EGU General Assembly 2024

Sharing is encouraged

HS7.4: Future hydroclimatic scenarios in a changing world | PICO

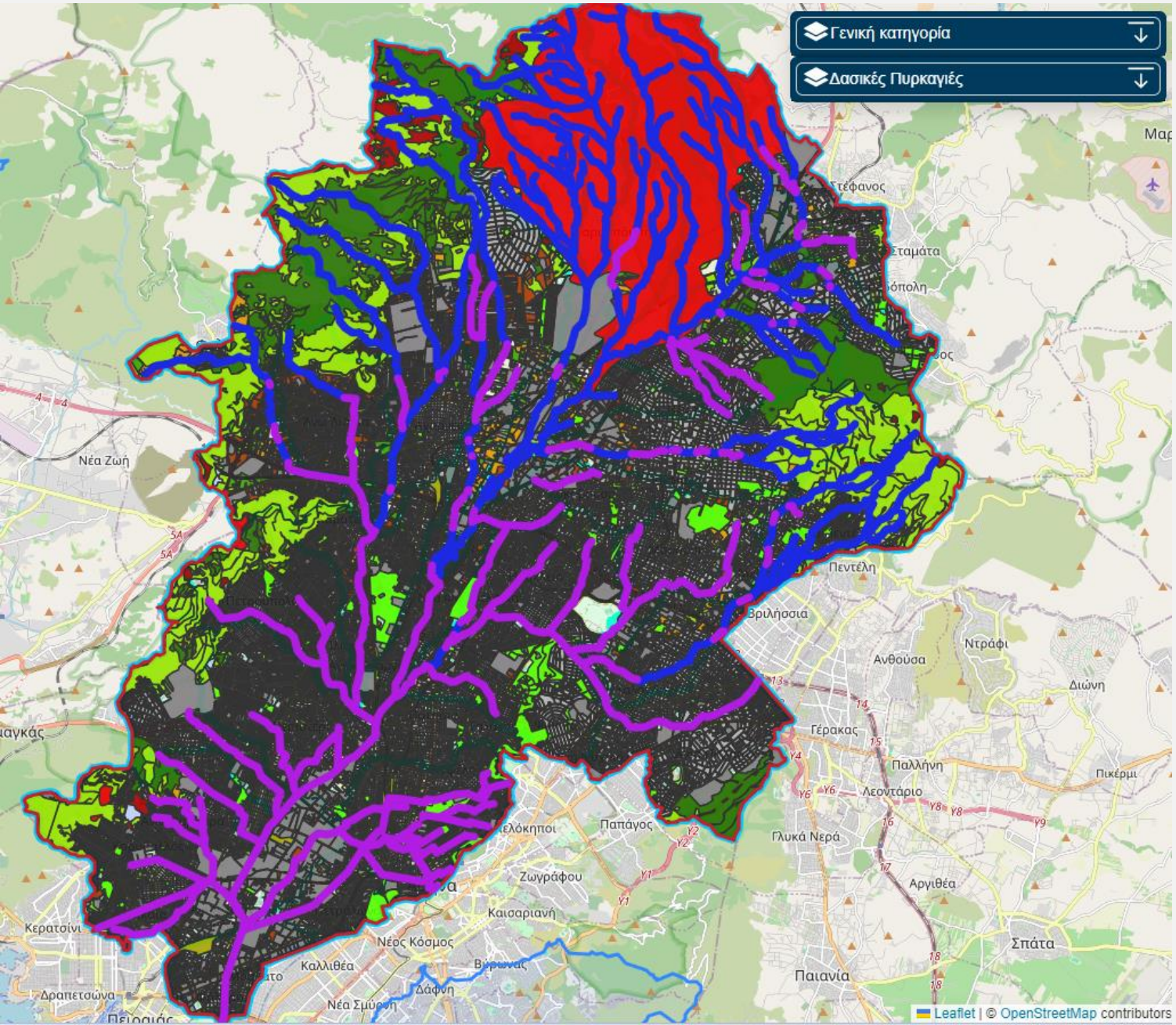
Flood risk assessment in the most heavily urbanized area of Greece, the case study of Kifissos river basin in Athens

