

Perspectives on Gender Mainstreaming in International Cooperation in STI: A Comparative Study

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Abstract: Gender equality is the fifth Sustainable Development Goals (SDGs) goal. However, there are still global gaps to be addressed for leveraging science, technology, and innovation (STI) for achieving this goal. Countries and governments at all levels need to effectively utilize STI to help mobilize the global community to assist in gender mainstreaming. International cooperation encompasses a great diversity of countries, regions, dominant religions, and cultures in broad terms – and this is undoubtedly a relevant hinderance to a gender equality narrative. Even within most homogeneous areas, such as the European countries, different levels of awareness on gender issues still prevail, impacting the practical relevance of the problem. Many gender-related projects, actions, and policies aim to counteract this. However, there is no clear guidance on what is expected from the institutions about addressing gender equality to mainstream gender into international dialogues. Therefore, gender equality runs the risk of remaining a “good intention”. In addition, there is little explicit data on the gender dimension in international agreements. The design for this study includes qualitative and quantitative data collected in the EU Horizon 2020 Gender STI. The framework is developed based on three main data sources collected from semi-structured interviews, an online survey, and a mapping exercise on gender equality in STI agreements in different regions worldwide. These sources, collected from more than 60 countries worldwide, allow data triangulation to validate the qualitative insights related to gender mainstreaming in STI. This paper offers critical insights on gender mainstreaming in international dialogues, which are becoming an essential instrument of change if cultural differences are considered. The institutional profile and professional culture are relevant to define each gender balance action's range and foster data production on the subject. Moreover, recent requirements in European funding instruments, such as Horizon Europe, have a broad impact on the international cooperation landscape, inducing a general institutional change and a reverse cultural bias.

Keywords: Gender mainstreaming, International cooperation, STI international dialogues, Gender research, Comparative study

1. Introduction

Gender equality is undergoing changes that are bringing an impact beyond anything we have seen in the 20th century. The Treaty of Rome incorporates the principle of equal pay for equal work and furthering, Marseille Declaration (2022) enforces gender equality based on the Ljubljana Declaration (2021) plus forward movement with the implementation of the new strategy for international cooperation in research and innovation (R&I). Following this, the European Union (EU) should mainstream and integrate the gender dimension in all the international cooperation activities in R&I, including the preparation and design, the implementation, and monitoring and evaluating policies.

Even though actions on gender equality have already taken place, it seems that more focused and implementable guidance is still missing.

This work aims to perform a comparative analysis worldwide, focusing on the main barriers and implementation measures of gender equality in international cooperation STI actions. We analyze, extract and summarize the collected data, namely a mapping exercise on gender equality in STI bilateral and multilateral agreements (528 revised), an online survey (204 responses), and structured interviews (80) performed with key actors in international cooperation activities in different regions of the world. This should reflect a foundation for current barriers in STI for gender mainstreaming and equality. Primarily through the range of the collected data, a worldwide overview can be given to help set the following actions in agreements, policies, memorandum of

understanding, and activities from different actors. By finding a common international experience, work can be done more efficiently and focused.

2. Literature Review

According to the literature, the lack of gender perspective results from the historical interaction of science, technology, and masculinity, guiding knowledge production and innovation (Cockburn, 1993; Harding, 1991). This phenomenon, embedded in male normativity, is manifested in different and interconnected ways in STI fields. In facing this scenario, the European Research Area Communication (2012) defined three objectives to foster an institutional change: gender equality in scientific careers, gender balance in decision-making, and integration of the gender dimension into the content of R&I.

These objectives considered dense literature on related topics and the research indicated differences in the distribution of gender within the areas of knowledge of universities. Following the research carried out by the United Nations, only 35% of the students enrolled in STEM (Science, Technology, Engineering, and Mathematics) courses are women (UNESCO, 2017). Several studies have been made to understand the channels through which these differences are perpetuated.

