural Disasters

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## ABSTRACT

*This paper analyses the situation of the European Union Solidarity Fund, as an important tool in the recovery after large-scale natural disasters. In the last millennium, the European Union countries have faced climate change, which lead to events with disastrous consequences. There are several ex-post financial ways to respond to the challenges posed by large-scale natural disasters, among which EU Solidarity Fund, government funds, budget reallocation, donor assistance, domestic and/or external credit. The EU Solidarity Fund was created in 2002 after the massive floods from the Central Europe as the expression of the solidarity of EU countries. Romania has received financial assistance from the EU Solidarity Fund after the occurrence of major natural disasters, regional and neighbouring country disasters. The assessment of large-scale natural disasters in EU is very important and in order to analyse if there is a concentration of large-scale natural disasters in EU we used the Gini coefficient. In the paper, the method of the statistical analysis and the correlation between several indicators were used to study the financial impacts of large-scale natural disasters in Europe, and especially in Romania.*

**Keywords:** Romania, European Union Solidarity Fund, large-scale natural disasters, damage, aid

**JEL Classification:** Q54, Q56

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## INTRODUCTION: LARGE-SCALE NATURAL DISASTERS, ECONOMIC LOSS AND DISASTER RISK SOURCES OF FINANCING

The average number of natural disasters worldwide has increased from about 30 per year in the 1950s to more than 400 since 2000 and the economic loss has increased from: 53.6 billion USD (1950-59), 93.3 billion

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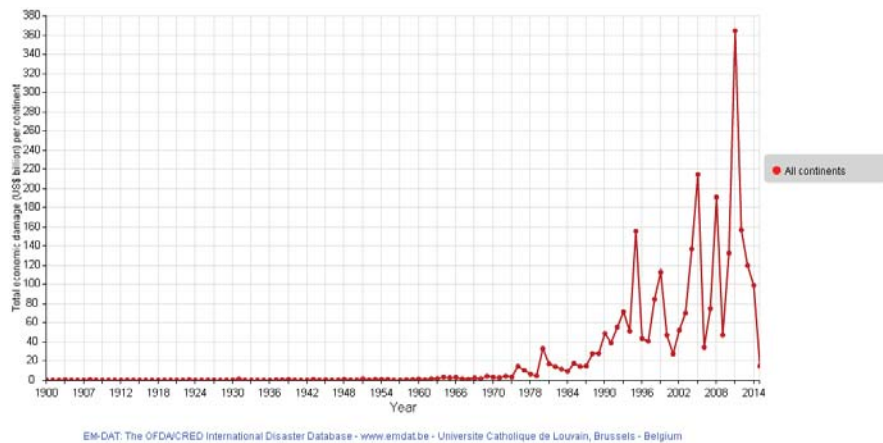
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USD (1960-69), 161.7 billion USD (1970-79), 262.9 billion USD (1980-89), 778.3 billion USD (1990-99) arriving in the last decade at 420.6 billion USD (Kunreuther and Michel-Kerjan, 2008).

Regarding the EM-DAT data (2015) we can observe that in 2011 natural disasters in the world: were reaching an alarming peak of total economic damage of 364.07 USD billion (see Figure 1).

