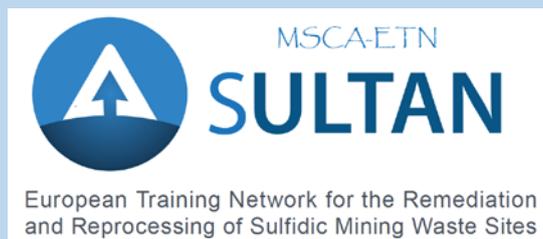


15 PhD positions in the EU Horizon 2020 Marie Skłodowska-Curie Project:



Applications are invited for 15 PhD positions ("Early Stage Researchers") to be funded by the Marie-Sklodowska-Curie Innovative Training Network "SULTAN² – European Training Network for the Remediation and Reprocessing of Sulfidic Mining Waste Sites" within the Horizon 2020 Programme of the European Commission. SULTAN is a consortium of high profile universities, research institutions and companies located in Belgium, Germany, Finland, Portugal, Switzerland, Spain and the Netherlands (**Figure 1**).

Key background info

Number of positions available

15 PhD Positions

Research Fields

Geology – Chemistry – Chemical Engineering - Metallurgy - Environmental Engineering - Materials Engineering-

Keywords

LCA, extractive waste, tailings, geology, geometallurgy, organic synthesis, mineral processing, biometallurgy, solvometallurgy, hydrometallurgy, ceramics, inorganic polymers, SCMs

Career Stage

Early Stage Researcher (ESR) or 0-4 yrs (Post Graduate)

Benefits and salary

The successful candidates will receive an attractive salary in accordance with the MSCA regulations for Early Stage Researchers. The exact (net) salary will be confirmed upon appointment and is dependent on local tax regulations and on the country correction factor (to allow for the difference in cost of living in different EU Member States). The salary includes a living allowance, a mobility allowance and a family allowance (if married). The guaranteed PhD funding is for 36 months (i.e. EC funding, additional funding is possible, depending on the local Supervisor, and in accordance with the regular PhD time in the country of origin). In addition to their individual scientific projects, all fellows will benefit from further continuing education, which includes internships and secondments, a variety of training modules as well as transferable skills courses and active participation in workshops and conferences.

On-line Recruitment Procedure (see Appendix 1 for full description)

All applications proceed through the on-line recruitment portal on the www.etn-sultan.eu website. Candidates apply electronically for one

to maximum three positions and indicate their preference. Candidates provide all requested information including a detailed CV ([Europass format](#) obligatory) and motivation letter. During the registration, applicants will need to prove that they are eligible (cf. ESR definition, mobility criteria, and English language proficiency). The deadline for the on-line registration is **15 August 2018**. The SULTAN Recruitment Committee selects between 20 and maximum 30 candidates for the Recruitment Event which will take place in Leuven (**October 2018, date to be confirmed soon**). The selected candidates provide a 20 minute presentation and are interviewed by the Recruitment Committee. Candidates will be given a domain-relevant peer-reviewed paper (prior to the recruitment event) by their prioritised Supervisor and will be asked questions about this paper during the interview to check if the candidate has the right background/profile for the ESR position. Prior to the recruitment event, skype interviews between the Supervisors and the candidates are recommended, along with on-line personality tests.

In order to facilitate their travel, preselected candidates (from outside Belgium) receive a fixed, lump sum of 250 euro (paid by the prioritised Supervisor). In order to avoid delays in reimbursements, candidates are asked to keep all invoices and tickets (cf. train, plane, hotel...).

The final decision on who to recruit is communicated the day after the Recruitment Event. The selected ESRs are to start their research as quickly as possible (target: 1 January 2019).

Applicants need to fully respect three eligibility criteria (to demonstrated in the Europass cv):

Early-stage researchers (ESR) are those who are, at the time of recruitment by the host, in the first four years (full-time equivalent) of their research careers. This is measured from the date when they obtained the degree which formally entitles them to embark on a doctorate, either in the country in which the degree was obtained or in the country in which the research training is provided, irrespective of whether or not a doctorate was envisaged.

Conditions of international mobility of researchers:

Researchers are required to undertake trans-national mobility (i.e. move from one country to another) when taking up the appointment. At the time of selection by the host organisation, researchers must not have resided or carried out their main activity (work, studies, etc.) in the country of their host organisation for more than 12 months in the 3 years immediately prior to their recruitment. Short stays, such as holidays, are not taken into account.

