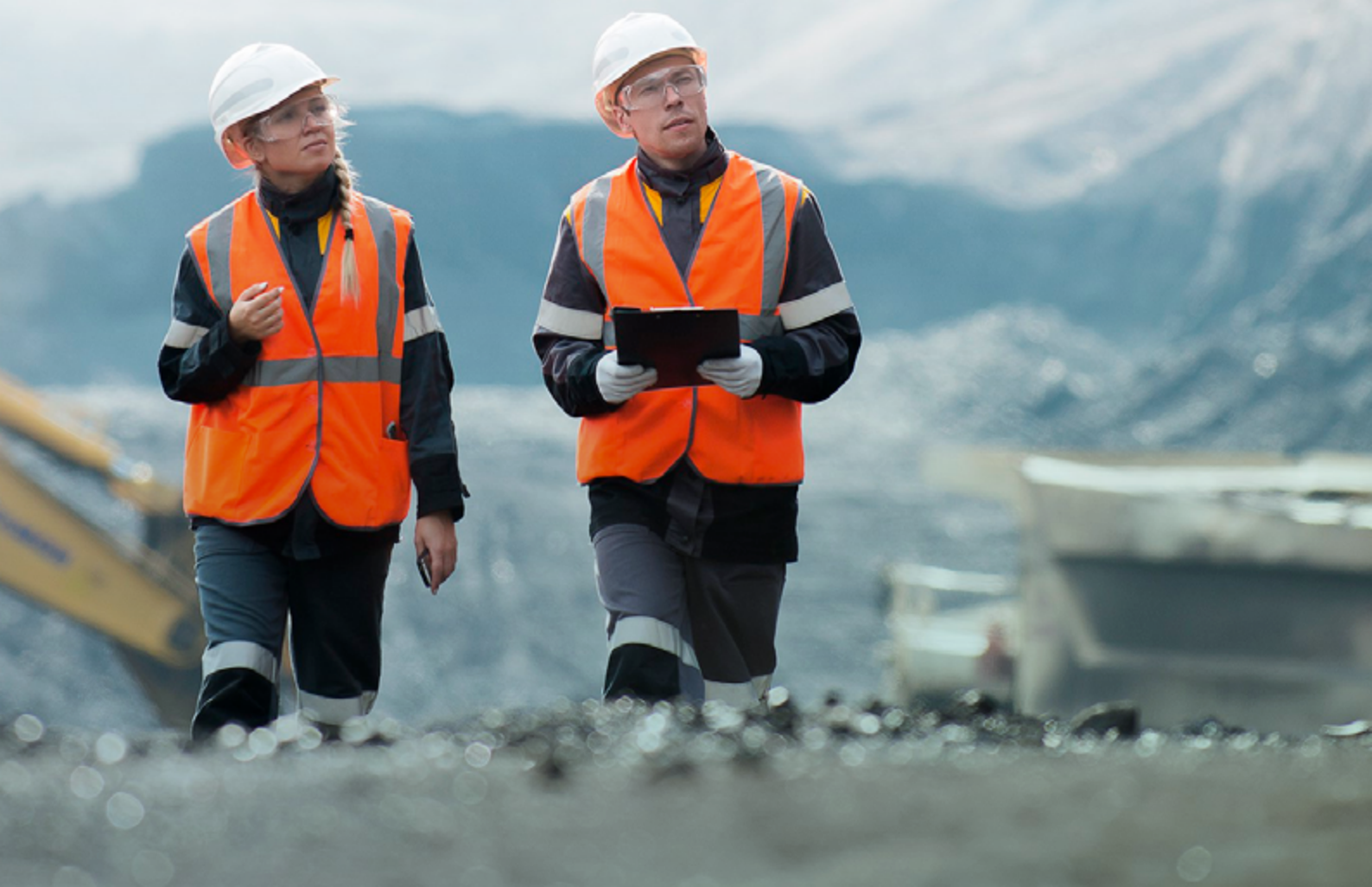
SIP | STRIM

Annual Report 2019

Mining innovation for a sustainable future



“Sustainability and reduced climate impact are the industry’s highest priority. SIP STRIM has a strong focus on these issues and this will continue during the next program period.”

Pia Lindström, Chairman of the board

Text: SIP STRIM
Layout: Geektown kommunikationsbyrå
Print: Lule Grafiska

Photo: Bolliden/Lars deWall

Summary

A year with gathered strength in focus

When we sum up 2019 and add it to the books, it is a very fruitful year that we can look back on. Six years of work with mining innovation in focus has resulted in many good results and innovations that I can proudly see have led the Swedish mining industry in the right direction.

At the program office, we see 2019 as the year of the roadmaps. During the spring, the new research and innovation agenda was released, which is the result of gathered strength from the industry, and then more roadmaps have come at a rapid pace. The roadmaps "Roadmap for a competitive and fossil-free mining and mineral industry", "Mining and mineral industry in a sustainable future" and "Competence roadmap: The road ahead for the mining and steel nation Sweden" focus on issues that are important for the industry, sustainability, climate impact and competence enhancement, and all roadmaps are extremely important documents that pave the way to meet industry's highest goals.

