SERA
Seismology and Earthquake Engineering
Research Infrastructure Alliance for Europe

# DELIVERABLE

## D1.2. Mid-term report, including impact assessment and updated risk register

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|---|---|
| **Work package** | WP1: Management |
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| **Reviewers** | Executive Committee |
| **Approval** | Management Board |
| **Status** | Final |
| **Dissemination level** | Public |
| **Delivery deadline** | 31.10.2018 |
| **Submission date** | 31.10.2018 |
| **Intranet path** | DOCUMENTS/DELIVERABLES |

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 730900.

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# Summary

This deliverable summarises the project status at M18. It provides details of the main project outputs (deliverables, workshops, publications), achievements against key objectives, management issues (such as changes to the Grant Agreement), and a description of the communication activities and exploitation of results at M18. The contents of this report will be further expanded in the first periodic report to the EC, to be submitted before the end of December 2018.

To cite a few highlights, the three calls foreseen for Transnational Access (TA) have already been launched, with 33 projects across the 10 TA facilities already allocated and the last call being now under evaluation; the first evaluation of Virtual Access (VA) for the 5 WPs providing VA in SERA has also been conducted by an international panel; of the 20 workshops foreseen in the project for Networking Activities (NA) and Joint Research Activities (JRA), 8 have already taken place and 6 are already planned; 24 publications related to SERA have been reported by the project participants; the Scientific Advisory Board already met with the occasion of the first SERA annual meeting in April 2018, and has provided their mid-term assessment report (D1.4). Finally, all project boards are active, and the project management plan (D1.1) is being followed, including the monitoring of the project financial and risk status described in this report.

# 1 Project key objectives and status at M18

Section 1 provides an overview of progress in SERA in relation to the project key objectives at M18. For each key objective, the main highlights are listed, as well as the status of associated deliverables and milestones. Further details regarding deliverables (D) and milestones (MS) are available in Section 2/Project outputs.

| KEY OBJECTIVE | HIGHLIGHTS |
|---|---|
| 1. Transnational access (TA) to ten high-class earthquake engineering and array seismology facilities in Europe. | ▪ The 3 foreseen TA calls in SERA have already been launched.<br>▪ 33 projects across the ten SERA facilities have been selected (out of 62), and the last selection of projects is currently under evaluation.<br>▪ Mid-term assessment of TA by the Scientific Advisory Board was positive [D1.4]. |
| 2. Virtual access (VA) to the main seismology data & product sets and products in Europe, including new data sets. | ▪ The VA panel completed the evaluation for M1-M18 and acknowledged good progress.<br>▪ Mid-term assessment of VA by SAB was positive [D1.4].<br>▪ Close collaboration with H2020 EPOS-IP TCS Seismology is in place for the integration of VA in EPOS.<br>▪ One workshop to expand the integration of new data into EIDA has already taken place (Spain/Portugal node) and the second one is planned (Balkans, 2019) [WP4].<br>▪ Draft EFEHR Consortium Agreement is in preparation, and expected to be signed in early 2019. |
| 3. Substantial advance in the integration of seismology and earthquake engineering. | ▪ Tools to expand and update the SERIES database are completed [D6.2, D6.3].<br>▪ Exploration of EPOS technical requirements for SERIES integration was conducted [D.6.4]. |

| KEY OBJECTIVE | HIGHLIGHTS |
|---|---|
| 4. New European Seismic Hazard reference model (ESHM20) for inclusion in the European construction normative. | ▪ Risk modelling output requirements for earthquake hazard are defined [D25.1].<br>▪ New data (earthquake catalogue, strain rate models, active faults, ground motion data) have been collected [D25.4].<br>▪ Collection of national seismic hazard models ongoing activity: contribution from Belgium, Germany, Switzerland, Romania, Slovenia, Spain, Russia and Northern Africa (collaboration with Global Earthquake Model).<br>▪ SERA and have now nominated liaison experts from each side to harmonise work between SERA and Eurocode 8. Two meetings have been held (Ispra, March 2018; Lausanne, October 2018). As a result, there is now a proposal to include an annex to Eurocode 8 with a set of European Hazard maps.<br>▪ Workshop with WP25 members is planned on December 4th 2018 (Milan).<br>▪ Workshop to present SERA WP25 products is planned for October 2019 (Pavia). |
| 5. New European Seismic Risk Model, including physical and socio-economic factors. | ▪ Taxonomy of buildings, pipelines and storage tanks for exposure and vulnerability models was conducted [D26.1].<br>▪ Socioeconomic indicators for integrated risk assessment are identified [D26.6].<br>▪ 2 workshops on building exposure and vulnerability already were conducted [WP26, Pavia in March 2018, Porto in September 2018]. A third one is planned for September 2019 in Istanbul. |
| 6. Multi-disciplinary science promotion | ▪ Deep seismic sounding community has started to discuss common metadata for future EPOS integration [D5.2, and workshop already held by WP5].<br>▪ Close collaboration between SERA and EPOS-IP TCS Seismology is in place for the integration of VA in EPOS. |
| 7. Inputs for the design of future experiments in seismology and earthquake engineering. | ▪ First future design workshop planned in Potsdam, October 2018 [WP4].<br>▪ Community workshop on site characterisation to be held in Thessaloniki, on December 6th 2018 [WP7].<br>▪ Workshop on site characterization, quality metrics and roadmap for Europe planned in L'Aquila March 4th-12th 2019 [WP7]. |
| 8. New methods for real-time assessment of construction shaking and damage. | ▪ Comparison of performance of four independent algorithms in the calculation of rapid finite-fault models completed, using the 2016-2017 Central Italy earthquake sequence and a dataset of 19 large global earthquakes [D28.1] |
| 9. New test results in the area of structure resilience. | ▪ Assessment of research infrastructures for smart city report produced (internal report). |
| 10. Further development of school-level educational programs & outreach in seismology. | ▪ Two of the three foreseen teachers' workshops have already taken place (Bucharest in November 2017, and Guimaraes in July 2018), as well as one specialists' workshop (UK).<br>▪ One more workshop is planned in Greece in 2019.<br>▪ Fact-sheets first series distributed. |
| 11. Integration of past infrastructure projects, SERA and EPOS | ▪ SERA coordinator & manager are part of the EPOS-IP Project Development Board; EPOS-IP manager is member of the SERA MB.<br>▪ First version of EPOS-SERA strategy document agreed. |