English language: Network fellows (ESRs) must demonstrate that their ability to understand and express themselves in both written and spoken English is sufficiently high for them to derive the full benefit from the network training.

The 15 available PhD positions

(see Figure 2 for interactions between ESRs/WPs)

ESR1: Resource potential and speciation of Cu-Zn tailings for future mining and remediation

Host: FCiencias.ID (Lisbon University, Portugal)

Main supervisor: Prof. Jorge Relvas (irelvas@fc.ul.pt)

Duration: 36 months

Required profile: Geologist or Geometallurgist

Objectives: (1) To characterise the physical, mineralogical & geochemical properties of Cu-Zn tailings of the Neves Corvo VMS deposit; (2) To determine the solid-phase speciation, metal distribution maps in sulphide minerals and variability of metal allocation; (3) To evaluate the exploitation potential for base, precious and critical metals (incl. Cu, Zn, Ag, Au, In, Se); (4) To perform geometallurgical evaluation of metals for mineral reprocessing; (5) To develop a "from mine to processing plant" model to optimise reprocessing of Cu-Zn tailings; (6) To perform an economic resource potential and remediation assessment.

ESR2: Geometallurgical characterisation of Zn-Pb tailings in view of (near) zero-waste valorisation

Host: KU Leuven (Belgium)

Main supervisor: Prof. Philippe Muchez (philippe.muchez@kuleuven.be)

Duration: 36 months

Required profile: Geologist or Geometallurgist

Objectives: To determine the spatial variability in the mineralogy and total geochemistry, incl. the base metals and critical metals such as In, Ge and Ga of a Zn-Pb tailing site; to specify the solid-phase speciation and map the distribution of the metals in the minerals; to evaluate the availability of the metals for further processing; to determine the applicability of the geochemical and geometallurgical characteristics proposed with a pilot study.

ESR3: International code compliant resource characterisation of sulfidic Cu-Zn-Pb tailings in an industrial tailings storage facility

Host: Helmholtz Zentrum Dresden-Rossendorf (Germany)

Main supervisor: Prof. Jens Gutzmer (j.gutzmer@hzdr.de)

Duration: 36 months

Required profile: Geologist or Geometallurgist

Objectives: To increase the efficiency and accuracy of exploration methods and assess the reprocessing potential of tailings. In more detail: (1) apply an internationally accepted reporting mineral resources and reserves standard (e.g. PERC - Pan-European Reserves & Resources Reporting Committee) requirements to establish the economic potential of resources contained in industrial tailings storage facilities; (2) construct a 3-D resource potential

model; (3) characterise the mineralogical and structural properties of the tailing material in order to identify the main value elements and pollutants. Ultimately this allows to (4) assess possible applications (e.g. construction material) of residues from the re-processing.

ESR4: Synthesis of new bio-based mining chemicals for froth flotation

Host: University of Oulu (Finland)

Main supervisor: Assoc. Prof. Henrikki Liimatainen (Henrikki.Liimatainen@oulu.fi)

Duration: 36 months

Required profile: Chemist or Material Scientist/Engineer

Objectives: To develop functional bio-based (cellulose, nano-cellulose) chemicals having selective affinity to the surfaces of selected mine tailings; to determine the chemical attaching mechanism by suitable analytical methods; to optimise process conditions for nano-cellulose based biochemical production based e.g. on the region-selective oxidation and deep-eutectic solvents.

ESR5: Synthesis of new chelating surfactants for ion flotation

Host: KU Leuven (Belgium)

Main supervisor: Prof. Wim Dehaen (Wim.Dehaen@kuleuven.be)

Duration: 36 months

Required profile: Organic chemist

Objectives: To design and prepare new surfactants containing chelating groups, using renewable starting materials or natural products with surfactant properties that are abundantly available. To investigate the efficiency and the selectivity of the removal of metal salts by ion flotation. To study the recovery of these metal salts from the collected foam.

