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Gender equality in geosciences – why and how?

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EUROPEAN GEOSCIENCES UNION – GENERAL ASSEMBLY
THE KEY ROLE OF GEOSCIENCES FOR THE GLOBAL CHALLENGE
OF SUSTAINABLE DEVELOPMENT: THE AGENDA 2030

LULEÅ
TEKNISKA
UNIVERSITET 



ENGIE – Encouraging Girls to Study Geosciences and Engineering

An EIT Raw Materials funded project 2020–2022 aiming to raise the interest of girls aged 13-18 for studying geosciences and related engineering disciplines. The final objective of the project is to achieve gender equality in the future of geo-sciences as well as understanding the reasons for the gender imbalance and early female disinterest in geo-sciences and creating best practices for the future.

ENGIE was implemented by the cooperation of 25 institutions.

- University of Miskolc
- Luleå University of Technology
- University of Zagreb
- Italian National Research Council
- La Palma Research Centre
- European Federation of Geologists
 - 19 national member associations of EFG (as Linked Third Parties).

In total 21 European countries.

Research example from the mining industry.



Some results from our survey and workshops

Geoscience education is not so numerical gender unequal from an overall perspective. But there are differences in different type of geoscience educations.

- Earth science (≈35-60% women)
- Environmental science (≈40-70% women)
- Geo and mining engineering (≈15-45% women)

Both girls and boys are familiar with and interested in geoscience and are good at that in school – when they are young.

- But the teachers think that boys have more interest (!)
- The male teachers do not think women's underrepresentation in geoscience is a problem.
- Gender biases are restricting girls' actions and opportunities (e.g. being outside, getting muddy, exploring just for fun) ...

But later in life something happens ...

- In higher academic levels there are few women within the STEM subjects.
- Geoscience educated women move away from the field of geoscience?

Women professionals experiences **at work**:
gender bias, gender inequality, hostile workplaces, masculine cultures, non-family friendly work settings ...

Something must
be done ...



Why do the industries and companies work with **gender equality** interventions?

“To be competitive, the industry needs to attract **skilled** people from the entire population.”

“Company image and culture must keep up with the rest of society to be **attractive.**”

“Gender equality and diversity gives more focus on a sound **safety** culture.”

Gender equality – an important base for social sustainable development



Gender aspects – mostly included in the industries’ discussions of recruitment

A need for more people and skills to the north of Sweden.

- Large industrial sectors – both new and old – steel, mining, batteries, energy, power, digitalisation.
- Investments in recruitment and attractiveness in industry, business, and academia as well as societies/municipalities.

Gender equality is seen as an enabler.

- High expectations and much talk about the need for increased gender equality to attract all kinds of people.

Mining conference give-aways
in Germany 2020



Gender inequality creates problems.

**Gender unequal systems in society and
working life in Sweden.**

- Gender segregated working life. With different conditions and opportunities for women and men.
- Stereotypical discursive images of women and men.
- Gender labelling of industrial work and technology as male.



Gender equality gives better flexibility, innovation capabilities?

Gender mixed work places (50/50 in numbers):

- There are women and men in all groups, at all levels.
- They can work together in the same work groups, can change jobs with each other, be each other's managers.
- Gender is "no big deal" in the organisation, nor in change projects
- An effective and flexible modern (and gender equal) work organisation – with good work environment for everybody?



Implement such things that the other just talk about.
No restoring mechanisms.

Gender equality is a prerequisite for sustainable production, better quality and development of the organisation?

Or at least:

Gender stereotypes and gender segregation function as hinder for organisational change. It makes the organisation slow, inflexible, and more difficult to change.

The more gender inequality in the organisation, the more problems and hinders for positive change

Workplaces with clear **internal gender division** (50/50 % in numbers)

- Clear **borders between women and men** – and their workplaces. Stereotype ideas and myths of women and men – and of women's jobs and men's jobs.
- Often combined with differences in work environment, work tasks, conditions, career possibilities, resources, wages, etc. between women's and men's jobs.
- **Difficult to mix women and men** – and their work tasks.
- A rigid organisation by gender ...

Open resistance and conflicts. Direct restoring mechanisms.

Gender homogenous workplaces (10/90 % in numbers)

- **"Minority" problems for women at male-dominated workplaces.** Visibility, stereotype roles and exaggerated differences. Are extra work environment problems for women.
- Conservation of stereotypical and old-fashioned expectations of women and men. Women's place is in the periphery, outside the job.
- Occupational identities and gender identities are formed simultaneously and interwoven. It easily becomes a **confusion of real/important competence and gender of the majority.** Sociobiological ideas about gender and competence.
- **Homosocial and emotional ties among men.** Men choose men, men like men. Strong standards for how a man should be. Can be power strategies – but just as much a way to create a free zone for a subordinated masculinity.
- A rigid organisation by gender (masculinity). Who dare to challenge it ... ?