2.1 Stereotypes

One aspect is the existence of stereotypes based on gender that allows the creation of preconceived judgments of people based on perception (McKinnon & O'Connell, 2020). Studies have shown that gender stereotypes are present and linked with representations and perceptions in society in which women are portrayed as having traits such as warmth and nurture. At the same time, men are depicted with characteristics such as competence and assertiveness (Fiske et al., 2002). In this sense, male stereotypes are much more linked with science, as rationality and objectivity are co-constitutive concepts of masculinity (Cockburn, 1993; Harding, 1991).

Therefore, girls and women are embedded in a frame where they frequently are not perceived as suited for science. When they enter areas of scientific endeavor, they are directed to careers linked to the warmth presented by those stereotypes. Research has indicated that gender stereotypes significantly affect STI fields, especially concerning STEM disciplines, as the hampering of the attraction, retention, and progression of girls and women to STEM (De Melo et al., 2012; McKinnon & O'Connell, 2020). According to Lavy & Sand (2015), this problem can stem from the stereotypical beliefs of teachers and parents of young children.

2.2 Glass Ceiling

Another significant impact is the gender imbalance in career progression and decision-making positions. The literature indicates that there are many "invisible barriers" that prevent women from progressing in their careers or, as Guy (1992) defined, a "glass ceiling". Guy described this metaphor by focusing on the structural barriers in the organizations where women advance into high-level positions – rather than individual or social factors.

According to Connell (2006), the "glass ceiling" approach has limitations since it uses a dichotomous perspective of gender and uses the logic in which the administration is thought to be "independent of gender", or neutral. In this sense, Connell identifies that although *equal* opportunity measures are taken, gender labor divisions are maintained in organizations and society. In her study, she proposes the "gendered institutions" perspective in which she identifies the multidimensional processes responsible for this division with patterns that set the context for practices. She applies a fourfold model with the following dimensions: gender division of labor, gender relations of power, emotion and human relations, and gender culture and symbolism. These dimensions help us understand how these gendered institutions' processes are organized, maintained, and undermined.

2.3 International Relations

This research examined International Relations (IR) literature to understand how gender is considered in the international dimension of STI.

The literature on the concept proposes that gender mainstreaming is a strategy in which all processes of policies take the gender perspective actively into the preparation, design, implementation, monitoring, and evaluation of policies. Following the lessons of feminist IR scholars, there are two perspectives on gender mainstreaming in international organizations: the discursive politics, therefore, the language and the meaning of gender equality and difference reflected in cultural norms, organizational identities, policies, procedures, material structures; and institutional politics, with focus on the political and temporal relationships, the bureaucratic and organizational dynamics (Hafner-Burton & Pollack, 2002; True, 2015).

To Hafner-Burton and Pollack (2002), gender mainstreaming presents a concept in which the gender dimension is inserted in all international governance. However, gender mainstreaming demands its adoption by *all* the main actors involved in the policy process, making it dependent on the timing and the nature of mainstreaming processes within and among organizations. They argue that gender mainstreaming is a function of three variables: political opportunities structure (openness of inputs and implementation capacity as outputs), mobilizing structures (collective vehicles of collective action mobilization), and dominant frames (strategic action to create shared understanding and legitimacy). In their study on global development institutions, they suggest structural factors are essential in the tendency to adopt gender mainstreaming. Individual agents also appear as necessary to strategically frame gender mainstreaming. In doing so, they stress the *structure-agent* endeavor, in line with Wendt (1987).

Using feminist analyses, True gives us crucial insights into the limitations and the potential of gender mainstreaming as a strategy for transformation and concludes that transformational potential is better explored at the international level when it involves significant feminist engagement, with the participation of women and men (True, 2015).

3. Methodology

This paper is based on a project's quantitative and qualitative investigation, which includes a consortium of 18 institutions from Europe, America, Asia, and Africa.

The quantitative approach aimed at analyzing gender content in international STI agreements, mapping 528 international agreements in STI through descriptive statistics (Kaur, Stoltzfus & Yellapu, 2018). It also carried out a survey with 204 key individuals from institutions responsible for international dialogues in STI. Based on the quantitative results, the qualitative analysis - the main data source used in this research paper - developed the framework to conduct 80 semi-structured interviews worldwide. All these data will be analyzed on this paper from a comparative perspective that considers the different regions covered, targeting their differences.

