SOUTH EAST EUROPE
Jointly for our common future

DMCSEE
Drought Management Centre for Southeastern Europe

Programme co-funded by the EUROPEAN UNION

4.2.3.
DROUGHT RISK ASSESSMENT BASED ON IMPACTS ARCHIVE

February 2012

AGRICULTURAL UNIVERSITY OF ATHENS

DELIVERABLE SUMMARY	
DELIVERABLE INFORMATION	
WP	WP4 - Drought risk assessment
Activity	4.2.3. Drought risk assessment based on impacts archive
Name of the output	Report in Drought risk assessment based on impacts archive
WP Leader	AUA
Activity-Leader	AUA
Participating partners:	AUA, EARS, OMSZ, ISSNP, DHMZ, UNSFA , RHMSS, HI-M, HMS, INEUM
Country	Greece
Location :	Athens
Authors:	[redacted]
E-mail:	[redacted]
Telephone number:	[redacted]

TableofContents

EXECUTIVE SUMMARY

The present draft document presents a short description of the summarized results produced by the application of Drought Vulnerability Index (DVI) that has been developed by Agricultural University of Athens, Greece in the context of DMCSEE Project.

The application refers to the illustration of the vulnerability conditions occurred on August of 2003 in theSoutheastern European (SEE) region.The application also includes the vulnerability description per participating country.

1. INTRODUCTION

The present draft document presents a short description of the summarized results produced by the application of Drought Vulnerability Index (DVI) that has been developed by Agricultural University of Athens, Greece in the context of DMCSEE Project.

The application refers to the illustration of the vulnerability conditions occurred on August of 2003 in the Southeastern European (SEE) region. The application also includes the vulnerability description per participating country.

The Drought Vulnerability Index application process is based on the methodology presented during the 5th DMCSEE Meeting and Training at Lasko, Slovenia, 28th/6 – 1st/7/2011.

2. DESCRIPTION OF APPLICATION PROCESS

Information and data for the following categories/indicators that consist the Index were asked by all partners:

1.cSPI-12 and cSPI-6: that category represents the non-agricultural (hydropower, households and tourism) and the agricultural (irrigation) use respectively.

2. Supply and Demand: that category describes the deficits in supplying capacity and in demand coverage. Their magnitude depends on the available amount of water. In cases where the supply capacity hardly covers the occurring demand (Supply = Demand), those two indicators receive the same scaled value. If the supply capacity is much higher than the occurring demands then the Demand scaled value is based on the deficit of the Supply capacity meaning that low deficits in a supply system with high capacity might not affect the demand coverage directly.

3. Impacts: that category describes the losses (in economic scale) that might have been caused due to the Supply – Demand deficiencies. Its magnitude depends on the difference between the latter indicators.

4. Infrastructure: that category describes the current infrastructure level of development regarding the level of deficiency. Newer or well-maintained infrastructure introduces lower vulnerability to drought.

The required data per indicator can either be obtained by the relative authorities (local or national) or be estimated by experts.

Then the data were classified in the following vulnerability scale (Table 1).

Table 1. DVI component scale

Vulneraility Level	SCALES											
	SPI			Supply		Demand		Impact		Infrastructure		
Less Vulnerable	0	Wet	≥ 1,50	0	No Deficits	0	No Deficits	0	None	0	Complete
Vulnerable	1	Quite Wet	0 to 1,49	1	15% Deficits	1	15% Deficits	1	15% Losses	1	15% Deficiency
Highly Vulnerable	2	Quite Dry	0 to -1,49	2	16-50% Deficits	2	16-50% Deficits	2	16-50% Losses	2	16-50% Deficiency
Extremely Vulnerable	3	Dry	≤ -1,50	3	>50% Serious Deficits	3	>50% Serious Deficits	3	>50% Losses	3	>50% Deficiency

Continuing:

1. The SPI 6 and 12 are calculated on a country scale (for every available meteorological station with the required data) and are spatially visualized using Kriging (Hole effects) in an ArcGIS environment for the Index's value to be known for every single part of the country. Based on the produced map, the DVI (on a later step) can be calculated for any

desired area even when climatic data (for the SPI calculation) do not exist (as long as data on the remaining indicators are available).

2. Based on the previous step several other areas can be included in the process for a more suited visual calibration of the index to be produced. Areas with zero drought vulnerability – such as mountain peaks – can be included towards that cause and are preferred.

3. Data on water demand, supply, relative infrastructure and impacts are gathered for all the included areas (not including mountain peaks) from the appropriate local and national authorities and agencies. The indicator values are turned into their scaled values.

4. The DVI value per selected area and month is calculated according to Equation 1. Continuing, those values are classified into vulnerability classes as follows (Table 2). Finally, the DVI is visualized using Inverse Distance Weighting in GIS and the results for both the Index performance and drought vulnerability in national level are deducted.

$$DVI = \sum_{i=1}^{6} \frac{Components' \, Scaled Value}{6} \qquad (1)$$

That equation implies that all the components are equally weighted.

Table 2. DVIscaled values

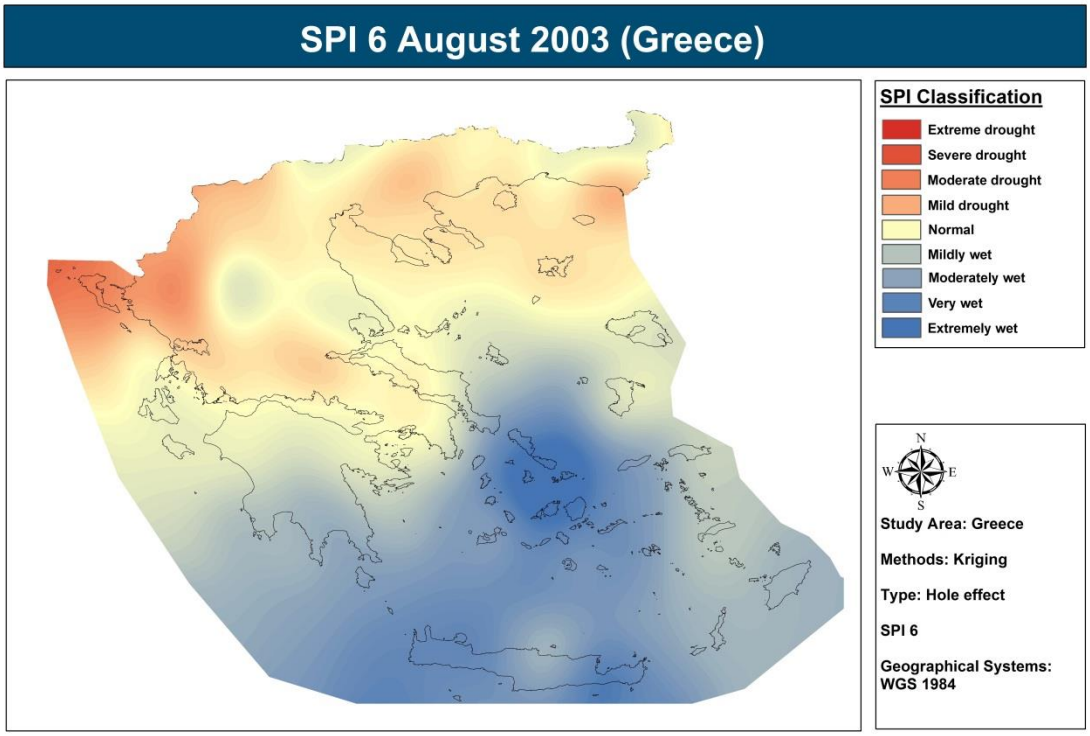
SDVI	Vulnerability scale	Signal
0.00 - 0.49	No or least vulnerability	
0.50 - 0.99	Low vulnerability	
1.00 - 1.49	Medium Vulnerability	
1.50 - 1.99	High Vulnerability	
2.00 - 2.49	Very high Vulnerability	
2.50 - 3.00	Extreme Vulnerability	

It has to be stated that by applying the full (0 – 3) classification scale instead of developing a new one occurring from the produced results, the absolute vulnerability of an area is measured instead of the relative one.