**Table 1.** SERA key objectives and progress status

# 2 Project outputs at M18

This section lists the specific outputs produced by SERA at M18, namely project deliverables, workshops, publications and outreach materials. Project milestones are also detailed in this section.

## 2.1 Deliverables

| Deliverable | Due | Leader | Status |
|---|---|---|---|
| D1.1. Project Management Plan | M3 | ETH | Submitted |
| D1.2. Mid-term report | M18 | ETH | Submitted |
| D1.3. Strategic interaction SERA-EPOS | M18 | INGV | Submitted |
| D1.4 Mid-term report of Scientific Advisory Board | M18 | ETH | Submitted |
| D2.1 Concept for internal and external communication and stakeholder dialogue | M4 | ETH | Submitted |
| D2.4 Principal website content | M6 | ETH | Submitted |
| D2.5 Internal newsletter M6-M12-M18 | M18 | ETH | Submitted |
| D2.7 Fact-sheets M12 | M12 | UPAT | Submitted |
| D2.12 Data Management Plan | M12 | EUCE | Draft to be submitted M19 |
| D2.13 Stakeholders workshop M15 | M15 | JRC | Submitted |
| D3.1 Survey of educational seismology activities in Europe and globally | M18 | UKRI | Submitted |
| D3.3 Compilation of resources for Seismo@school | M18 | UKRI | Submitted |
| D4.2 Report on metadata challenges and proposed solutions | M12 | ETH | Submitted |
| D5.1 Inventory of available DSS databases | M9 | UU | Submitted |
| D5.2. Position document of the DSS community on future data accessibility of DSS data | M12 | UU | Submitted |
| D6.2. Expansion of the SERIES database | M18 | JRC | Submitted |
| D6.3 Updated version of SERIES database | M18 | UPAT | Submitted |
| D6.4 Review of current SERIES and EPOS databases | M12 | JRC | Submitted |
| D7.1 Standard for site condition metadata | M18 | AUTH | Draft at M19, full version M21 |
| D8.1. Technical report on SERA Transnational Access activities TA1-TA10 M12 | M12 | EUCE | Submitted |
| D18.1. Report on access statistics and service provision of VA1-VA5 M16 | M16 | EMSC | Submitted |
| D19.1. Assessment report of VA External Board on VA1-VA5 M18 | M18 | EMSC | Submitted |

| Deliverable | Due | Leader | Status |
|---|---|---|---|
| D25.1 Engineering output requirements for natural and anthropogenic earthquake hazard. | M6 | EUCE | Submitted |
| D25.2 Updated databases of seismicity, faults and strain rates for ESHM20 | M12 | INGV | Submitted |
| D25.3 Seismic source model for ESHM20 | M18 | ETH | Draft submitted, full version M23 |
| D25.4 Updated GMPE logic tree and rock/soil parametrization for ESHM20 | M18 | GFZ | Draft submitted, full version M23 |
| D26.1 Taxonomy of European residential, commercial, industrial buildings and industrial plants | M6 | EUCE | Submitted |
| D26.2 Methods for developing European residential exposure models | M12 | EUCE | Submitted |
| D26.6 European socioeconomic indicators and indices for integrated risk assessment | M18 | EUCE | Submitted |
| D28.1 Report on methodologies for the real-time, automatic determination of fault geometry | M18 | ETH | Submitted |

**Table 2.** Project deliverables status at M18.

Of the 30 deliverables foreseen by M18, 26 have been submitted to the EC in their final form, and 2 as drafts. Below is a description of the deliverables to be completed.

### D2.12 Data Management Plan (EUCE)

We now have a common agreement on the scope of the DMP discussed with our EC officer. The DMP will focus on TA only, and a preliminary version will be submitted in November 2018 before the end of the first reporting period. This version will include in Annex the user agreements between the TA facilities and users concerning the management of research data. If necessary, an updated version will be submitted in the third year.

### D7.1 Standard for Site Condition Metadata (AUTH)

WP7 requested to delay this deliverable by 3 months, to be able to incorporate the inputs resulting from the community workshop now planned for December 6$^{th}$ 2018 in Thessaloniki. A draft will be submitted in November 2018, and the full version no later than end of January 2019.

### D25.3 Seismic Source Model for ESHM20 (ETH)

A preliminary version has been submitted to the EC at M18, describing the current status and steps towards completion at M22: the SC8 requests for the 2018 ESHM model were shifted for 2020. In fact, a reference pan-European hazard map will be accepted as an input to the next generation of the Eurocodes standards if the acceptance of the members is met. This new request shifted the data collection and analysis, as well as the model building. The seismogenic source model will now be discussed and reviewed by JRA3 modelling team in a workshop planned on December 5$^{th}$ in Milan. The final report of the model will be delivered in M22 together with the relevant documentation, access to the datasets, analysis results and hazard calculation output.

