Flood impact assessment on the development of Archaia Olympia riparian area in Greece

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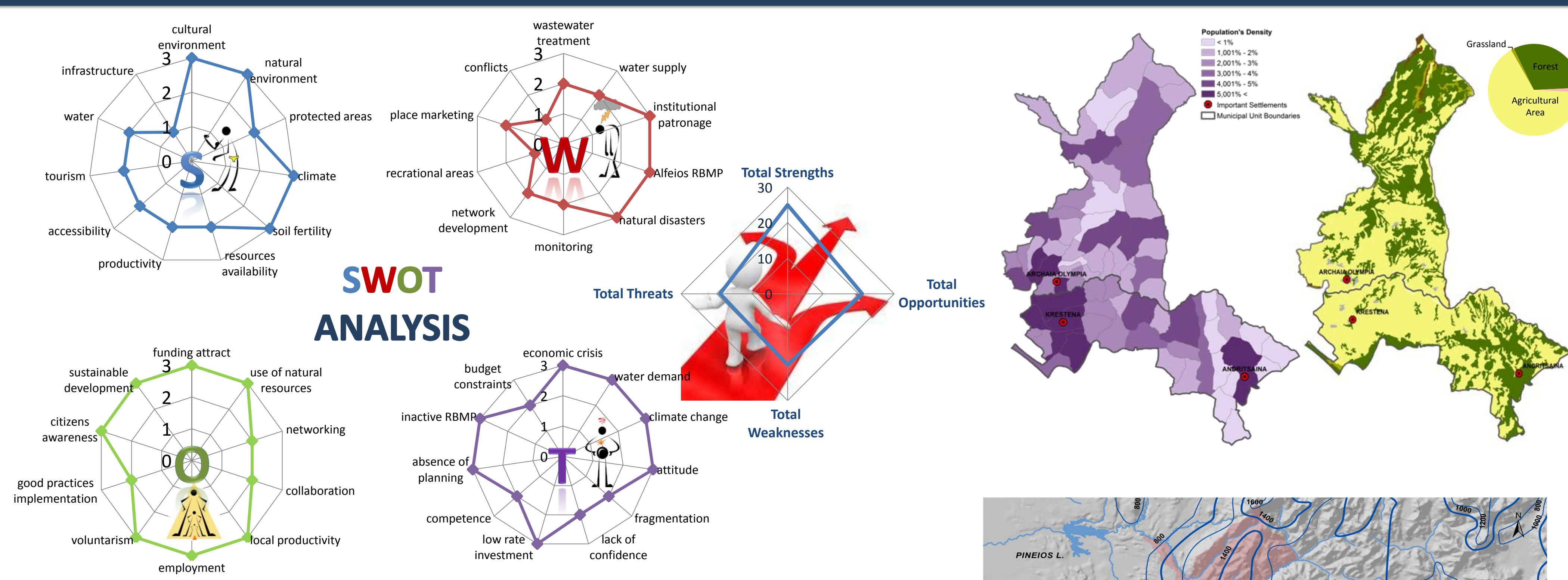yannopp@upatras.gr

DANGER! FLOOD ZONE

OVERVIEW

The riparian area of Archaia Olympia has outstanding cultural significance since it is the birthplace of the Olympic Games and athletic ideals. It is, also, characterized by a natural environment of great importance due to the fact that Alfeios River runs through it. Frequent flood events in the area have provoked many damages (i.e. ancient city of Olympia destruction by a massive layer of flood deposits) and, since nowadays, have led to severe economic and social impacts and high-cost flood protection works.