### Natural disasters in the world and total economic damage (USD billion)

Figure 1



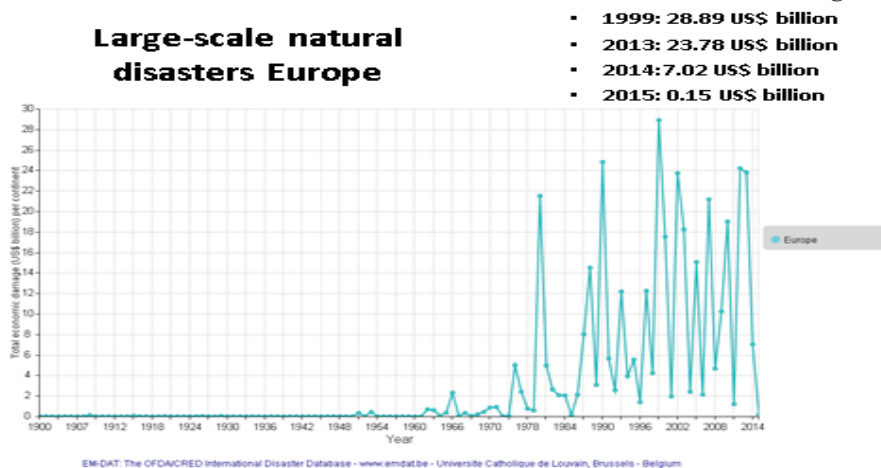
The rising trend of natural disasters and of their economic consequences can be explained by population growth, increase in population and housing units in vulnerable areas, also more complete reporting due to improvements in information technology and more important a rise in climatic disasters: extreme weather events, including storms, floods, droughts, heat waves, sea waves, heavy rainfall, and wet ground slides (Oh and Reuveny, 2010). Mahul and Ghesquiere (2011) consider that the upward trend is principally due to increase in population and assets exposed to adverse natural events, to growing urbanization, environmental degradation, and expected increase in the number and intensity of hydro-meteorological events resulting from climate change.

In the last century, Europe was affected by several natural disasters with important economic consequences (see Figure 2).

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## Large-scale natural disasters in Europe and total economic damage (USD billion)

Figure 2



In view of socio-economic and climate changes Rojas et al. (2013) estimate that Czech Republic, Romania and especially Hungary will likely experience large flood damages by the end of this century and the United Kingdom, France and Italy in Western Europe as well as Romania, Hungary, and Czech Republic in Eastern Europe show the highest absolute damage estimates and are likely to bear the highest costs of adaptation

In order to respond to the challenges posed by the large-scale natural disasters Governments have access to **various sources of financing following a disaster**. Mahul and Ghesquiere (2011) have categorised these sources in ex-post, such as donor assistance, budget reallocation, domestic or external credit, or tax increase and ex ante financing instruments, that need a planning and includes reserves or calamity funds, budget contingencies, contingent debt facility, parametric insurance, CAT-bonds, traditional insurance. Jongejan and Barriou (2008) consider that it is impossible to define a universal panacea for the natural catastrophe coverage: an insurance arrangement that works in one country might not work in another.

In Europe, the major natural catastrophes from the beginning of the century have created the need of solidarity and thus it was created in 2002 an important fund, vital for many countries from EU: the European Union Solidarity Fund.

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## **METHODOLOGY, DATA AND RESULTS OF THE RESEARCH RELATED TO NATURAL DISASTERS IN EUROPE**

In the research were studied large scale natural disasters in Europe, and in Romania using reliable, actual and specialized secondary sources: European Commission site, CEA, EM-DAT: CRED/OFDA International Disaster Database Brussels, Université Catholique de Louvain, data from Romanian Waters National Administration and statistic data from the National Institute of Statistics (Statistical yearbook 2013 and TEMPO-Online time series) and specialized literature.

The assessment of large-scale natural disasters in Europe is difficult, but necessary. In order to analyse if there is a concentration of large-scale natural disasters in European Union the Gini coefficient was used. The method of the statistical analysis and the correlation between several indicators were used to study the financial impacts of large-scale natural disasters in Europe, and especially in Romania. The intensity of the correlation between the damages caused by natural disasters and the environment protection expenditure in Romania was analysed using Spearman correlation coefficient.

### **The European Union Solidarity Fund: important instrument in the recovery after large scale natural disasters in Europe**

The European Union Solidarity Fund (EUSF) was set up to express European Union solidarity to disaster-stricken regions within Europe in an efficient and flexible manner. The European Union Solidarity Fund was created in 2002, after the massive floods from the Central Europe and since then 24 different European countries have received aid for an amount of over 3.784 billion € (see Table 1).