The diversity of the consortium in the Gender STI project has made it possible to conduct interviews with institutions worldwide. The interviews included prominent Universities, Research Performing Organisations, Research, and Technology Organizations, National Research and Education Networks, funding agencies, non-governmental organizations specializing in gender in STI, Ministries, governmental institutions, and companies with high expertise in policy dialogues and international cooperation in STI.

The in-deep interviews took place between January and April 2022. Due to the Covid 19, the interviews were restructured using online and management software tools to perform synchronous and asynchronous work.

3.1 Conduction of the Interviews

The project partners interviewed selected key stakeholders in institutions responsible for international dialogues in STI, and a manual on how to proceed with the interviews was developed.

The methodological choice of semi-structured interviews, is one of the most frequently used interview techniques in qualitative analyses (Kallio et al., 2016), because it allows the investigation different points of view about a fact through the iperspective of reality the interviewed persons have and taking into consideration the culture and the environment they are embedded in. The semi-structured approach also guarantees the comparability between 80 interviews across different institutions, countries, and cultures. The manual had, therefore, two main objectives: 1) inform and support the partners in conducting the interviews; 2) allow a comparative analysis of the answers obtained from different countries and different groups of stakeholders.

It is essential to mention that the questions were designed to offer both qualitative and quantitative insights. This is possible since the questions started with yes or no answers and were then developed into which, why, and how solutions. Therefore, the collection of extensive responses allowed translation to quantitative results that gave a quick overview of the status of gender has in international dialogues.

Another critical issue is the fact that the interviews were primarily conducted in the native language of the stakeholder, and the data was translated and then transcribed into an Excel file with the following structure:

1. List of interviewees (country, organization, role)
2. Long answers which reflect quotes from the interviews
3. Quantitative results which reflect solutions in numerical form

Sheet 1 includes basic information from each interviewee that allows us to analyze results by country, type of organization, and role. In the second sheet, the answers to the interview could be shown with examples, experiences, direct measures, and more and were not space limited. Based on these answers, the classification was used to transcribe the answers in Sheet 3. Most of the questions were laid out so that one could answer a "yes", "no", or "partially; I don't know; n/a". This classification makes it possible to transform the results into quantitative data.

4. Results

The research performs a comparative analysis between world regions, with a focus on the main barriers and the implementation measures of gender equality in international cooperation actions as indicated by the stakeholders. Of the 80 in-depth Interviews, 32 were conducted in Europe (Finland, Austria, Spain, France, Italy, Ireland, Portugal, Poland, and Cyprus). In Latin America, 25 Interviews were conducted in Chile, Brazil, Colombia, Nicaragua, Costa Rica, Argentina, Uruguay, and Panama. The 12 interviews in Asia were held in Australia, India, South Korea, and China. In North America, seven interviews were held in Canada and the USA. The 4 interviews in Africa were conducted in South Africa. The continental distribution is presented in Table 1.

Table 1: Continental Distribution of Interviews

Continent	Number of Interviews
Europe	32
Latin America	25
Asia	12
North America	7
Africa	4
Total	80

In-depth interview responses were transcribed. From the total 15 questions for the quantitative analysis, 4 were selected for this paper to provide a detailed analysis by continent.

- Q1 Are there cultural and institutional barriers that could be limiting the inclusion of gender equality measures in international cooperation actions?
- Q2 Do the international cooperation agreements or project proposals in which you have been involved set targets to increase the gender dimension in research and innovation content?
- Q3 During the implementation of the international cooperation agreements/actions in which you have been involved, do you use and/or produce sex-disaggregated data whenever possible?
- Q4 Does your team/organization implement measures to prevent gender-biased research outcomes?

Overall, the answers were classified as "yes", "partially; I don't know; n/a" and "No". Figure 1 reflects the responses of all interviewees who could be categorized, which shows the trend for each question worldwide.

