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## DELIVERABLE

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### D3.5 Report on Integration between educational and citizen seismology initiatives: achievements and strategies

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<b>Lead</b>	BGS
<b>Authors</b>	Nikolaos Melis (NOA)
<b>Reviewers</b>	
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## Table of Contents

Summary .....	3
1 Introduction .....	3
2 Initiatives with future prospects.....	4
2.1 Greece.....	4
3 Achievements .....	11
3.1 Greece.....	11
4 Strategies for the future.....	13
5 References .....	13

## Summary

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This deliverable describes the initiatives that have been carried on for the integration between educational and citizen seismology. Some initial achievements are also described and the strategies for follow up of activities and initiatives in future applications and developments.

## 1 Introduction

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School and Citizen Seismology are two strategically important initiatives directed: (a) to educational seismology (i.e. introducing seismology to school learning process), and (b) to the direct involvement of citizens mainly in aspects of operational seismology, with aim to increase resilience and awareness of the population, especially in regions of high seismic activity and hazard. Within the SERA project and WP3, we aimed to show the involvement of educational seismology through its application in schools (school seismology), and through their connection/link to the local society, demonstrate the increase of citizen interest to seismology issues and in particular their active involvement to civil protection, with increased production of information directed to operational centers and scientists. In that sense, we aimed to investigate, where possible, whether school seismology can have an impact in increasing citizen involvement, with result the improved resilience and awareness in the local society.

In SERA WP3, there were 5 workshops aimed to introduce methods of school seismology to teachers and improve their knowledge and ability to teach aspects of seismology to primary and secondary school students. On all workshops there was a session to introduce citizen seismology aspects and to show ways of succeeding the involvement of citizens to operational seismology services and through them increase resilience and awareness in society.

We explored an example of such exercise that took place in Greece, during the 25-26/06/2019 Teachers Workshop in Patras city, west Corinth Gulf, central Greece. An area of high seismicity of moderate magnitude events that can be felt in the city and usually cause panic. This example has been initiated within SERA WP3 and it has been followed through the whole period of the SERA project. This aimed to follow on activities in the future and connect them to other future proposals and possibly funded succeeded projects.

## 2 Initiatives with future prospects

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### 2.1 Greece

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The Patras example was used within SERA WP3 to show the interaction between school and citizen seismology initiatives, and to demonstrate the increase of resilience in the local community through targeted school activities. NOA has initiated several activities to introduce School Seismology aspects to primary and secondary education. In Patras, in particular, there was a great interest by a private schools campus, Arsakeia Schools in Patras (Arsakeia Schools contain all ages in education, comprising pre-school, primary, secondary and high school), that try to link school initiatives with local society.



**Figure 1.** The Patras Arsakeia Schools Campus, situated in open grounds North of Patras city.

Arsakeia Schools contain also in their premises the Patras Science Center. A center that hosts three specialized interactive exhibitions in: Mathematics, The Spirit of Logic and Information and The Laws of Nature. It is visited regularly by students of all levels with interest in Mathematics, Logic and Informatics, learning the meaning of Mathematics in everyday life.



**Figure 2.** The Patras Science Center



**Figure 3.** The Patras Science Center. Part of the exhibition of logic is shown.

NOA aimed in SERA WP3 to conduct the Teachers Workshop for Greece in the Arsakeia Schools in Patras and follow SERA WP3 activities through the link with the particular school campus.

First, there was a low cost accelerometer that was deployed in the school. This was used to demonstrate earthquake recordings on site (there is high seismic activity of moderate to low magnitude events in the immediate vicinity, west Gulf of Corinth area, which is highly felt at the school and the city of Patras). The recordings were used in exercises of school seismology themes, completed in class by students of primary and secondary educational level. The students were taught, through lab exercises, to inspect seismic phases arriving at the station, locate events using single station technique (the station at their school) or using in addition incoming data from other stations in the vicinity via NOA recordings, estimate the magnitude of the felt event, measure maximum PGA value at the station and in other stations in Patras, calculate / estimate Intensity and explain the felt earthquake effect in MMI scale. It is interesting to mention and the results from these exercises were published and communicated

in the school web site, informing the local community, as well as at local newspapers demonstrating the interest and the work of the students in seismology and felt events in the city of Patras.