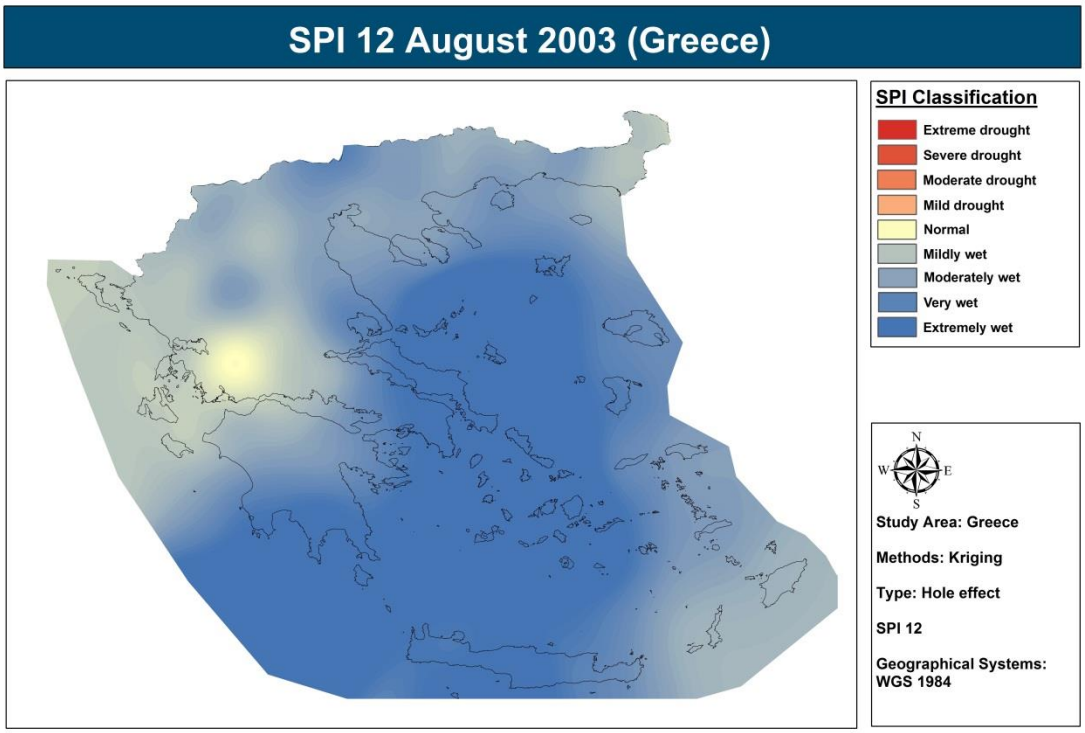
3. DESCRIPTION PER COUNTRY

3.1. GREECE

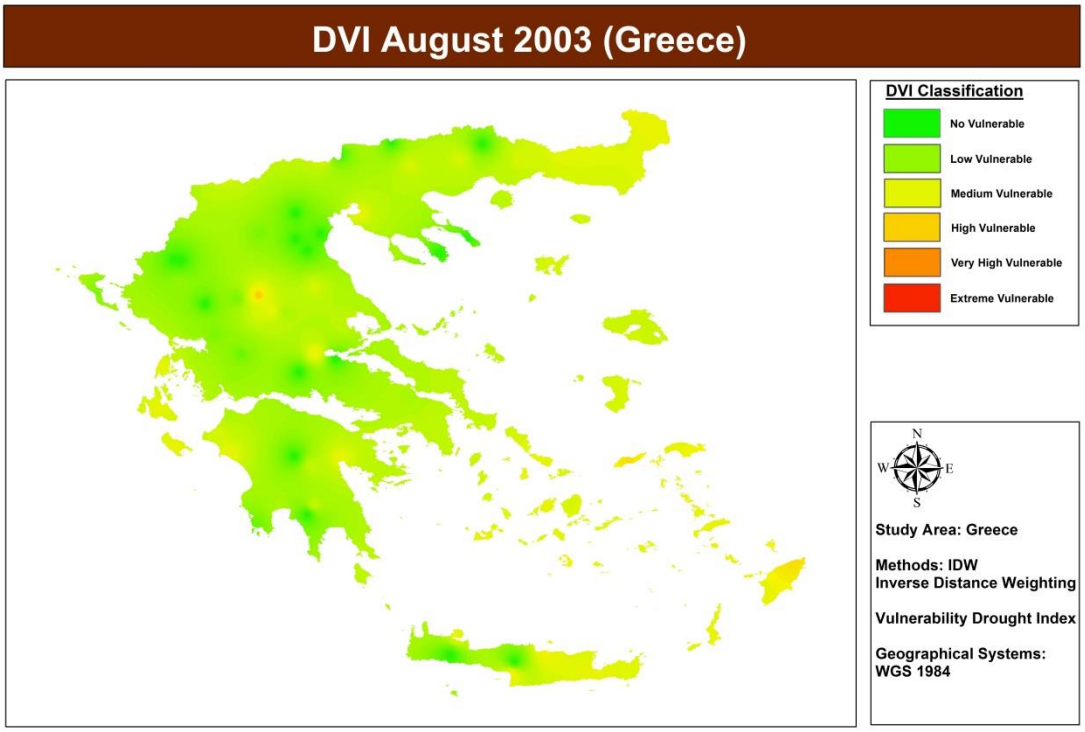
The SPI 6 and 12 as well as the vulnerability status of Greece for the August of 2003 are presented in the following maps (1-3). According to those maps, Greece presents low/medium vulnerability. That is mainly affected by SPI 6 factor that presents dry conditions on the northern and central areas of the country increase the country's vulnerability as well as – up to a degree – to the deficits in supply capacity and consequently to the failure of demand coverage.The SPI 12 element that presents no drought conditions during the period of interest is a buffering factor that reduces the vulnerability of the country.



Map 1.SPI 6 August 2003 (Greece)



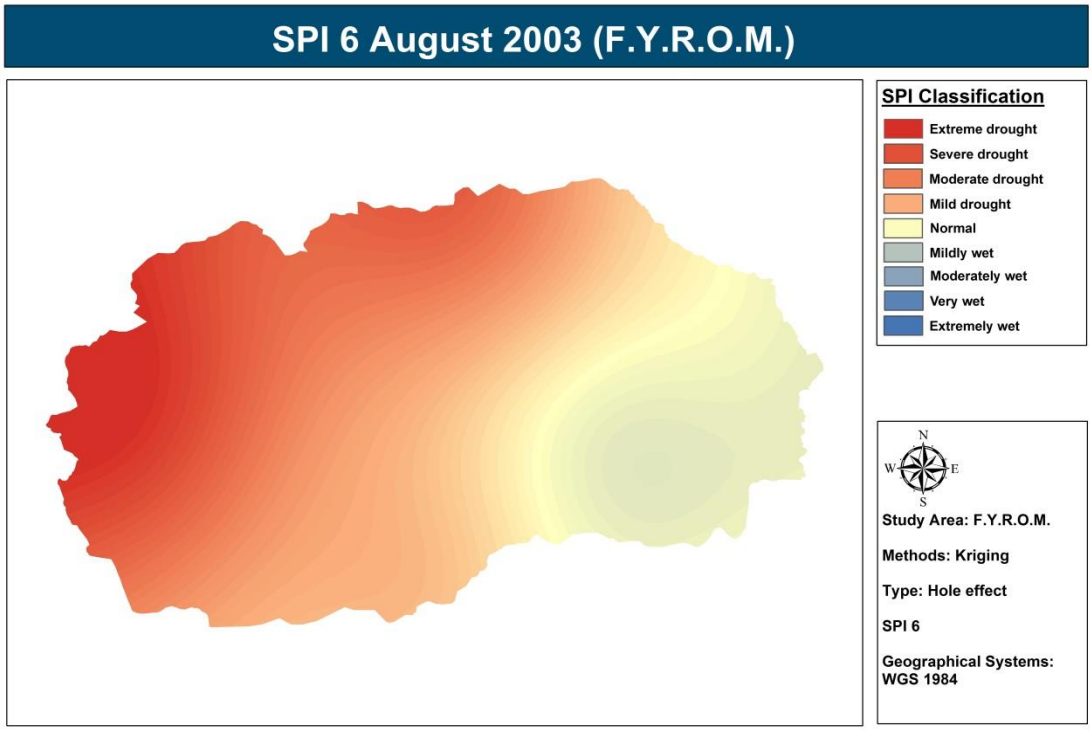
Map 2.SPI12 August 2003 (Greece)



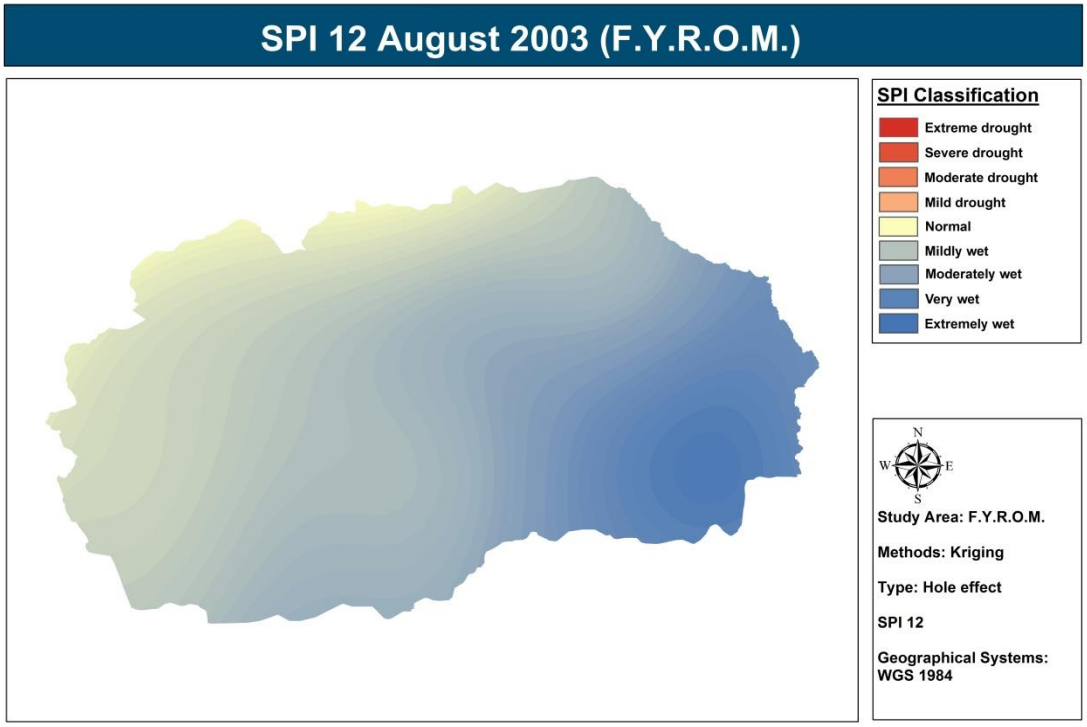
Map 3.DVI August 2003 (Greece)

