3rd African Conference on Fundamental and Applied Physics

GENDER Equity and Equality in the research area

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Today narrative: numbers, questions, ideas

In recent years, gender inequalities have been widely discussed, or bitterly contested, like never before.

The narrative I am telling you comes from my personal experience, from studies and researches done by others and by me (small amount).

Data reported in the following slides come from different sources, which you can found on the web. The reference years are not always the same because a good statistics need time and not all the countries give the same data referring to the same year.

Many data are coming from European studies, but the reality is not so different in the United States. We don't have enough historical data on South American, African and Asian institutes.

Numbers are important, but we have to know what we are measuring and how, take into account possible errors and also the *boundary conditions*.
Numbers are useful, but they don't tell all the story. Interviews and questionnaires are necessary to have a good research and good data.

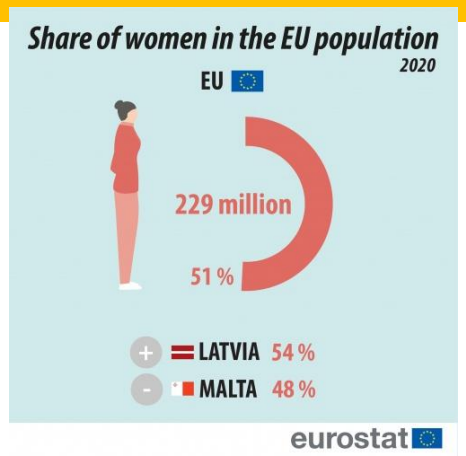
You can agree or not, but I hope that you will start asking more, thinking on these subjects and act differently.

Gender refers to sociocultural norms, identities, relations and attitudes. It is a concept socially constructed, that can change across time and place.

- **'Gender equality'** is the absence of discrimination on the basis of a person's sex in opportunities, e allocation of resources and benefits, or access to services.
- **'Gender equity'** recognises that women and gender-diverse people are not in the same 'starting position' as men. This is because of historical and social disadvantages. Treating women, gender-diverse people and men equally might not actually be fair. In fact, it can create further disadvantage. Gender equity is the process to achieve gender equality.

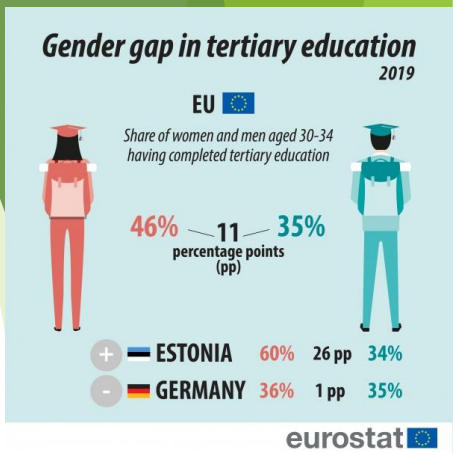
Gender pervades structures and processes in organisations/working world

Gender equity is not a past issue

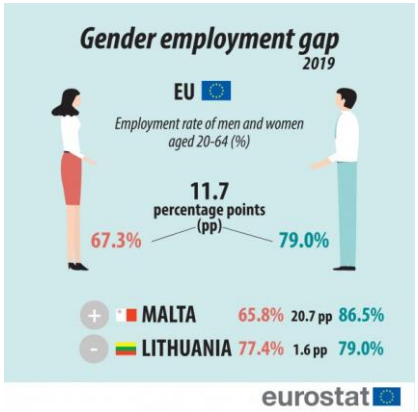


Women have entered occupations previously closed to them

significant changes in women's participation in educational paths, up to higher education



tertiary education (i.e. who graduated from universities or other higher education institutions).
54% of all tertiary students are women



Wwoman presence in STEM sectors has grown (see field of life sciences) but remained under-represented in most STEM fields, with little or no progress since 2015

their presence has also increased in leadership positions

Gender asymmetries still persist and it is clear that they do not disappear "naturally».....

The GAP depends on different woman participation to the labour markets in each country

STEM: Science, Technology, Engineering, Mathematics

Recognize inequalities

- To design and implement interventions/measures it is necessary to recognize **inequalities, which are often hidden**, not recognized in social and work organization.
- The American sociologist Joan Acker was the first to have interpreted and studied labor organizations as gender structures in which inequalities are activated and sustained by the processes she defines as gendering processes. **Gender inequalities are often invisible because they are so deeply embedded in everyday life, between people and work processes.**
- She argued that inequalities had to be made visible at the organisational levels to invite change.

Research institutes and/or universities are not unrelated to these processes, including career progression, being work organizations.