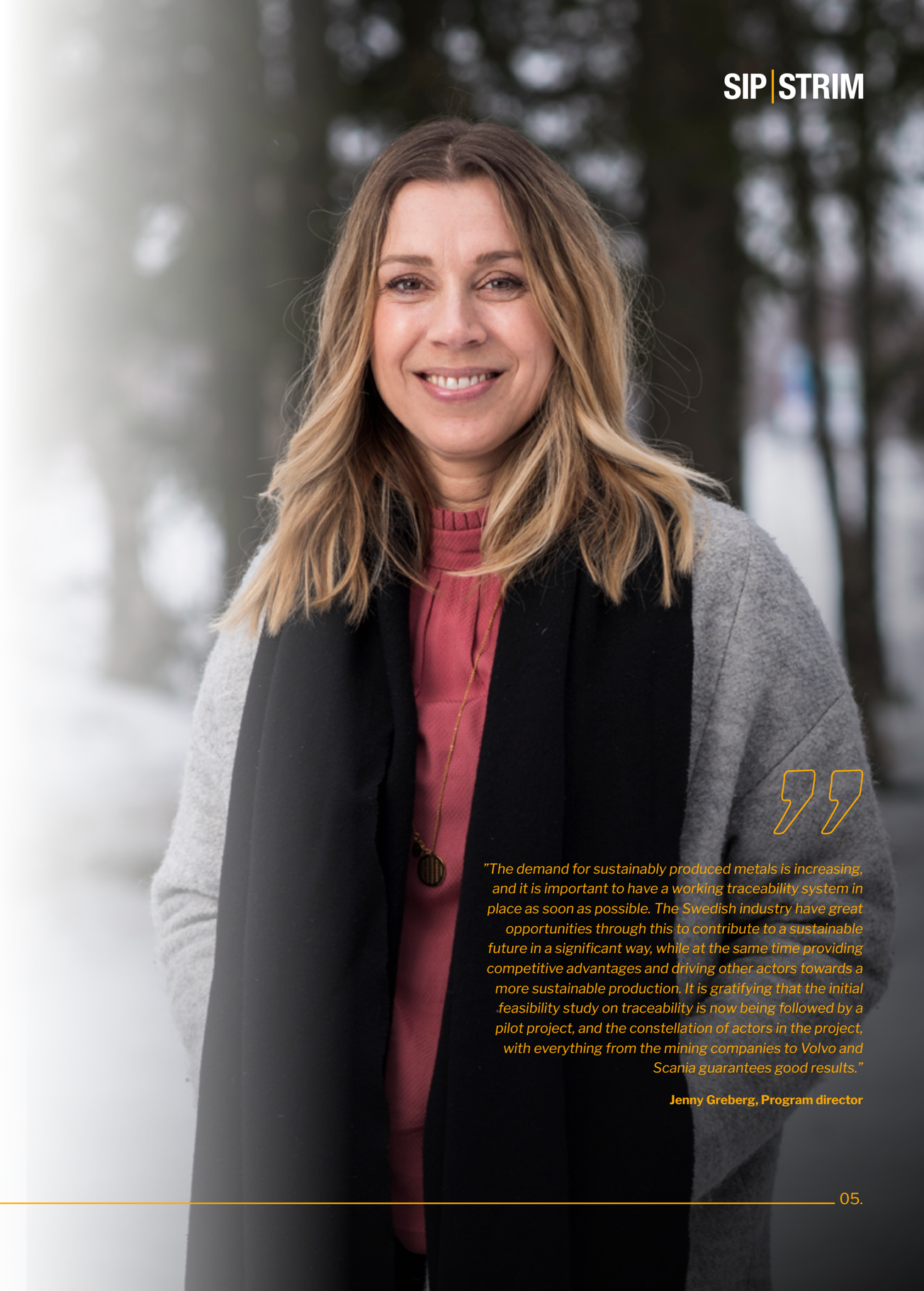
During the latter part of the year, we have worked extensively with internationalisation and influence work, which we believe will yield good results in 2020. SIP STRIM's role is to drive innovation, stimulate the Swedish innovation system and leverage major investments, something that we have with us several successful examples of where we with small effort managed to create large significant projects and initiatives. Our total contribution of 4.3 MSEK has given us 188 MSEK back, in the form of EU funding for mining innovation projects to our actors.

The fact that climate issues sailed at the top of everyone's agenda became increasingly clear during the year. Important discussions were launched at the mining industry's annual Top Management meeting, focusing on R&D, where the Minister for Enterprise and Energy Ibrahim Baylan participated together with leading people from the mining cluster. As a result of this meeting, shortly afterwards, together with Swedish and Finnish representatives, I was invited to round table discussions on sustainable supply of raw materials and long-term sustainable value chains with the Minister for Enterprise and Energy Ibrahim Baylan and Finland's counterpart Katri Kulmuni. During the meeting, it was high-lighted that traceability of metals is very high on both countries' agendas, which made us very happy when SIP STRIM's new project TraceMet was in the pipeline to start up at the end of the year. Traceability is an area where Sweden can take the lead and show the way.

Something else that has been very positive for the program and that enables investments of the size required, is the increased staffing of the program office during the year, and we look forward to continuing with the same strong mass in the coming years to meet the industry's expectations and to drive Swedish mining innovation forward.

2019 was another year that SIP STRIM led the mining industry towards a more innovative and sustainable world. I hope you join us in 2020!

Jenny Greberg
Program Director



"The demand for sustainably produced metals is increasing, and it is important to have a working traceability system in place as soon as possible. The Swedish industry have great opportunities through this to contribute to a sustainable future in a significant way, while at the same time providing competitive advantages and driving other actors towards a more sustainable production. It is gratifying that the initial feasibility study on traceability is now being followed by a pilot project, and the constellation of actors in the project, with everything from the mining companies to Volvo and Scania guarantees good results."

Jenny Greberg, Program director

SIP STRIM brings together the mining cluster around innovation

Society faces major challenges, primarily related to climate and environmental impacts, but also challenges related to competitiveness. Collaboration within the Swedish mining cluster is unique and SIP STRIM is an important instrument for supporting and driving that collaboration so that we can jointly achieve our high goals.

As Chairman of the Board, I see great importance and potential in the industry having a strategic innovation program that is fully integrated with industry and the industry organisation. This enables the joining of forces required for the Swedish players to continue to be world leaders and show the way towards the sustainable and efficient mining industry of the future.

In 2019, the first five strategic innovation programs underwent a thorough six-year evaluation. The evaluation concluded that the programs are good tools for collaboration and an effective way for all actors to gather. I am proud to announce that SIP STRIM's evaluation results, which we received in December, gave us an acknowledgment of the program's value and that the industry is committed to supporting the SIP.

I feel both proud and confident in the fact that we have created a strategic innovation program with wide breadth that can develop our industry and solve problems along the entire value chain. SIP STRIM raises issues ranging from exploration and characterisation to equality, diversity and social issues. The program was the first of the strategic innovation programs to put gender equality and diversity high on the agenda, and it is nice to see that it has produced results. In 2019, we approached an increasingly gender-balanced project portfolio with a total of 40% female project managers for our projects.

I look forward to the second half of SIP STRIM's operating period, which I know will give the Swedish mining industry the opportunity to take ever greater strides in innovation!