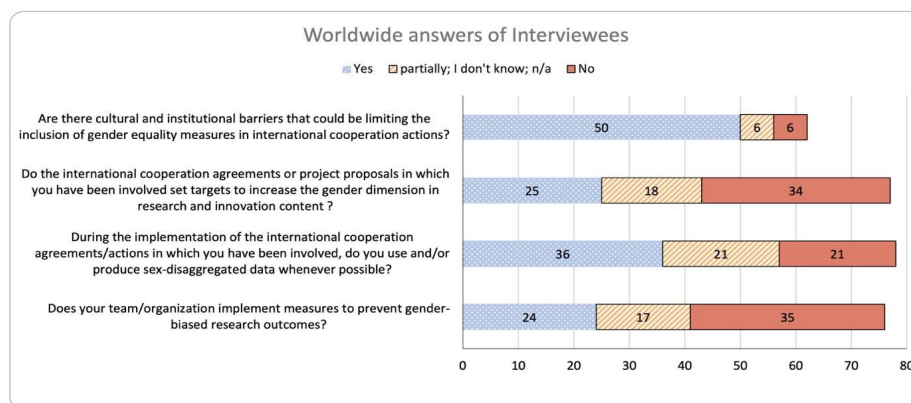


Figure 1: Overall Answers of Interviewees

Figure 2 illustrates the continental distribution of question 1, "Are there cultural and institutional barriers that could be limiting the inclusion of gender equality measures in international cooperation actions?". All regions, with more than 75%, answered this question with "Yes". This indicated that respondents from all the regions acknowledge the barriers to gender equality.

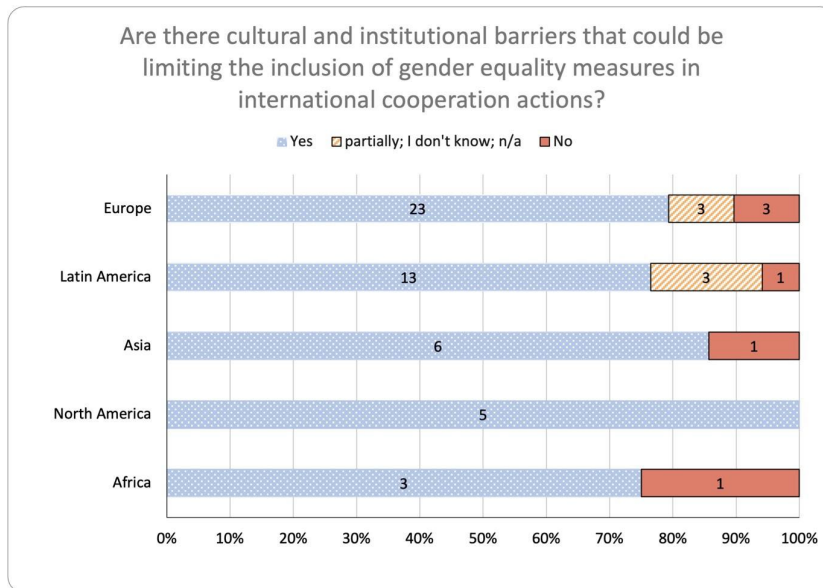


Figure 2: Continental Distribution to Question 1

The results change, however, when presented with more specific questions about the problem. The continental distribution of question 2, "Do the international cooperation agreements or project proposals in which you have been involved set targets to increase the gender dimension in research and innovation content?" is shown in Figure 3. Africa stands out with 75% "Yes". Closely followed by Asia, with more than 50% answering with "Yes". Whereas in Latin America, 56% of interviewees answered "No".