Stavroula Sigourou[1], Alexia Tsouni[1], Vasiliki Pagana[1], Panayiotis Dimitriadis[2], G-Fivos Sargentis[2], Romanos Ioannidis[2], Efthymios Chardavellas[2], Dimitra Dimitrakopoulou[2], Nikos Mamasis[2], Demetris Koutsoyiannis[2], and Charalampos (Haris) Kontoes[1]

[1] National Observatory of Athens (NOA), Institute for Astronomy, Astrophysics, Space Applications and Remote Sensing (IAASARS), Operational Unit "BEYOND Centre of EO Research & Satellite Remote Sensing"

[2]National Technical University of Athens (NTUA), School of Civil Engineering, Department of Water Resources and Environmental Engineering, Research Group ITIA

Kifissos river basin & Challenges in urban flood modelling



Kifissos river basin:

- highly urbanized (80% of the river basin)
- affected by forest fires over the last years
- complex hydraulic network (60% of the total river network is artificial)

Need:

- advanced methodologies for an accurate assessment of urban flood processes towards reliable modeling and efficient management

Challenge:

modelling of a river basin with many hydraulic works

=> It needs to be addressed to simulate the current situation of the river flow and support the expanding constructions.

Methodology for flood risk assessment

Data collection & modifications

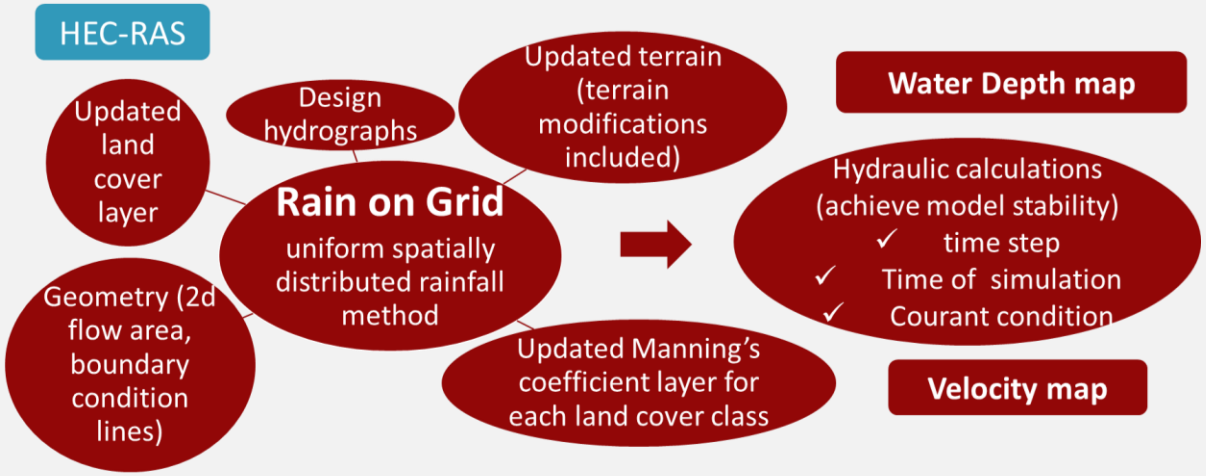
Terrain modifications with buried substreams

Precipitation from ombrian curves

for 50, 100, 1000 years return periods

$$x = \lambda \frac{(T/\beta)^{\xi} - 1}{(1 + k/\alpha)^{\eta}}, \qquad \xi > 0$$

Hazard – 2D Hydraulic models



Field visits

R1-P46-G: Private Footbridge	
Coordinates (GGRS87)	474968.3287, 4197482.714
Construction material MAT	MAT=f,w
Shape and dimensions of bridge DIM	DIM=o, h=1, d=0.3, l=7.5(6)ground
dominant substrate of river bed MANb and left MANl and right river bankMANr	MANb = g, MANl= p, MANr=p