Pia Lindström
Chairman of the Board

This is SIP STRIM

SIP STRIM is the strategic innovation program for the mining and metal producing industry and is one of seventeen national strategic innovation programs supported by Vinnova, the Swedish Energy Agency and Formas.

IN ANSWER TO SOCIETAL CHALLENGES

The program aims to create conditions for international competitiveness and sustainable solutions to global societal challenges, such as access to raw materials and sustainable raw material production. Within the program, companies, academia and other organizations work together to contribute to new innovations.

INNOVATION AT THE FOREFRONT

Sweden's mining and metal producing industry is already at the forefront today and in order to constantly improve, the industry has gathered strength and developed a national strategic research and innovation roadmap for the Swedish mining, mineral and metal producing industry. SIP STRIM works along the entire value chain, which is addressed in the third edition of the roadmap. The value chain ranges from exploration, resource characterization, mining, mineral technology, metallurgy and recycling for both mining companies and suppliers. The areas of environmental performance, attractive workplaces, as well as gender equality and diversity are integrated and prioritized throughout the value chain, and the areas of social acceptance and the provision of skills are central.

ACTIVITIES THAT MAKE A DIFFERENCE

All efforts made by the program aim to realize the roadmap's visions. The program's efforts range from strengthening Swedish innovation capacity in the area, to supporting and initiating projects and other activities that enable research, development and innovation, to promote the social benefit of the industry and to work for social acceptance and to promote secure competence provision.

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Vision: A world leading mining and mineral producing industry contributing to a sustainable society

Photo: LKAB/Fredric Alm

SIP STRIM in numbers

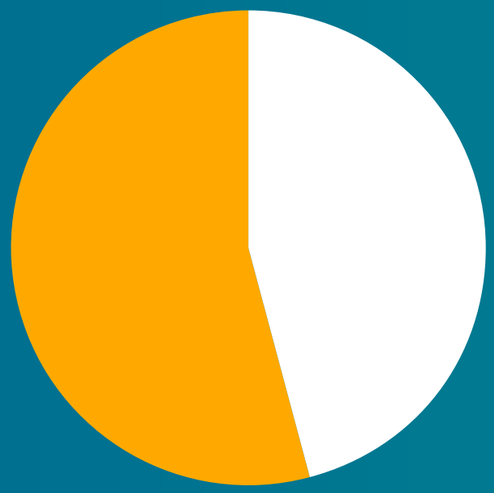
LEVERAGE

4,3 MSEK

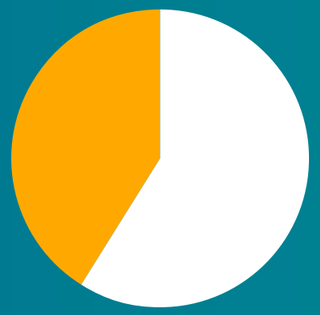
188 MSEK

Since start:
4,3 MSEK gives 188 MSEK

GENDER EQUALITY
Project leaders all projects



2019:
54 % female / 46 % male



Since start:
41 % female / 59 % male

PROJECTS

LAUNCHED PROJECTS 2019				
Full-scale projects	Pilot projects	Pre-studies	Strategic projects	Leverage projects
4	1	8	7	3

2019:
53 on-going projects

Since start:
134 total projects

PARTNERS

PROGRAM BUDGET

69 242 195 SEK / 38 862 000 SEK

2019:
Total / public financing

394 200 449 SEK / 208 220 490 SEK

Total, since start:
Total / public funding

Organization

SIP STRIM is chaired by a Board of directors whose members are appointed by the various organizations that collaborate within the program. The day-to-day activities are managed by the program office hosted by Luleå University of Technology. In addition, there is an advisory body, the Executive committee, which together with the program office is responsible for the thematic development of SIP STRIM's focus areas.

Anyone who wishes to contribute to realizing the goals and visions described in the Strategic research and innovation roadmap for the Swedish mining, mineral and metal producing industry is welcome to take part in the activities of SIP STRIM.

BOARD OF DIRECTORS

Pia Lindström, *Boliden (acting chairman)*
Monika Kristel Hernblom, *Boliden (deputy chair)*
Susanne Rostmark, *LKAB*
Göran Tuomas, *LKAB (deputy)*
Åsa Gabrielsson, *Epiroc*
Anders Gustafsson, *Zinkgruvan Mining*
Katarina Malaga, *RISE*
Johan Eriksson, *Swerim (deputy)*
Karin Högdahl, *Uppsala University*
Thomas Kalscheuer, *Uppsala University (deputy)*
Pär Weihed, *Luleå University of Technology*
Charlotta Johansson, *Luleå University of Technology (deputy)*
Susanne Gylesjö, *Vinnova (adjunct)*
Maria Sunér Fleming, *Svemin (adjunct)*

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Nikolaos Arvanitidis, *SGU*
Peter Holmes, *Uppsala University*
Åke Krukka, *Epiroc*
Lars Malmgren, *LKAB*
Erling Nordlund, *Luleå University of Technology*
Hamid Manoucheheri, *Sandvik*
Kari Niiranen, *LKAB*
Anders Sand, *Boliden*
Johan Eriksson, *Swerim*
Monika Hernblom, *Boliden*
Karin Willquist, *RISE*
Lars-Åke Lindahl, *Svemin*
Lotta Lauritz, *LKAB*
Patrik Söderholm, *Luleå University of Technology*
Lena Abrahamsson, *Luleå University of Technology*
Kurt-Ove Åhs, *Boliden*
Pär-Erik Martinsson, *SIP PiiA*
Rikard Mäki, *Boliden*
Robert Mäkelä, *ABB*

Photo: Patrik Öhman, Yours

PROGRAM OFFICE

Niclas Dahlström, *Project Manager*
Lawrence Hooey, *Technology and Innovation Manager*
Jenny Greberg, *Program Director*
Terese Mella, *Communications Manager*
Matz Sandström, *Project Manager*

"The evaluation shows that the programs have contributed to increased knowledge, new collaborations and to companies investing in research and innovation in Sweden. This type of player-driven national investment is becoming increasingly important to keep pace with the rapid societal changes that are taking place in Sweden and globally."

Darja Isaksson, Director General of Vinnova

Six-year evaluation of SIP STRIM

The first five strategic innovation programs underwent a major six-year evaluation during the year. The programs evaluated are Lättvikt, Metalliska material, Processindustriell IT och automation (PiiA), Produktion2030 and SIP STRIM.