Slow change. Passive resistance. Indirect restoring mechanisms.

The workplaces might need some help to change ...



The workplaces might need some help to change – and in a good direction?

Gender and diversity theories.

- Can be good tools for understanding and handling of **both change and resistance.**

It is important that gender research results are used.

- Both from the more theoretical research and the applied and interactive research.

Co-design – applied development together with industrial companies – to make the results useful.

- The joint development and use of research results is an important part of the research.

Research example from the mining industry

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“Attract” – Roadmap for attractive, inclusive and safe mining work

A project about the mining work of the future

skills, attractive workplaces, work environment safety and gender equality.

Socio-technology theories

human-centric design of technology and organisation.

Gender and diversity theories

as tools for designing technology, organisation, workplace cultures and workplaces.

A research project (2022-2025) at Human Work Science at Luleå University of Technology financed by the strategic innovation program *Swedish Mining Innovation* (a joint venture by the national research funds Vinnova, Formas and the Swedish Energy Agency).

Research team at LTU (5 senior researchers, 5 PhD students) + mining companies (LKAB, Boliden, BDX).



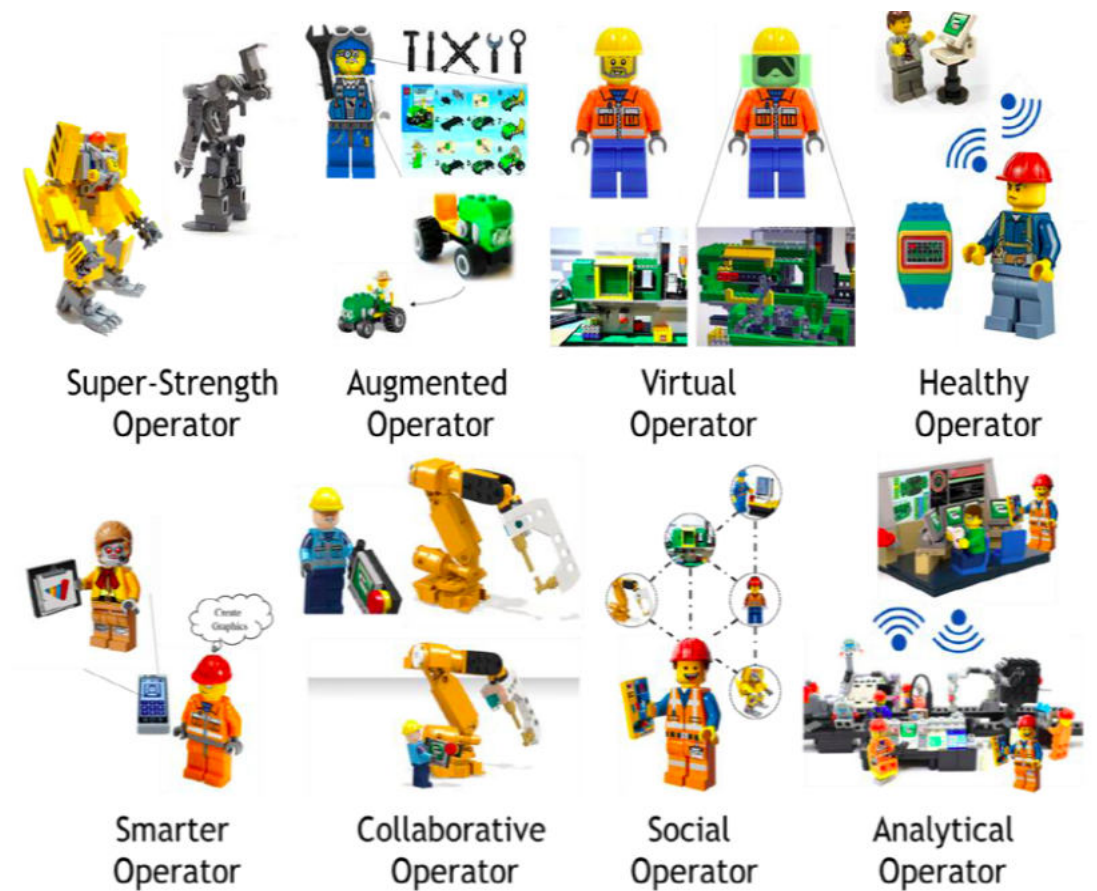
How is gender connected to the industrial work of the future?

And the green and digital industrial transition?

*Firstly, rapid and large investments in new and old **male dominated industries** and areas of expertise ...*

Secondly, although development will not be as technology-deterministic, rapid or unambiguous as both the common dystopian and utopian visions predict, there will be quite **large changes and new conditions for industrial work.**

And thus, **the gender patterns in the organisations are affected ...**



*Industrial workers in "Industry 4.0"
(note: all male Lego figures).*

New technology challenges the old workplace cultures and professional identities ...

