

ESM annual report 2018

1 Goals of ESM Foundation in 2018

ESM Foundation pursues (as described in the foundation deed), “to support and conduct research in the field of rare metals with regard to their industrial application”. Applied to current challenges and opportunities of the industry, this relates to the following fields of research (support) or other activities (inter alia):

- Consumption of rare metals in Switzerland for modern technologies like electromobility, energy generation and storage, information and communication technology and the related challenges for our economy;
- Material flows of rare metals with regard to economic questions like relevant markets and future price developments;
- Relevant ecological, social and legal issues concerning the topic of rare metals;
- Other sustainable solutions for future supply security with rare metals in Switzerland, like substitution, product design etc.;
- Cooperation possibilities with partners abroad to enhance supply security and sustainability.

The foundation pursues these goals through activities in the following three areas:

1. Direct research support in Switzerland in the field of rare metals;
2. Establishment and coordination of cooperation projects for the promotion of the subject area;
3. Support of junior researchers and public relations work.

Important areas in 2018 included (inter alia):

- Coordination of international cooperation with regard to rare metals, possible supply risks for countries without their own reserves like Switzerland, strategies for the reduction of those risks involving Swiss organisations (Swissmem, SATW, EMPA);
- Coordination of a European education project about rare metals and their sustainable management across the whole value chain, involvement of Swiss universities and research institutions (EPFL, EMPA) in this activity, support of Swiss students taking part in the education programs of the project (SATW);
- Seminar about rare metals in Switzerland on the secondary and tertiary school level and as an extra-occupational activity with participants from Swiss universities, teaching materials publishers, the Swiss confederation and academia;
- Promotion of potential young scientists by participating in SATW TecDays, with a module about “Critical Metals in the Loop” in order to raise awareness of tertiary school students for the topic of rare metals;
- Promotion of public debate about the topic of rare metals in Switzerland by participating in the FocusTerra series “BodenSchätzeWerte – our management of raw materials”;
- Participation in national and international events related to the topic, like the Swiss resources forum in Dübendorf, the World Materials Forum in Nancy and the UN Resource Management week in Geneva.

2 Meetings of the board of trustees

Meetings of the board of trustees took place on April 12 in Zurich and on November 8 in Bern. Luis Tercero could not attend on April 12 and on November 8 Stefan Kohler and Hans-Jörg Althaus were absent; all other members of the board were present. Two additional telephone meetings took place on March 7 and August 16. Regular telephone sessions between the president and the CEO were also held.

3 Report of the financial committee

The financial manager of the foundation, D. Gonsetz, informed the board of trustees monthly about the financial situation of the foundation. The CEO submitted once or twice a month financial documents about the activities of the office to the financial council for examination and approval.

The cumulative performance of the ESM portfolio was -5.84% at the end of 2018.

In 2018, there were no personal changes in the ESM Foundation.

Miss Sandra Müller, former PhD student at EMPA (group Patrick Wäger), supported the foundation in August for three weeks (100 work hours). Her main tasks were project accountancy, participation at the Swiss Resources Forum 2018 and the advertisement of the SusCritMat Autumn School. Law intern Andri Abbühl continued to support the foundation on an independent basis with the maintenance of the website, social media and other accompanying tasks. For the support of the accounting, Mister Markus Hoffmann from TOP Treuhand continues to offer his service. The office in Bern was registered in the register of commerce, which means that the family compensation fund of the CEO changes to the canton of Berne from 2019.

4 Report on projects and activities

4.1 EIT Raw Materials project „SusCritMat“ (2017-2020)

The project “Sustainable Management of Critical Raw Materials (SusCritMat) is the first European education project which deals with promoting knowledge in the area of critical raw materials. The project develops modules about a wide range of topics which are relevant for a sustainable management of rare metals, like criticality assessment, product design, business models, life cycle assessments and material flows. The participants at the courses organized by the project learnt about the most important methods and issues from experts in the field. They are meant to be enabled to do research on their own in the relevant field for their academic subject or business.

In 2018, training materials of three types (presentations, films, exercises) were developed and distributed and three events were held:

- The first “Winter School” of the project took place from January 15 to 19 in Les Diablerets (canton of Vaud) and addressed mostly PhD students from different disciplines. There were 33 participants, 18 consortium partners and one representative from EIT Raw Materials present. The participants were occupied in groups with the following products/components: LED lamp, solar panel, cutting tools, EMV chip, USB stick, mobile phone display, glass fibre cable, Li-Co-battery. They checked these components or products for critical materials, analysed them using the methods they had acquired during the week, and presented their analysis and a recommendation how a company should deal with this material in the future.