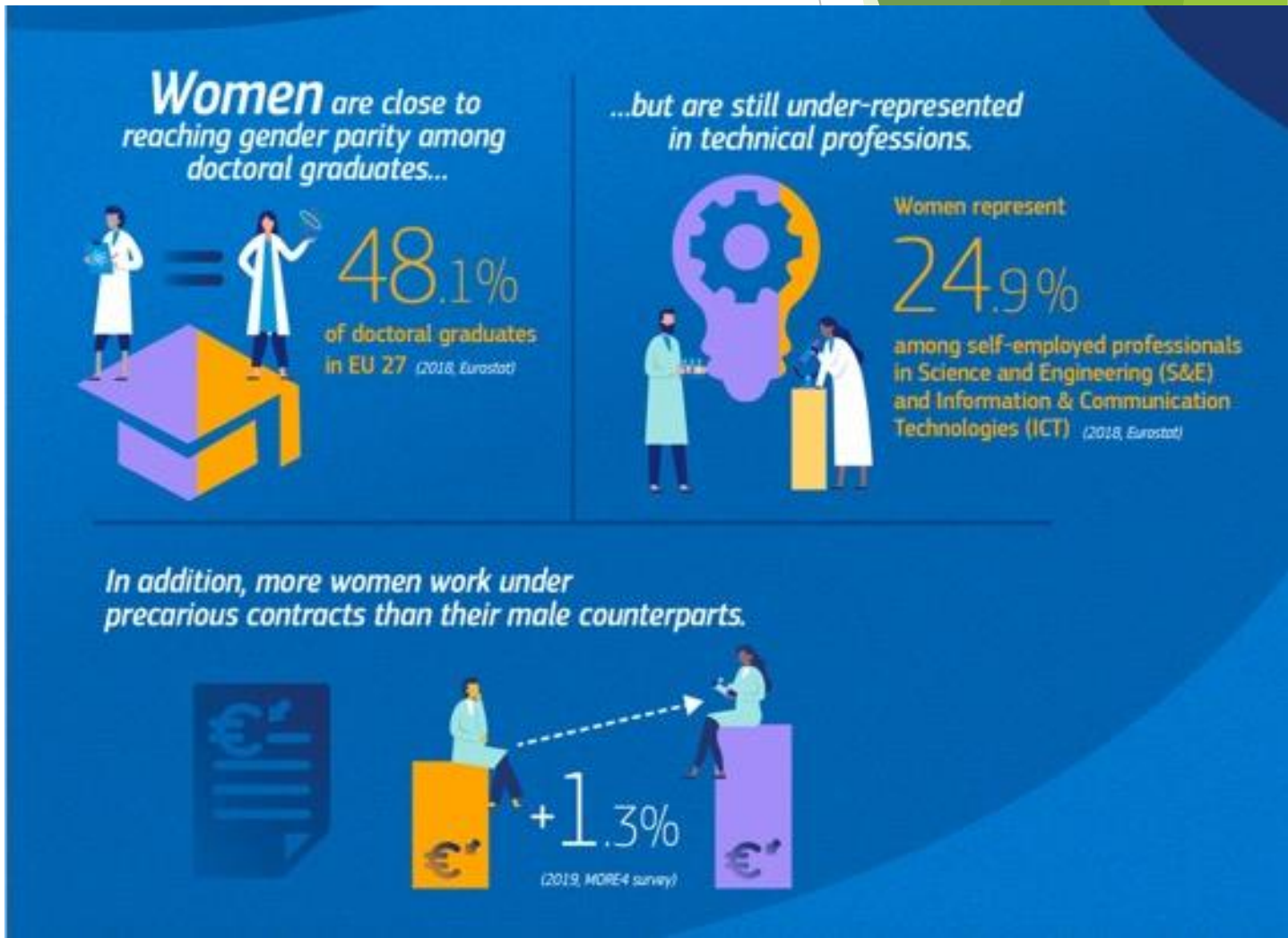
Women continue to face violence and discrimination. On average, women earn lower salaries and have lower levels of access to education compared to men.

Measurements: some numbers to start

An instrument of European Research Area **(ERA)**

She Figures has become an indispensable reference: it is the triennial report published by the European Commission since 2003 which analyzes the gender composition of academic and research staff in Europe

The number of temporary, non-permanent and part-time academic positions has grown significantly in contrast to tenured and permanent ones.