3.2. F.Y.R.O.M

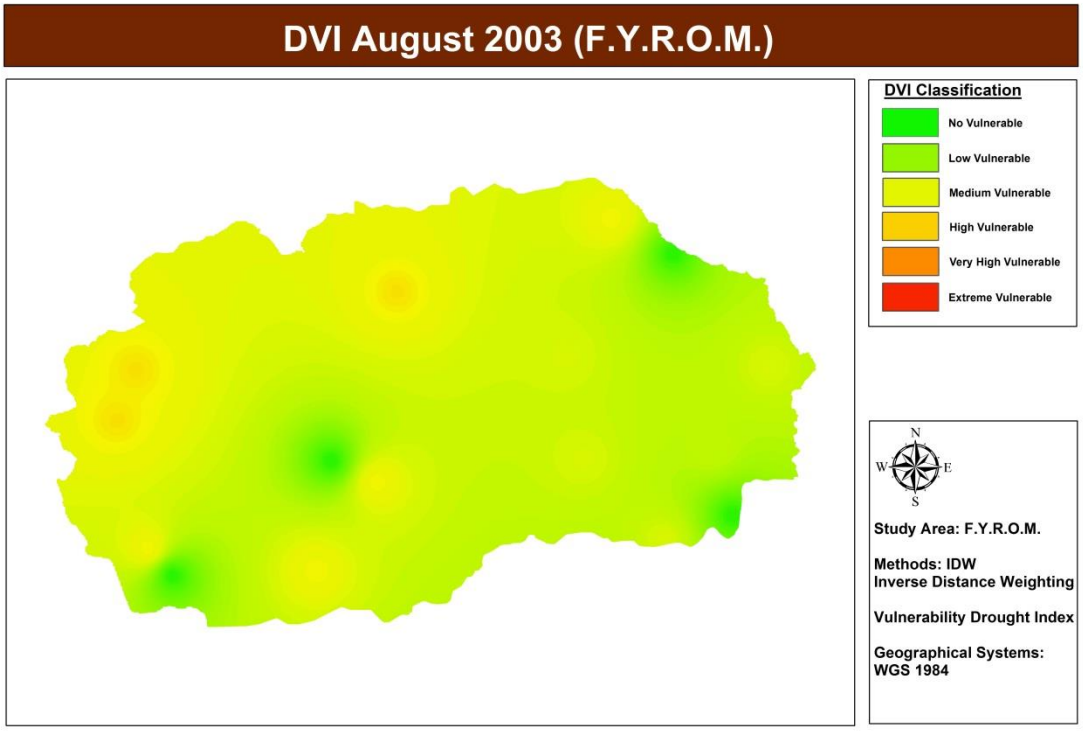
The SPI 6 and 12 as well as the vulnerability status of F.Y.R.O.M for the August of 2003 are presented in the following maps (4 – 6). According to those maps, F.Y.R.O.M presents medium vulnerability that is mainly affected the SPI 6 value – that presents severe drought in national level – and the deficits in supply capacity. The SPI 12 element that presents wet conditions during the period of interest is a buffering factor the reduces the vulnerability of the country.



Map 4.SPI 6 August 2003 (F.Y.R.O.M.)



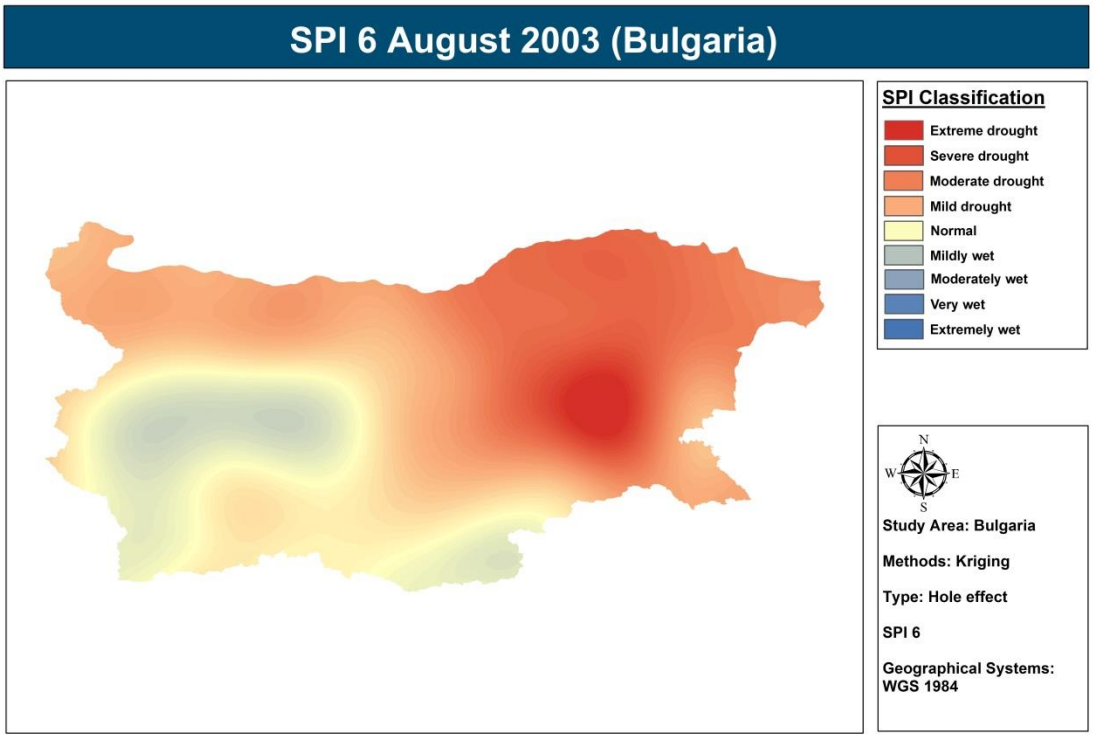
Map 5.SPI12 August 2003 (F.Y.R.O.M.)



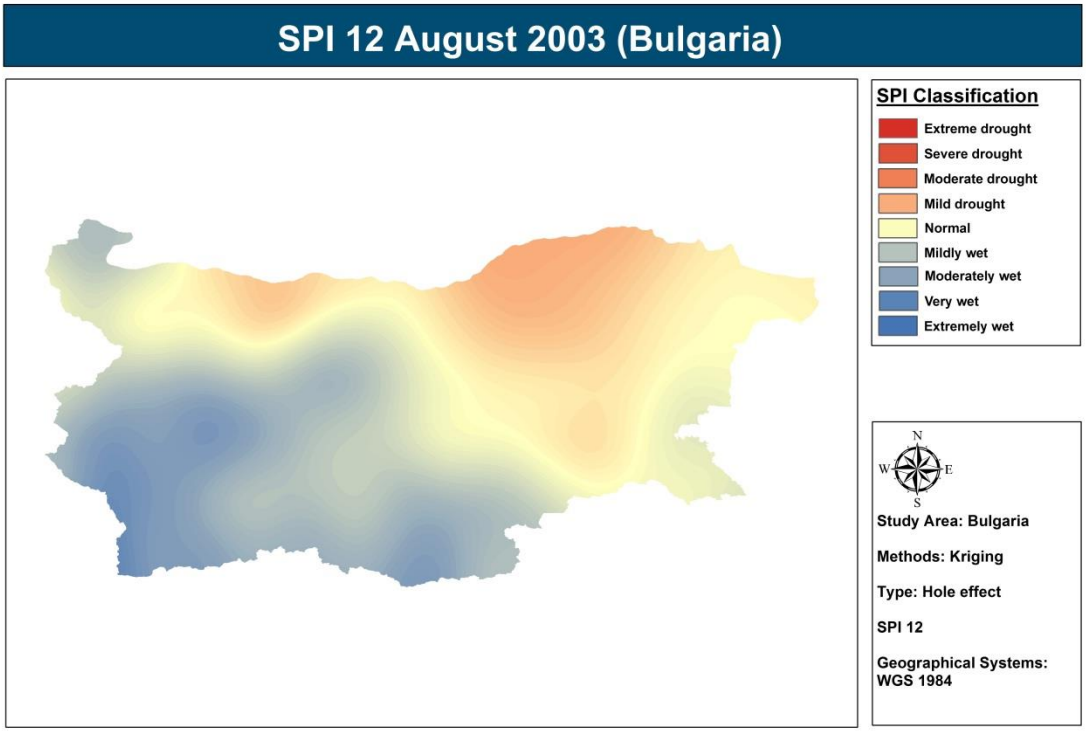
Map 6.DVI August 2003 (F.Y.R.O.M.)