At the Winter School 2018, Swiss participants were supported through a “Fachförderung” by SATW.

- An “Autumn School for Professionals” was held from October 24 to 26 at TU Delft. The participants could choose between three thematic “tracks” about the topics of legislation and regulation, circular economy and analytics. The three tracks were about equally frequented by the about 70 participants. During the Autumn School, short videos were shot with learning content for public distribution. Inter alia, research by EMPA about material flow in used car electronics is shown in these videos.
- There was a “Short Course on Cobalt” as a one-day event in the framework of the European Raw Materials Week in November in Brussels. This event aimed at giving insight into different approaches to the topic and at distributing the contents of SusCritMat further by using the subject of Cobalt. Interactive group work combined the different modules. The event was a success with 30 participants and will also be held in Cambridge in 2019.
- In March, the consortium met at the University of Leiden in order to plan the further activities in the project. In two evaluations by EIT Raw Materials in May and September, progress of the project was positively rated. The consortium has decided to apply – under coordination by ESM – for a follow-up project at EIT Raw Materials.

4.2 EIT Raw Materials Projekt „IRTC“ (2018-2020)

The project «International Round Table on Materials Criticality” (IRTC), coordinated by ESM Foundation, started in April 2018. The project organises “Round Tables” at international conferences in the years 2018 and 2019, at which experts in the field of critical materials discuss relevant topics and subsequently publish joint papers about them. IRTC gathers those leading international experts in the field of critical materials for the first time in a joint project. ESM Foundation is not just active as coordinator, but is also represented in the expert panel (A. Reller, C. Hagelüken, P. Wäger, L. Tercero) and is engaged as advisor (E. Lutz). The project provides the foundation not just with scientific networks and an active role in the international debate about rare metals, but also high visibility abroad.

The first event of the project took place in June 2018 in Vancouver, Canada, in the framework of the conference “Resources for Future Generations”. The topic of the Round Table was the question how the methodology of criticality assessment influences their results. Presentations and videos are available on the website of the project (www.irtc.info). Based on this discussion, the first publication of the project, “How Methodology determines what is critical” is currently in work and will be published in 2019.

In October, there was a second Round Table in Tokyo, where the relation between criticality and the circular economy was discussed. The results were the following, in short:

- Circular Economy can be thought of as a strategy for the reduction of supply risks, e.g. by intensifying recycling, reuse, waste reduction etc. Both concepts can also be seen in another relation: criticality can inform the circular economy about prioritising raw materials.
- Circular Economy and criticality both have different definitions with varying indicators. Both concepts can be conceived as purely economic, but can also include ecological and social aspects. Depending on the choice of the indicators, circular economy and criticality can have diverging goals.
- A transition to the Circular Economy can reduce criticality of certain raw materials (by a reduction in consumption, more recycling), but can also increase it (by a higher demand due to new technologies). The cumulated effects of these mechanisms depend on the exact future scenarios.

- Even though both concepts differ in many respects, they can have common goals and concepts. The potentials and limits of mutual amplification ought to be examined further and should be analysed with the necessary attention for methodological differences.

ESM Foundation was invited by DG GROW (Milan Grohol) together with representatives of EIT Raw Materials (CEO Karen Hanghøj, Senior Advisor Substitution & Recycling Roland Gauss) to a meeting in order to discuss the IRTC and its role in the European debate about criticality. A. Hool and P. Wäger were in Brussels on December 17 for this meeting (C. Hagelüken participated by telephone). Besides Milan Grohol and DG GROW, Björn Debecker from EASME, Martyn Chamberlain from DG RTD and Andrew Coop from DG Trade were present; via telephone, Gian Andrea Blengini and Patricia Ales Dias from the Joint Research Centres in Ispra and Petten also joined in. The debate was in principle positive; the European Commission welcomes the activities of the project and supports a potential continuation. In particular, it is interested in the development of an “early warning system” for critical materials for companies. ESM works at a follow-up proposal for the project which will pursue this idea (see section 9).

Further Round Tables will take place in 2019 in San Antonio, Beijing and Brussels. The project IRTC was evaluated positively by EIT Raw Materials in October. The consortium has decided to apply – under the coordination of the ESM – for a follow-up project at EIT Raw Materials.

4.3 Horizon 2020 Projekt FORAM

ESM Foundation is involved in an advising role at the Horizon 2020 project FORAM. FORAM (“Towards a World Forum on Raw Materials”) deals with establishing a world-wide platform of international experts and stakeholders in the field of raw materials. The office visited the pilot event of the project on June 27, 2018, in Nancy. M. Hofmann from MatSearch reported at the board meeting from November 12 about the successful conclusion of the project and about planned further activities. ESM will continue to pursue its activities for this project and engage further if needed.