ESR6: Innovative ultra-fine particle flotation through agglomeration for the re-processing of Cu-Zn, Zn-Pb and Cu-Zn-Pb mining residues

Host: TU Clausthal (Germany)

Main supervisor: Prof. Daniel Goldmann (goldmann@aufbereitung.tu-clausthal.de)

Duration: 36 months

Required profile: Mineral processing engineer or Chemical engineer

Objectives: To develop direct flotation techniques for the reprocessing of tailings; to evaluate the adsorption and flocculation as well as particle agglomeration; to determine the zeta-potential, adsorption characteristics, floatability and selective flocculation; to identify new flocculants and the possibility of selective flocculation.

ESR7: Advanced leaching of Cu-Zn, Zn-Pb and Cu-Zn-Pb tailings using microwave heating

Host: VITO (Mol, Belgium)

Main supervisor: Dr. Jeroen Spooren (jeroen.spooren@vito.be)

Duration: 36 months

Required profile: Chemist or Hydrometallurgist

Objectives: To apply microwaves (MWs) to increase selectivity, efficiency and kinetics of hydro- and solvometallurgical leaching systems for tailings; to understand the interaction of MWs with the solid tailing material in order to enhance local crack formation; to determine the MW activation of water and its influence on the leaching system; to perform MW heating of ionic liquids (ILs) in order to enhance IL based leaching systems.

ESR8: A new approach to high-pressure leaching of Cu-Zn, Zn-Pb and Cu-Zn-Pb tailings using salt-containing water sources

Host: TU Clausthal (TUC, Germany)

Main supervisor: Prof. Daniel Goldmann
(goldmann@aufbereitung.tu-clausthal.de)

Duration: 36 months

Required profile: Hydrometallurgist

Objectives: To identify and characterise possible salt-containing water sources (sea water, industrial waste water, brines or groundwater); To specify the influence of ions on the high-pressure leaching of sulphide concentrates; To develop a thermodynamic model to predict the applicability of alternative water sources; To work out an experimental validation of the model using actual water samples (process water, waste water, sea water etc.)

ESR9: Innovative bioleaching approaches for the extraction of valuable and hazardous elements (As, Cd) from Cu-Zn, Zn-Pb and Cu-Zn-Pb

tailings

Host: Helmholtz Zentrum Dresden-Rossendorf (Germany)

Main supervisor: Dr. Katrin Pollmann (k.pollmann@hzdr.de)

Duration: 36 months

Required profile: Biometallurgist or Microbiologist

Objectives: To investigate bioleaching activities of (halo)alkaliphilic sulphur-oxidising micro-organisms that live at neutral to alkaline conditions; to develop bioleaching processes of carbonate-rich tailings at neutral to alkaline conditions; to investigate processes at mineral surfaces; to understand sulphur metabolism of micro-organisms at alkaline conditions.

ESR10: Recovery of metal ions from dilute aqueous solutions by ion flotation

Host: KU Leuven (Belgium)

Main supervisor: Prof. Koen Binnemans
(koen.binnemans@kuleuven.be)

Duration: 36 months

Required profile: Hydrometallurgist or Analytical chemist

Objectives: To develop a process for the recovery of metal ions from acidic sulphate solutions by ion flotation; to develop methods to strip the metals from the loaded foam and to recycle the surfactants; to develop a process to recover cadmium and arsenic from acidic effluents by ion flotation.

ESR11: Utilisation of purified, tailings-derived mineral residues in inorganic polymers

Host: University of Oulu (Finland)

Main supervisor: Prof. Mirja Illikainen (Mirja.Illikainen@oulu.fi)

Duration: 36 months

Required profile: Materials Scientist/Engineer, Chemist

Objectives: To study pre-treatment methods to increase the alkali-solubility of aluminium, silicon, iron and magnesium from Cu-Zn, Zn-Pb and Cu-Zn-Pb tailings and understand the mechanisms of action. To synthesize inorganic polymers from purified mineral residues.

ESR12: Sustainable use of sulfidic tailing residues in ceramics

Host: Wienerberger (Kortrijk & Beerse, Belgium)

Main supervisors: Hilde Chambart
(Hilde.Chambart@wienerberger.com) & Prof. Valérie Cappuyns
(KU Leuven, valerie.cappuyns@kuleuven.be)

Duration: 36 months

Required profile: Materials Scientist/Engineer

Objectives: To investigate the possibilities to replace primary raw materials for ceramics by tailings, taking into account production parameters (facing, drying and firing processes), as well as the product quality (intrinsic technical and aesthetical aspects), and environmental issues (compliance with environmental legislation).