3.3. BULGARIA

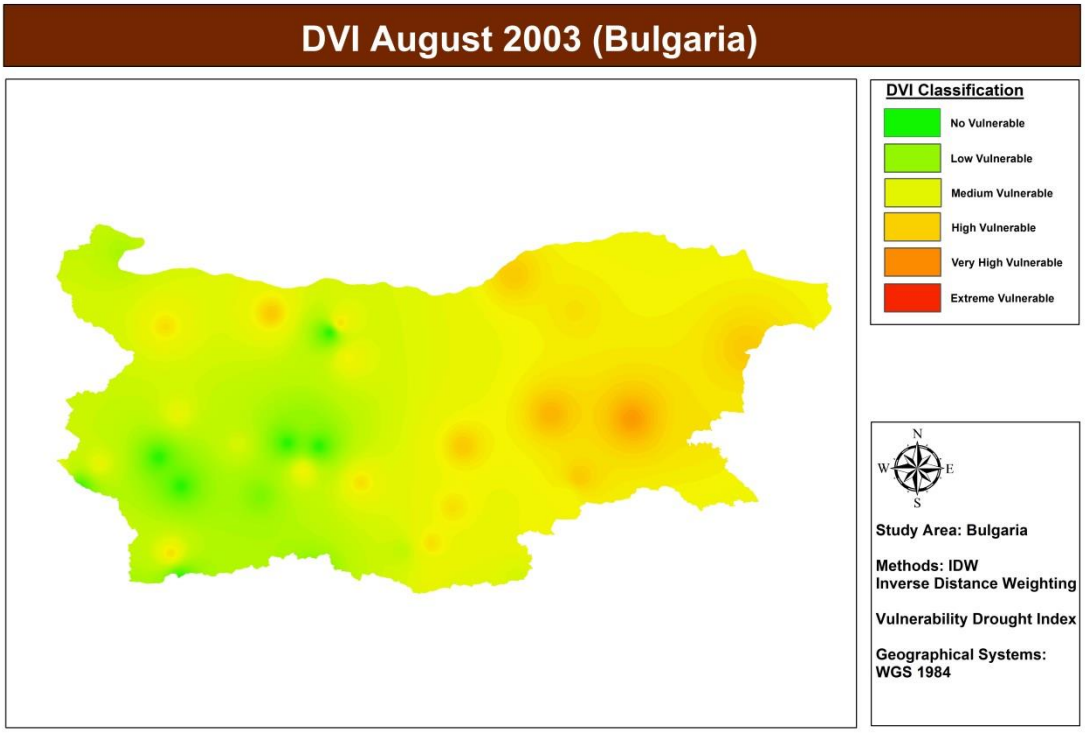
The SPI 6 and 12 as well as the vulnerability status of Bulgaria for the August of 2003 are presented in the following maps (7 - 9). According to those maps, Bulgaria presents medium/high vulnerability especially in the eastern part of the country. The score is mainly affected by the SPI values and not due to water deficits or infrastructure inefficiency. The SPI 6 and 12 maps present extreme and mild drought conditions respectively. The southwestern part of the country presents low vulnerability.



Map 7.SPI 6 August 2003 (Bulgaria)



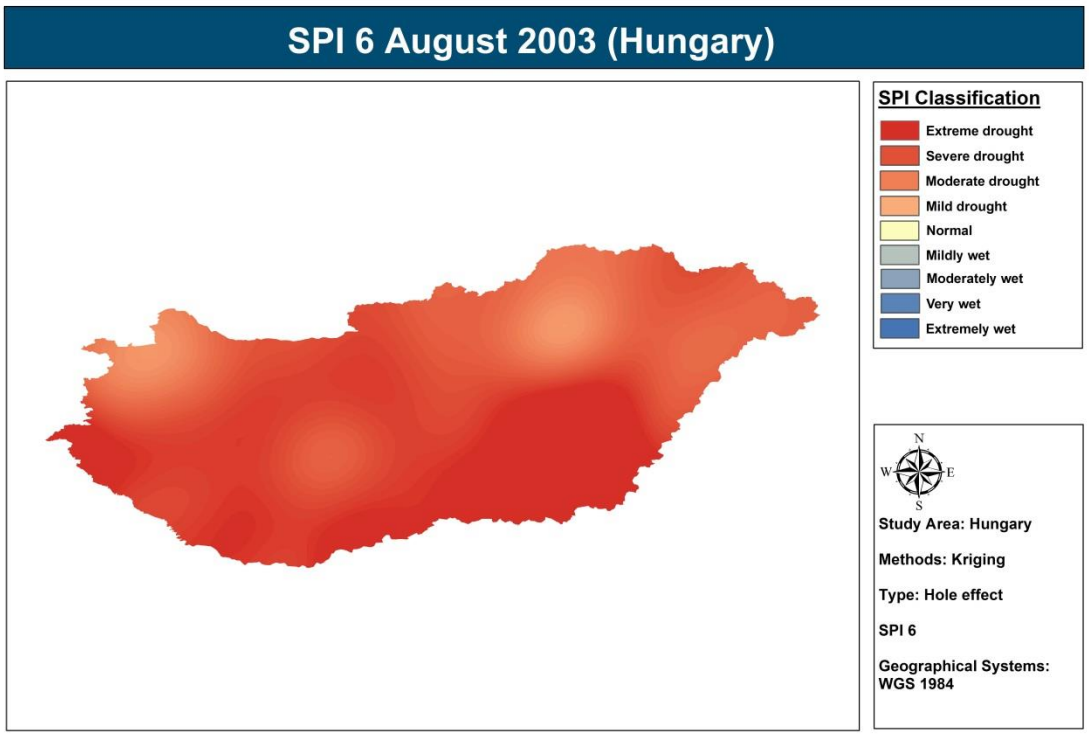
Map 8.SPI12 August 2003 (Bulgaria)



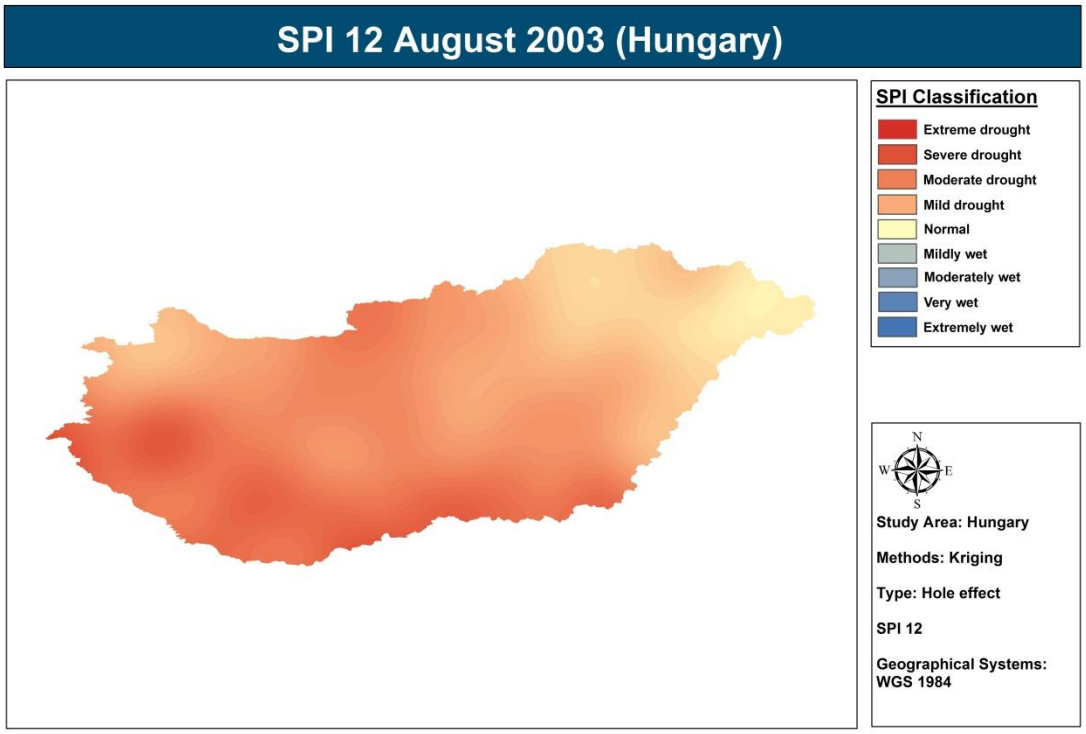
Map 9.DVI August 2003 (Bulgaria)