The evaluation has shown that the investment in strategic innovation programs has led to broad collaboration, the spread of technology across traditional industry boundaries and strengthened international competitiveness of the participants.

For SIP STRIM, the evaluation shows that the program greatly contributes to strengthened competitiveness and thereby growth. The key actors in the Swedish mining and metal mining sector have succeeded in mobilizing with strong collaboration. Furthermore, it was shown that SIP STRIM has been successful with external monitoring and internationalisation. In several cases, leverage has been created for carrying innovations further to larger EU projects. The evaluation shows that we have worked effectively to stimulate innovation and promote participation among SMEs with our annual innovation idea competition being a good example. Our focus on, and success with gender equality issues was raised, and we will continue this work. It has also been noted that the scientific publications from the projects are published in highly ranked journals.

In summary, the evaluation shows that SIP STRIM is a well-functioning program that delivers good results. The evaluation also shows that SIP STRIM has an important role to play in gathering the power needed to achieve the industry's ambitious goals regarding sustainability and competitiveness.

The national strategic research and innovation roadmap sets our sights

Swedish mining companies, technology providers, universities and research institutes have jointly developed a common strategic research and innovation roadmap for the Swedish mining, mineral and metal producing industry that is revised every third year. The third update of the roadmap was released at this years Bergforsk- och STRIMdagarna, May 15 at Kulturens hus in Luleå.

The aim of this national research and innovation roadmap is to jointly define the challenges, objectives and activities that are relevant and describe how research and innovation will further strengthen the competitiveness and sustainability of the mining and metal-producing industry including equipment supplier and services sector. Bringing together all stakeholders to create a common vision and identifying the key industry-wide challenges further enhances our collaborative approach which is recognised internationally as a fundamental strength of our innovation system.

Photo: Epiroc

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Events and activities during 2019

13 FEBRUARY
Pitch event SIP STRIM and Eit RawMaterials Innovation idea competition

15–16 MAY
Bergforsk- och STRIMdagarna
Photo: Anders Alm

1–4 JULY
Almedalen

1 OCTOBER
SIP STRIM Program day

7–11 OCTOBER
Swedish Brazilian innovation week

7 NOVEMBER
AI workshop - Hype or Hope?

27–28 MARCH
GMG Forum: Future Mining Forum

4–5 JUNE
MINERS workshop

24 SEPTEMBER
Seminar: Creating value through closure. Progression beyond compliance?

15 OCTOBER
Top Management meeting

18 OCTOBER –22 NOVEMBER
EU Raw materials week

27 NOVEMBER
SIP STRIM Swedish Mining Innovation Award at Svemin's Autumn meeting

JAN 2019 — **DEC 2019**

1 MARCH
Launch of projects approved in 2018 call

15 MAY
Launch of 2019 open call for projects

AUGUST–OCTOBER
Call information sessions held around Sweden

7 NOVEMBER
Close of 2019 open call for projects

"The follow-up of projects within SIP STRIM gives a positive picture of both the projects, SIP STRIM's efforts and the expected impacts of the projects. Collaboration within the projects, increased Swedish innovation capacity and efforts for sustainable development are prominent in the survey. The results of the survey are very much in line with the results of the previous survey 2017/2018. Efforts to increase gender equality are more evident in the later survey."

Matz Sandström, Program manager

Open call projects launched in 2019

The open call for the year attracted a broad range of technological innovation projects representing all segments of the value chain for mining and metals from exploration to recycling.

Eight pre-studies, four full-scale and one pilot project were launched. Digitalization and automation for safer and more efficient mining and metal production processes are well represented. Sustainability and environmental challenges include metal supply from recycling, of innovation critical metal (Li), replacement of toxic chemicals with sustainable forest product-based flotation agents and flexible use of raw and secondary materials, and improved environmental controls. Eleven new actors were engaged in the projects. There was also the highest ratio of women to men project leaders in all open calls so far at 62 %/38 % which helped to raise the overall program to the desired gender balance.

Project descriptions are available on SIP STRIM and Vinnova's website.

Photo: LKAB/Fredric Alm

PRE-STUDIES

Digital driver support for interaction between vehicles in mining environments
RISE Research Institutes of Sweden AB, RISE ICT/Interactive Piteå
Granted funding: SEK 500 000
Total budget: SEK 827 000
Partners: Epiroc Rock Drills AB, Mobilaris AB, Scania CV AB

Developing a numerical tool to optimise mining sequences and minimize seismic hazard using mine stiffness concept
Luleå University of Technology
Granted funding: SEK 487 500
Total budget: SEK 650 000
Partners: LKAB

Platinum-group elements in Swedish Ni-Fe-Cu sulfides
Luleå University of Technology
Granted funding: SEK 469 000
Total budget: 625 000
Partners: University of Barcelona

Energy Efficiency in Rocks Comminution using High Power Microwaves
Uppsala University
Granted funding: SEK 500 000
Total budget: SEK 670 000

Distance, Awareness and Orientation: Exploring Augmented Reality Applications for the Deep Mining Industry
Boris Design Studio AB
Granted funding: SEK 469 000
Total budget: SEK 625 000
Partners: Mine Tec, RISE Research Institutes of Sweden AB

Efficient metalpowder process with innovative sensor technique
RISE Research Institutes of Sweden AB, RISE Acreo
Granted funding: SEK 400 000
Total budget: SEK 540 099
Partners: Höganäs AB

GRÄV – mining value change
RISE Research Institutes of Sweden AB
Granted funding: SEK 431 000
Total budget: 702 000
Partners: Karlstad Innovation Park, Sticky Beat AB, Up is down AB, Voestalpine precision strip AB

Recovery of Lithium from dust generated in pyrometallurgical treatment of Li-ion batteries
Luleå University of Technology
Granted funding: SEK 500 000
Total budget: SEK 666 666

FULL-SCALE PROJECTS

Automated Drill Planning for Multiple-Boom Rigs in Underground Mining
Örebro University
Granted funding: SEK 4 038 000
Total budget: SEK 8 078 926
Partners: Alfred Nobel Science Park, Epiroc Rock Drills AB, Zinkgruvan mining AB