Second, there was involvement of NOA research seismologists, Dr N. Melis and Dr I. Kalogeras, to attend open days, seminars and school exercises with seismology subject involved. In more detail, there were seminars given to students and parents with the opportunity of two occasions of school open days to the public. There were seminars addressed to students and teachers in several occasions hosted at the schools.

Third, there was the SERA Teachers Workshop that took place during 25-26 June 2019 in the Patras Science Center at the school campus, introducing teachers from Patras and the greater vicinity of western Greece, to school and citizen seismology aspects.



**Figure 4.** On October 2018, a P-Alert low cost strong motion acceleration sensor was deployed at Arsakeia schools. It was used locally and linked to NOA monitoring center in Athens via EW plugin and seedlink.



**Figure 5.** Open day at Arsakeia schools in Patras. Seminar to students and their parents. Visitors from other schools from Patras are also attending the seminars.

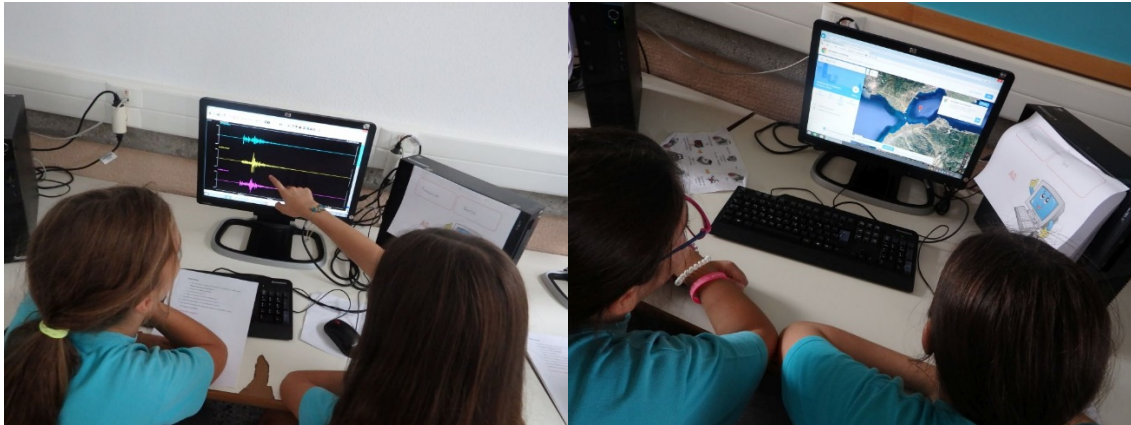


Figure 6. Students inspecting accelerograms of a local event and its location near their school.

**SERA**  
Seismology and Earthquake Engineering  
Research Infrastructure Alliance for Europe

ΕΣΤΙΑ  
ΕΡΕΥΝΩΝ  
ΠΑΤΡΑΣ

25-26 June 2019  
*Patras Center of Sciences*  
Teachers Workshop  
*"Seismology in Education and Society"*

KTE

Institute of Geodynamics  
National Observatory of Athens

SOCIETY FOR THE PROMOTION  
OF EDUCATION AND LEARNING  
FOUNDED 1836  
ARSAKEIA - TOSITSEIA SCHOOLS

ARSAKEIA OF PATRAS

Figure 7. The Patras SERA Teachers Workshop Logo, advertising school and citizen seismology issues expected to be presented and discussed.