SHE FIGURES 2021

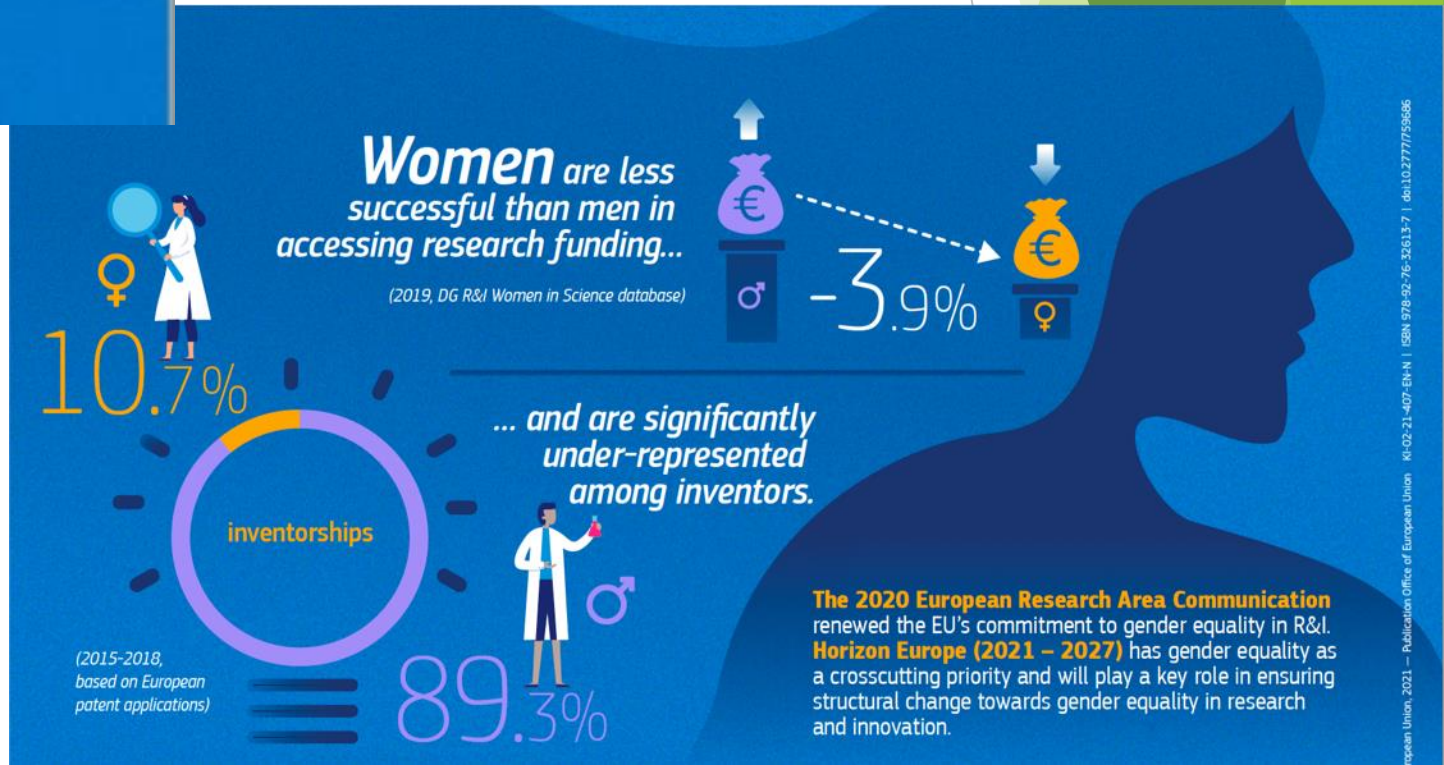
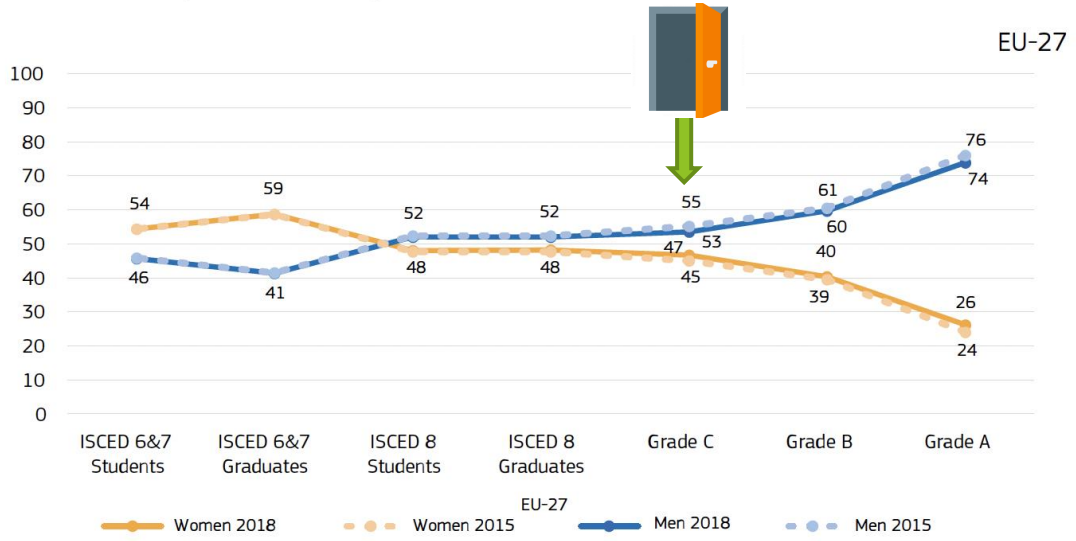
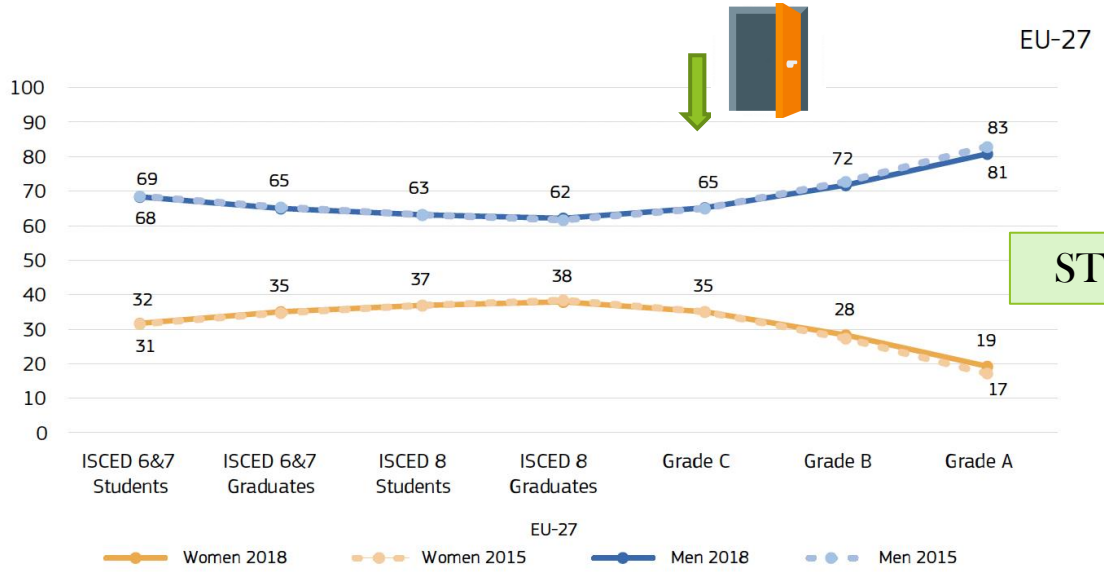


Figure 6.1 Proportion (%) of men and women in a typical academic career, students and academic staff, EU-27 & EU-28, 2015-2018



SHE FIGURES 2021: Scissor diagrams

Figure 6.2 Proportion (%) of men and women in a typical academic career in science and engineering, students and academic staff, EU-27 & EU-28, 2015-2018



STEM

ISCED 6 – Bachelor's or equivalent level.
ISCED 7 – Master's or equivalent level.
ISCED 8 – Doctoral or equivalent level.
Grade C: The first grade/post into which a newly qualified PhD (ISCED 8) graduate would normally be recruited within the institutional or corporate system.
Grade B: All researchers working in positions that are not as senior as the top position (A) but definitely more senior than the newly qualified PhD holders (C) (i.e. below A and above C).
Grade A: The single highest grade / post at which research is normally conducted within the institutional or corporate system

Data from 2018 show that, at European level, women continue to be under-represented among doctoral graduates in the narrow STEM fields of Physical Sciences (38.4%), Mathematics & Statistics (32.5%), ICT (20.8%), Engineering & Engineering Trades (27%), and Architecture & Construction (37.2%).

The average annual growth rate in the number of women and men doctoral graduates varied significantly at country level across the narrow fields of STEM: **the boundary conditions, the actions adopted are important!**

In the Accademia and in the research, the gap increases upon entry into the world of work..a kind of **GLASS DOOR!!!!**

(See Ilenia Picardi ref)

Switching into the Jobs of Tomorrow- STEM

Agenda 2030

Adopted by the United Nations General Assembly in September 2015, the **2030 Agenda for Sustainable Development** tackles a broad range of global most pressing challenges of our time, aiming to eradicate poverty, reduce multiple and intersecting inequalities, address climate change, end conflict and sustain peace.