Organosolv lignin hydrophobic nanoparticles as low-carbon-footprint biodegradable flotation collectors
Luleå University of Technology
Granted funding: SEK 2 399 000
Total budget: SEK 4 799 416
Partners: Akzo Nobel Surface Chemistry AB, Boliden Mineral AB, Sveaskog förvaltnings AB

SO4-BIORED Demonstration of biological sulfate reduction in cold climates
RISE Research Institutes of Sweden AB
Granted funding: SEK 1 632 000
Total budget: SEK 3 265 175
Partners: Boliden Mineral AB, Fortum waste solutions AB

Optimized roasting of complex copper sulphide concentrates for flexible raw material utilization
Luleå University of Technology
Granted funding: SEK 4 072 000
Total budget: SKE 8 148 945
Partners: Boliden Mineral AB (Smelters and Mines), Semtech Metallurgy AB

PILOT PROJECT

Improved resource efficiency through dynamic loading control II
Luleå University of Technology
Granted funding: SEK 3 356 000
Total budget: SEK 7 263 711
Partners: Agio system och kompetens i Skandinavien AB, LKAB

Completed open call projects 2019

PRE-STUDIES

Stochastic Mine Design
Gosselin Mining

Granted funding: SEK 350 000
Total budget: SEK 1 000 000
Partners: Sofreco, McEwen Mining Inc.

Innovative DTH drill monitoring a pre study
Luleå University of Technology

Granted funding: SEK 496 000
Total budget: SEK 496 000
Partners: Epiroc Rock Drills, LKAB

Distance, Awareness and Orientation: Exploring augmented reality applications for the deep mining industry
Boris Design Studio AB

Granted funding: SEK 469 000
Total budget: SEK 625 000
Partners: Mine Tec, RISE Research Institutes of Sweden AB

Recovery of Lithium from dust generated in pyrometallurgical treatment of Li-ion batteries
Luleå University of Technology

Granted funding: SEK 500 000
Total budget: SEK 666 666

Energy efficiency in rocks comminution using high power microwaves
Uppsala University

Granted funding: SEK 500 000
Total budget: SEK 670 000

Efficient metalpowder process with innovative sensor technique
RISE Research Institutes of Sweden AB

Granted funding: SEK 400 000
Total budget: SEK 540 099
Partners: Höganäs

Platinum-group elements in Swedish Ni-Fe-Cu sulfides
Luleå University of Technology

Granted funding: SEK 469 000
Total budget: SEK 625 000
Partners: University of Barcelona

Digital driver support for interaction between vehicles in mining environments
RISE Research Institutes of Sweden AB

Granted funding: SEK 400 000
Total budget: SEK 827 000
Partners: Epiroc Rock Drills, Mobilaris, Scania CV

FULL-SCALE PROJECTS

PREP – Primary resource efficiency by enhanced prediction
Luleå University of Technology

Granted funding: SEK 4 550 000
Total budget: SEK 15 767 019
Partners: Lundin Mining, LKAB, Boliden, Chalmers University of Technology, Outotec

Innovative quality assured fayalite slag products (IQSLAG)
Luleå University of Technology

Granted funding: SEK 4 351 000
Total budget: SEK 8 113 798
Partners: Nordkalk, Boliden Mineral AB, Peab, Xore AB

SafePos II – Safety positioning for the mining industry II
RISE Research Institutes of Sweden AB

Granted funding: SEK 1 920 000
Total budget: 3 200 000
Partners: Luleå University of Technology, Skellefteå kommun, LKAB, Dräger Safety, Boliden, Alecom, SP, Interspiro, Mobilaris, SICS Swedish ICT

Field test of FBG-based sensor system – beneficial for industry and society
Maskinteknik i Oskarshamn AB

Granted funding: SEK 1 494 500
Total budget: SEK 3 392 710
Partners: Svensk Kärnbränslehantering AB, RISE Research Institutes of Sweden AB, SKB Näringslivsutveckling AB, Oskarshamns kommun

Strategic initiatives and projects 2019

ENDED 2019

Exploring alternative sustainable futures for the Swedish mining industry
The purpose of the project is to highlight the role of the mining and minerals industry and the interaction with society in sustainable social transformation and, together with various relevant stakeholders in society, discuss and drill into the importance of the mining and mineral industry in a sustainable society and the challenges and opportunities it faces. The goal is a picture of the future mining and mineral industry role in sustainable social development and a strategic activity program to navigate from behind for a clear contribution to sustainable social development in the continued operations.

Coordinator: Svemin AB
Granted funding: SEK 2 265 000
Total budget: SEK 2 685 000

Hard Rock Tour 2019
The purpose of the Hard Rock Tour activity is to inspire and inform them about their choices for further studies in topics related to the mining industry. The plan is to create a tour where the program with connection to the mining industry is packaged in a concept that visits upper secondary schools in Norrbotten and Västerbotten. The tour will be staffed by students from the educational programs. We will also offer classroom presentations where a student talks about Luleå University of Technology, his educational program and his study experience for a whole class at the upper secondary school.

Coordinator: Luleå University of Technology
Granted funding: SEK 500 000
Total budget: SEK 500 000

MINDI Mining Industries Data Initiative
The MINDI program shall for mining companies and their machinery and system suppliers, contribute to increased mining productivity by developing knowledge and promoting the application of a data-driven approach. Objectives: A developed strategy and architecture for handling data in their organisation; increased partners companies knowledge and understanding of how they should utilise their data resources, which will enable them to make their operations more efficient; richer and continuously updated geological models will give better understanding of the rock and ore body.

Coordinator: Nordic Rock Tech Centre
Granted funding: SEK 691 000
Total budget: SEK 1 997 000

Roadmap for a fossil-free mining and mineral industry
The roadmap describes how fossil freedom can be achieved in the mining and mineral industries. It works inter alia as a tool for strategic planning before and during the transition and shows how technology, investments, policies, and systems need to be developed in interaction. The roadmap has identified priority areas for innovation, as well as already on-going projects. It has been used and can be used to improve dialogue within and outside the industry.