3.4. HUNGARY

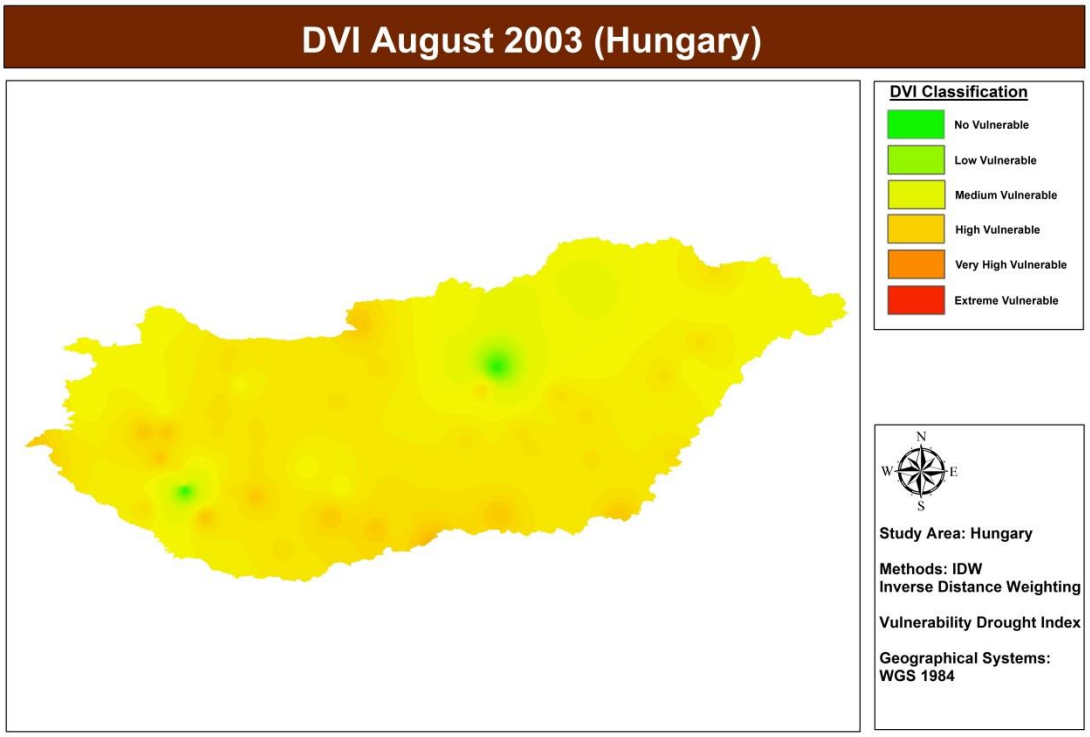
The SPI 6 and 12 as well as the vulnerability status of Hungary for the August of 2003 are presented in the following maps (10 - 12). According to those maps, Hungary presents high vulnerability that is mainly affected by both the SPI values that present severe and moderate drought conditions in national level. The deficits in supply capacity and infrastructure deficits present lower vulnerability but not too low in order to act as a buffering factor and reduce the average vulnerability of the country.



Map 10.SPI 6 August 2003 (Hungary)



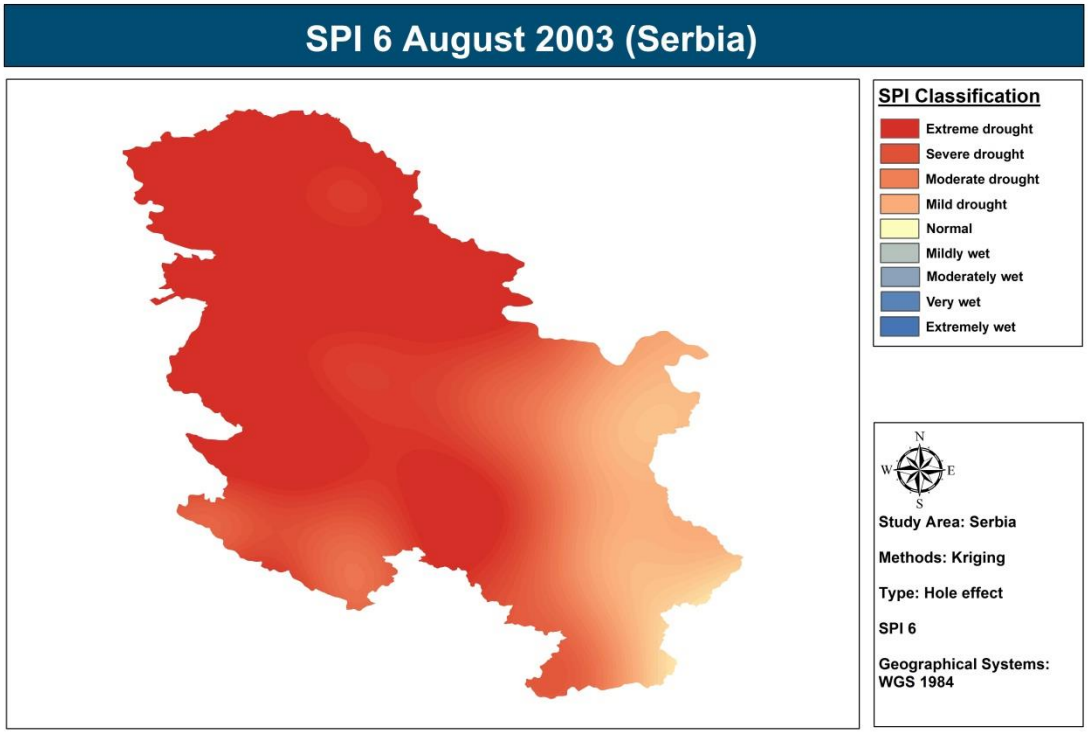
Map 11.SPI12 August 2003 (Hungary)



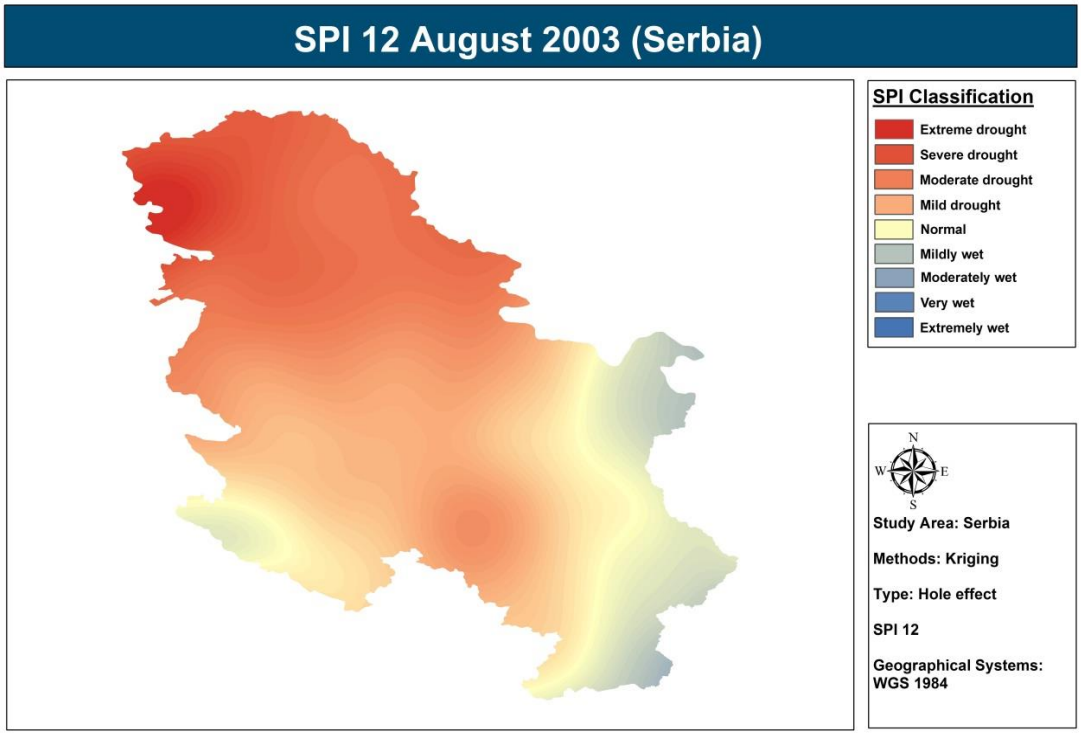
Map 12.DVI August 2003 (Hungary)