Defines an integral roadmap for the future

***17 Sustainable development goal (SDGs)**: development that meets today's requirements without compromising the ability to meet the needs of future generations*

STEM disciplines are those defined as enabling new trades and professions of the future.

The workforce work in STEM disciplines is a small group, which is growing and considered crucial for the economic innovation and production

Scientists and engineers have to solve some of the more vexing and new challenges!!!!

“Turning promises into action: **gender innovation – STEM”**

The economic benefits of gender equality have been also deeply analysed; see for example the European Institute for Gender Equality report

We need all new possible ideas in order to face all the diversities (COVID and vaccine stories taught us a lot in these years).

If women will not be largely involved in these processes we will have solutions tailored only for a subgroup of people!!!

17 Sustainable Development Goals (SDGs).

It is crucial for women and girls to have equal opportunities to contribute to, and benefit from, STEM

https://www.unwomen.org/en/news/in-focus/women-and-the-sdgs
Girls4STEM: Gender Diversity in STEM for a Sustainable Future, https://doi.org/10.3390/su12156051

More data on women in academics and research

The 8March report by Times Higher Education (*) analysed how well higher education institutions across the globe are performing. Measure the contributions to SDG5 "achieving gender equality and empowering all women and girls" over 776 institutions in the world

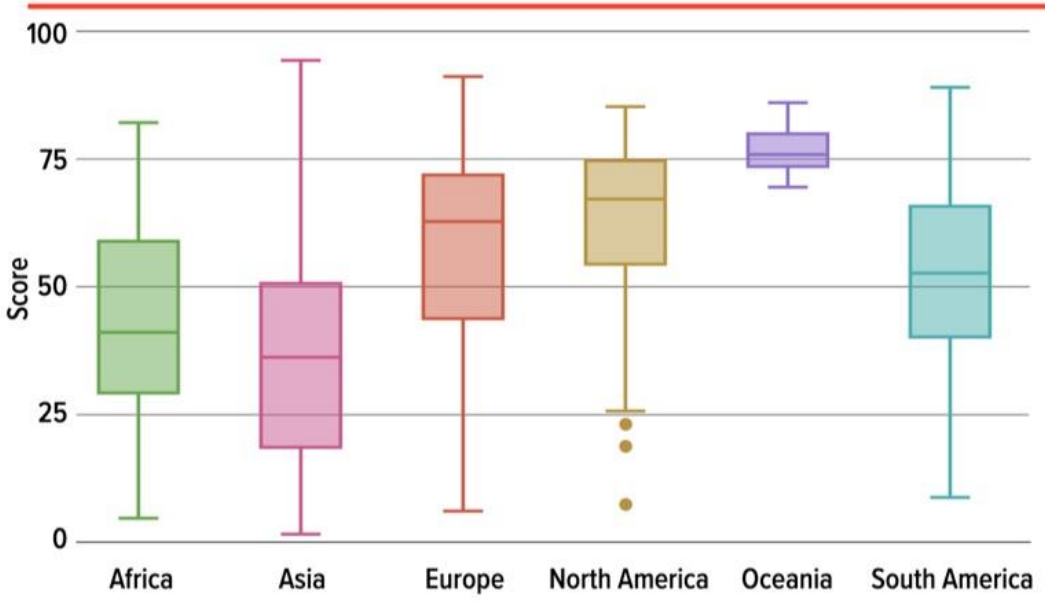


Figure 13. Distribution of scores per region for indicators related to research and academics

Note: The boxplots show the distribution of scores, with the middle line in each box representing the median score and the ends of the whiskers showing the maximum and minimum scores, excluding any outliers. Outliers are represented by the dots located outside the whiskers.

Senior academics includes professors, deans, chairs and senior university leaders