Coordinator: RISE Research Institutes of Sweden AB
Granted funding: SEK 1 066 357
Total budget: SEK 1 222 357

Roadmap for competence supply for the Swedish mining and steel industry
The aim of the project was to clarify the needs and challenges of the mining and steel industry regarding the ability to secure future skills and competences. This was partly done to enable the trade and employers' organisations and the companies to prioritise their future investments. The aim of the project was to create a roadmap for the provision of future competences and skills that is well worked through and established. The created roadmap is well established by the industries, clear and fulfills the aim and purpose of the project fully.

Coordinator: Svemin AB
Granted funding: SEK 781 016
Total budget: SEK 1 481 016

SIP STRIM Performance Assessment and Sustainability Baseline
The aim of the Project is to i) establish a baseline of sustainable related data for the Swedish mining and metal extraction industry and develop a database which will host sustainability related data ii) analysis over time of the efficiency of SIP STRIM program related to the program's targets.

Coordinator: Swedish Geological AB
Granted funding: SEK 1 043 000
Total budget: SEK 1 043 000

Traceability – for sustainable metals and minerals
The project developed a concept for a traceability system for copper. The system enables stakeholders early in the value chain to use sustainability as a competitive advantage and enable customers in the whole value stream to demand and buy sustainable certified copper. Mapping the copper flow was a challenge as players in the value chain are reluctant to share the information, but the project was able to create a sufficiently good understanding of the flow to achieve the project goals. The steering committee is now committed to test the developed system in a pilot study.

Coordinator: RISE Research Institutes of Sweden AB
Granted funding: SEK 1 944 811
Total budget: SEK 2 244 811

ON-GOING

Integrated Smart Test environment for the mining industry – SMIG
Co-operation with SIP PiiA
The degree of automation and digitisation are constantly growing in the mining industry. Mining companies, for example, invest a lot into removing people from the production front, aiming at improving both safety and efficiency. The development requires new solutions and products, solutions and products that need to be tested in reliable and efficient test beds. A first step of the project is to map the current situation to identify possibilities for test activities and product development. A first version of an integrated, smart test bed will be produced. The new test bed must be able to handle several delicate problems. For example, the test bed should be able to take into account if there is competition between participating actors because all actors may not want to share all their results. Other important aspects are related to business models to develop how the SMIG test bed will be financed and organised, and how can it support evaluation of new business models.

Coordinator: Luleå University of Technology
Granted funding: SEK 14 612 000 (Funding granted through Strategic innovation program for process industrial IT and automation - PiiA)
Total budget: SEK 60 000 000

Mines and Minerals Innovation Summer
The purpose is to arrange a national summer program where students work on thematic innovation cases within the mines and minerals value chain. Four students divided into two teams complete two innovation cases in 2020. The innovation case has either been brought closer to the market or they have been dismissed, so-called fail-fast. The program and the innovation cases have been exposed to actors in the industry and in the innovation system.

Coordinator: LTU Business
Granted funding: SEK 360 000
Total budget: SEK 440 000

Mining and society
The purpose of the project is to identify and show the experiences and consequences that mining can have on the local community and on a regional level to create social acceptance and development. The project also intends to carry out activities that create enhanced understanding as well as positive results for gender equality, population structure and skills supply. The goal is to identify and develop activities to strengthen the community where mining is taking place, based on research and experience.

Coordinator: Georange Ideella Förening
Granted funding: SEK 850 000
Total budget: SEK 1 440 000

SIMS VR-mine in Teknikens Hus
The purpose of this project is to awaken curiosity and show how a state-of-the-art mine works. Goal -Together with SIMS mining create an exhibition where the visitor gets a good understanding in how a modern mine works. -To stimulate curiosity and interest in the mining industry -To contribute to a more nuanced picture of the importance of mining for further development in society. -Creating an exhibition that appeals to and attracts both boys and girls.

Coordinator: Stiftelsen Teknikenshus
Granted funding: SEK 150 000
Total budget: SEK 150 000

The Swedish mining industry's current and future relationship with biodiversity
The aim of this project is to produce a description of the current situation and assessment of the future outlook of the Swedish mining industry's relationship with biodiversity at a comprehensive, strategic level. The goal is to produce a comprehensive position document for the Swedish mining industry on biodiversity issues. The document will cover various aspects of biodiversity issues and include proposals for a strategic roadmap for how the industry should be able to reduce or completely avoid net losses of biodiversity in the future.

Coordinator: Ecogain AB
Granted funding: SEK 690 000
Total budget: SEK 1 010 000

Traceability – a pilot for sustainable metals and minerals
This strategic project follows the successful Traceability – for sustainable metals and minerals project which was completed in May 2019. It will develop a pilot system to certify the origin of metals and minerals, the carbon footprint and the percentage of recycled materials - and make it traceable throughout the value chain. The system should be reliable, functional and distributed so that it can be used by various actors in the value chain. Such a system can drive the development towards a more sustainable metal production globally, by giving responsible producers a competitive advantage and improving the conditions and incentives for recycling metals and minerals. TraceMet will be developed and evaluated for both steel and copper flows, two independent value chains. It will highlight opportunities and challenges for developing, implementing and using this type of traceable certification systems. By spreading the results even outside the Swedish mining industry, interest and demand for this type of system solutions is expected to increase. This can lead to a positive spiral that, in the long run, will benefit responsible producers and thus contribute to more sustainable development.

Coordinator: IVL Svenska Miljöinstitutet
Granted funding: SEK 4 385 300
Total budget: SEK 5 825 300

Web training; environment and work environment regards at exploration drilling
The purpose is to provide a web-based training for drillers in both exploration drilling and other kinds of drilling. The goal is to increase knowledge and considerations of environmental and work environment aspects, thereby improving safety and environmental performance when drilling. It is possible, if required, to introduce certification linked to completed and approved education.

Coordinator: Svemin AB
Granted funding: SEK 425 000
Total budget: SEK 915 000

Virtual Reality Lab LTU
The purpose of the SBN Virtual Reality Lab is to create attractive research and learning environments where academia and industry can meet in order to use virtual environments for visualisation, simulation and analysis of products and processes in areas of excellence in research and innovation ´Attractive built environment´ and ´Future mining´. Our goal is to enable researchers and students to undertake studies in realistic, virtual environments, and in connection to existing research and learning environments at the university.