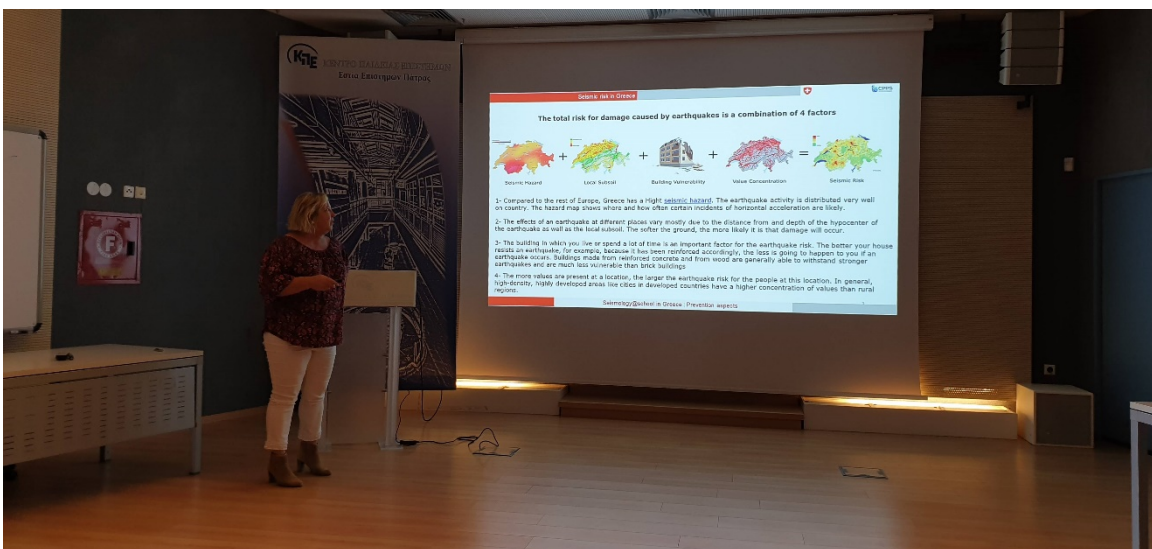


Figure 8. Photographs from the SERA Teachers Workshop in Patras, Greece.



**Figure 9.** Photographs from the SERA Teachers Workshop in Patras, Greece.

The SERA Teachers Workshop in Patras (25-26 June 2019) has been presented in previous reports. Here we just show some sample photographs that were taken during the workshop seminars and lab experiments, through demonstration of exercises to teachers. The workshop was dedicated to teachers of physics, geology, mathematics, informatics and technology. They had to be situated in Patras and western Greece. We had 30 teachers during the two day workshop. They were given the opportunity to express their ideas at the end of the workshop and their interest to follow on the aims of the project and facilitate in the future, through their attempts to introduce and replicate the presented labs in their classroom, schools and colleague teachers. They are expected to keep contact with NOA and within future project opportunities in the area to be used as a good contact to expand the groups and application.

Moreover, special interest it was shown in connecting the ideas to local society and introduce citizen science applications as the EMSC Lastquake Application.