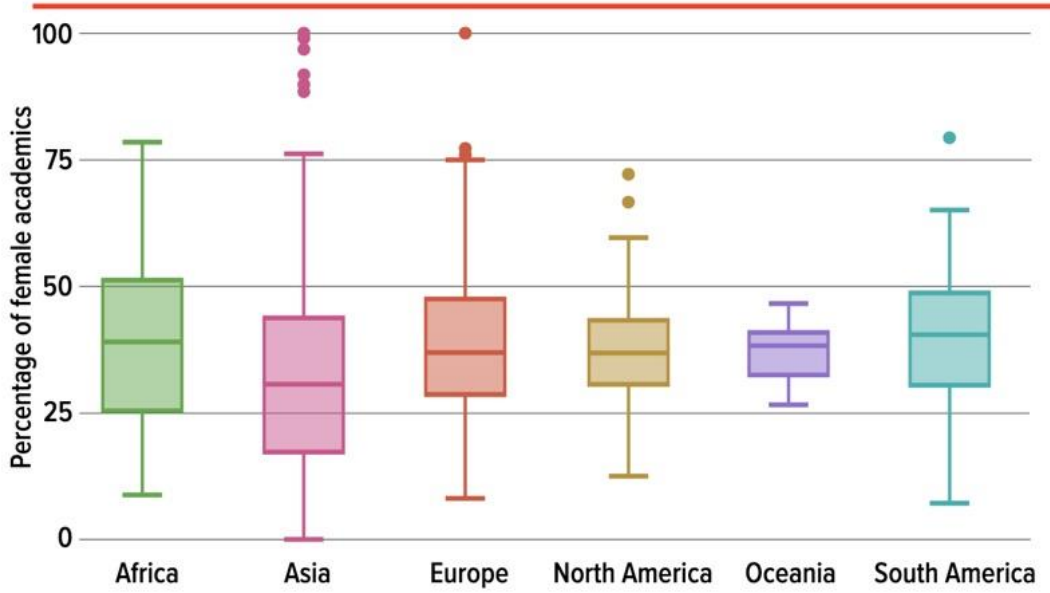
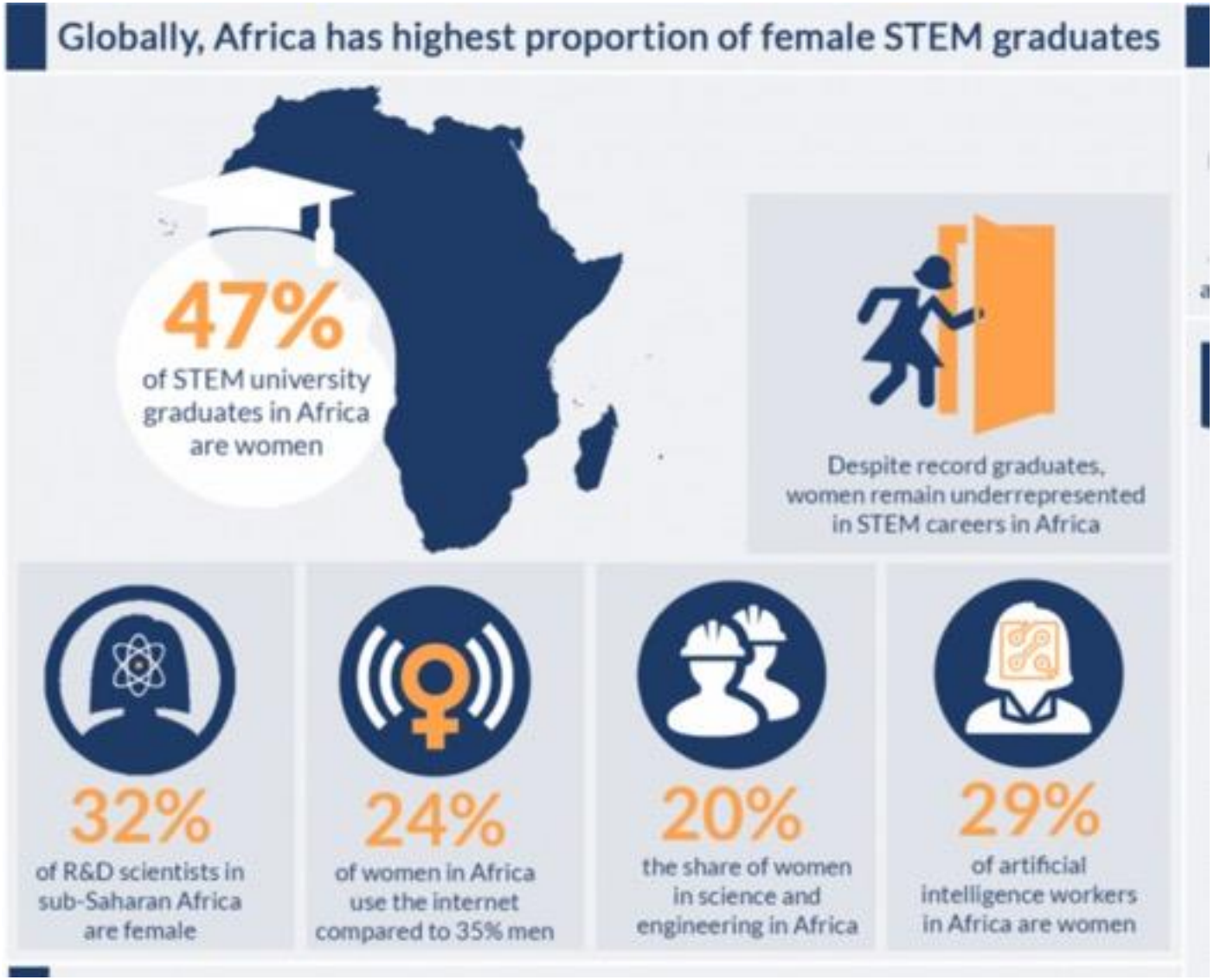


Figure 14. Distribution of share of senior female academics per region

Note: The boxplots show the distribution of scores, with the middle line in each box representing the median score and the ends of the whiskers showing the maximum and minimum scores, excluding any outliers. Outliers are represented by the dots located outside the whiskers.

* The 8 March report by Times Higher Education and the United Nations Scientific, Cultural and Educational Organization

Women in STEM in Africa



GLASS DOOR!!!!

* The 8 March report by Times Higher Education and the United Nations Scientific, Cultural and Educational Organization

https://www.womeninscience.africa/africa-has-highest-proportion-of-female-stem-graduates/

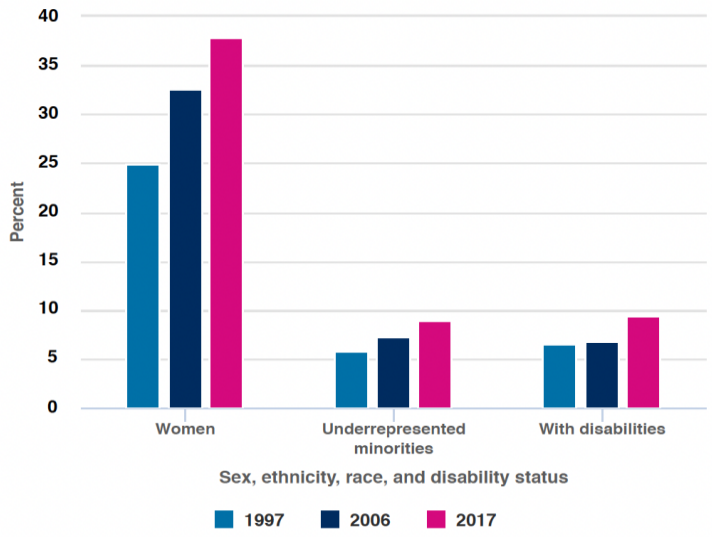
For United States, see also the analysis «Why So Few? Women in Science, Technology, Engineering, and Mathematics» and https://ncses.nsf.gov/pubs/nsf19304/digest

National Science Foundation, National Center for Science and Engineering Statistics, 2019

The % of women in doctoral position in (Science, Engineering, and Health) SEH has increased, from 25% in 1997 to 38% in 2017.