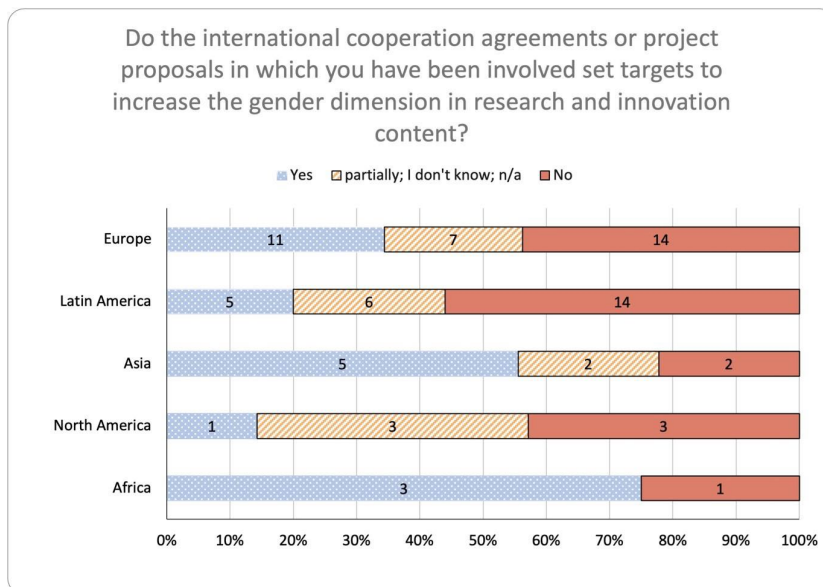


Figure 3: Continental Distribution to Question 2

The question 3 "During the implementation of the international cooperation agreements/actions in which you have been involved, do you use and/or produce sex-disaggregated data whenever possible?" is illustrated in Figure 4. Europe performs outstandingly, with 69% of Interviewees answering "Yes". Latin America has a broad range of "partially; I don't know; n/a". Africa (75%) and Asia (50%) have the most significant percentage of Interviewees answering "No". While Asia and Africa responded positively about setting the targets (Figure 3),

respondents from both regions affirmed that they do not use or produce sex-disaggregated data (Figure 4) – and Europe shows the inverse result.

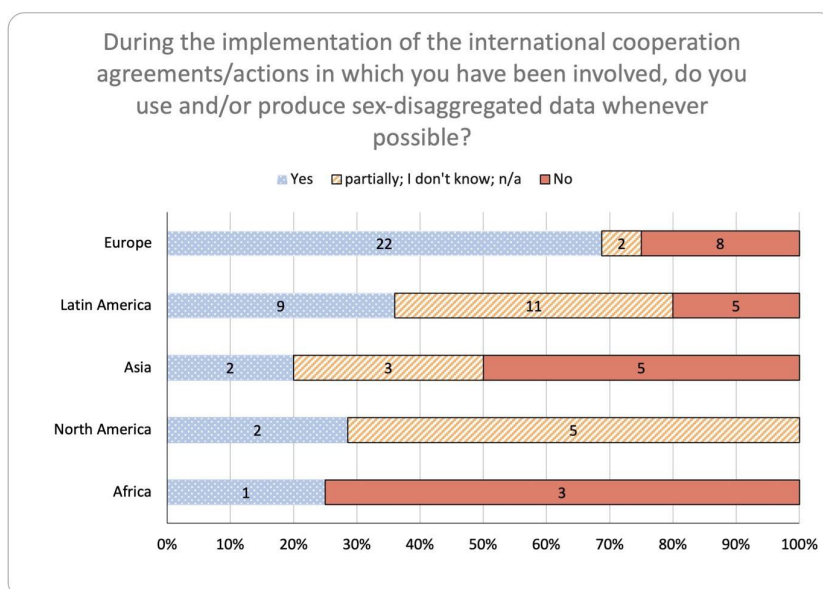


Figure 4: Continental Distribution to Question 3

Question 4 "Does your team/organization implement measures to prevent gender-biased research outcomes?" is illustrated in Figure 5. North America is outstanding, with 86% of interviewees answering "Yes", while in Europe, only 43% implement measures to prevent gender-biased research outcomes. The other regions perform around the 50% mark answering "No".