**European Union Solidarity Fund Interventions 2002-July 2015 - damage and aid granted**

*Table 1*

		Total Damage mil.€	Total Damage %	Aid mil.€	Aid %
1	AUSTRIA	4,368.00	4.57%	170.74	4.51%
2	BULGARIA	1,092.00	1.14%	39.20	1.04%
3	CROATIA	802.00	0.84%	22.79	0.60%
4	CYPRUS	165.00	0.17%	7.60	0.20%
5	CZECH REPUBLIC	3,579.00	3.74%	160.90	4.25%
6	ESTONIA	48.00	0.05%	1.30	0.03%
7	FRANCE	7,571.00	7.92%	203.70	5.38%
8	GERMANY	22,004.00	23.02%	971.40	25.67%
9	GREECE	3,032.90	3.17%	112.70	2.98%
10	HUNGARY	1,238.00	1.29%	37.60	0.99%
11	IRELAND	521.00	0.54%	13.00	0.34%
12	ITALY	30,230.00	31.62%	1,318.90	34.85%
13	LATVIA	193.00	0.20%	9.50	0.25%
14	LITHUANIA	15.00	0.02%	0.40	0.01%
15	MALTA	30.00	0.03%	0.96	0.03%
16	POLAND	2,994.00	3.13%	105.60	2.79%
17	PORTUGAL	2,308.00	2.41%	79.80	2.11%
18	ROMANIA	4,033.00	4.22%	119.00	3.14%
19	SERBIA	1,105.00	1.16%	60.20	1.59%
20	SLOVAKIA	764.00	0.80%	26.10	0.69%
21	SLOVENIA	1,273.00	1.33%	48.30	1.28%
22	SPAIN	1,332.00	1.39%	31.00	0.82%
23	SWEDEN	2,297.00	2.40%	81.70	2.16%
24	UNITED KINGDOM	4,612.00	4.82%	162.30	4.29%
	<b>TOTAL</b>	<b>95,606.90</b>	<b>100.00%</b>	<b>3,784.69</b>	<b>100.00%</b>
	average	3983.62		157.70	

Created using data from European Commission, EU Solidarity Fund Interventions since 2002, Last update: 10 July 2015 (by country), available at: [http://ec.europa.eu/regional\\_policy/sources/thefunds/doc/interventions\\_since\\_2002.pdf](http://ec.europa.eu/regional_policy/sources/thefunds/doc/interventions_since_2002.pdf)

The European Union Solidarity Fund has been used for recovery after large disasters, covering the damages caused by floods, forest fires, earthquakes, storms, drought and other natural catastrophes. The European Union Solidarity Fund finance essential emergency operations, non-insurable damages, such as: restoring infrastructures, securing of prevention infrastructures, such as dams, measures to protect cultural heritage, cleaning up, costs of emergency services and temporary accommodation.

The EU Member States and the countries negotiating membership can receive aid from the European Union Solidarity Fund in the event of natural disasters. The affected country must apply to the European Commission within 12 weeks of a disaster. The financial aid proposed by the Commission must be approved by the Council and the European Parliament.

There are three categories after the occurrence: major disasters, regional disasters and neighbouring country. The major disaster was considered if total direct damage caused by a disaster exceeds €3 billion (at 2011 prices) or 0.6 % of the country's gross national income, whichever is lower. For the regional

disasters the eligibility threshold is 1.5% of the region's gross domestic product (GDP), or 1% for an outermost region. The amount of aid is based on total damages, function of the major disaster threshold. 2.5% is paid for the part of total direct damage below the major disaster threshold and 6% is paid for the part of damage exceeding the major disaster threshold (EC, EUR-Lex, 2014).