4.4 Modules to critical metals at the SATW TecDays

Since 2017, ESM is engaged at the SATW TecDays, an initiative at high schools, with the aim to get young people interested in a scientific career.

In 2018, the foundation participated in three TecDays: at Gymnasium Seefeld in Thun BE (March 21), at the Kantonsschule Seetal in Baldegg LU (November 7) and at the Kantonsschule Olten SO (November 29). In modules of a length of 90 minutes, students were introduced into the topic of critical metals and their supply chains. The module aims at raising awareness among young people for raw materials and to promote interest in the topic. The main part of the module is the board game “In the Loop”, which shows the limited nature of critical metals, geopolitical influences and the potential of recycling and other sustainability strategies. The module gets positive feedback and will, therefore, also be held in 2019 three or four times in different parts of Switzerland.

4.5 Advisory Board in the NFP73 project “Postfossile cities”

ESM Foundation is in the advisory board of the NFP73 project “Postfossile cities”. The project started in February 2019 and is coordinated by Patrick Wäger. To identify possible development paths to postfossile cities, the project develops a simulation game in the context of the “Swiss city 2050”. A

fictional Swiss city on the Swiss plateau is simulated as if free from fossile carbon. The office visited both the advisory board meeting on June 8 and September 13.

4.6 Research promotion

To ESM Foundation planned a large research grant concerning the topic “Policy developments in the area of rare and critical metals in Switzerland and their impact on Swiss industries” with a cost frame of about 50’000 CHF. The call for proposals occurred in November; the project should be done in 2019.

5 **Memberships and cooperations**

The memberships at EIT Raw Materials, SATW, the World Resources Forum and the FEMS are continued in 2018. Other important cooperations took place in 2018 with NEROS, FocusTerra and the UNECE expert group for resource management.

5.1 World Resources Forum (WRF)

The membership fee is 5’000 CHF a year includes a session at the WRF, which takes place every two years in Switzerland (the next forum will be in October 2019). The office attended the general assembly of the WRF in June; Miss Sandra Müller represented ESM at the Resources Forum Switzerland in October. A further cooperation with the WRF represented the Horizon 2020 project FORAM (see section 5.3).

5.2 EIT Raw Materials

The membership fee for EIT Raw Materials with its 30’000 euros is a large expense for the foundation. However, it profits as member of the EIT from an extensive network and from the possibility to be granted project support. The project SusCritMat generated about 72’000 CHF for the foundation in 2018, the project IRTC about 27’000 CHF.

The office visited the Steering Committee of the Central CLC in January in Grenoble, the general assembly of EIT Raw Materials in May and the “Brokerage Day” in October in Berlin. A cooperation with EIT Raw Materials also took place at the RFG2018 conference in June, where a joint session was held.

5.3 SATW

The SATW general assembly in May was attended by the office. SATW supported Swiss students in 2018 financially in their participation at the SusCritMat Winter School in January.

5.4 FEMS

Cooperation with FEMS was continued in 2018; further cooperation was planned for 2019 at the TMS Annual Conference in march and at the EUROMAT conference in September.

5.5 NEROS

The ESM (A. Reller, P. Wäger and A. Hool) met in August with Rainer Kündig from the network of mineral resources (NEROS) to discuss potential future cooperation. This could be i.a. the organisation of a joint podium discussion next year.

5.6 FocusTerra

Members of the ESM board were present at the event “Rare Metals for a Digital World” organised by FocusTerra and WERZ (HSR) in Zug. Patrick Wäger held a presentation about “Rare Metals – Resources

for Future Technologies” and Christian Hagelüken talked about “Recycling of rare metals from used electronic devices”. The following podium discussion was hosted by Alessandra Hool.

5.7 UNECE expert group for resource management

For the second time, the ESM (P. Wäger, A. Hool) attended the UNECE Resource Management Week (previous name: Resource Classification Week) in Geneva, and has been engaged since 2018 also with the (co-) organisation of its own events (see section 7.4) and the sponsoring of a lunch. Since May 2018, the ESM, represented by A. Hool, is also a member in the UNECE work group “Sustainable Development Goals Delivery”.

6 Organised seminars and events

6.1 SusCritMat Winter School, Autumn School and Short Course

The SusCritMat Winter School took place from January 14 to 19 in Les Diablerets (canton of Vaud), the Autumn School from October 22 to 24 and a Short Course took place on November 16 in Brussels. Further information can be found in section 5.1.