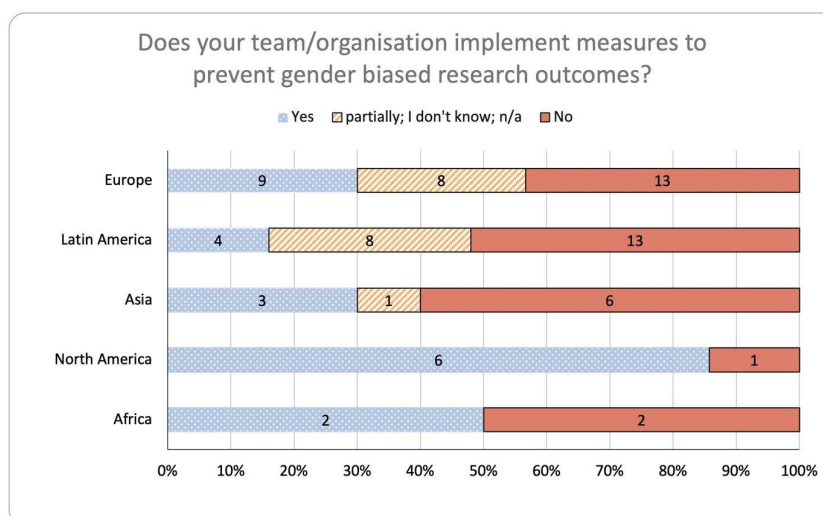


Figure 5: Continental Distribution to the Respective Question 4

These quantitative results apparently point to the fact that even though all the regions are aware of the need of gender mainstreaming, concrete measures are still not the actual picture of STI and that different barriers still limit the inclusion of gender equality measures in international cooperation actions. The qualitative answers below enlighten those results.

In *European* countries, different levels of awareness of gender mainstreaming still prevail, impacting the effective relevance of gender measures. Sometimes, these issues are not considered a priority or a matter of concern. Interviewees pointed to the belief that change must occur naturally and not be induced artificially as the main barrier. This would appear to echo a perception that the problem is in society and, therefore, it cannot be tackled inside institutions, In other words, it appears to indicate that institutions are merely reflections of society and not places of innovative action for developing society.

In STEM especially, it was suggested that "there cannot be equality because there are not enough women in this field". There are cultural barriers in science in which men dominate some fields such as information and communication technologies and do so under the broad view that "it's not a woman thing". Thus, the existence of gender bias in the research ecosystem negatively impacts not only women in some fields but also in leadership roles – either in national or international contexts. Further, they stressed that there are male-oriented industries (e.g., automotive) where men are seen as the standard. At the same time, women are included as experts, consultants, and even senior scientists but not in managerial roles. There are still areas dominated by gendered stereotypes, hampering the diversity responsible for science that aims the social development.

It was highlighted that international cooperation agreements are mostly gender-blind. Gender issues are not formally addressed, and equality in research teams mainly stems from the inner dynamics of the groups. So, there are no formal parity rules, while in general, parity tends to exist in an organic form. These answers show the lack and the need for gender mainstreaming in these institutions.

In *Latin America*, it was stressed by the interviewees that the structures are still patriarchal and that, historically, their countries are still very male-oriented. And even extending beyond this, many prejudices exist against having different or diverse work teams. Respondents stressed the formal educational system and an academic hierarchy favoring male employees to take high positions at the international level. As these specific functions (decision-making) demand full-time dedication, female employees are inhibited from applying due to their social and professional stereotype that women have responsibilities at home – which is not the case for men. Stereotypes appear as a vector for glass ceiling procedures, as indicated in many studies (Bian et al., 2017; Bukstein & Gandelman, 2019; Lavy & Sand, 2015).

It was also pointed out that there is still no formal and natural inclusion of gender aspects into concrete actions for in international cooperation activities. Some answers indicated that the international arena is a more complicated due to cultural differences between countries. Progress on gender has been made in terms of discourse, but there are weaknesses remain in translating this it into implementation actions in the agreements. Respondents stressed that today it is a question of complying with specific regulations.

On the one hand, it is only bureaucratic. Still, on the other hand, it raises the importance of regulations in advancing some issues often avoided by the same bureaucracies. It is common practice to include specific clauses in international agreements but instead in project proposals. This underlines the "fear of change" and the administrative issues on the agreements as main barriers, which include expressions such as "We've always done it this way; so why should we change things". There is also a lack of trained people who are qualified to make and negotiate international agreements. It was emphasized that there is no dedicated unit for gender equity that could revise the agreements appropriately and give advice in many institutions. This is an indication of the difficulty faced for the implementation of actions toward gender mainstreaming, as stressed by (Hafner-Burton & Pollack, 2002).