Coordinator: Luleå University of Technology
Granted funding: SEK 1 000 000
Total budget: SEK 6 732 000

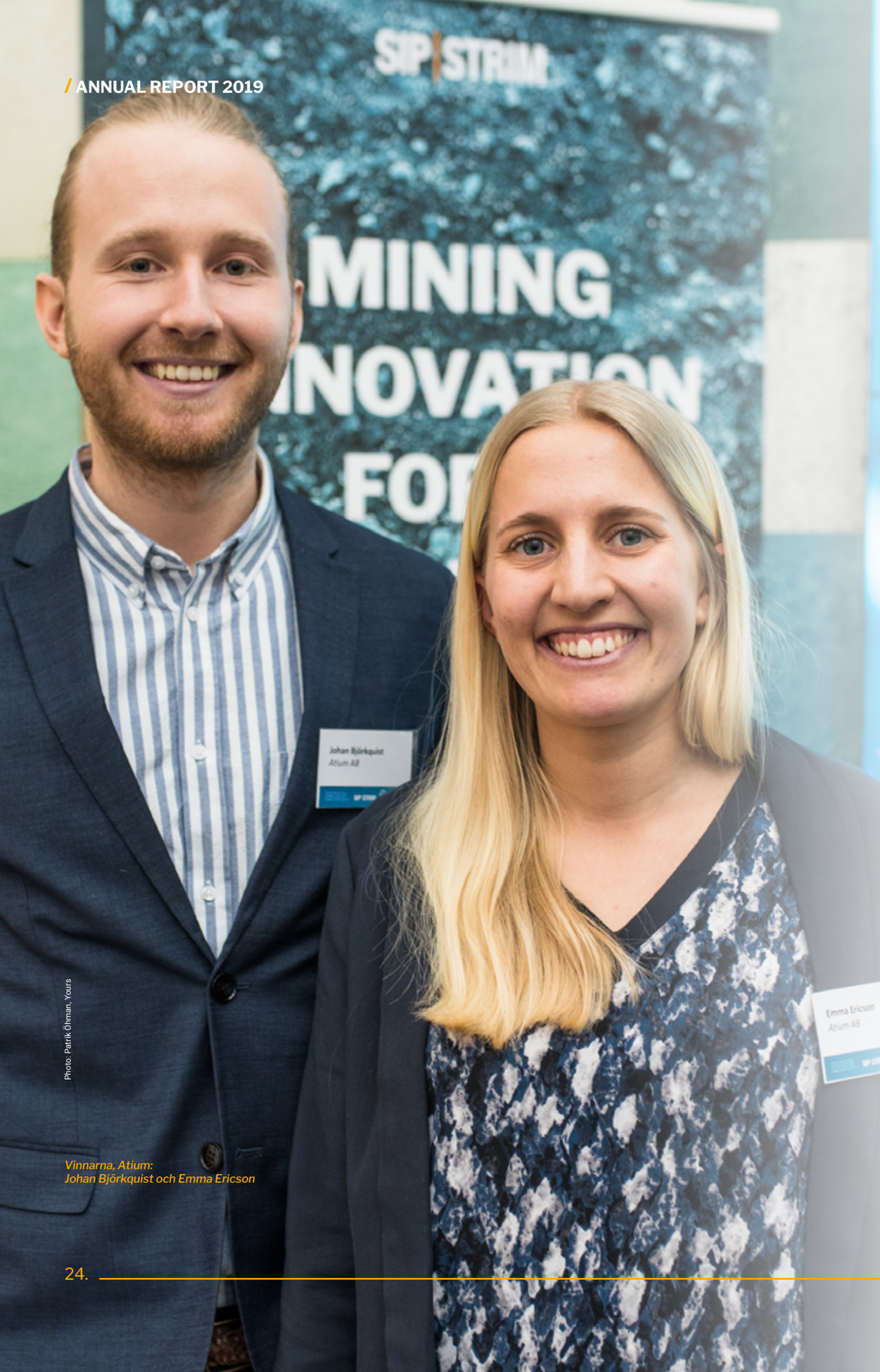


Photo: Patrik Öhman, Yours

Vinnarna, Atium:
Johan Björkquist och Emma Ericson

SIP|STRIM

The jury's motivation reads: "Mercury is one of the ten most dangerous substances for human health, according to WHO. At the same time, it is an extensive global problem. Many industries, including the mining industry, handle mercury in process and waste water. Atium AB develops a more efficient and sustainable technology to selectively clean water from mercury with a reusable filter. The method can clean low concentrations in an energy-efficient manner. The idea has a great development potential because purification of mercury is a global need, and there are also opportunities to develop the method for purifying water from other heavy metals."

SIP STRIM's winner – Atium AB, "Innovation for more efficient and sustainable purification of water from mercury"

SIP STRIM Innovation Idea Competition

SIP STRIM's innovation idea competition is an annual upcoming event and was organised for the fifth time in 2019. The competition, which aims to strengthen Swedish competitiveness in the mining and metal-producing industry, is an excellent opportunity for small business owners, entrepreneurs and suppliers to have the opportunity to realize an idea, but also a great opportunity to make contacts with representatives from the industry.

This year's competition, which was organized together with EIT Raw Materials attracted a record number of applications and from these, the expert jury selected the twelve sharpest innovations that were pitched to the jury and audience on February 13 at Luleå Science Park.

After careful deliberation, it was clear that SIP STRIM's winner became Atium AB for their idea of efficient and sustainable purification of mercury from water, and EIT's winners was ReVibe Energy for their idea with wireless recording and analysis of vibration and shock monitoring equipment for mining equipment and industrial environment. The two winning innovators received SEK 600 000 each to realize their idea.

SIP STRIM Swedish Mining Innovation Award

During the year, a new award, SIP STRIM Swedish Mining Innovation Award was instituted. The award was established to highlight and reward an innovation, project or other that has been of great importance to mining and innovation in Sweden.

The entire nomination process confirmed that Sweden is rich in fine solutions. From the many nominations submitted to the jury consisting of experts from financier, industry and the industry organisation three finalists were chosen: Boliden for their electric trolley solution in Aitik, Fortum Waste Solution for their innovation around purification of process water and Mobilaris Mining & Civil Engineering for their innovative solution Mobilaris Onboard™.
At the awards ceremony at Svemin's Höstmöte at Nalen on November 27, it was announced that final winner of the first SIP STRIM Swedish Mining Innovation Award was Mobilaris.