The importance of flooding in the studying area is demonstrated by flood protection works identified in the region since 1500 BC [1]. Pausanias scripts refer to flood contribution to high agricultural productivity in the area.
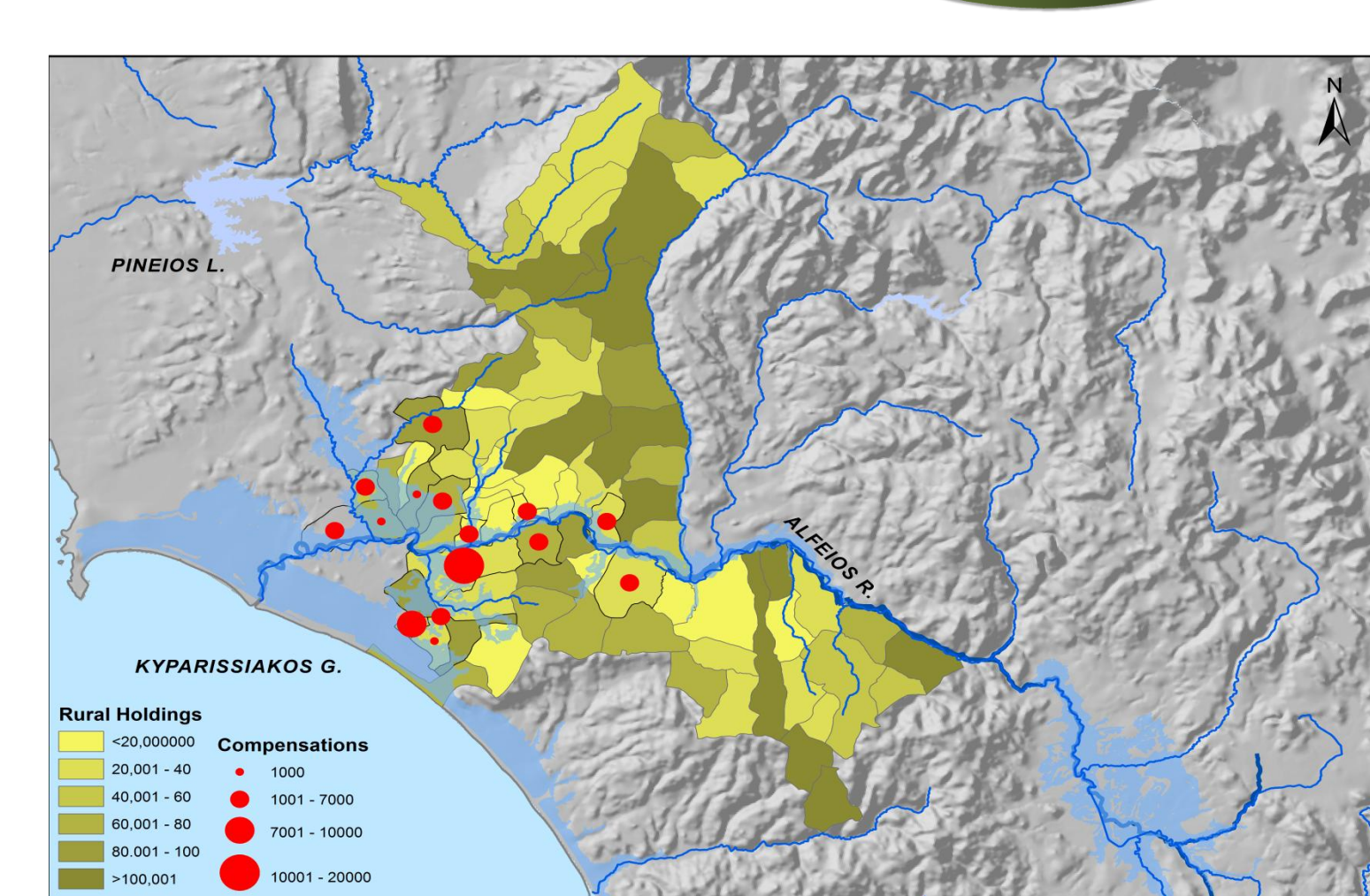