Vulnerability

- Population Density;
- Population Age;
- Building Type (construction materials and the presence of pilotis)

Exposure

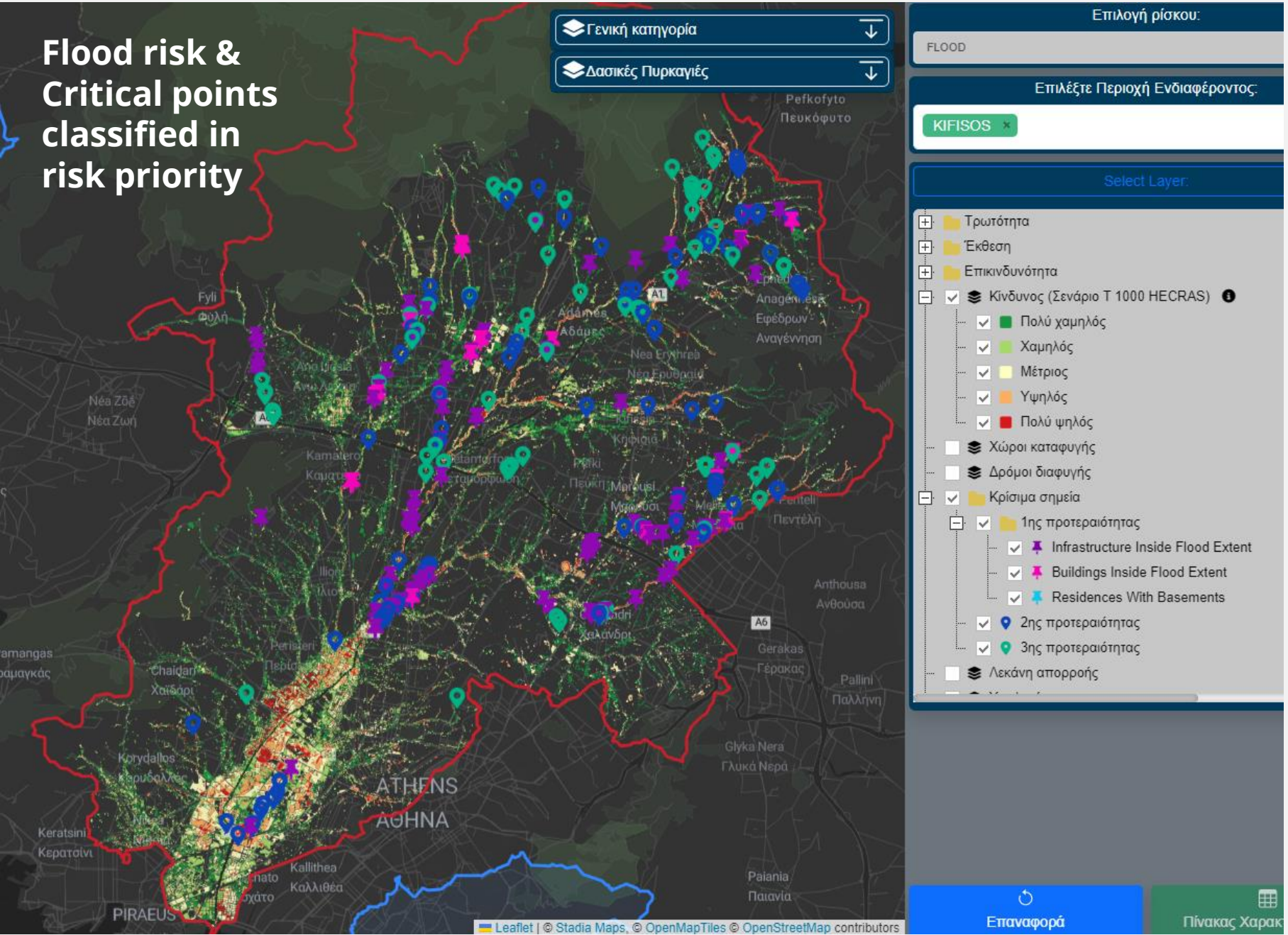
- Land values

Vulnerability (Age, Population Density and Buiding type)	Flood Hazard 1	2	3	4	5
1	1	1	1	2	3
2	1	2	2	3	4
3	1	2	4	4	5
4	2	3	4	5	5
5	3	4	5	5	5