ESR13: Use of sulfidic tailing residue for underground cementitious concrete

Host: ETH Zürich (Switzerland)

Main supervisor: Prof. Guillaume Habert
(habert@ibi.baug.ethz.ch)

Duration: 36 months

Required profile: Materials Scientist/Engineer

Objectives: The objective is to develop a flowable material based on sulfidic tailing that will be able to set into a hard concrete material. This involves the development of a process to deflocculate the tailing in the early stage as well as the development of a sulphoferrite cement based on internal reaction with sulfidic material.

ESR14: Environmental and health impact of hazardous metals from tailing to product

H Host: KU Leuven (Belgium)

Main supervisor: Prof. Valérie Cappuyns
(KU Leuven, valerie.cappuyns@kuleuven.be)

Duration: 36 months

Required profile: Environmental Scientist/Engineer, Materials Engineer

Objectives: To evaluate the solid-phase speciation of hazardous elements, linked to the leaching of hazardous elements under different conditions, and how leaching changes during processing and valorisation of mine tailing materials; To evaluate the environmental and health impact of elements in materials from original tailings to downstream applications.

ESR15: Environmental assessment and decision support for the process design of tailings valorisation

Host: ETH Zürich (Switzerland)

Main supervisor: Prof. Stefanie Hellweg
(stefanie.hellweg@ifu.baug.ethz.ch)

Duration: 36 months

Required profile: Environmental Scientist/Engineer

Objectives: To Provide a flexible model to the scientific community, which can be parameterised to specific locations and system set ups, allowing to environmentally assess tailing valorisation systems; To environmentally assess the new valorisation processes and compare them among each other as well as with conventional tailings; To detect potential drawbacks and trade-offs at an early development stage and provide feedback to process designers about priorities and system improvements.

ETN SULTAN project abstract and key project information

For more than 100 years the EU mining industries have been discarding their extractive-waste residues. Estimates suggest this represents 29% of the EU-28's current waste output. When poorly managed these residues are a significant environmental hazard. Sulfidic Cu-Zn, Zn-Pb and Cu-Zn-Pb tailings pose the largest challenge, as they are prone to acid mine drainage. However, these tailings also contain valuable metals. Recently, the European Innovation Partnership (EIP) on Raw Materials launched a "call to arms" to transform the "extractive-waste problem" into a "resource-recovery opportunity". Additionally, the EIP has warned about the acute shortage of talent in this sector. In order to develop a highly skilled work force, to mitigate environmental risks and to economically recover valuable raw materials, the ETN for the remediation and reprocessing of sulfidic mining waste sites (SULTAN) provides the first-ever training programme dedicated to the reprocessing of tailings. SULTAN has pooled the interdisciplinary and intersectoral expertise of leading EIT

RawMaterials members, world-leading mining and chemical companies, covering all the links in the tailings-reprocessing value chain. SULTAN develops cutting-edge methodologies to assess the resource potential of Europe's main tailings families (WP1) and explores eco-friendly mining chemicals to be used in advanced metal-extraction/recovery set-ups (WP2). SULTAN not only recovers the metals but also valorises the clean(ed) tailing residues in circular-economy applications, incl. inorganic polymers, green cements and ceramics (WP3). In WP4 a novel environmental assessment methodology is developed. The 15 SULTAN ESRs also benefit from a unique soft-skills training programme (WP5) and maximise the impact of their research through dissemination and exploitation (WP6). This will kick-start their careers as highly employable professionals in the EU's tailings reprocessing/remediation sector, as well as for geological surveys, teaching and scientific organisations, and public bodies.