1980s-2010s: Automation and remote control.

Technology development to improve productivity, quality and safety. Better working environment.

Above-ground production centres, remote monitoring and control.

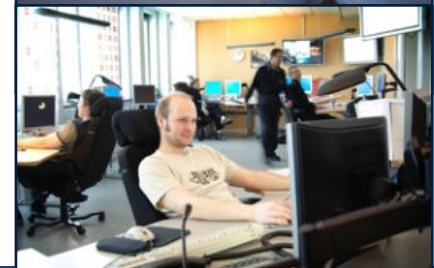
Today: Intelligent, connected and automated technology systems. And green transition.

Digitalisation, mobile smart IT tools, wearable sensors, positioning, internet-of-things, Industry 4.0, robots, drones, AI ...

Innovation, flexibility, sustainability, agile and learning organisations.

Electrification, new type of green fossil free products – new production sites.

New contexts and new conditions for mining work..



New contexts and new conditions for mining work

Improved work environment and safety.

New types of work tasks, new professional roles, new skills.

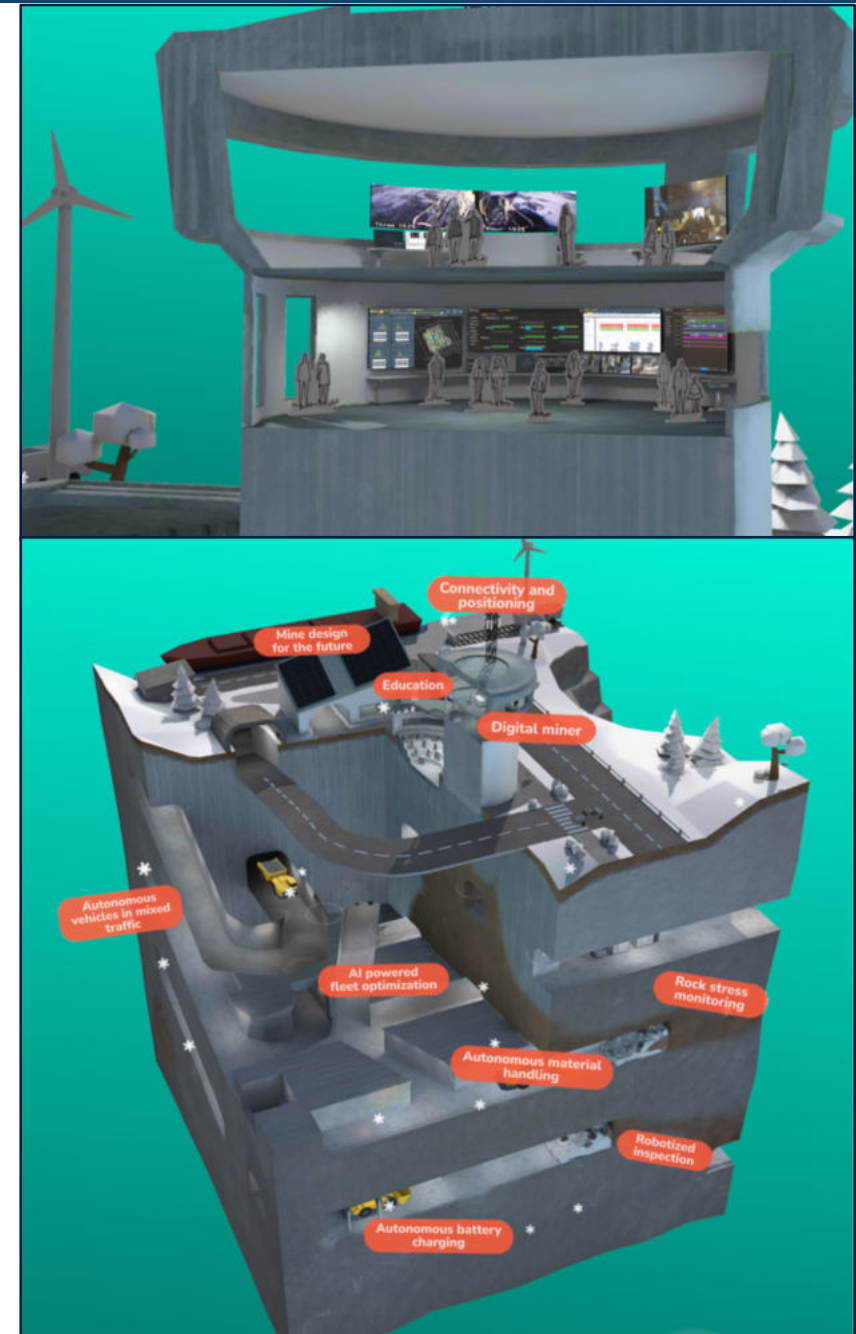
New places, office-like, remotely away from the “mountain”.