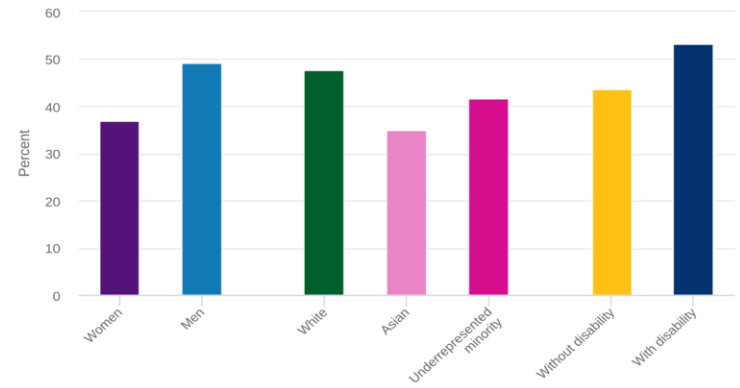
Women, underrepresented minorities, and those with disabilities as a percentage of the academic doctoral workforce: 1997, 2006, 2017

Chart View Table View



National Center for Science and Engineering Statistics | NSF 19-304

FIGURE 6-F
Doctoral scientists and engineers employed in universities and 4-year colleges who are tenured: 2017



Note(s)
Underrepresented minority groups include black or African American, Hispanic or Latino, and American Indian or Alaska Native. Survey of Doctorate Recipients asks the degree of difficulty—none, slight, moderate, severe, or unable to do—an individual has in seeing (with glasses); hearing (with hearing aid); walking without assistance; lifting 10 pounds; or concentrating, remembering, or making decisions. Respondents who answered "moderate," "severe," or "unable to do" for any activity were classified as having a disability. Doctoral scientists and engineers includes those who received research doctorates in science, engineering, and health fields.

Source(s)
National Science Foundation, National Center for Science and Engineering Statistics, Survey of Doctorate Recipients, 2017. Related detailed data: WMPD table 9-26 and table 9-29.

45% of SEH doctorate holders in 2017 were tenured. Among SEH doctorate holders in academia, a larger share of men than women had tenure in 2017. Whites had the highest rates of tenure.

Achieving gender equality : policies and services in the university

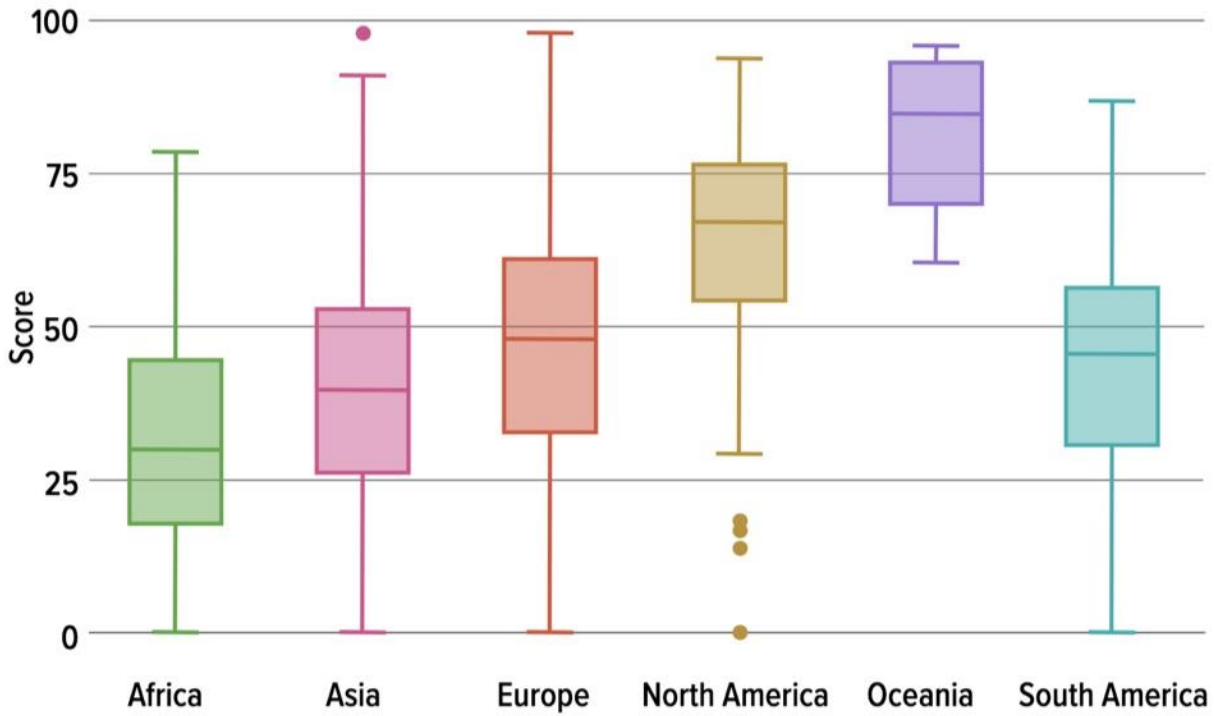


Figure 17. Distribution of scores per region for university-wide indicators

Note: The boxplots show the distribution of scores, with the middle line in each box representing the median score and the ends of the whiskers showing the maximum and minimum scores, excluding any outliers. Outliers are represented by the dots located outside the whiskers.

less likely to have policies and services.

The university-wide policies and services on gender equality is even more geographically varied than the student-focused measures. Probably university-wide indicators are more dependent on local cultural, social and demographic contexts.....more related also to the work and society organization

* The 8 March report by Times Higher Education and the United Nations Scientific, Cultural and Educational Organization

Why so few?

Why so few?