### D25.4 Updated GMPE Logic Tree and Rock/Soil Parametrization for ESHM20 (GFZ)

A preliminary version has been submitted to the EC at M18, describing in detail the work conducted so far, collaboration with other WPs in SERA (JR3, JR4), preliminary results and next steps to complete the selection of the model for ESHM20. As for D25.3, directly related to this deliverable, a full version will be completed by M23.

## 2.2 Milestones

| Milestone | Due | Verification | Status/Comment |
|---|---|---|---|
| MS.1 SERA boards nominated (SAB, TA-SEP, VA-EP) | M1 | Internal | Completed |
| MS.2 Project website established | M1 | Website | Completed (www.sera-eu.org) |
| MS.3 Project management plan | M3 | Internal | Completed (D1.1) |
| MS.4 Plan for dissemination & exploitation of results | M12 | Internal | Completed (D2.1) |
| MS.5 Data Management Plan | M12 | Internal | In progress - Draft ready November 2018 |
| MS.6 DDSS community agrees to integration with EPOS | M12 | Workshop | In progress - D5.2 Position document submitted, Workshop held 10.04.18. |
| MS.7 Successful mid-term evaluation by SAB | M18 | Report | Completed (D1.4) |
| MS.8 Mid-term TA and VA access according to plan | M18 | SAB | Completed (D1.4) |
| MS.9 Updated seismic source and GMPE models for Europe | M18 | Community approval | In progress - community meeting for approval scheduled Dec. 2018 |

**Table 3.** Milestones status (MS) at M18.

All milestones to be reached by M18 are completed or well underway. In particular, Ms.5 (Data Management Plan) will be reached with the draft DMP to be submitted in November 2018 (D2.12), and Ms.9 (Seismic source model), which is now coupled to the calendar of the Eurocode development as explained in section 2.1.

## 2.3 Workshops

The SERA Grant Agreement dedicates a specific budget to the organisations of the following workshops (please note additional workshops not listed below are also taking place, see Table 1):

| WP | Foreseen | Status at M18 |
|---|---|---|
| WP2 | 2 workshops with external stakeholders for code development and risk mitigation strategies | - SERA - CEN/TC 250/SC8 workshop on seismic hazard [Ispra, 01.03.18, organised by JRC]<br>- SERA - CEN/TC 250/SC8 workshop to review the ESHM20 model [Pavia, planned October 2019, organised by EUCE] |
| WP3 | 6 seismo@school & specialists workshops | - Seismo@school workshop for teachers from Romania, Moldova, Ukraine [Bucharest, 02.11.17, organised by INFP]<br>- Seismo@school workshop for teachers from Portugal, [Guimaraes, 10.07.18, organised by IST]<br>- Seismo@school workshop planned in Greece in 2019, organized by NOA<br>- Specialists workshop for school networks [Citizen Seismology, London, 15.02.18, organized by NERC]<br>- Specialists workshop for school networks [Marsquakes, planned in Nice, 16.01.2019, organized by CNRS] |
| WP4 | 2 workshops on future design of seismic networks and instrumentation | - Community workshop [Potsdam, planned 21.11.18, organised by GFZ) |
| WP4 | 3 regional workshops for the expansion of the EIDA coverage | - EIDA Spain-Portugal workshop [Madrid, 08.03.18, organized by IST]<br>- EIDA Balkans workshop [planned March 2019, organised by INFP] |
| WP5 | 2 workshops to inventory experiments, data and scientific questions for Deep Seismic Sounding (DSS) | - DSS workshop [Vienna, 10.04.18, organised by UU] – linked to D5.2<br>- DSS workshop [Krakow, 17.06.2018, organised by UU] |
| WP25 | 4 workshops to involve additional European experts in the elicitation of four key components for the new hazard model | - Workshop held [Ljubljana, 30.05.18, organised by ETH]<br>- Workshop with WP25 members planned on December 4th 2018 (Milan).<br>- SERA - CEN/TC 250/SC8 workshop to review the ESHM20 model [Pavia, planned October 2019, organised by EUCE] |
| WP26 | 3 workshops on elicitation and validation of different components of the risk model | - First workshop [Pavia, 01.03.18, organised by EUCE]<br>- Second workshop [Porto, 27.09.18, organised by UPORTO]<br>- Third workshop [Istanbul, planned September 2019, organized by BOUN] |

**Table 4.** Status of SERA workshops

## 2.4 Publications

2018

Aiken J. M., Aiken C., Cotton F. (2018); A Python Library for Teaching Computation to Seismology Students. Seismological Research Letters doi.org/10.1785/0220170246.

Bindi D., Cotton F., Spallarossa D., Picozzi M., Rivalta E. (2018);Temporal Variability of Ground Shaking and Stress Drop in Central Italy: A Hint for Fault Healing? Bulletin of the Seismological Society of America ; 108 (4): 1853–1863. doi.org/10.1785/0120180078.

Bindi, D., Kotha, SR., Weatherill, G. et al. (2018). The pan-European engineering strong motion (ESM) flatfile: consistency check via residual analysis. Bull Earthquake Eng. doi.org/10.1007/s10518-018-0466-x.

Bindi D., Spallarossa D., Picozzi M., Scafidi D., Cotton F. (2018): Impact of magnitude selection on aleatory variability associated with Ground-Motion Prediction Equations: Part I- Local, energy, and moment magnitude calibration and stress drop variability in central Italy, Bull Seism Soc Am, doi.org/10.1785/0120170356.

Garcia-Aristizabal A. (2018). Modelling fluid-induced seismicity rates associated with fluid injections: examples related to fracture stimulations in geothermal areas, Geophysical Journal International, Volume 215, Issue 1, 1 October 2018, Pages 471–493, doi.org/10.1093/gji/ggy284.