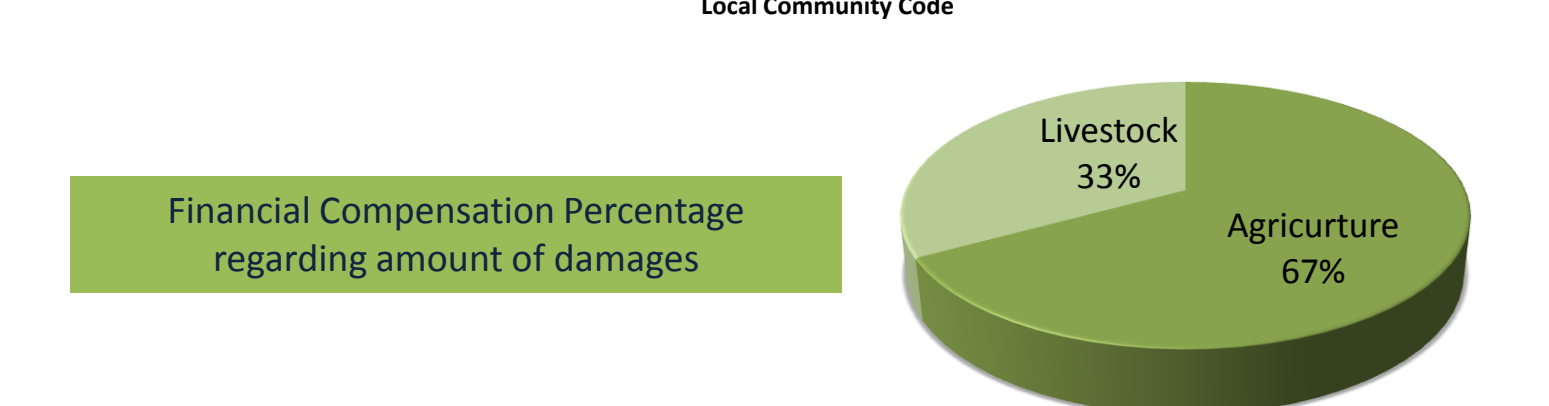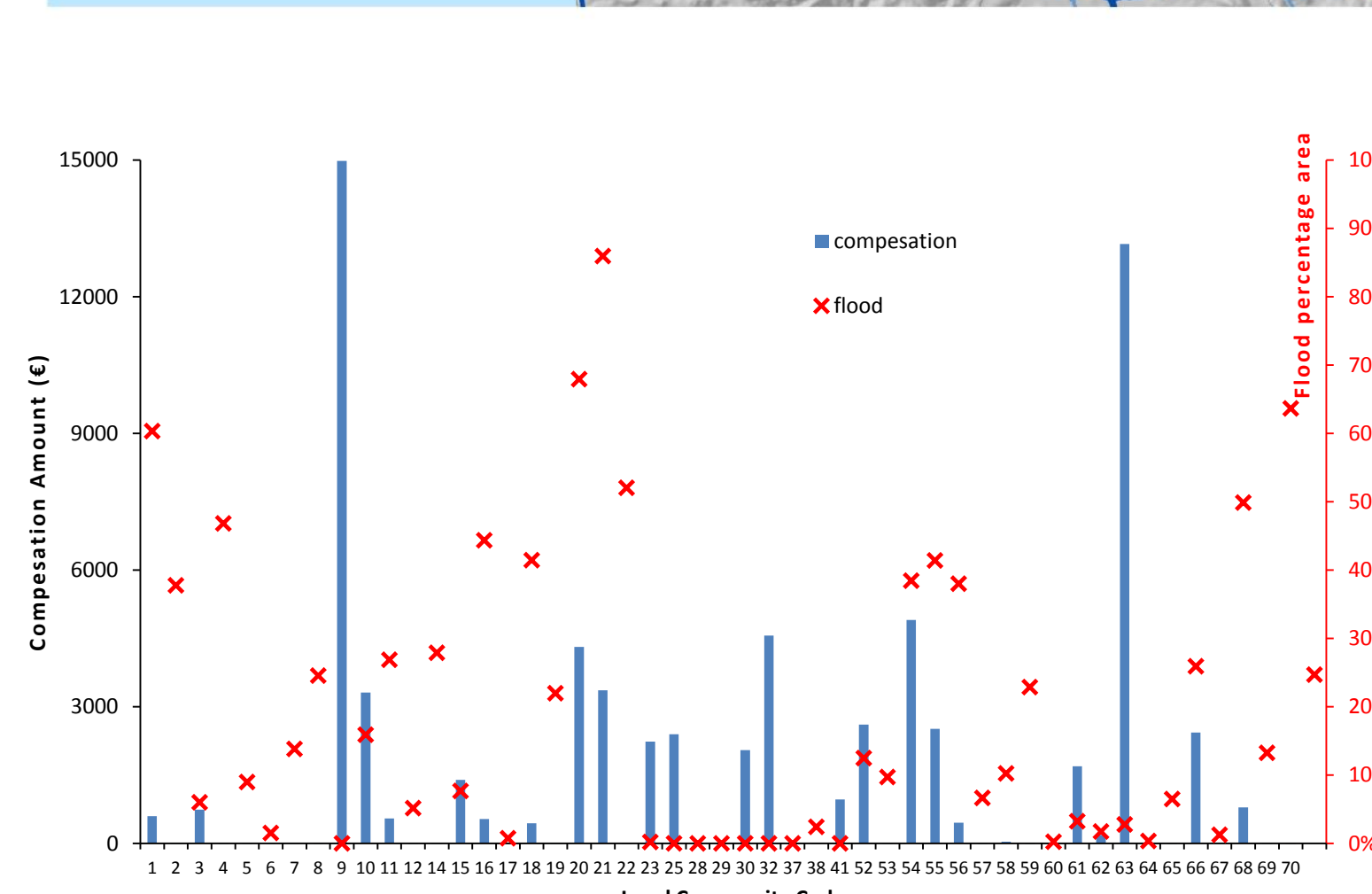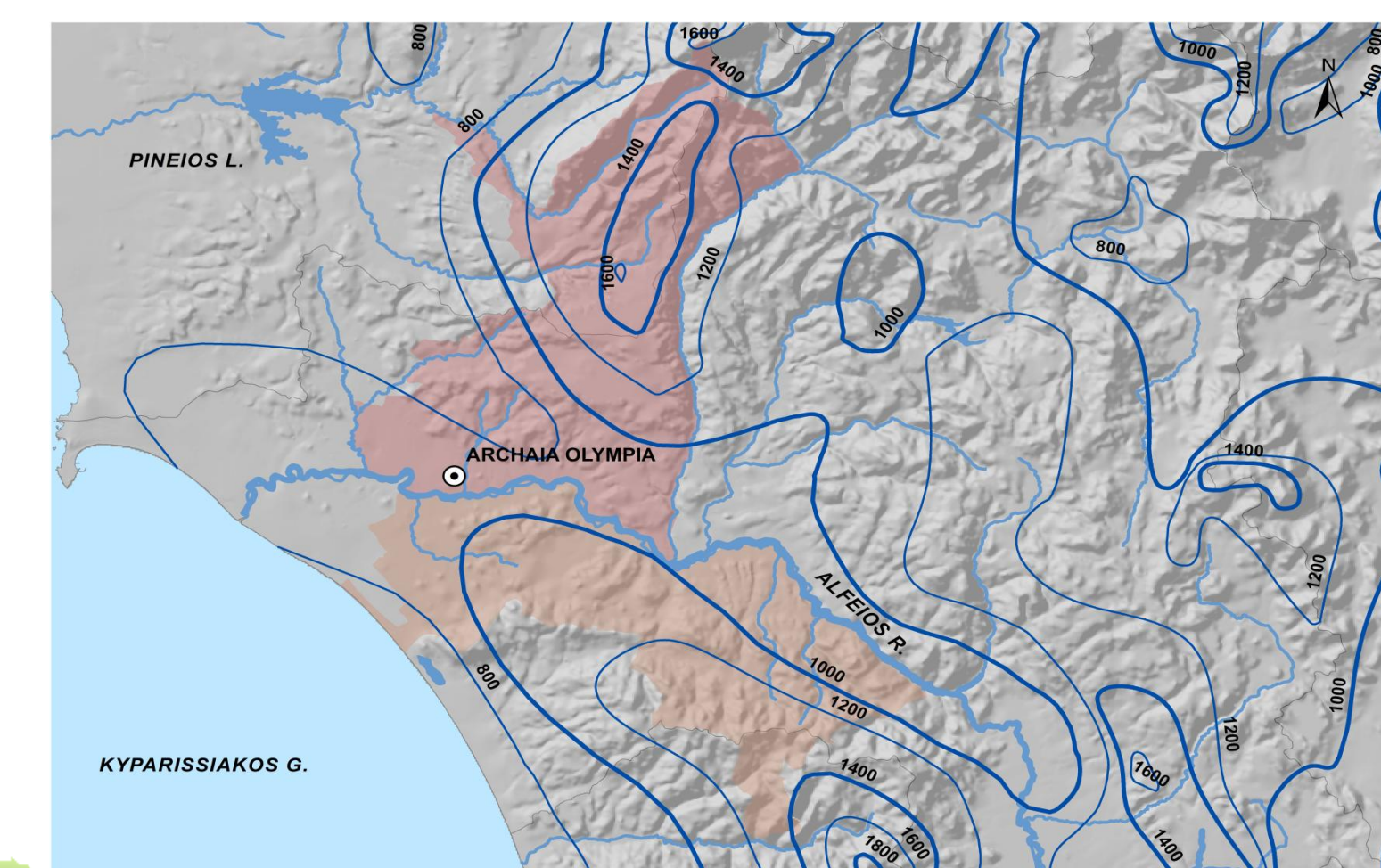
Recognizing the significance of the region for the developing economy and environmental sustainability, strategic management plans and flood control policies must be drawn up.