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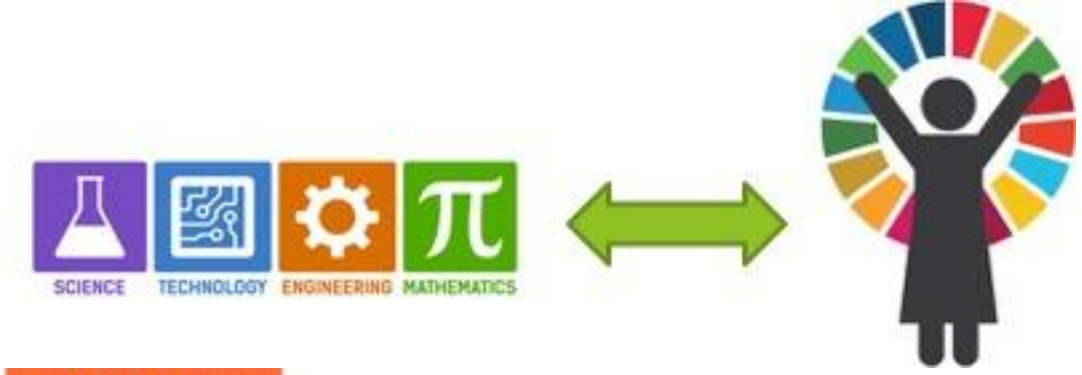


FIGURE 8

Participation of women in research and STEM fields remains far from parity

Only **1 in 3** researchers is a **WOMAN**

Women hold less than **25%** of **SCIENCE, ENGINEERING** and **ICT JOBS** globally

A mere **17%** of inventors in **INTERNATIONAL PATENTS** were women, compared to 83% men

Women are **2X** less likely than men to know how to write a **COMPUTER PROGRAMME**

Sources: UNESCO's database of female researchers as a percentage of total researchers, in headcounts; ILO's database of employment by sex and occupation; WIPO, 2023; United Nations, 2023, Global SDG Indicators Database.

Reasons for women's low representation in STEM fields

Gender norms and stereotypes

Online and offline harassment

Discriminatory practices

Lack of role models

Low connectivity and access

Why so few?

Working environment is becoming ever more frantic and demanding

Stereotypes and implicit bias

Unfavourable academic climate for female scientists (commonly referred to as a 'chilly climate')

Allocation of time to the different kinds of academic tasks performed by men and women

Management styles value *masculine* practices of competition and aggression, then senior managers may need to develop identities as tough and assertive in order to be credible. However, this is not expected from women, whose gendered identity could be judged harshly if they adopt more *masculine* attributes to perform their role.

Bullying, microaggression and harassment (not only sexual) online and offline

Languages

Cultural-gender norms, gender roles

Work-life balance: social norms of burdening women with excessive family responsibility for childcare, elderly care and house- hold management

Beliefs about how males and females should act.

Why so few in Physics ?

Numbers:
still among the worst discipline - very few women.

Knowledge:
strong resistance to look for a gender dimension, to incorporate a gendered perspective

personal choices are made within particular social contexts, and stereotypes are part of that context

Neutral.
Physics is what we do,
how do the research, create labs and groups

message that Physics only welcomes students who are materially secure, raised in prestigious school districts, and freely able to divert family time to work.

Demands of full work-devotion within academia and STEM, Physics in particular

Gendered identities are constructed but also brought into workplaces.

Culture:
extreme objectivity-cult and elitism.

Women physicists report less access to the resources they need to perform research and attend conferences

A strong identification with the discipline

The myth of mericrotacy: what we define excellence?

Traditional image of an ideal scientist: a male worker without domestic or familial obligations and totally committed to his work as the norm .

The concept of TIME:
'longhours culture'
& constant availability

The construction of Physics as a "hard" subject

How to foster gender equity: different approaches

Fixing the women approach
Increase the number of women at all career levels

This is not enough!

Actions, strategies were mainly conditioned by the "equal opportunities" approach

Joan Acker (American sociologist): she was the first to have interpreted and studied labor organizations as gender structures in which inequalities are activated and sustained by the processes she defines as *gendering processes.*

Martha Nussbaum (American philosopher): the capability approach, capacity building.
Develop what people are able to do and to be.

Transformative processes inside the institution

Fixing the institution/organization approach moves the focus from women to institutions.
Move from changing the women to changing the institutions, working organization. Remove the barriers

Fixing the knowledge approach
New research - integration of the gender perspective/ dimension into research content and teaching

Fixing the organization approach in ERA

Fixing the number approach

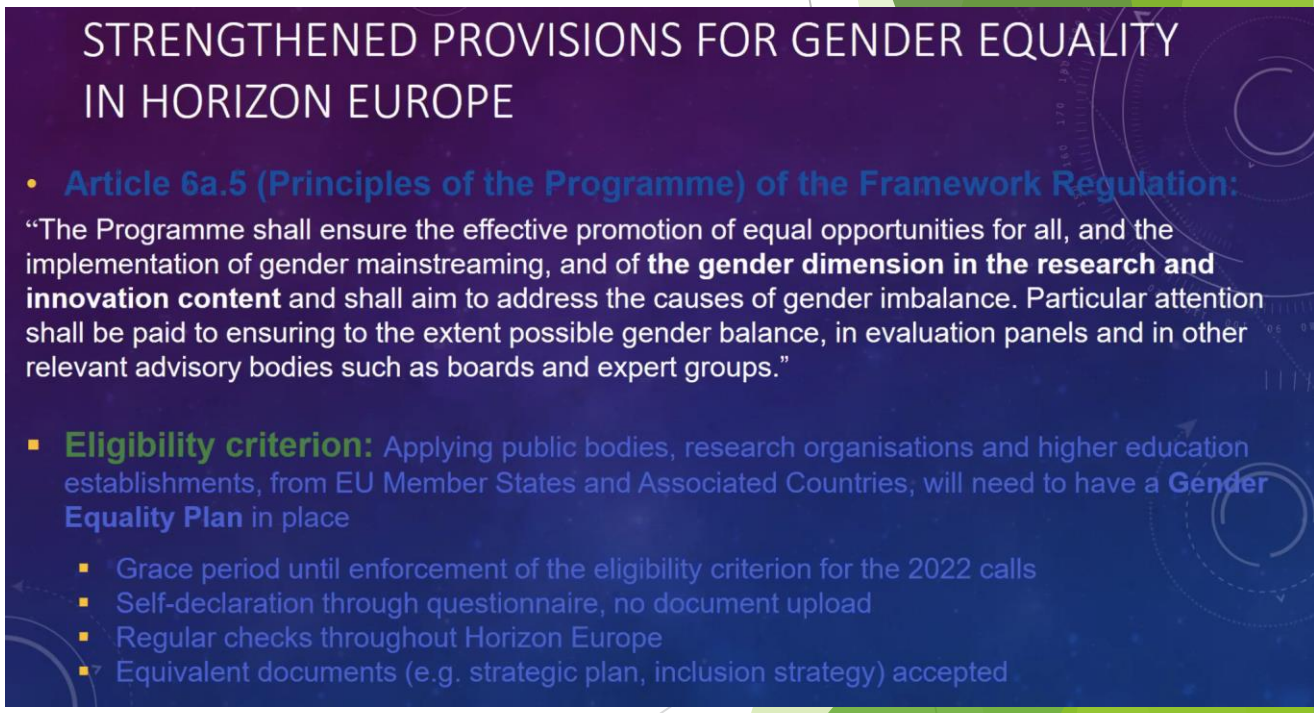
Fixing the organization/institute approach