### 3 Achievements

#### 3.1 Greece

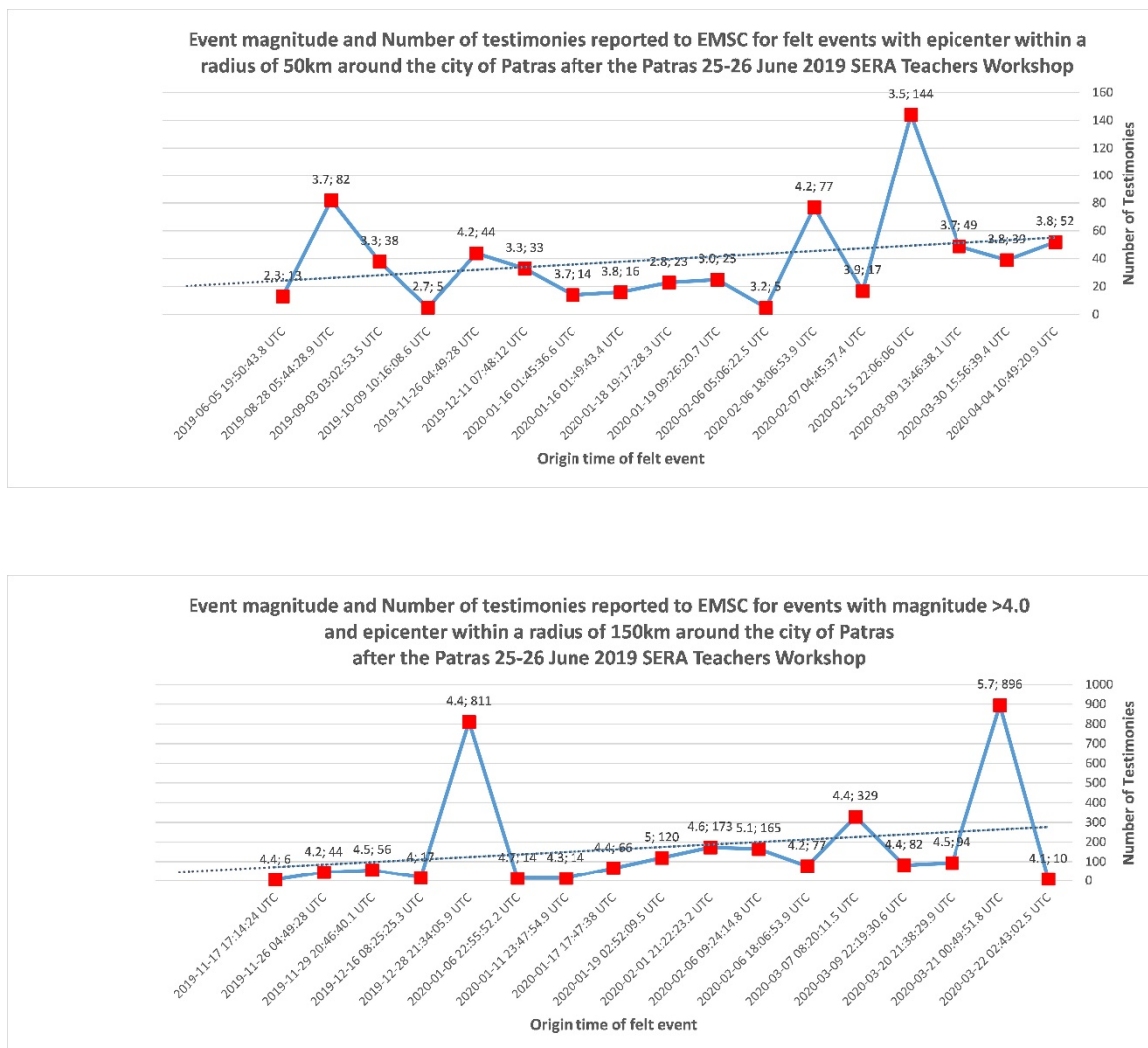
In the Patras SERA Teachers Workshop 2019, there was special importance given to the citizen involvement during an earthquake event. LastQuake EMSC Application was introduced as a tool of communication, exchange of information and citizen participation and collaboration via receiving and sending information and observations (photographs) from the field and their specific location. The citizen originated data are very important to scientists and can be used in operational manner as proof of earthquake effects in urban areas. These can be used in producing USGS like ShakeMaps, thus mapping the consequences.



Figure 10. EMSC LastQuake Application

We follow the LastQuake Application and we noted that there was an increase of citizen responses after the seminars and the Workshop in Patras. Figure 11 depicts the increasing trend of incoming information and response of citizens using the application after the events and aims of SERA WP3 through the NOA approach in the area.

For two extracts of data from the EMSC testimonies database after June 2019: (1) for local felt events within a radius of 50km around the city of Patras and (2) events with magnitude greater or equal to 4M in a radius 150km around the city of Patras, respectively, we note the same increase in trend for the number of testimonies reported per event. The response of citizens has increased and it is also shown in local newspapers.



**Figure 11.** Extract of number of testimonies per event in a selected radius around the city of Patras, after LastQuake was explained and introduced through the NOA approach in the area.

## 4 Strategies for the future

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The Patras example showed encouraged results to the NOA approach in involving students, teachers and through them citizens and the local community. Resilience was increased and we expect the next strong event, which will give us further justification of these results from this approach achieved in SERA. We further plan to introduce the approach to future projects (i.e. TURNkey H2020 project started in June 2019) and expand the activities also to other areas in Greece. Linking groups together from other areas is also under planning as it is expected to give extended improved results.

## 5 References

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Bossu, R., Roussel, F., Fallou, L., Landès, M., Steed, R., Mazet-Roux, G., Dupont, A., Frobert, L. and Petersen, L., 2018. LastQuake: From rapid information to global seismic risk reduction, *Inter. J. Dis. R. Reduction*, 28, 32-42, Doi: 10.1016/j.ijdr.2018.02.024.

### Liability claim

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