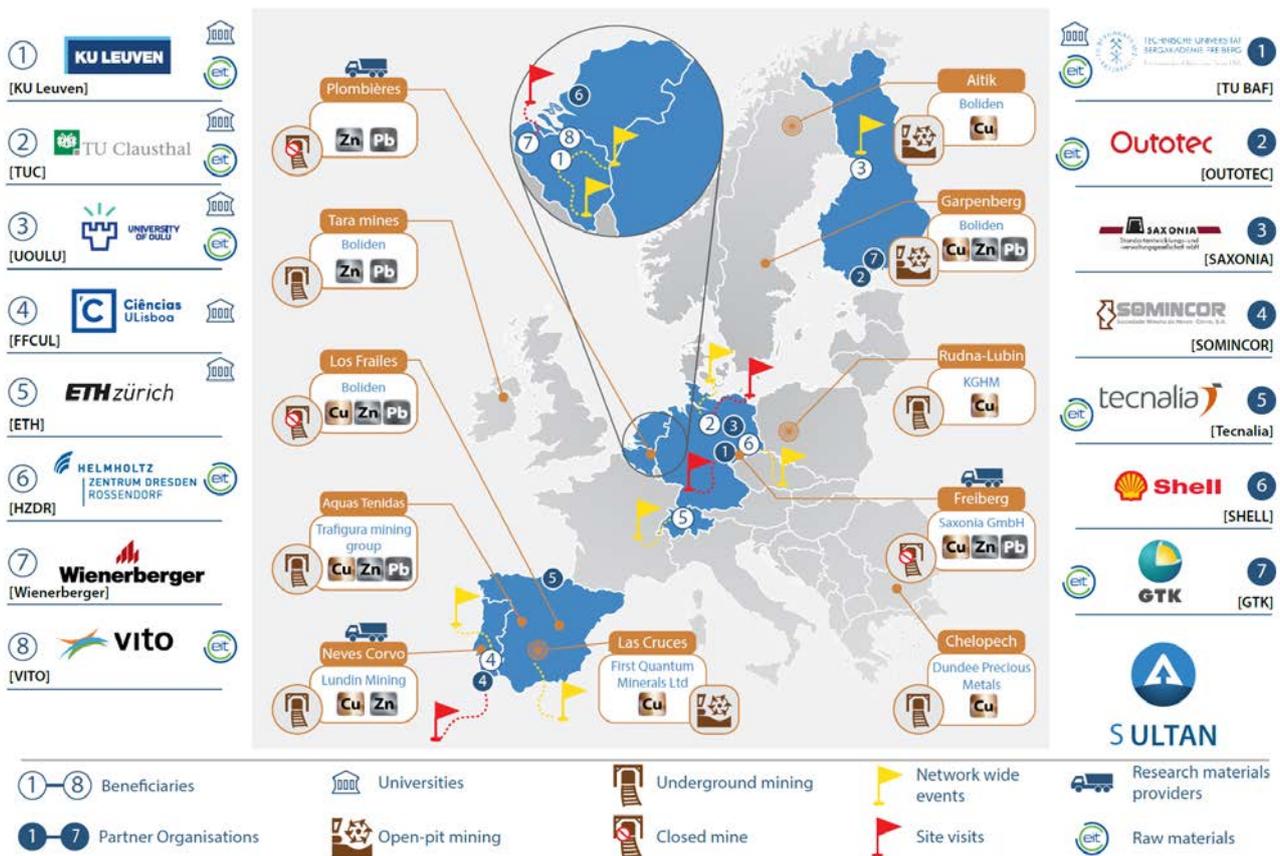


Figure 1: SULTAN Consortium

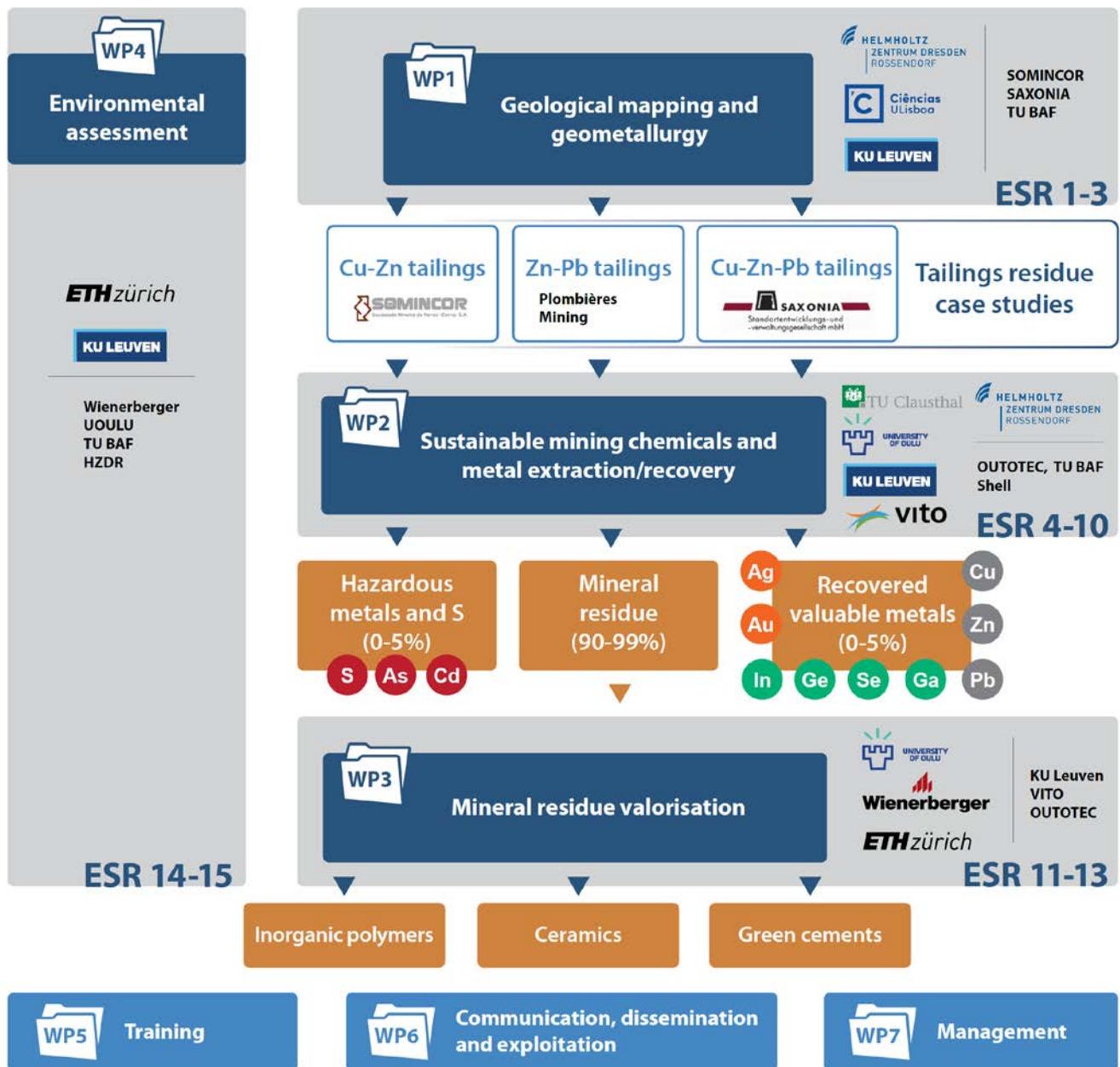


Figure 2: SULTAN WPs and ESRs

General coordinator for ETN SULTAN:

Prof. Philippe Muchez (KU Leuven)

Philippe.muchez@kuleuven.be

General contact person for ETN SULTAN:

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KU LEUVEN

**SUSTAINABLE INORGANIC
MATERIALS MANAGEMENT**

Appendix 1: Recruitment Procedure and Principles

A preliminary SULTAN recruitment web page is put on-line (June 2018). A special effort is made to promote the vacancies at Central and Eastern European universities (e.g. KU Leuven's Central Europe Leuven Strategic Alliance – CELSA). To attract the right students, the required profiles are clearly listed for each ESR position (e.g. ESR1: geologist or geometallurgist).

Applications are made through an on-line, eligibility-proof form on the SULTAN recruitment webpage. The candidates apply for a maximum of three specific ESR positions and list their order of preference. The Supervisors provide the names of their preferred candidates to the RC, which in its turn produces a short list of candidates: 2 per position. As such a maximum of 30 ESRs (from an initial pool of 120-200 candidates) are invited to the Recruitment Event, which coincides with the pre-kick-off meeting (Leuven, M2).

Each candidate gives a presentation and is interviewed by the RC. Candidates will be given a domain-relevant peer-reviewed paper (prior to the recruitment event) by their prioritised Supervisor and will be asked questions about this paper during the interview to check if the candidate has the right background/profile for the ESR position. Prior to the recruitment event, skype interviews between the Supervisors and the candidates are recommended, along with on-line personality tests.