Khan A., Denton P., Stevenson J., Bossu R. (2018). Engaging citizen seismologists worldwide, Astronomy & Geophysics, Volume 59, Issue 4, 1 August 2018, Pages 4.15–4.18, doi.org/10.1093/astrogeo/aty190.

Lanzano, G., Sgobba, S., Luzi, L. et al. (2018): The pan-European Engineering Strong Motion (ESM) flatfile: compilation criteria and data statistics. Bull Earthquake Eng. doi.org/10.1007/s10518-018-0480-z.

López-Comino, J. A., & Cesca, S. (2018). Source complexity of an injection induced event: The 2016 M 5.1 Fairview, Oklahoma earthquake. Geophysical Research Letters, 45, 4025–4032. doi.org/10.1029/2018GL077631.

J. A. López-Comino, S. Cesca, J. Jarosławski, N. Montcoudiol, S. Heimann, T. Dahm, S. Lasocki , A. Gunning, P. Capuano & W. L. Ellsworth (2018): Induced seismicity response of hydraulic fracturing: results of a multidisciplinary monitoring at the Wysin site, Poland. In: Scientific Reports (8: 8653). dx.doi.org/10.1038/s41598-018-26970-9.

Lizurek G., Wiszniowski J., Van Giang N., Plesiewicz B., Dinh Quoc Van (2017). Clustering and Stress Inversion in the Song Tranh 2 Reservoir, Vietnam. Bulletin of the Seismological Society of America ; 107 (6): 2636–2648. doi: doi.org/10.1785/0120170042

Jagt, L., Ruigrok, E., Paulssen, H. (2017). Relocation of clustered earthquakes in the Groningen gas field. Netherlands Journal of Geosciences, 96 (5), S163-S173. doi.org/10.1017/njg.2017.12

J. A. López-Comino et al. (2017): Induced seismicity response of hydraulic fracturing: results of a multidisciplinary monitoring at the Wysin site, Poland. Scientific Reports 8. doi.org/10.1038/s41598-018-26970-9

Neagoe C., Grecu B., Manea L.M. (2017): Improving Real-Time Detection and Location of Local Seismic Events in Romania. SGEM2017 Conference Proceedings. Vol. 17, Issue 14, 181-188 pp, doi: 10.5593/sgem2017/14/S05.023

Neagoe C. , Grecu B., Radulian M. (2017): Focal Mechanism and Source Directivity for Vrancea Intermediate Depth Earthquakes. SGEM2017 Conference Proceedings. Vol. 17, Issue 14, 133-140 pp, doi: 10.5593/sgem2017/14/S05.017

Westwood R. F., Toon S. M., Cassidy N. J. (2017): A sensitivity analysis of the effect of pumping parameters on hydraulic fracture networks and local stresses during shale gas operations. Fuel, Volume 203, 2017, pages 843-852, doi.org/10.1016/j.fuel.2017.05.004

2017

Grecu B., Neagoe C., Partheniu R., Nastase E., Zaharia B. (2017): New Seismic Noise Model for Romania. SGEM2017 Conference Proceedings. Vol. 17, Issue 14, 285-292 pp, DOI: 10.5593/sgem2017/14/S05.036

Leptokaropoulos K. , Staszek M., Cielesta S., Urban P., Olszewska D., Lizurek G. (2017): Time-dependent seismic hazard in Bobrek coal mine, Poland, assuming different magnitude distribution estimations. In: Acta Geophysica 65: 493. dx.doi.org/10.1007/s11600-016-0002-9

Lizurek G. (2017): Full Moment Tensor Inversion as a Practical Tool in Case of Discrimination of Tectonic and Anthropogenic Seismicity in Poland. In: Pure Appl. Geophys. 174: 197.dx.doi.org/10.1007/s00024-016-1378-9

Lizurek G., Wiszniowski J., Van Giang N., Plesiewicz B., Dinh Quoc Van (2017). Clustering and Stress Inversion in the Song Tranh 2 Reservoir, Vietnam. Bulletin of the Seismological Society of America ; 107 (6): 2636–2648. doi: doi.org/10.1785/0120170042

Jagt, L., Ruigrok, E., Paulssen, H. (2017). Relocation of clustered earthquakes in the Groningen gas field. Netherlands Journal of Geosciences, 96 (5), S163-S173. doi.org/10.1017/njg.2017.12

López-Comino, J. A. et al. (2017): Induced seismicity response of hydraulic fracturing: results of a multidisciplinary monitoring at the Wysin site, Poland. Scientific Reports 8. doi.org/10.1038/s41598-018-26970-9

Neagoe C., Grecu B., Manea L.M. (2017): Improving Real-Time Detection and Location of Local Seismic Events in Romania. SGEM2017 Conference Proceedings. Vol. 17, Issue 14, 181-188 pp, DOI: 10.5593/sgem2017/14/S05.023

Neagoe C. , Grecu B., Radulian M. (2017): Focal Mechanism and Source Directivity for Vrancea Intermediate Depth Earthquakes. SGEM2017 Conference Proceedings. Vol. 17, Issue 14, 133-140 pp, DOI: 10.5593/sgem2017/14/S05.017

Westwood R. F., Toon S. M., Cassidy N. J. (2017): A sensitivity analysis of the effect of pumping parameters on hydraulic fracture networks and local stresses during shale gas operations.Fuel, Volume 203, 2017, Pages 843-852, doi.org/10.1016/j.fuel.2017.05.004

# 3 Management status

## 3.1 Main meetings at project level

### Management Board (MB)

During the first 18 months, the MB has met in four occasions, twice in face-to-face meetings (Zurich, Bucharest), and twice by teleconference. Every six months the MB has received a status report elaborated by the project manager, with the highlights of the covered period and decisions to be taken. The status report covers management aspects, status of deliverables and milestones, foreseen modifications to the grant agreement, and a summary of communication activities, NA, JRA, TA and VA (networking, joint research, transnational access, virtual access).