The main objective of this study is to identify the vulnerable local communities where the economic and social flood impacts are important. SWOT analysis, Factor analysis and Spatial analysis methods are proposed as policy tools, which contribute to decision–making processes. Understanding the adverse effects of flooding on development activities such as farming, tourism could assist in recognizing communities that need proper indemnifications and policy measures.
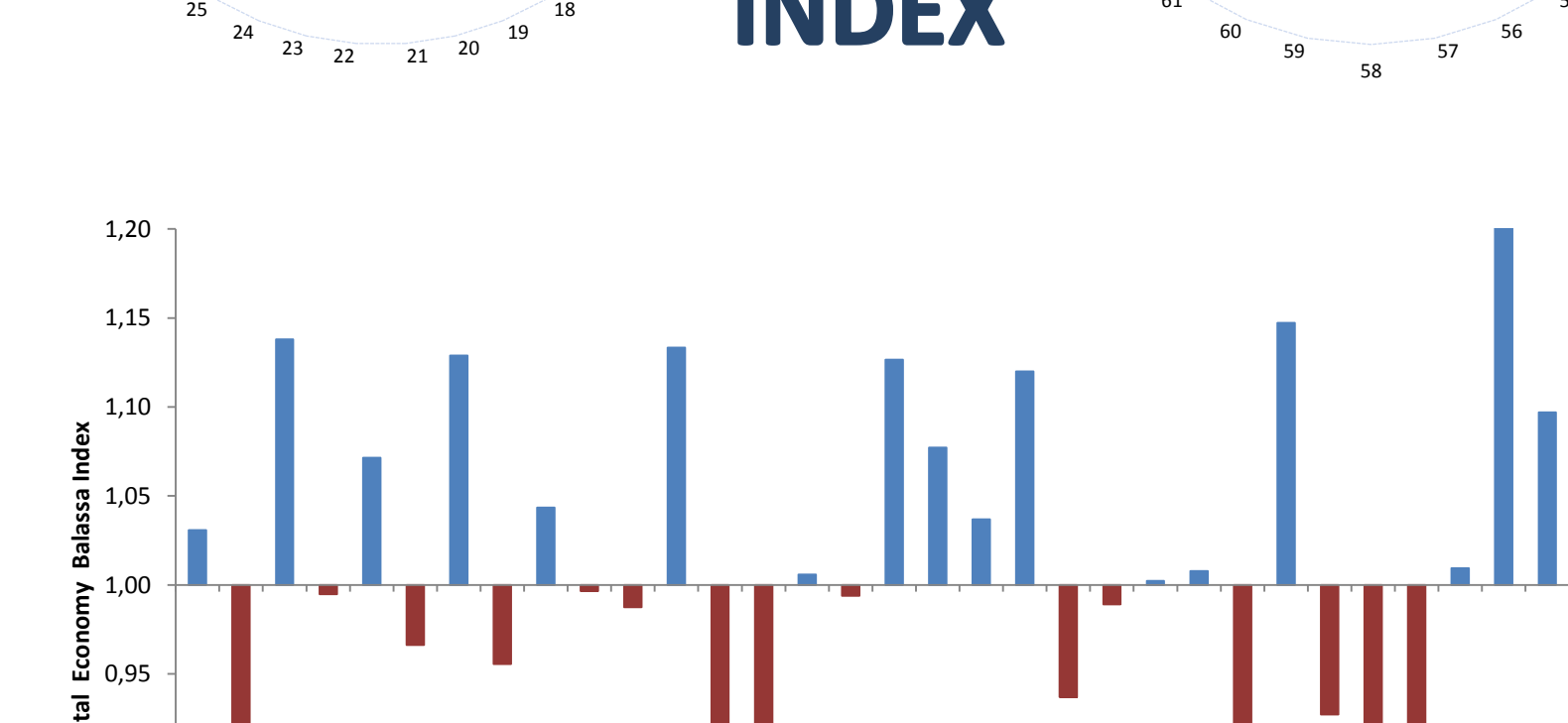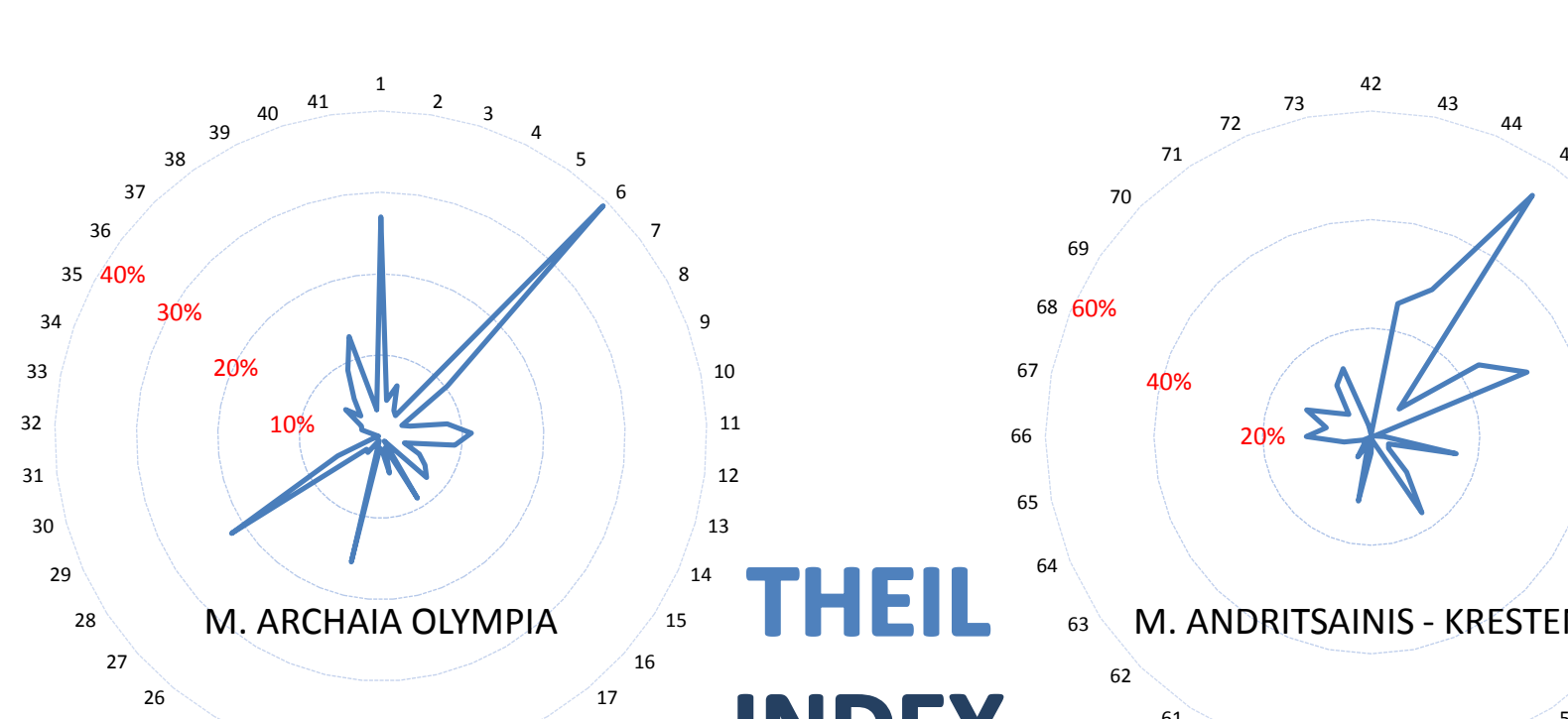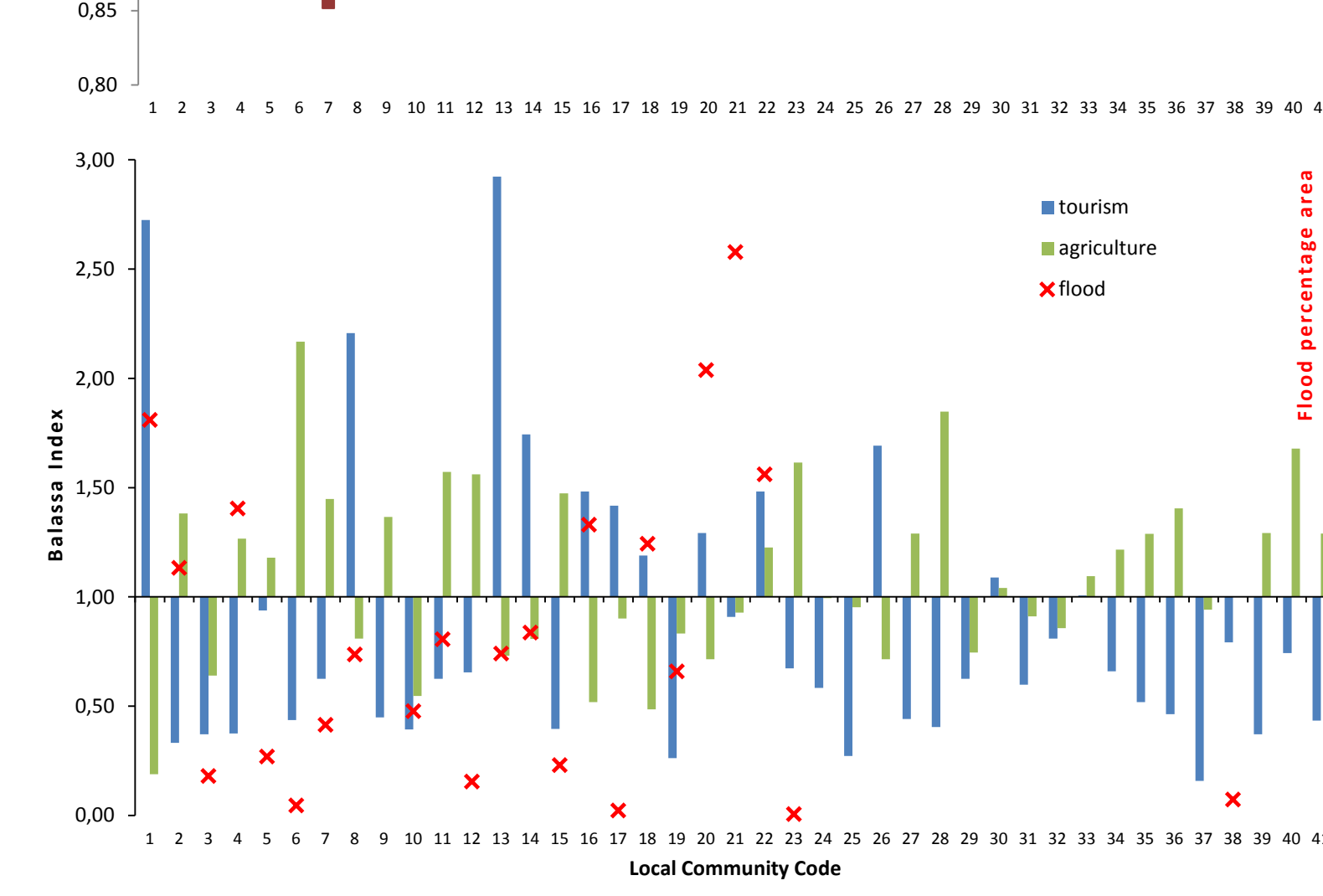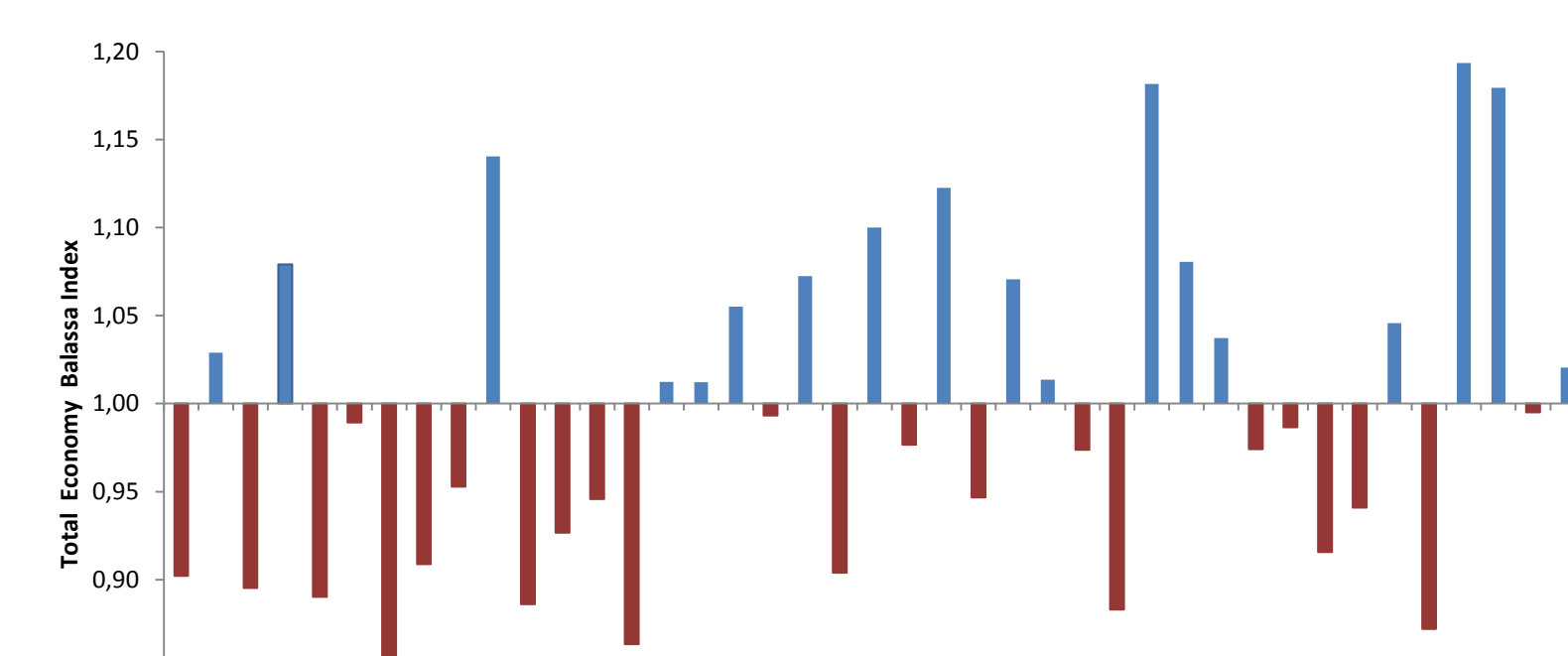
968 km²
27645 inh.