After a thorough evaluation during the Recruitment Event, the candidates are ranked and a collective decision is made. In this way a complementary team of ESRs can be assembled, as positively experienced from previous ETN recruitment events (e.g. NEW-MINE, all 15 ESRs recruited).

In case not all 15 ESRs can be recruited during the collective Recruitment Event, the recruitment procedure is "decentralised", meaning that the involved supervisors continue the search for good candidates. The GC is kept informed at all times when new eligible candidates appear. The GC makes an official complaint in case the Code of Conduct for the Recruitment of Researchers is breached. The involved supervisor is then expected to find another candidate. Recruitment problems are also, if still needed, discussed during the RC meeting (M6, M12) in order to deliver specific action plans to target specific networks relevant for the vacant ESR positions.

All details concerning the recruitment-procedure principles are communicated on the on-line application portal, so that potential ESRs know exactly what to expect and are stimulated to apply. All recruitment (pre and final selection) is in line with the European Charter for Researchers, providing the overarching framework for the roles, responsibilities of both researchers and employers. The Code of Conduct for the Recruitment of Researchers functions ensures that the selection procedures are transparent and fair.

The recruitment strategy of SULTAN fully complies with the Code of Conduct definition of merit. For example, merit is not just measured by a researcher's grades, but on a range of evaluation criteria, such as teamwork, interdisciplinary knowledge, soft skills and awareness of the policy impact of science.

The RC has members of each gender and considers the promotion of equal opportunities and gender balance as part of the recruitment strategy. Also, in view of the RRI principles, special efforts are made to attract women and ESRs from new EU Member States.

In order to facilitate their travel, selected candidates (from outside Belgium) receive a fixed, lump sum of 250 euro (paid by the prioritised Supervisor). In order to avoid delays in reimbursements, candidates are asked to keep all invoices and tickets (cf. train, plane, hotel...).

SULTAN aims at a participation of 50% female ESRs in the network. Researchers are employed on fixed-term contracts and are registered as staff candidates for PhD degrees. Therefore, they are entitled to pension contributions, paid holidays, and other benefits as governed by the universities and industrial companies.

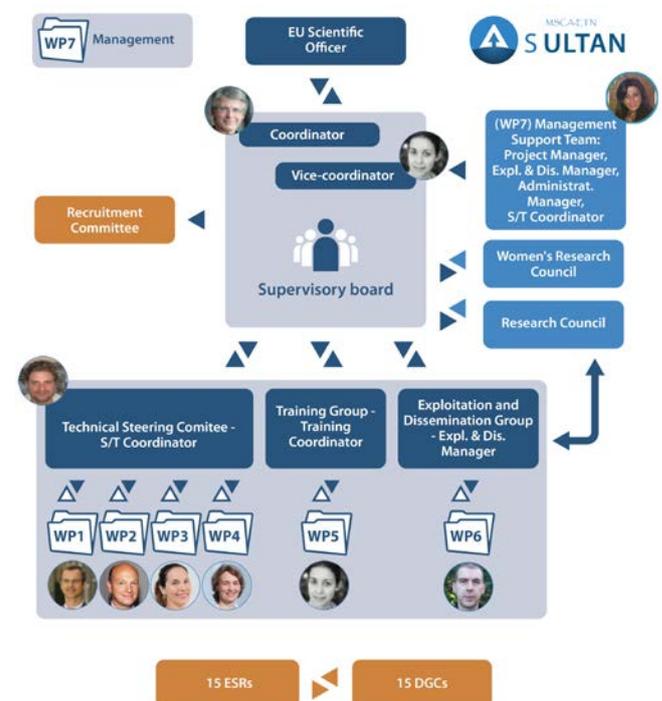


Figure 3: SULTAN Governance including RC

RC = Recruitment Committee = This committee involves the General Coordinator, the Vice-Coordinator (f) and one representative per Beneficiary (D. Goldmann, M. Illikainen (f), J. Relvas, J. Gutzmer, H. Chambart (f), S. Hellweg (f) and J. Spooren). Its goal is to oversee the recruitment of the 15 ESRs during the collective recruitment event. During the recruitment event additional Supervisors may be present.