The jury also awarded Jan-Eric Sundkvist, Senior Metallurgist at Boliden Mines Technology in Boliden an Honorary Prize. Jan-Eric was nominated by colleagues for the efforts he has made within and for Boliden during a long period of time, and the jury decided that an honorary award was fitting to acknowledge Jan-Eric's efforts.

The jury's motivation reads: "The winner of the SIP STRIM Swedish Mining Innovation Award 2019 has, through great inventiveness, found a solution that is a prerequisite for the paradigm shift that the mining industry is facing. The innovation has global potential, and is a fine example of Swedish mining innovation at the forefront. With great innovation they have combined existing technologies and created new flexible solutions that are easily integrated into existing systems. The solution, which is a step towards Industry 4.0 in the mining industry, contributes to increased personal safety, fuel savings and increased productivity."

Mobilaris

WINNERS & JURY

Jenny Greberg, *SIP STRIM*
Lennart Evrell, *SCA, Svenskt Näringsliv, ICA and Epiroc*
Mikael Nyström, *Mobilaris*
Hans Wahlquist, *Mobilaris*
Maria Sunér Fleming, *Svemin*
Margaretha Groth, *Vinnova (Not in the picture)*

Photo: Henry Lundholm, Tale

The jury's motivation reads: "Jan-Eric Sundkvist is one of the most innovative people in the Swedish mining industry, and for a long period has been of great importance for mining innovation in Sweden. He is experienced as generous with his ideas, inventive and as a person who solves difficult problems in an easy way. Jan-Eric has done a great deal for his group, his area of expertise and his company."

Jan-Eric Sundkvist

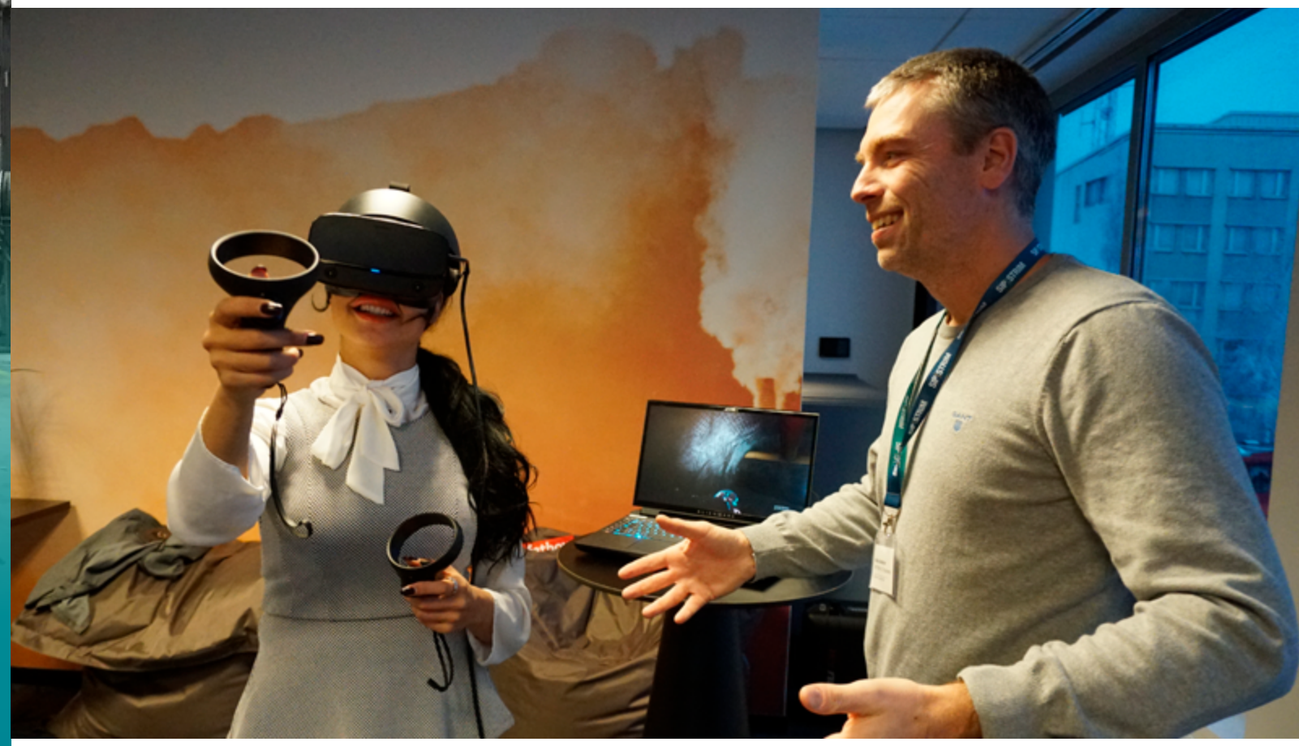
SIP STRIM PhD network MINERS – a cluster of future leaders and specialists across Sweden

The purpose of the PhD network is to bringing together doctoral students from different disciplines and universities in Sweden and facilitate dialogue with industry and other stakeholders to give a broad overview of industry in Sweden, allow them to exchange ideas and inform others on education and research opportunities.

This improves contacts between universities and establishes a cross-disciplinary network – a cluster of future leaders and specialists across Sweden.

1ST SIP STRIM PHD NETWORK MINERS WORKSHOP

The network's first workshop was held in the beginning of June in Gällivare and collected together 24 doctoral students from the Luleå University of Technology, Chalmers, Stockholm University and Outotec. Many of the participants had never visited a mine before, so it was very much appreciated that they were able to visit the Aitik and Malmberget mines and meet company representatives. The participants also presented to each other the projects they are working on, and it was found both interesting and beneficial to listen to related subjects.



AI in Mining

During the year, we conducted a study (AIming) with the aim of identifying areas where AI has the potential to create new values and increase the competitiveness of the Swedish mining industry.

The work has been done in close collaboration with representatives of the industry and its suppliers, but also with research players with specialist expertise in the field. Several actors were interviewed and as part of the study, a workshop was conducted in which the interview results were presented and the participants contributed additional thoughts and ideas. The workshop, which attracted more than 50 participants and also offered inspirational speakers and information about our large companies' AI initiatives, was much appreciated and we hope for a follow-up in 2020.

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Photo: Boliden/Lars deWall

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