METHODOLOGY

SWOT ANALYSIS
- estimates the vulnerable and strong elements of a study area by environmental and socio-economic perspective

THEIL INDEX
- evaluates the economic structure diversification rate among the local communities of the study area [2]

BALASSA INDEX
- indicates the advantageous and disadvantageous local communities related to the mean economic structure of each municipal unit

FACTOR ANALYSIS
- calculates factors that explain the variability among eight observed, correlated variables [3]

SWOT ANALYSIS

THEIL INDEX

L.Cs IN MUNICIPALITY OF ARCHAIA OLYMPIA

1	ARCHAIAS OLYMPIAS
2	ASPRON SPITION
3	VASILAKIOU
4	IRAKLIAS
5	KAMENIS
6	KAYKONIAS
7	KLADEOU
8	KOSKINA
9	KRYONERIOU
10	LINARIAS
11	LOUYROU
12	MAGIRA
13	MIRAKAS
14	MOURIAS
15	KSIROKAMPOU
16	PELOPIOU
17	PEUKON
18	PLATANOU
19	POURNARIOU
20	SMILAS
21	STREFIOU
22	FLOKA
23	CHELIDONIOU
24	ANTRONIOU
25	AGIAS KYRIAKIS
26	AGIAS TRIADOS
27	KAKOTARIOU
28	KRYOVRISIS
29	TSIPIANON
30	LAMPIAS
31	ASTRA
32	OREINIS
33	LALA
34	ACHLADINIS
35	DOYKA
36	KOUMANI
37	MILEON
38	NEMOUTAS
39	NERAIDAS
40	PERSAINIS
41	FOLOIS