3.5. SERBIA

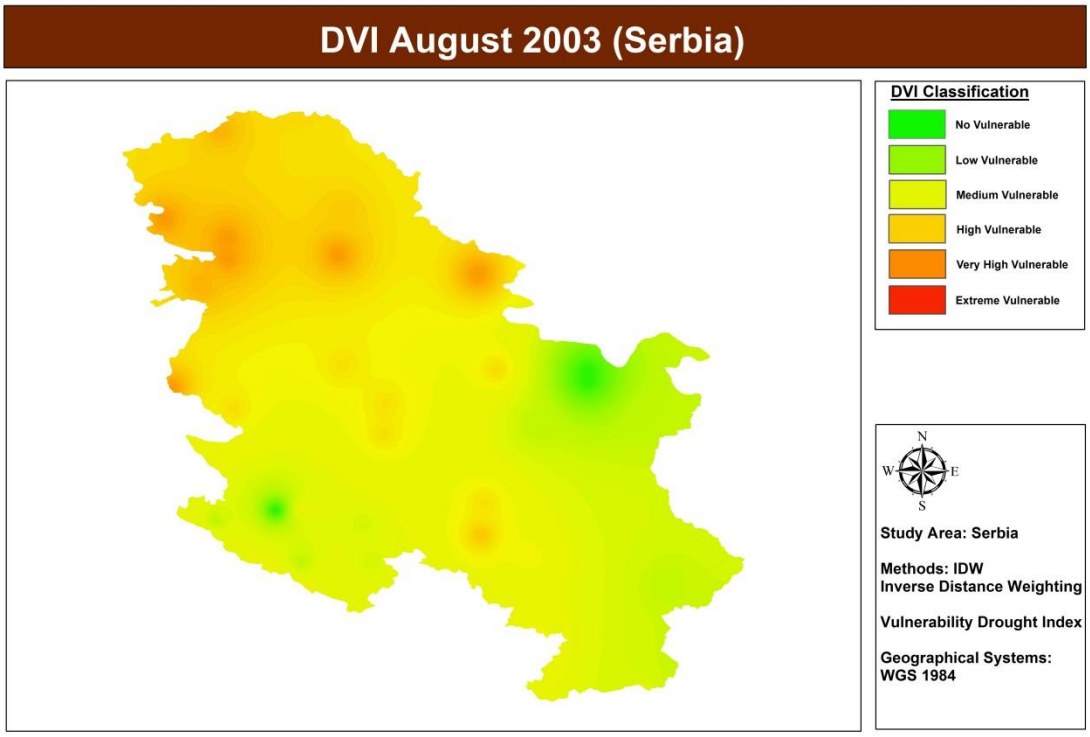
The SPI 6 and 12 as well as the vulnerability status of Serbia for the August of 2003 are presented in the following maps (13 - 15). According to those maps, Serbia presents medium/high vulnerability that, like Hungary, is mainly affected by both the SPI values that present severe and moderate drought conditions in national level. The deficits in supply capacity and infrastructure deficits present lower vulnerability but not too low in order to act as a buffering factor and reduce the average vulnerability of the country.



Map 13.SPI 6 August 2003 (Serbia)



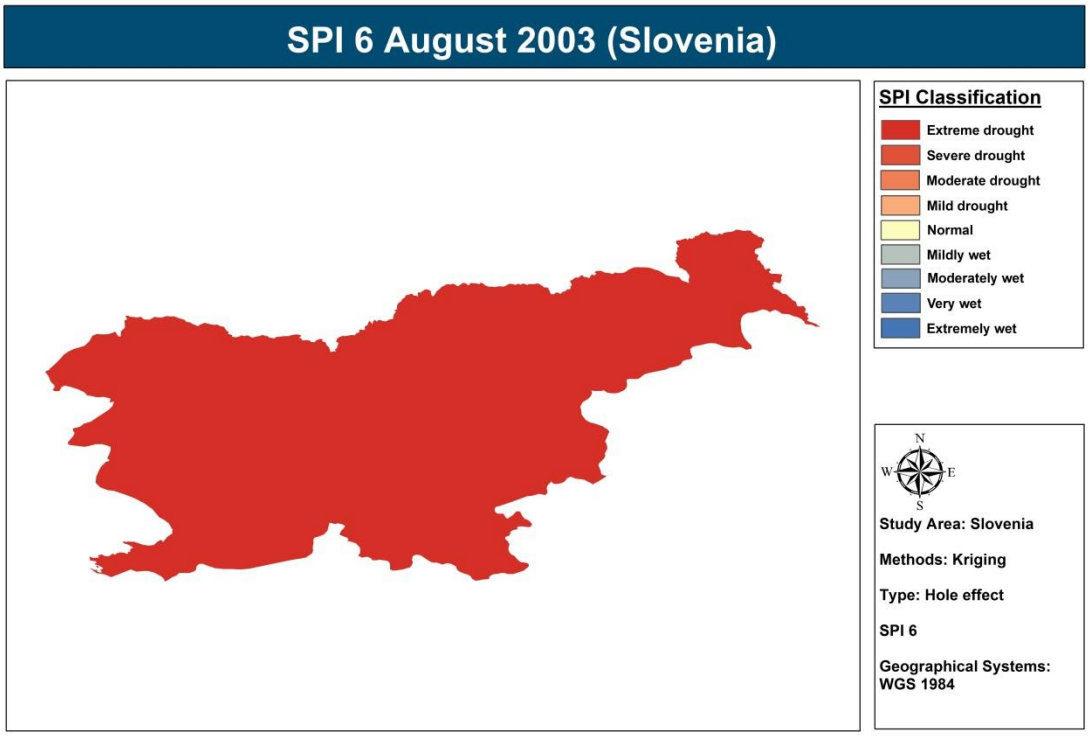
Map 14.SPI12 August 2003 (Serbia)



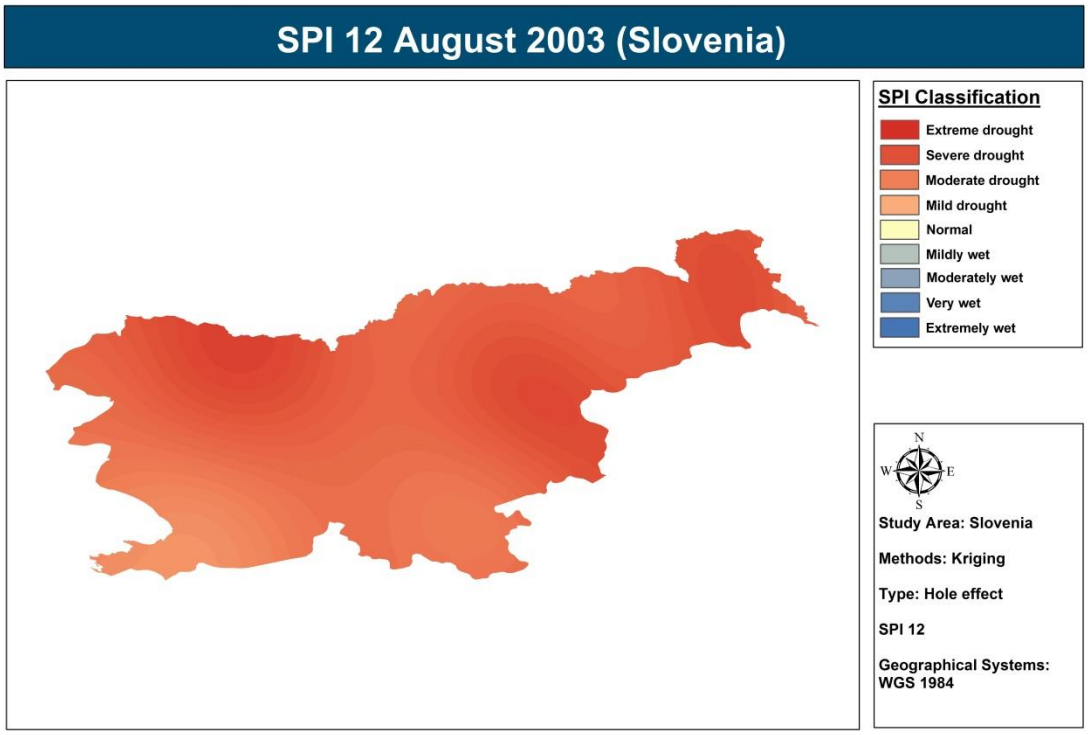
Map 15.DVI August 2003 (Serbia)

3.6. SLOVENIA

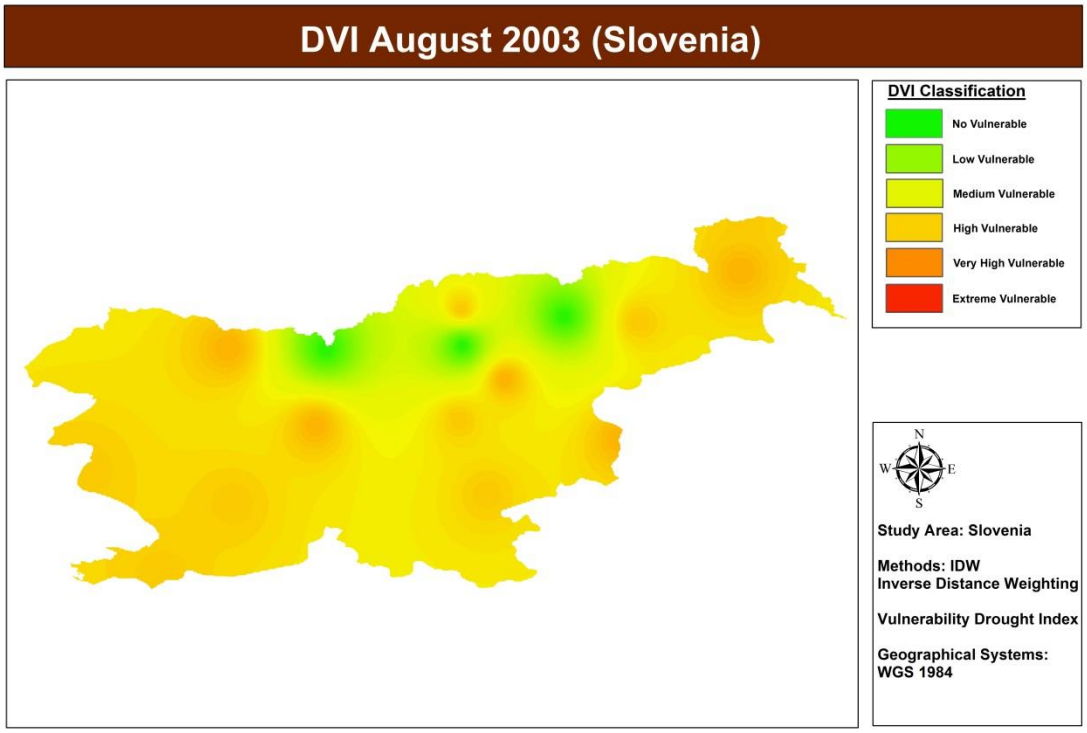
The SPI 6 and 12 as well as the vulnerability status of Slovenia for the August of 2003 are presented in the following maps (16 - 18). According to those maps, Slovenia presents medium/high vulnerability that, like Hungary and Serbia, is mainly affected by both the SPI values that present severe and moderate drought conditions in national level. The deficits in supply capacity and infrastructure deficits do not play significant role in the average vulnerability of the country.