The composition of the MB was approved in May 2018: D. Giardini (Coordinator, chair), M. Calvi (EUCE, earthquake engineering integration), H. Pedersen (CNRS, NA and EPOS integration), L. Freda (INGV, EPOS integration), A. Pinto (JRC, NA), A. Pavese (EUCE, TA coordinator), R. Bossu (EMSC, VA coordinator), F. Cotton (GFZ, JRA seismology), J.-R. Grasso (CNRS, JRA anthropogenic seismicity), M. Fardis (UPAT, JRA earthquake engineering), the Communication Officer (M. Marti, with no vote) and the SERA Manager (K. Saleh, with no vote). H. Pedersen requested to be replaced in April 2018, and since then C. Cornou, also from CNRS, is part of the MB.

### General Assembly (GA)

The Consortium Agreement foresees an annual meeting of the General Assembly. The first one was celebrated in May 2017 in Zurich, together with the project kick-off. The second General Assembly will take place in early December 2018, right before the submission of the EC first periodic report. The GA has also approved a decision by written procedure regarding the first SERA amendment now underway.

### Annual science meeting

It is foreseen to have a science meeting per year to discuss progress in the project across all WPs. In addition to the kick-off meeting (May 2017, Zurich), the first annual meeting took place in Bucharest in April 2018, with around 100 project participants from all SERA WPs, as well as the SERA Scientific Advisory Board. The next science meeting will take place in April 2019 (location to be determined).

### Scientific Advisory Board (SAB)

The SAB is composed of three members, with a role in the overall monitoring of the project and the approval of specific tasks linked to milestones (for instance the use of Transnational and Virtual access). Members are Prof. Rathje (U. Texas), Prof. Bisch (ENCP) and M. Dolce (Italian Civil Protection). The SAB participated in person to the first science annual meeting, and has elaborated the contents for D1.4. Mid-term assessment report of the SAB.

### Transnational Access Selection and Evaluation panel (TA-SEP)

The composition of the VA-EP is the following: Peter Fajfar (U. Ljubljana), Eduardo C. Carvalho (ex EC8 chairman), Alain Pecker (École Nationale de Ponts et Chaussées), Alberto Michelini (INGV-Rome), in addition to the TA Coordinator (Alberto Pavese). The TA-SEP has already conducted two evaluations for two TA calls, and will perform the last one once the current closed in closed at the end of M18.

Virtual Access Evaluation panel (VA-EP)

The composition of the VA-EP is the following: VA coordinator (Rémy Bossu, EMSC), Paul Earle (NEIC/USGS), John Douglas (University of Strathclyde), Hong Kie Thio (AECOM), J. Wassermann (Univ. Munich) and Marcelo Assumpçao (Univ. of São Paulo). The VA-EP has now had first exposure to the VA activities, and elaborated an assessment report at M18 (D.19.1) based on the reports of the concerned WPs on VA statistics (D18.1). The panel will issue another report at M36, and is expected to take part in the last scientific annual meeting.

## 3.2 Management tools

The **project management plan** (PMP, deliverable D1.1) was submitted in July 2017. The PMP contains a general description of the project, including schedule, deliverables, milestones, governance structure, as well as the management procedures and tools foreseen for the project implementation. The composition and procedures of the different SERA boards is also described. The PMP also contains the signed Consortium Agreement.

WP1 has elaborated guidelines to specific topics, namely **Guidelines for Trans-national Access and Virtual Access** (Nov. 2017), where information on TA/VA user and cost eligibility, budget and EC reporting can be found. Also, **Guidelines for EC reporting** in SERA (April 2018) have been distributed to all WP leaders and financial contacts.

For the monitoring of **project progress**, all WPs have been requested to elaborate a summary after each meeting at WP level; these summaries are uploaded regularly onto the intranet Documents per WP section.

To monitor the **financial project status**, and in preparation for the EC report M1-M18, WP1 conducted an internal financial check for the period M1-M12 with all the partners and linked third parties (see further down in this section).

A co-working platform (http://sera-sp.ethz.ch) was set up to facilitate internal communication and exchange. The platform serves as a repository for documents relevant to the project including deliverables, meeting minutes, and internal reports.

Finally, all WP leaders and partners have received a package with the documents to be completed for the **first EC periodic report M1-M18**.

## 3.3 Modifications to the Grant Agreement

In August 2018 the first grant amendment request was initiated, following the liquidation process undergone by partner AMRA. The amendment request was approved by the General Assembly by written procedure prior to submission to the EC. AMRA was able to complete project tasks for M1-M17, while the remainder tasks (equivalent to 7 PMs and approximately 40 kEuro of EC funding) will be assumed by existing SERA partners ETH, GFZ and IG-PAS within the same WP as AMRA. The amendment request was submitted mid-October and it is at the stage of preparation of the termination report.