Build an equitable, sustainable, and just society

HORIZON EUROPE

The Gender Equality Strategy 2020-2025 emphasises the importance of tackling the gender gap in the proportion of STEM graduates within the context of an EU economy that is rapidly transforming towards digitalisation (European Commission, 2020b).

Reforming and Enhancing the European R&I system



Eligibility criterion: ask for GENDER EQUALITY PLANS!!!!

Fixing the Knowledge approach: Gendered Innovations*

»**Gendered innovations**" stimulates new ideas and excellence in science and technology by integrating sex, gender, and intersectional analysis into research.
Develop gender-sensitive innovations for our society

Urban planning, transport

SMART MOBILITY: CO-CREATION AND PARTICIPATORY RESEARCH

The challenge

Mobility patterns tend to be gendered in terms of where, when and why people take trips from home. Transportation planning – for both modes and infrastructures – often does not take into account the diversity of needs and issues that affect transportation. For example, the need for safety can restrict mobility opportunities for specific groups.

Where, when, and why people take trips.
Plans often do not take into account diverse users' needs. For example, the need for safety can restrict mobility for specific women, gender nonconforming individuals, and the elderly.
INCLUDE DIVERSE NEEDS, DIFFERENT QUESTIONS

Osteoporosis Research in Men: Rethinking Standards and Reference Models

Men account for nearly a third of osteoporosis-related hip fractures in Europe and the U.S. (Dhanwal et al., 2010). Nonetheless, osteoporosis is considered primarily a disease of postmenopausal women, and men are rarely evaluated or treated for it .

Londa Schiebinger
https://genderedinnovations.stanford.edu/GI%202%20How%20Inclusive%20Analysis%20Contributes%20to%20R&I.pdf

Gender innovation: developing knowledge of gender equality issues

robotics, machine learning,artificial intelligence

FACIAL RECOGNITION: ANALYSING GENDER AND INTERSECTIONALITY IN MACHINE LEARNING

The challenge

Facial recognition systems (FRSs) can identify people in crowds, analyse emotion, and detect gender, age, race, sexual orientation, facial characteristics, etc. These systems are often employed in recruitment, authorising payments, security, surveillance or unlocking phones. Despite efforts by academic and industrial researchers to improve reliability and robustness, recent studies demonstrate that these systems can discriminate based on characteristics such as race and gender, and their intersections. In response, national governments, companies and academic researchers are debating the ethics and legality of facial recognition. One point is to enhance the accuracy and fairness of the technology itself; another is to evaluate its use and regulate deployment through carefully implemented policies.

Facial and voice recognition systems:darker-skinned females are the most misclassified group

Bias in machine learning is multi-faceted and can result from data collection, or from data preparation and model selection. **The data may contain human bias.** *Training data must be sufficiently broad and diverse to enable the predictive model inclusive of all persons.*

Londa Schiebinger
https://genderedinnovations.stanford.edu/GI%202%20How%20Inclusive%20Analysis%20Contributes%20to%20R&I.pdf

Changing the narrative: take actions

Rethinking dominant cultures and daily practices in accademia and research

When we speak of gender issues we speak, act for women, men, all persons

?

?

Remove obstacles which can be different for each of us!!

Work against discrimination

Increase the overall awareness on gender issues

Education

Teach students that brain is like a muscle....gets stronger and works better the more it is exercised.

Passion, dedication and self-improvements are the road to create contributions..not simply innate talent!!

Reflect on how policies and practices have different impacts on and needs of different gender
how gendered structures and practices are reproduced by organisational and individual behaviour.

Create places inside universities where it is possible to interact more informally to create relationships
Work on the sense of belonging to a group
Sponsor a woman in physics group

?

Work on gender-integrated leadership

?

Gender transformative approach
Gender mentoring program (a transformative programme for mentee and mentors at INFN for women and men)

Develop a participatory research, processes
Mutual empowerment
Favouring cooperation instead of competition

Give a value to “care” tasks

Role models can help counteract negative stereotypes

Changing the narrative: gender-transformative research approach

Develop a participatory research, processes
Mutual empowerment
Favouring cooperation instead of competition

Inside the research

Gender transformative approach

- Policies and practices reflect awareness of differential impacts on and need of different genders(including minorities). Plans, priorities and approaches are proactively designed to meet the needs of all people.
- Starting from an objective, engage diverse local actors in transformative reflection and change processes regarding underlying forces and factors that shape equality and equity, such as gender and social norms, attitudes, practices and rules.
- provides space for women and men to engage in an iterative process of critical learning, reflection, questioning and action

The change has to involve all of us

From the research to outside

Usually in the business-model, in the common problem-solving process used in science the researcher stands objectively outside the system under study and produces a research output, which is then adopted and adapted by users to solve a specific problem. The adoption or adaptation is usually not the researcher's concern. The result is a disconnect between researcher and user, resulting too often in research technologies that do not meet local needs and are abandoned.

In the "gender -transformative" approach the research is carried out within and as part of a more complex social-ecological system. Researchers are pushed to think beyond the specific problem they are aiming to address and embrace a broader perspective on how development is achieved.

Freerly choosing

Yesterday

Today

Today

4 women out of 10 men registered;
1 woman out of 2 men in presence

Campus)

Thanks for your attention

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