L.Cs IN MUNICIPALITY OF ANDRITSAINIS - KRESTENON

42	LIVADAKIOU
43	VRESTOU
44	ANDRITSAINIS
45	THEISOAS
46	FANARIOU
47	MYRONION
48	ROVION
49	KOUFOPOULOU
50	LINISTAINIS
51	DRAGOGIOU
52	KALYVAKION
53	FRIKSHS
54	MAKRISION
55	KALLIKOMOU
56	PLOUTOKORIOU
57	SKILLOYNTIAS
58	DIASELLON
59	KRESTENON
60	AMYGDALEON
61	DAFNOULAS
62	KALLITHEAS
63	SEKOULA
64	GRYLLOU
65	TRYPITIS
66	RAXON
67	GRAIKA
68	SAMIKOU
69	VRINAS
70	KATO SAMIKOU
71	PLATIANAS
72	ALIFEIRAS
73	MATESIOU

M. ARCHAIA OLYMPIA   M. ANDRITSAINIS - KRESTENON

Financial Compensation Percentage regarding amount of damages

Livestock 33%   Agricurture 67%

APPLICATIONS

Factor Analysis employs Principal Component Analysis as the extraction method and Oblimin with Kaiser Normalization, as the rotation method.

Combining the outcomes of Factor Analysis, two hidden (but expected!) factors emerged: The characteristic hydro-morphology of the study area (factor D1) and the historical heritage value of ancient Olympia (factor D2). D1 explains the 36% of variance and D2 24%, respectively. The analysis underlines (a) the high dependence of Archaia Olympia on the flood events of Alfeios R. (D1) which threaten the archaeological site and agricultural production and (b) the high economic development of this local community due to strong socio-economic and touristic variables (D2).

Oblimin rotation shows that (a) touristic variables are independent to flood and agriculture variables and (b) total economic factor depends both on tourist and agricultural activities.

Kaiser-Meyer-Olkin (KMO)	0.690
Cronbach's alpha	
D1	0.788
D2	0.785
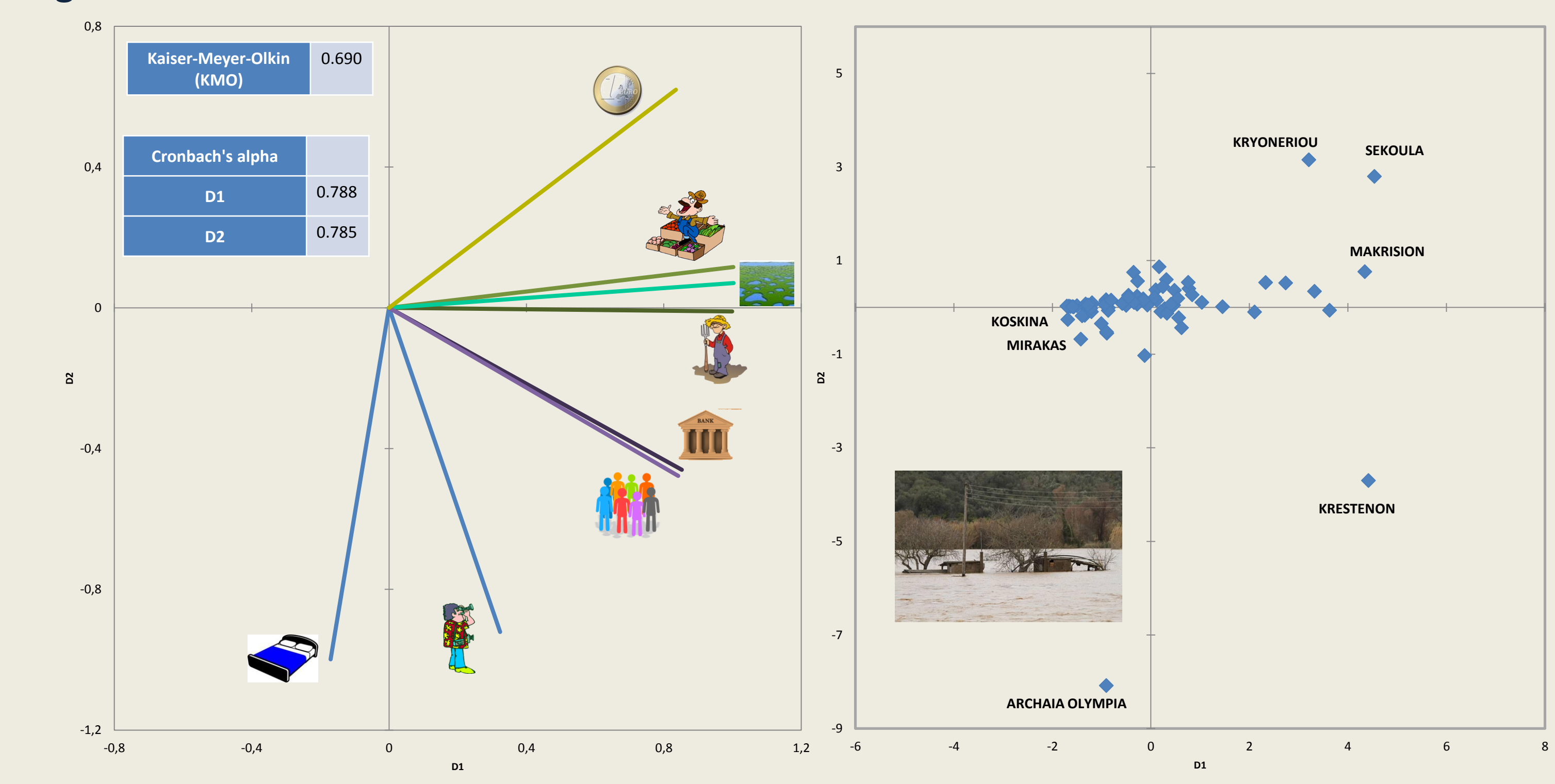
CONCLUSION