## 3.4 Financial status

In preparation for the financial report of the M1-M18 period, WP1 conducted an internal financial check for the first year of SERA. This internal check covered both budget expenditure and person-months for the M1-M12 period for all SERA partners and linked third parties. A summary is shown in Table 3.

| *Direct costs, k€* | Staff costs | Other costs | Subcontracts | Special unit costs | PMs (NA, JRA) |
|---|---|---|---|---|---|
| Grant Agreement | 5'660'413 | 1'354'635 | 96'000 | 2'225'969 | 907 |
| Spent M1-M12 | 1'696'979 | 265'677 | 31'163 | 119'953 | 239 |
| % Spent M1-M12 | 30% | 20% | 32% | 5% | 26% |

**Table 5.** Summary of financial check M1-M12 (costs in kEuro).

- The selection of TA projects is progressing well (all three calls are already launched), and 33 projects are approved. The low budget execution just reflects the fact that the first selection took place in M6, therefore the expenditure is already foreseen to increase considerably by M18, with the first EC report, and further in year 3.

- For NA, JRA and VA activities all financial contacts are aware of ongoing activities and are able to report PMs and associated costs. Consolidated data will be delivered at M18 for the first EC report. The level of budget execution and PM efforts seems appropriate at year 1.

## 3.5 Risk register

The risk register mapping structure is described in D1.1. Project Management Plan. It uses the magnitude classification shown in Table 6.

| **Impact** | | | | |
|---|---|---|---|---|
| Very high | M | H | H | H |
| High | M | M | H | H |
| Medium | M | M | M | H |
| Low | S | S | M | M |
| **Likelihood** | Low | Moderate | High | Very high |

**Table 6.** Risk magnitude classification.

The risk register is updated by the SERA management, and the current status can be found in Table 7 for all risks identified at the time of proposal.

During M1-M18, new risks emerged and were mitigated:

- Termination of partner AMRA: This has been described in 3.3; A solution was found within existing partners for the technical and financial part, and it was implemented with the mechanisms foreseen in the Consortium Agreement.

- Potential difficulty to execute TA projects within SERA duration: This risk was highlighted at the second MB meeting, and mitigated by advancing all TA calls to the first half of the project, in order to allow sufficient time for completion before project ends.

- Modification of the SC8 requests for the ESHM model: During the SERA implementation, a new calendar of requirements was set up by Eurocode 8, with requirements shifting to 2020. Mitigation measured have included ensuring participation of SERA members at the CEN-TC250-SC8 meetings, and slight shifting of WP25 deliverables to ensure full consistency between SERA outputs and requirements by Eurocode 8.

| Nr. | Identified risk | Magnitude | Current status | Mitigation measures (in GA) |
|---|---|---|---|---|
| 1 | Project duration of 3 years too short, failure to deliver in time and quality. | M | **Low risk**<br>Good progress at M18 | - Mature communities and partners.<br>- Project monitoring by MB.<br>- Involvement of SAB in science annual meetings and assessment reports. |
| 2 | Too strong dependencies between WPs, Delayed delivery in one WP hindering progress in other WPs. | M | **Low risk**<br>Dependencies are identified and coordinated | - Project monitoring by MB<br>- Not present in the NA and limited to two dependencies in JRA. |
| 3 | Underestimation of required resources for scientific developments, with the risk that scientific contributions fail to be integrated or tested or distributed. | M | **Risk decreasing**<br>All WPs are following the schedule and internal checks are conducted by management, including spending and in-kind contributions | - SERA design based on the experience of past successful projects of comparable class; verify spending and the availability of offered in-kind contribution |
| 4 | Available resources spread too thinly, with too many WPs and beneficiaries, with the risk to failing in maintaining the planned workflow and timeline. | L | **Risk decreasing**<br>Support measures in place like: all-participants annual meetings, project intranet, website, deliverable support, workflow support documents (project management plant, guidelines for TA/VA, guidelines for EC reporting, intranet guidelines, project templates). | - SERA design based on the experience of past successful projects of comparable class guarantee efficient and appropriate management |

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| Nr. | Identified risk | Magnitude | Current status | Mitigation measures (in GA) |
|---|---|---|---|---|
| 5 | Failure to successfully integrate the SERA services and access in the EPOS TCS; SERA service and access are not aligned with EPOS TCS timeline or ICS technical design. | M | **Risk decreasing**<br>SERA is implemented in close coordination with EPOS-IP, with the EPOS project director in SERA MB, EPOS TCS participants in SERA WPs, and SERA Coordinator & Manager leading the EPOS-IP financial work-package.<br>- For VA, SERA services are part of the EPOS catalogue of services already.<br>-For TA, the highest risk is the financial capacity of EPOS to cover high TA costs in the future, EPOS-ERIC is aware of the foreseen participation of EPOS to the TA costs. | - SERA design done in Close coordination with EPOS-IP, with common activity and TCS leaders; TCS-ICS integrator directly involved in SERA development |
| 6 | Failure in integrating the earthquake engineering community in SERA and EPOS; the proposed infrastructure does not meet the user needs; poor impact of the new infrastructure. | M | **Risk stable**<br>- For TA, the highest risk is the financial capacity of EPOS to cover high TA costs in the future, EPOS-ERIC is aware of the foreseen participation of EPOS to the TA costs.<br>- High response to TA offering through TA calls in SERA | - Revise and check Communication Plan<br>- Improve impact of dissemination<br>- Check impact assessment and science cases |
| 7 | Failure to deliver the offered Transnational Access; Poor access to infrastructures and/or poor quality of data and services | M | **Risk low**<br>- All three foreseen TA calls already launched, to allow completion within SERA lifetime.<br>- TA calls advertised widely (project website, EUCENTRE website, social networks, newsletters)<br>- 33 proposals already approved.<br>- TA access status compared to plan approved by SAB | - Monitor access; improve the facility access and the attractiveness of the offered infrastructure; increase communication on the access offered |