6.2 IRTC Round Tables

The first two IRTC Round Tables took place on June 17 in Vancouver and on November 9 in Tokyo, see section 5.1.

6.3 Seminar at EMPA

A Seminar supported by SATW about the education in rare and critical materials took place on February 27 as a one-day event with 26 participants at the EMPA academy. The results of the three workshops have been evaluated and published in the SATW blog. The participants reached the three following results:

1. Resources and criticality issues are relevant in a broad range of science, technology and humanities curricula on the university level.
2. General system thinking generates competences for the comprehension of resources and criticality issues and should therefore be particularly promoted in curricula.
3. For this end, methodological knowledge and the ability to interpret facts and results need to be enhanced.
4. Future decision makers must be educated in order to be able to recognise risks and opportunities concerning the risks and chances in the management of critical metals. Professional trainings with certificates should also be provided to this end (e.g. in quality management).
5. While a basic idea of materials circles should be taught on the primary level, on the secondary level conveying knowledge about risks of materials, global supply chains and their ecological and social consequences should be aimed at. On the university level, the focus should be on imparting methodological and negotiating competence.
6. Teachers – also above primary school level – should ensure that the topic can be “experienced”, has a relation to daily life and is embedded in a larger context.
7. There needs to be more transparency and oversight over available offers and teaching materials is required so teachers can be better informed and resort to better resources.

8. Large parts of society can be reached by making the global context of the problem in the framework of sustainable development comprehensible.
9. The competence oriented education, which is promoted by the Lehrplan 21, focuses on critical thinking, system comprehension and anticipating actions and is therefore fit to convey the topic.
10. Different target groups must be reached through various mechanisms: Politics via policy briefs, civil society via more transparency (e.g. labels which can help with purchasing choices).

A possible deepening of the topic at further events will be discussed in 2019.

6.4 Workshop at the UNECE Resource Management Week

In the framework of the UNECE Resource Management Week 2018, ESM was active on April 24 as co-organisator of a symposium about the availability of resources from secondary sources. The Foundation was also the main organisator and leader of the “Special Workshop on Waste Valorization”. The workshop was the subsequent event to the ESM session at the WRF 2017 “Strategic Raw Materials and Sustainable Development”. It had a good attendance with more than 100 participants; the audio materials are available online in three languages (<https://conf.unog.ch/digitalrecordings/#>).

7 Publications

7.1 Special Issue „Critical Raw Materials“ in the magazine „Sustainable Materials and Technologies“

ESM Foundation has co-edited a special edition to critical materials in the newly established magazine “Sustainable Materials and Technologies” (Elsevier): as guest editor (A. Hool) and as a (Co-) author of contributions (A. Reller, P. Wäger, L. Tercero, C. Hagelüken, A. Hool). The Special Issue is available online since autumn 2018.

7.2 Supplementary teaching material for geography classes

A supplementary teaching material for geography classes was further being worked on. It is planned to be finalized in 2019 and published by Hep publishing.

8 Planned activities for 2019

- ESM will hold the following events in 2019:
 - Session at the Magnetic Materials Symposium at the TMS Annual Meeting in Texas, March 13
 - IRTC Round Table at the TMS Annual Meeting in Texas, March 14
 - SusCritMat Short Course on Electric Mobility in Cambridge, April 9 and 10
 - IRTC Round Table at the Tsinghua-University in Beijing, July 7
 - SusCritMat Summer School for teachers in Cambridge, July 10-12
 - Symposium „Critical Raw Materials for a sustainable future“ at EUROMAT 2019 in Stockholm (in cooperation with Roderick Eggert, Tomer Fishman, Dimitrios Panias), september 2 to 5
 - Session at the World Resources Forum, October 23 and 24
 - IRTC final event in Brussels, November 18
- The engagement at the SATW TecDays will continue to exist. The new TecDay with participation by ESM Foundation will take place on May 7 in Trogen AR.
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- The grant for research (s. section 5.6) should be used. In addition, the board would also like to support works on Master, PhD or Postdoc level in order to strengthen the younger generation.
- Project submissions for follow-up proposals of SusCritMat and IRTC and participation at a Horizon2020 project to the topic of “Responsible Sourcing” are planned.

9 Annual accounts 2019 budget 2019

The office has made the financial report 2018 in cooperation with TOP Treuhand in Dübendorf. The method for booking securities was adapted to the current “best practice” standards. Revision is done by BDO AG in Solothurn. The budget 2019 was determined at the board meeting on November 12; possible adjustments will be decided upon at the board meeting of April 4, 2019.