Map 16.SPI 6 August 2003 (Slovenia)



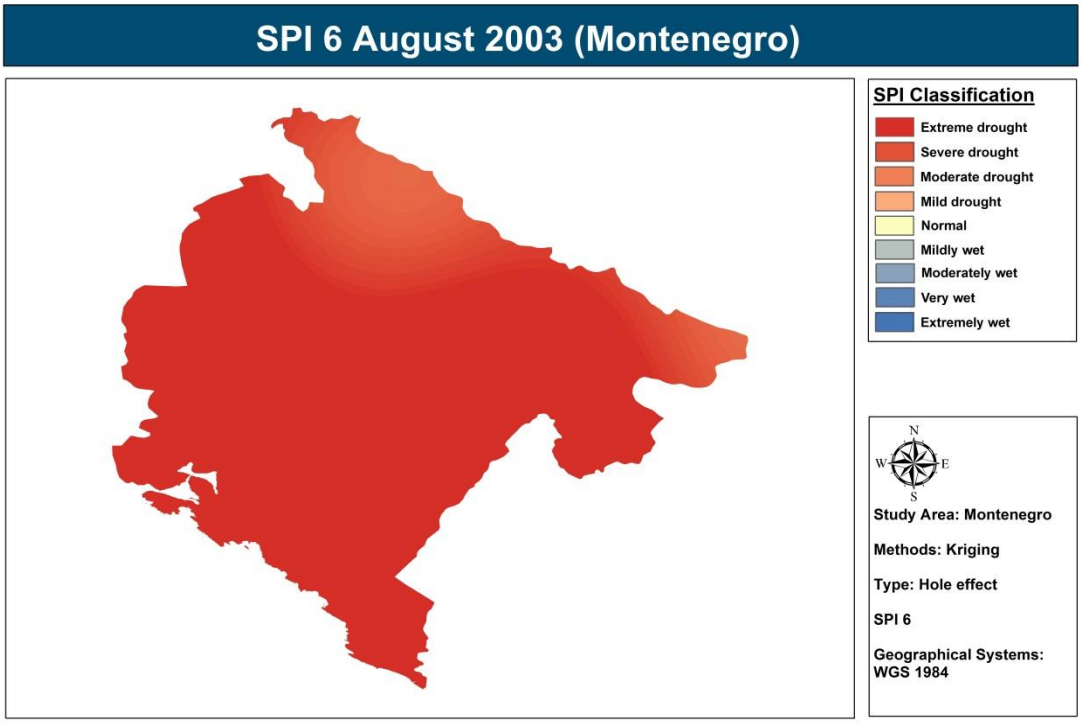
Map 17.SPI12 August 2003 (Slovenia)



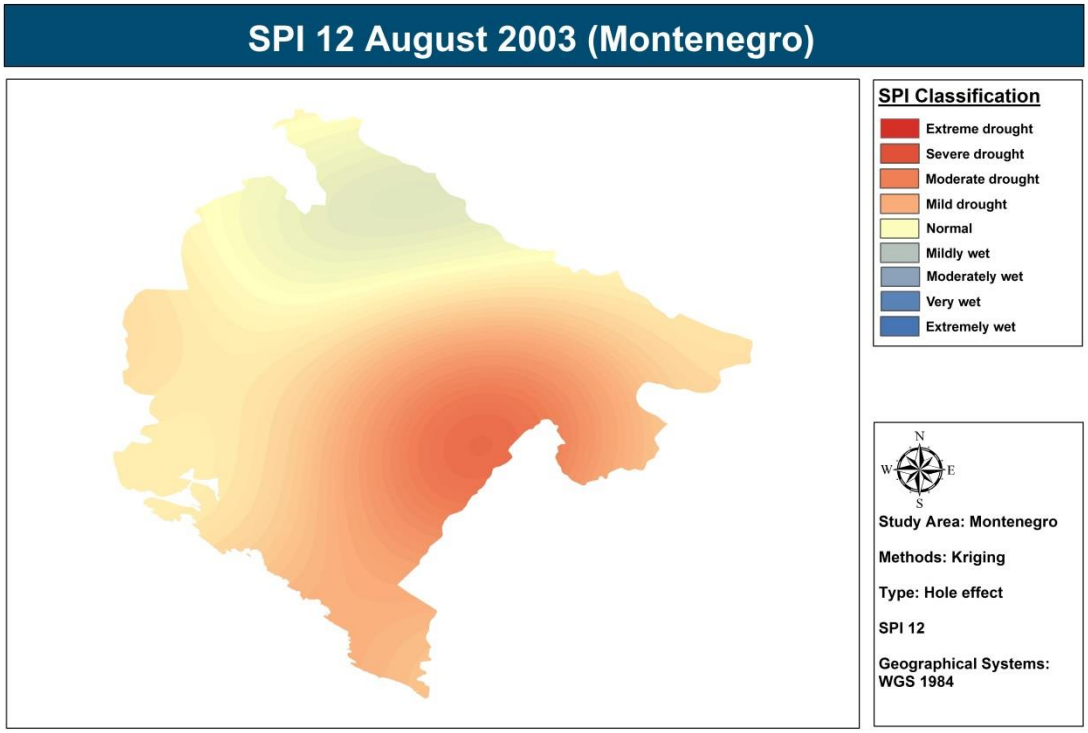
Map 18.DVI August 2003 (Slovenia)

3.7. MONTENEGRO

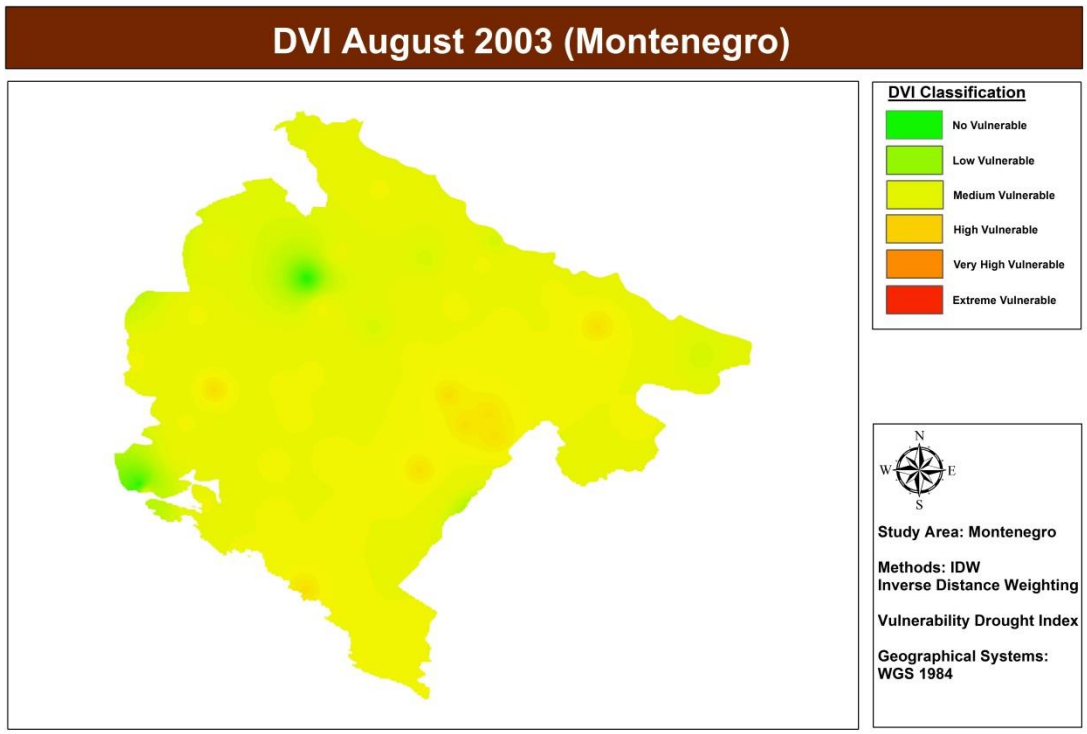
The SPI 6 and 12 as well as the vulnerability status of Montenegro for the August of 2003 are presented in the following maps (19 - 21). According to those maps, Montenegro presents medium vulnerability that is mainly affectedthe SPI 6 factor that presents dry conditions on the northern and central areas of the country increase the country's vulnerability. The SPI 12 that presents moderate drought conditions increases the country's vulnerability as well.The remaining factors – even though lower – do not succeed in reducing the average vulnerability.