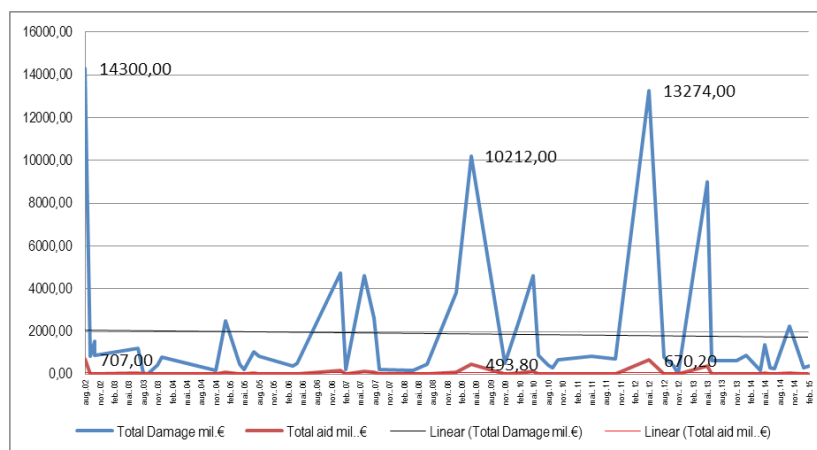
Under new rules adopted in 2014 (Regulation (EU) No 661/2014), working procedures have been simplified and eligibility criteria clarified, and extended to cover drought. The European Union Solidarity Fund annual budget: is € 500 million (2011 prices), plus any funds remaining from the preceding year and the European Union Solidarity Fund is funded outside the EU's normal budget (i.e. by additional money raised by EU countries).

Other changes are related to the possibility of advance payments, shorter administrative procedures and the introduction of reporting requirements as measures to encourage disaster risk prevention strategies.

In Europe, the phenomena which produced most of the damages were floods, followed by earthquake. In 2002, there were the most important damages (14300.00 million €) and the biggest aid granted from the European Union Solidarity Fund (707 million €) as a result of floods produced in the countries from Central Europe: Austria, Czech Republic and Germany (see Figure 3).

### European Union Solidarity Fund Interventions 2002-July 2015 - damage and aid granted (million €) by date of occurrence of the event

Figure 3



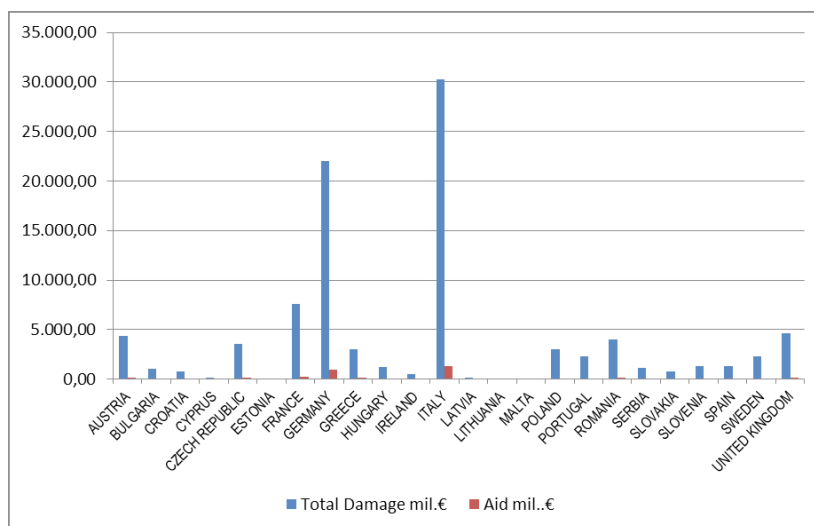
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On the second place function of the damage, there is the earthquakes Emilia-Romagna, produced in May 2012 in Italy, with damages of 13 274 million € and 670.2 million € aid granted from the EUSF (see Figure 3).

In the period 2002- July 2015, function of the damage the first 10 countries most affected by natural catastrophes are in order: Italy, Germany, France, United Kingdom, Austria, Romania, Czech Republic, Greece, Poland and Portugal. Function of the aid granted from EU Solidarity Fund, the first 10 countries receiving aid for recovery after natural disasters are in order: Italy, Germany, France, Austria, United Kingdom, Czech Republic, Romania, Greece, Poland and Sweden.

**European Union Solidarity Fund Interventions 2002-July 2015 by country**

*Figure 4*



Created using data from European Commission, EU Solidarity Fund Interventions since 2002, Last update: 10 July 2015 (by country), available at: [http://ec.europa.eu/regional\\_policy/sources/thefunds/doc/interventions\\_since\\_2002.pdf](http://ec.europa.eu/regional_policy/sources/thefunds/doc/interventions_since_2002.pdf)

Using the Gini coefficient (Pop et al., 2011, p. 194), the degree of concentration of damages and the degree of concentration of aids granted from European Union Solidarity Fund were studied. The coefficient varies between 0, which reflects complete equality and 1, which indicates complete inequality, complete concentration of the amounts.