New ways of organising work – team, learning, flexibility, agile.

Increased and **new demands on attractive workplaces**, responsibility, trust, commitment, social sustainability and gender equality (more women), diversity, etc.

In the future there will be a different kind of people and skills recruited – and also the current ones need to change...

Big differences between the old and new?



Can the new technology (by itself) create more gender equality and new gender patterns?

Better working environment and new (increased) competence requirements.

- *Should mean that more women can work in industry?*

New (higher) demands on efficient, flexible and sustainable organisations.

- Will be a driving force for companies' work for gender equality, diversity and social sustainability?
- *Should create attractive workplaces for both women and men?*

This will impact on culture and behaviour in the workplace.

- *Should mean changing informal gender patterns in the workplace?*

The number of women as mining workers is slowly rising



Boliden







Women mining workers in Sweden:

1700-1850: 15-20 % women

(in some mines 50 %)

1900: 1 % women

1975: 3 % women

2005: 4 % women

2020: 18 % women

2022: 20% women

In total: 25% women.

But the new technology meets a reluctant context – the old gender patterns at the workplaces ...

The new technology meets a reluctant context – the gender patterns at the workplaces.

The "old" mining work was (and is) largely male-dominated.

- Numerically and physically: 80% of miners are men. In total in the industry about 75% men.
- Workplaces, equipment and organization designed by and for men.

Also discursive and symbolic male.

- Gender labelling of mining work as male and miner as male.
- Gender interwoven with worker identity, competence and workplace culture.
- Old working-class masculinity – the miner masculinity ("macho masculinity").

Changing and (un)changing masculinities.

- Since men are the majority in male-dominated organisations — they to a large extent carry and do workplace cultures there.
- Masculinities are made and changed in the workplace – in relation to changes there (and in the outside world).



A real mining worker is a man, brave, big and strong and works underground with "manual" work?

This is creating resistances to changes ...

A workplace culture lagging behind development?

A real mining worker is a man, brave, big and strong and works underground with "manual" work?



Changes are happening, but not smooth and not without resistance ...

The changes in technology and organisation are challenging to the (male) mining worker identity and workplace culture.

- An old mine worker masculinity with roots in the old mining work.

The workplace culture is conservative and lags behind development (at least initially).

- Glorifying “the old times” and the “macho-masculinity”.
- Following the old “symbols” rather than the new.
- **Aiming to keep the mining work male ...**

Creating somewhat paradoxical resistance (at least initially) towards:

- New technology (!)
- Safety
- Environmental awareness
- Gender equality
- Women miners

Will the new jobs be as male as the old ones (only different)?



3d-printer practice items for engineering students at a German university (2018)

Will the new jobs be as male as the old ones (only different)?

Can the implementation of computers, programming, gaming, deep tech, digitalisation, AI ...

– male-dominated and male-gendered technologies and areas of expertise –

... in an old male-dominated industry – really contribute to more women ?

How will the new jobs and technologies in the green and digital transformation be gendered?

But after a while, the connection to (macho)-masculinity releases ?

After a while, the connection to (macho)-masculinity releases?

We can already see a move from the old “mining worker” to a digital high-tech worker.

- The workplace culture, the mining worker identity and ideas of “the real mine work” are gradually changing.
- There is no longer any place or function for the old?

And signs of increased gender equality

- Better working environments for women, clearly improved attitudes and workplace cultures and more women.

Also less gendered (male) workplaces?

- As a necessary development for companies to be able to work effectively with the development and change of organisation and technology?
- New types of mining worker femininities and masculinities are emerging?



The old type of “macho-culture” at mining workplaces is progressively becoming obsolete.

Why gender equality at workplaces within geoscience – and how?



A fairly equal number of women and men as well as mix of women and men creates **attractive jobs and workplace cultures**.

It is good for **work environment**, safety, competence, quality and creativity – and gender equality.



Gender-equal organisations function better – change and flexibility.

Foundation for **resilient and sustainable** production systems.



Concrete changes are needed at the workplaces.

In the technology, organisations, cultures and norms (especially among the “majority” – the men).



New technologies challenge (as a “side effect”) gender biases and stereotypes – and open up for more gender equality? Or not?

Important to look out for and **prevent resistance and obstacles**.

So, what to do? How to diversify geoscience?

Exposure and access to STEM subjects at a young age.

Change circumstances not individuals.

- Avoid stereotypes and stereotypical images.
- Make Geoscience subjects visible.

Challenge rather than reproduce inequalities.

- Show the variations and diversity in geoscience.
- Learning activities without gender bias.

Take variations into account.

- Different fields and contexts, national and local differences.
- Diversity of skills, jobs, professionals and social background.
- How do learning activities portray or represent geoscience positions?



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