Map 19.SPI 6 August 2003 (Montenegro)



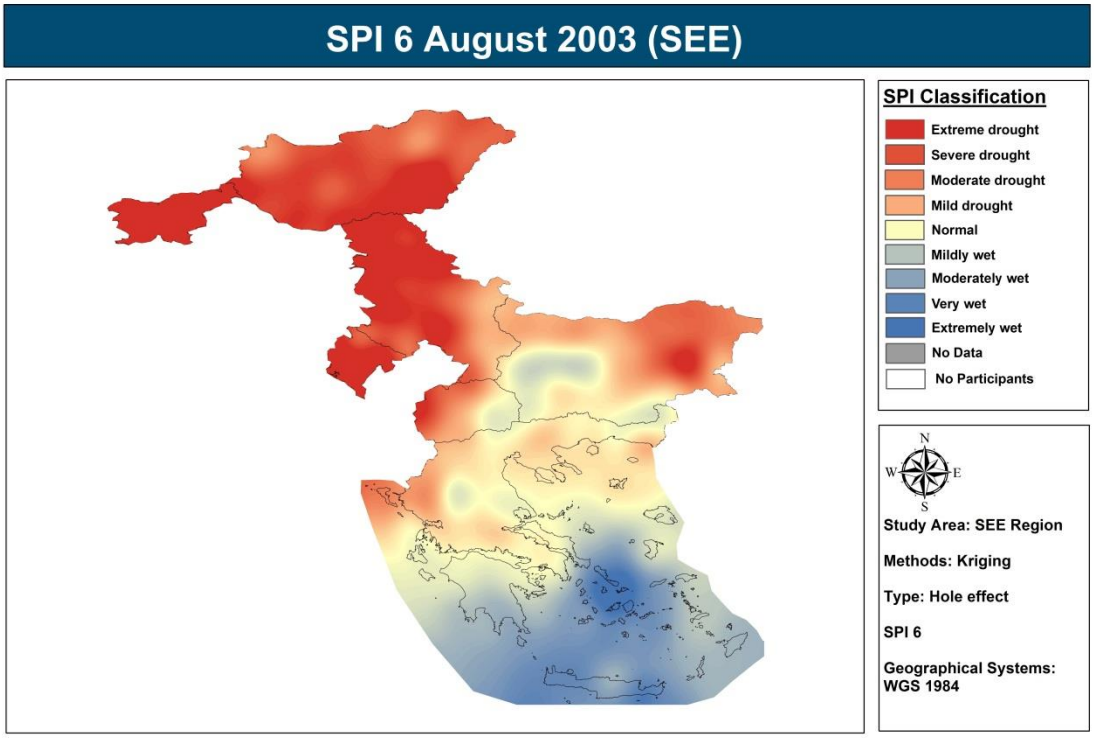
Map 20.SPI12 August 2003 (Montenegro)



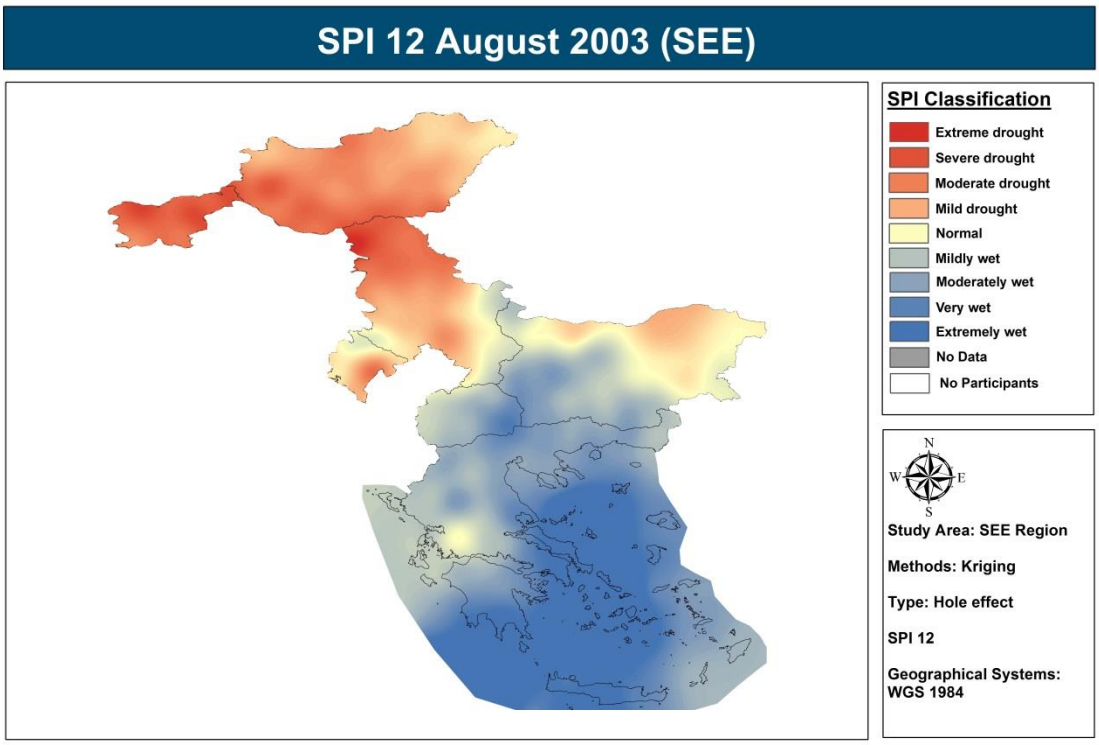
Map 21.DVI August 2003 (Montenegro)

4. TOTAL RESULTS – SEE REGION - CONCLUSIONS

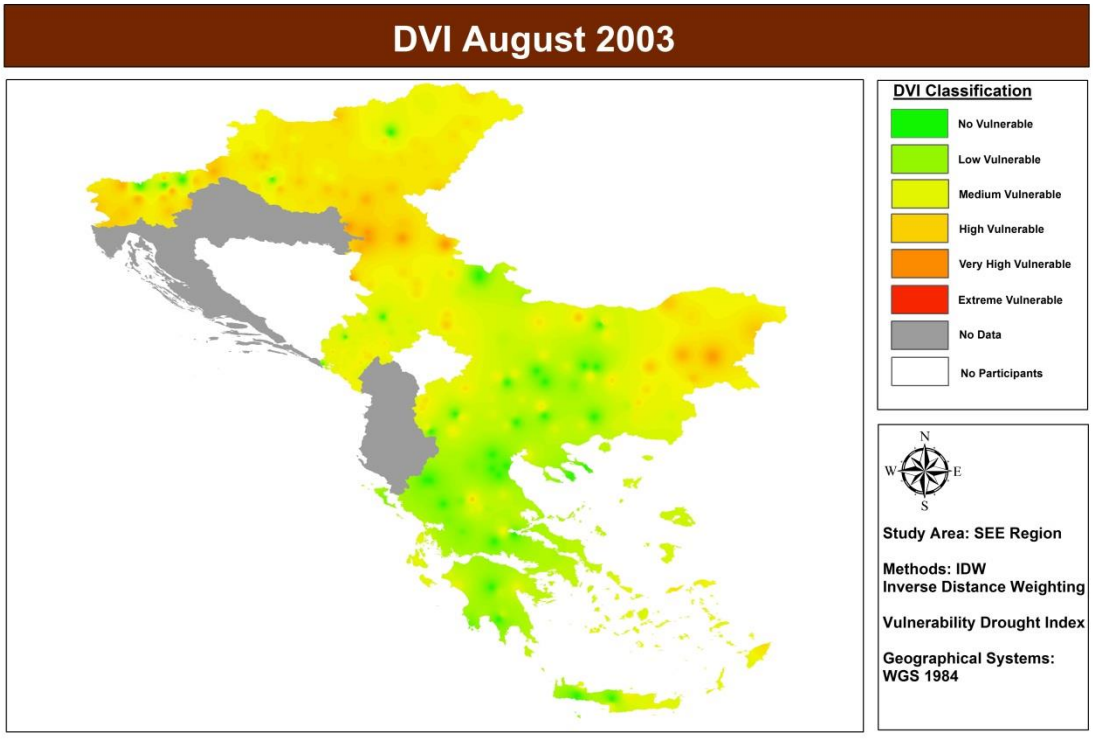
The SPI 6 and 12 as well as the vulnerability status (based on the previously described results) of the whole SEE region (Albania and Croatia are not included) for the August of 2003 are presented in the following maps (22 - 24). According to those maps, the area'svulnerability increases from the south (Greece) to the north with Serbia and Slovenia to present the highest vulnerability degree. The SPI values support those results since the drought conditions follow the same pattern.



Map 22.SPI 6 August 2003 (SEE)



Map 23.SPI12 August 2003 (SEE)



Map 24.DVI August 2003 (SEE)