| Nr. | Identified risk | Magnitude | Current status | Mitigation measures (in GA) |
|---|---|---|---|---|
| 8 | Failure to deliver the planned Virtual Access, Poor service access to data and/or poor quality of data offered | M | Risk low<br>- VA-EP in place<br>- First evaluation conducted<br>- VA access status approved by SAB | - Monitor access; improve the facility access and the attractiveness of the offered infrastructure; increase communication on the access offered |
| 9 | Failure of EPOS to secure the timely ERIC signature and full implementation; SERA services cannot be integrated in EPOS. | M | Risk low<br>- EPOS-ERIC will be launched in November 2018<br>- Funding committed for 2019<br>- Strong impact of the services and Access offered by SERA for stakeholders also without EPOS | - Strong impact of the services and Access offered by SERA for users and stakeholders also without EPOS |
| 10 | Failure to timely identify and mitigate risks; potential risks are discovered too late to enable efficient recovery | L | Risk low<br>- Regular progress collection by project manager of WP activities<br>- Regular reporting of project activities to MB<br>- Risk register in place, maintained by management | - Benefit from experience of past projects; update regularly the Risk Register by the MB; monitor mitigation measures |
| 11 | Underestimate ethical risks; improper use of data and products for geohazards and geo-resources applications | L | Risk low<br>- Regular reporting project activities to MB | - Rigorous application of the ethical standards and guidelines of Horizon2020; monitor by MB and SAB |
| 12 | Over-dependence on key individuals; lack of community building; poor involvement of partners | L | Risk low<br>- Management plan (D1.1) identifies clearly roles and responsibilities for teams, project management, executive board, advisory board | - Adopt a management plan tailored to the complexity of the project and of the integration in EPOS |
| 13 | Reduced visibility and impact; failure in maximizing the impact | M | Risk low<br>- Communication plan in place (D1.2), with website, social networks, internal & external newsletters, dissemination to partners | - Verify and strengthen communication and dissemination strategy and activities; guarantee the full exploitation of results. |

**Table 7.** Risk register at M18.

# 4 External communication status

Since the beginning of the project, the main communication measures have been successfully launched and promoted. For external communication, this includes a project website, a bi-annual newssheet, a fact sheet series, and a Twitter account. To facilitate internal communication an online platform for file sharing and collaboration was set-up and an internal newsletter regularly distributed. To ensure a common design for all communication activities a corporate design was established. SERA launched and supported in addition numerous occasions for knowledge exchange in form of meetings, publications, and workshops.

## 4.1 SERA website

The SERA website (www.sera-eu.org) acts as the main external communication tool. It addresses all external target groups and provides information on a general and comprehensible level. The website also offers detailed information about work packages, deliverables, conference dates, and helpful links.

The website is online since October 2017. For further information see deliverable 2.4: principle website content online.

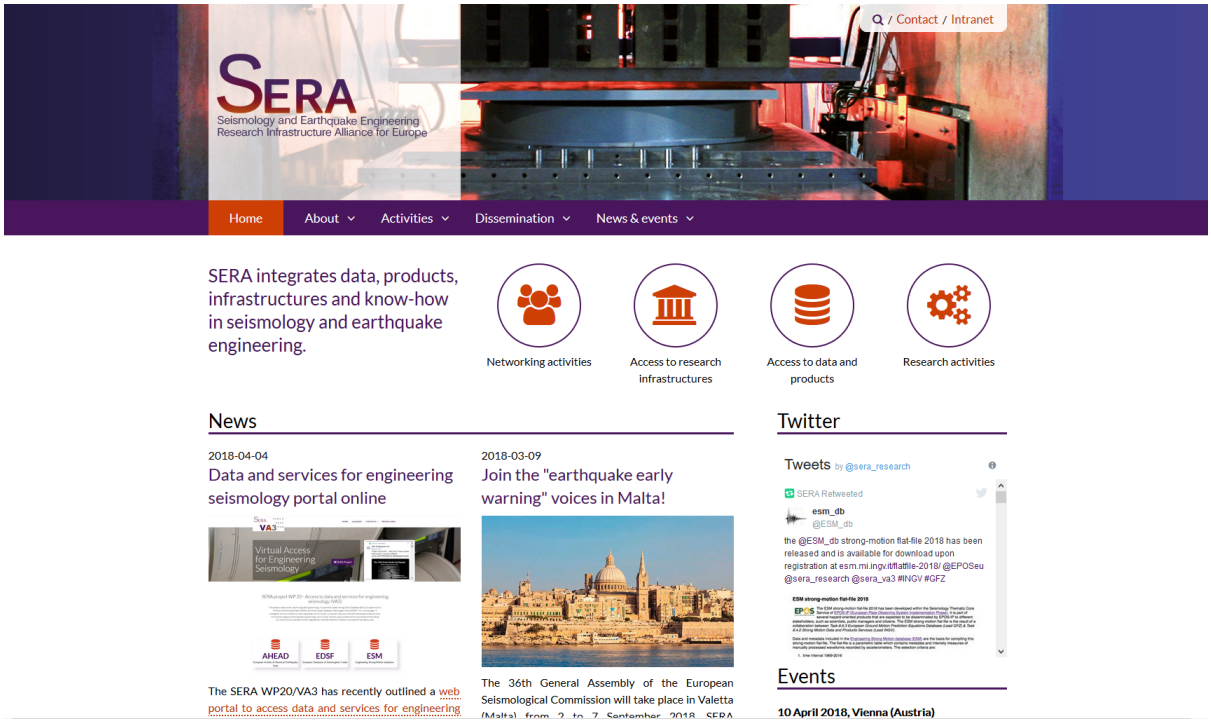


**Figure 1:** Screenshot of the SERA homepage.

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## 4.2 Bi-annual newssheet

The external newssheet serves as information channel between the project participants and the external public. It provides comprehensive insights into the various project activities, developments, and achievements. Within the reporting period, two external newssheets have been distributed reaching almost 200 recipients.