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$$C_{Gc} = \sqrt{\frac{n \sum p_i^2 - 1}{n - 1}} \quad [1]$$

$n$  = the number of terms of the series  
 $p_i$  = the share of item  $i$   
 $D_i$  = the value for the item  $i$   
 $D$  = the total value

$$p_i = \frac{D_i}{D},$$

$$D = \sum_{i=1}^n D_i$$

$$C_{Gc \text{ aid}} = 0.41$$

$$C_{Gc \text{ damage}} = 0.37$$

For the period 2002-july 2015 the results indicate a coefficient of concentration of 0.37 in the case of the damage and a coefficient of concentration of 0.41 in the case of the aid from European Union Solidarity Fund, indicating a moderate concentration in both cases.

European Union Solidarity Fund is an important tool in the recovery after large scale disasters in Europe, essential for the recovery after large scale natural disasters for the EU countries.

### **Romania, natural disaster risk reduction and European Union Solidarity Fund**

Romania is exposed to many natural hazards: earthquakes, floods, storm, landslide drought and extreme temperature. In the case of earthquakes the economic losses can be high, especially, because densely populated areas are affected. The infrastructure and the residential buildings present a high vulnerability to seismic risk. Bucharest is considered as one of the capitals with the highest seismic risk. The event with the most difficult consequences was the earthquake from 1977, which had killed 1641 persons and the amount of total damage was of 2 billion \$ (see Table 2).



### Top 10 Disasters 1900-2015 in Romania - Total damage

Table 2

Disaster No	Type	Date	Total damage ('000 US\$)
1977-0048	Earthquake	4/3/1977	2,000,000
2010-0251	Flood	21-06-2010	1,111,428
2005-0365	Flood	12/7/2005	800,000
1970-0029	Flood	11/5/1970	500,000
2000-9328	Drought	00-06-2000	500,000
2005-0473	Flood	14-08-2005	313,000
2005-0214	Flood	21-04-2005	200,000
1998-0193	Flood	15-06-1998	150,000
2001-0288	Flood	19-06-2001	120,000
1997-0166	Flood	4/7/1997	110,000

Guha-Sapir, D. Below, R. and Hoyois Ph. (2015) EM-DAT: The CRED/OFDA International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium

However, the most frequent disasters with important economic losses were related to floods (see Tab. 2). As far as it concerns the flood risk, 1028000 ha of land are exposed to flooding, 928935 citizens live in high flood risk areas and 903 localities are situated in high flood risk areas (Romanian Waters National Administration, 2013). Floods are a devastating phenomenon and in this century there were major floods. In 2005, 2008, 2010 and 2014 floods have affected large areas and the country received aid from European Union Solidarity Fund (see Table 3).

### European Union Solidarity Fund Interventions since 2002 for Romania

Table 3

Occurrence	Nature of disaster	Category	Damage (million €)	Aid granted (million €)	Total aid granted (million €)
April 2005	Spring Floods	major	489	18.8	<b>119</b>
July 2005	Summer Floods	major	1.050	52.4	
July 2008	Floods	regional	471	11.8	
June 2010	Floods	major	876	25.0	
August 2012	Drought and fires	major	807	2.5	
April 2014	Spring Floods	neighbouring country	168	4.2	
July 2014	Summer Floods	regional	172	4.3	

Data from European Commission, EU Solidarity Fund Interventions since 2002, Last update: 10 July 2015 (by country), available at: [http://ec.europa.eu/regional\\_policy/sources/thefunds/doc/interventions\\_since\\_2002.pdf](http://ec.europa.eu/regional_policy/sources/thefunds/doc/interventions_since_2002.pdf)

The damages caused by natural disasters generate important expenses related to restoring and recovery and also expenses related to the prevention of natural calamities.