Vulnerability & Flood Hazard	Exposure 1	2	3	4	5
1	1	1	1	1	1
2	2	2	2	2	3
3	3	3	3	4	4
4	4	4	5	5	5
5	5	5	5	5	5

Results, Validation & Mitigation measures

Flood risk & Critical points classified in risk priority

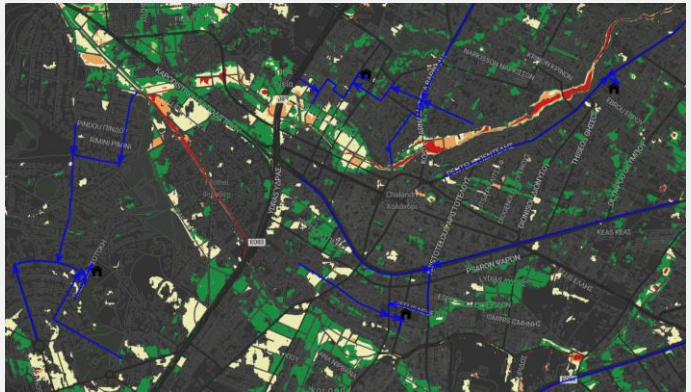


Cross-check with:

- the high-risk areas pointed out from the authorities
- the civilians' calls to the Fire Brigade for water pumping (over the last 15 years)

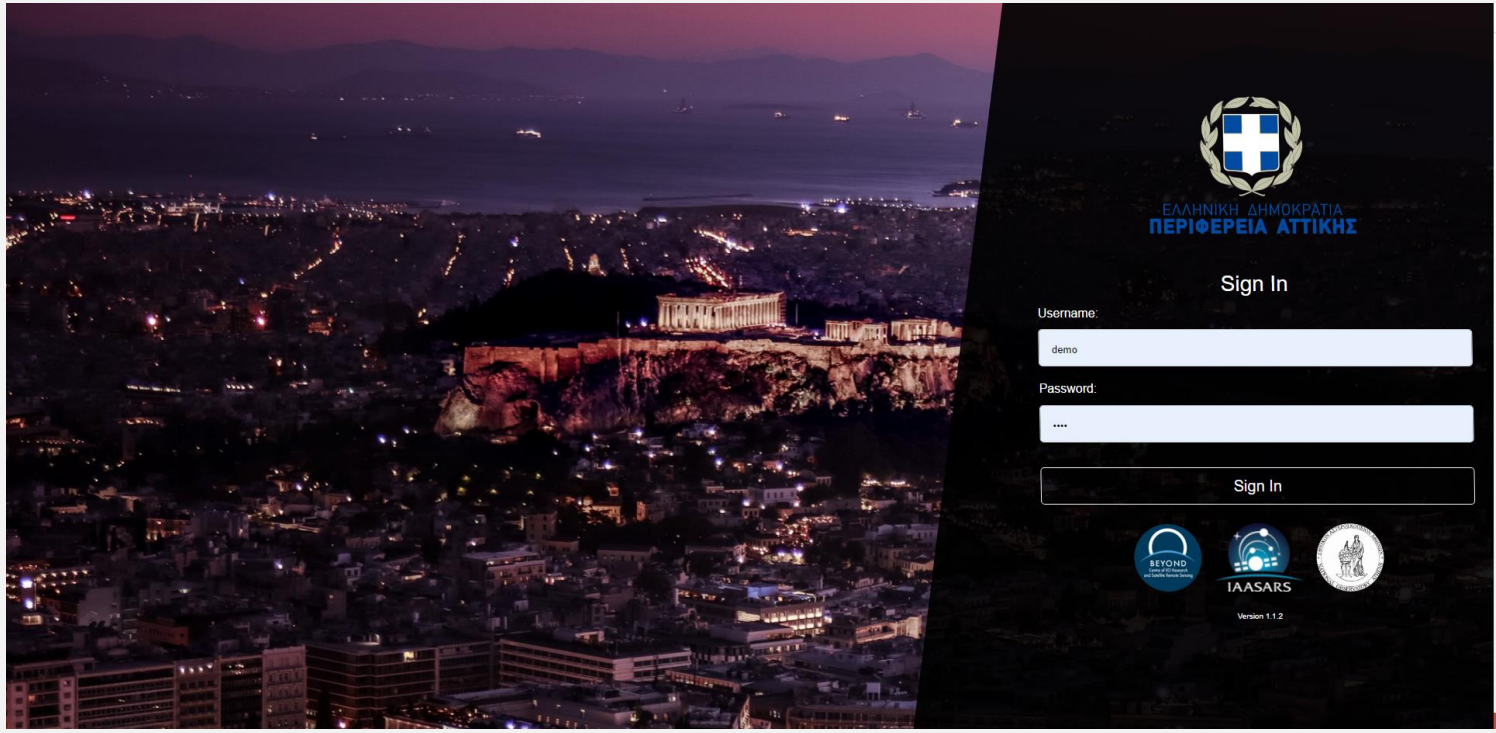
Mitigation measures:

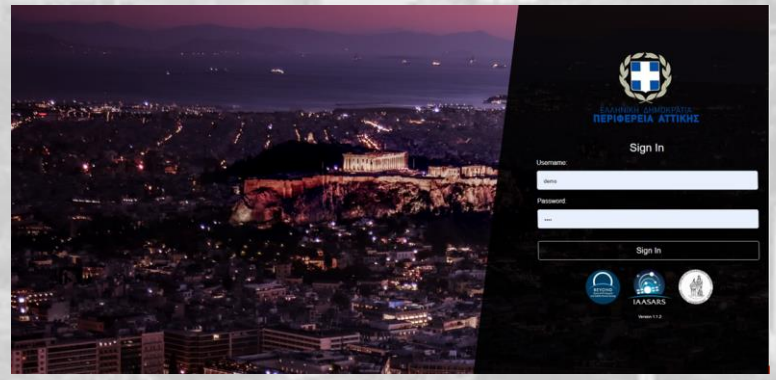
- Safe covered refuge areas.
- Design of proposed escape routes in order to evacuate the residents safely.



Conclusions

- ✓ First, it is very important that **for the first time all the pre-existing, collected and produced data along with the scientific analysis, are properly organised and stored on a user-friendly web platform**, becoming available to all Prefecture's and Municipalities' services.
- ✓ This supports the **operational needs** during the crisis, as well as the **preparedness** and the **strategic decision making** towards **disaster resilience**.
- ✓ Moreover, it's the first time that such a **holistic approach** for flood risk assessment is implemented on **building block level** in Greece.
- ✓ The prototype knowledge created through the project supports the Prefecture of Attica in the optimum implementation of the **National Civil Protection Plan** and the work of **Civil Protection Coordination Bodies**.
- ✓ All the above-mentioned were **confirmed and evaluated positively** according to the stakeholders' feedback, and supported civil protection exercises.





IMAGINATION TAKES US BEYOND OUR LIMITS

Thank you for your attention!

Stavroula Sigourou

PhD candidate, School of Civil Engineering, National Technical University of Athens,
Research Associate, Operational Unit BEYOND of IAASARS/NOA,
MSc., Dipl. Rural and Surveying Engineer
sigourou@noa.gr

http://beyond-eocenter.eu/
https://www.itia.ntua.gr/en/