## 4.3 Fact sheet series

To account substantially to a better understanding of seismic hazard and risk in Europe, several questions have to be answered. With the fact sheet series, SERA addresses key questions by explaining crucial terms and concepts as well as by presenting first results to an interested public. The fact sheet series was launched on 12 April 2018, covering topics such as seismic hazard, engineering seismology and shake table experiments. In total, four fact sheet series are planned.

## 4.4 Twitter account

SERA operates a twitter account. Its purpose is to enhance the visibility of the project and to inform the interested public about SERA's workshops, conferences, results and outputs. Currently, 159 persons are following @sera_research. In return, @sera_research follows related projects, project participants, and relevant stakeholders (until today: 106 following).

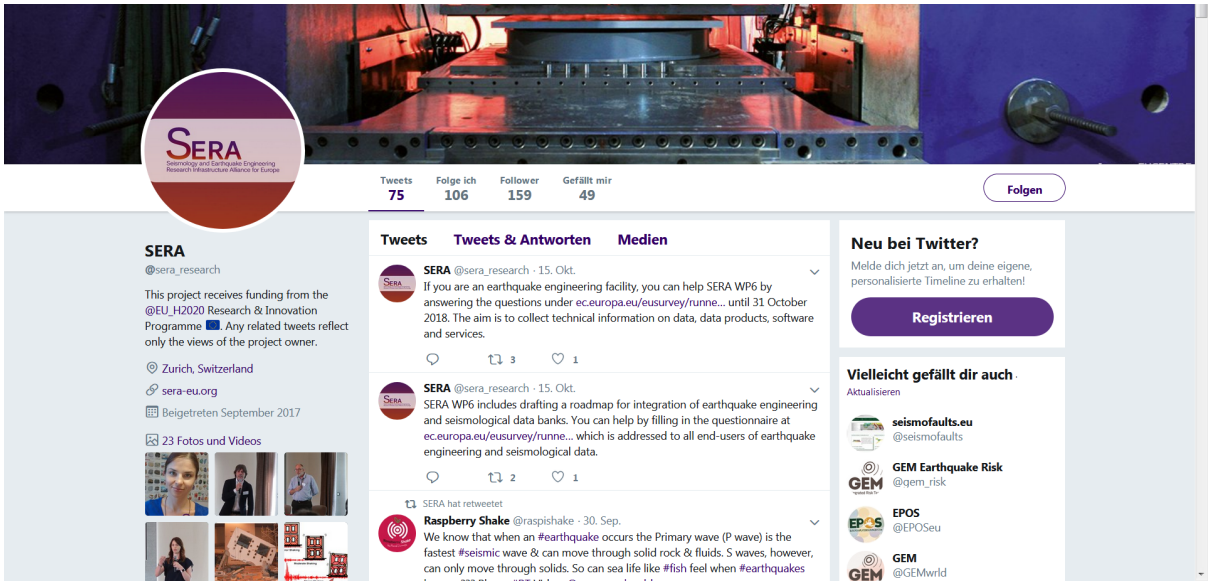


**Figure 2.** Screenshot of the SERA twitter account.

# 5 Impact and exploitation of results

A full reporting of impacts achieved by SERA will be provided at the end of the project, specifically addressing the foreseen impact described in the proposal (a. to j. below).

a. Integration of the key research infrastructures in Europe for natural and anthropogenic earthquake risk assessment and mitigation.
b. Capacity of our society to mitigate seismic risks and react during an earthquake and in the post-earthquake recovery period.
c. Harmonization of hazard and risk input, output, and assessment methodologies.
d. Long-term integration of the seismological and seismic engineering communities.
e. Safe exploitation of geo-resources.
f. Impact to the European construction sector (sustainable and economic development).
g. International reach of the SERA activities and results.
h. Impact for the construction of EPOS.
i. Impact for the competitiveness of the European Research Area.
j. Impact for the future ability to predict earthquakes.

At M18, all activities are going in the good direction for achieving the foreseen impact described in the proposal. Some examples of indicators of progress are:

- With a total of 9 already celebrated workshops, SERA has offered a significant number of opportunities for knowledge exchange and the dissemination of its findings. The workshops conducted reached a wide variety of audiences (up to 400 teachers through Seismo@school workshops, and over 1000 participants in conferences) including among others scientists, technicians, engineers, and managers.
- With an average of 2'500 unique visitors per month on the SERA website, almost 200 subscribers of the bi-annual newssheet, and currently more than 100 followers on Twitter, SERA has a large coverage and uses its different communication channels effectively to inform and interact with its stakeholders. By setting up a data management plan, SERA in addition, seeks to optimize data access within the project and with interested stakeholders.
- Virtual access is going according to plan, with statistics of access provided in D18.1.
- All Transnational access calls have now been launched, and 33 experiments across all TA facilities have been already selected. This shows a very good response of the user community to the call and potential for impact to the construction sector.
- Eurocode has agreed through its technical group CEN/TC 250/SC8 to include an annex to the updated Eurocode 8 with a set of European Hazard maps, meaning that SERA will produce results to be embedded into the next European construction regulations.
- There is full coordination in place between SERA and EPOS-IP, ensuring that there is a coherent approach to strategy, implementation of services and resource planning between both projects, and towards EPOS-ERIC.

SERA
Seismology and Earthquake Engineering
Research Infrastructure Alliance for Europe

# Contact


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