Using Spearman correlation coefficient we have analysed the intensity of the correlation between the damages caused by natural disasters and the environment protection expenditure in Romania (see Table 4).

**Correlation between the damages caused by natural disasters and environment protection expenditure in Romania**

*Table 4*

	Years	Damage (million €) $Y_i$	Environment protection expenditure (mld. Lei) $X_i$	$r_{y_i}$	$r_{x_i}$	$d_i^2$
1	2008	471	16.5	3	3	0
2	2010	876	18.4	1	2	1
3	2012	807	20.8	2	1	1
4	2014	340	16.4	4	4	0

Created using data from: European Commission, EU Solidarity Fund Interventions since 2002, Last update: 10 July 2015 (by country), available at: [http://ec.europa.eu/regional\\_policy/sources/thefunds/doc/interventions\\_since\\_2002.pdf](http://ec.europa.eu/regional_policy/sources/thefunds/doc/interventions_since_2002.pdf)

National Institute of Statistics (2015) TEMPO-Online time series, Bucharest: INS.

Spearman correlation coefficient: for a sample of size  $n$ , the  $n$  raw scores  $X_i, Y_i$  are converted to ranks:  $r_{x_i}, r_{y_i}$ , and  $S_p$  is computed from (Ionciă et al. 2006, p. 19):

$$S_p = 1 - \frac{6 \cdot \sum d_i^2}{n(n^2 - 1)} \quad [2]$$

Where  $d_i = r_{x_i} - r_{y_i}$  is the difference between ranks.

$S_p$  damages- prevention expenses = 0.8

The value of 0.8 of the Spearman correlation coefficient indicates a powerful, straight connection between the damages caused by natural disasters and the environment protection expenditure in Romania. The result can be explained by the fact that the environment protection expenditure in Romania includes “investments and internal current expenditure for carrying out the activities of environment observation and protection and refer to environment damages prevention or repair” (National Institute of Statistics, 2014). Normally, as the value of damages resulted from natural disasters is larger, the environment protection expenditure augments.

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## CONCLUSIONS

In the world, from the middle of the last century till now, the economic loss generated by natural disasters has increased almost 8 times, from 53.6 billion USD (1950-59) to 420.6 billion USD in the last decade. The augmentation can be explained by a series of factors: population growth, increase in population and housing units in vulnerable areas, and more important a rise in climatic disasters. There is also a positive factor explaining the increase: more complete reporting due to improvements in information and communication technology.

In order to prevent and to cover the economic damages the Governments have access to various financial instruments: international funds, budget reallocation, domestic or external credit, donor assistance, tax increase, reserves or calamity funds, budget contingencies, insurance etc.

In Europe, after the major floods from the beginning of the century, the European Union Solidarity Fund was created. Since then 24 different European countries have received aid for an amount of over 3.784 billion € for the recovery after numerous natural catastrophes: floods, earthquakes, forest fires, droughts, storms and other.

The assessment of large-scale natural disasters in Europe is very important and in order to analyse if there is a concentration of large-scale natural disasters in EU we used the Gini coefficient regarding the damages and the aid granted. For the period 2002-july 2015 the results indicate a moderate concentration in both cases.

In this period, Romania was also affected by natural disasters and has received the assistance from the European Union Solidarity Fund. Between the damages caused by natural disasters and the environment protection expenditure in Romania there is a powerful, straight connection (confirmed by the value of the Spearman correlation coefficient).

The reconstruction after natural disasters is very difficult and the European Union Solidarity Fund is a vital element in the recovery after major calamities.

### Acknowledgments

This research was funded by the European Commission through the ENHANCE project: Enhancing Risk Management Partnerships for Catastrophic Natural Disasters in Europe (Grant Agreement number 308438).

The sole responsibility for the content of this document lies with the authors.

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The paper has been presented at the 9th International Conference on Applied Statistics, November 13, 2015, Bucharest, organized by Econometrics and Statistics Department of Bucharest Academy of Economic Studies in collaboration with the National Institute of Statistics and Romanian Society for Statistics.

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