SWOT analysis indicates the development perspective of the study area. The rating of strengths and opportunities is higher than weaknesses' and threats'. Ballassa and Theil Index indicate (a) dissimilarities in sectoral composition of each community compared with the physiognomy of each municipality and (b) the comparative (dis)advantage of each community relative to the reference municipality. The combination of the described procedures paired with G.I.S. and Factor Analysis outcomes highlights the adverse effects of flood events on the economic growth of the riparian area and points out critical communities.
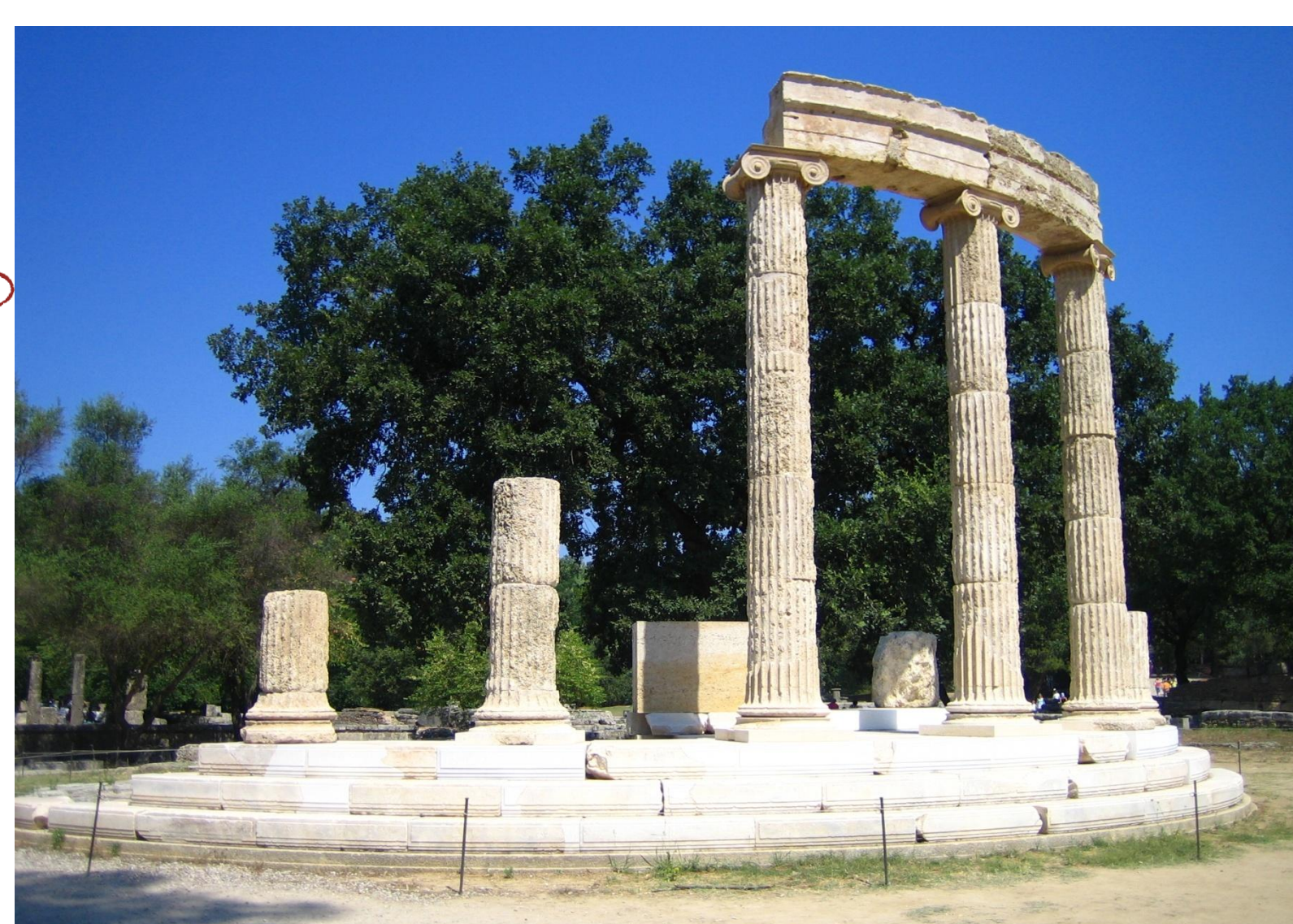
The methodology followed could act as a fundamental approach for decision-making and may be further examined with validation processes. Decision- and policy-makers can use the above methodology in order to support their decision-making on flood events.

REFERENCES

[1] Mariolakos I. and Fountoulis I. (2007), Geoenvironmental impacts of fires in the wider area of Archaia Olympia, Kronios Hill - Measure proposals, (http://library.tee.gr/digital/m2264/m2264_mariolakos1.pdf)
[2] Cutrini E. (2005), The Balassa Index meets the Theil Index: a Decomposition Methodology for Location Studies, (http://www-sre.wu-wien.ac.at/ersa/ersaconfs/ersa05/papers/123.pdf)
[3] http://en.wikipedia.org/wiki/Factor_analysis (accessed online 3/4/2013)