It was also underlined that decision-makers still do not have enough training to visualize the gaps and do not consider the impact that a research outcome can have when it uses gender glasses.

Asian countries agree that there is a gap in STEM education and that women are not welcome in some institutions because of their activities and responsibilities. As main barriers, they focused on socio-cultural norms; patriarchal underestimation of what women can and cannot do; masculine, macho focus among men and women leaders; lack of gender sensitivity. Those answers point to a leaky pipeline and lack of flow and push. These countries remark that institutional mechanisms to check on such cultural impediments and to ensure equal representation are not in place and that not all the world is socialized with gender aspects (e.g., Arab nations).

In *North America*, it was highlighted that there needs to be awareness of the underrepresentation of women in certain fields. Thus no specific measures are suggested to remedy the situation, and there are not enough women in decision-making positions who can make a difference.

By contrast, in *South Africa*, it was pointed out that there are no institutional barriers but that there are perceived barriers. One of the respondents answered that the problem "is in people's minds, men and women, and if an institution is chasing numbers, it sometimes makes the mistake of naming incompetent women instead of men". It seems to point to the underestimation of glass ceilings hampering women in STI, or that gendered institutions are working under the male normativity, unaware of gender inequalities expressed in the mismatch of social and work environments. The lack of mainstreaming is also perceived in the answers.

5. Conclusion

The results offer an exploratory analysis with a great range of coverage and can help understand the composition of the glass ceiling that tackles gender inequality in STI. Based on the analysis of the results on the barriers and the main measures identified in different regions, this conclusion also reflects on possible solutions that could contribute to the implementation of gender mainstreaming in international dialogues in STI.

As it was stressed that international cooperation agreements are built upon scientific areas of common interest and are mostly gender-blind. A mapping study of 528 STI agreements from 50 countries, conducted by the Gender STI project and aiming to explore how gender equality is addressed in the agreements, showed that gender content was found in 15 percent of the identified agreements. The modification of agreements is not something that can be done easily. However, when a revision is required, this can be done by the inclusion of new clauses. Negotiating and including clear gender clauses in international agreements appears to be a necessary measure, and so also does a linkage to national laws that promotes gender mainstreaming in all agreements.

Furthermore to this, it is necessary to explicitly expose the principle of diversity in agreements. That means, for example, prioritizing the intersectional variables, like class, caste, religion, region, race, ethnicity, age, etc., and suggesting specific measures to eliminate the gender gap in sex ratio, nutrition, health, literacy and education, economic participation, participation in decision-making areas including politics, entrepreneurship, leadership, etc. These clauses will broaden an agreement and help rethink the objective and outcome of the research. Gender equality in the agreements should be part of the scientific integrity principles in international collaboration and a key condition for full use of the existing potential in leadership, scientific knowledge, and creative innovation. Clauses addressing the gender dimension in R&I content should be included, as well as that gender-based violence in international actions shall be monitored. Having a gender committee to look at the agreement that can advise and work more with the policymakers is an important element, as well as workshops on gender mainstreaming in decision-making positions.

Nevertheless, we must consider that the agreement alone does not create awareness. The topic is on the discussion table for implementing the actions in a general way. The results show the importance of gathering macro-level and micro-level data available on a sex-disaggregated level and trying to influence the concerned departments in the organizations that are concerned to work on maintaining this data. At the production of micro-level data, the following shall be considered: orientation of research staff on avoiding gender biases starting directly from framing tools; data collection for use in writing the report and outcomes; initiatives on women's entrepreneurship promotion; the number of women leaders, champions, panelists, authors and participants that international cooperation projects have attracted. In addition, work with artificial intelligence providers to ensure gender (and other) biases are scrubbed from surveys, recruitments, and promotions needs to be considered.

The gender dimension in R&I content remains an issue in the quantitative results. Therefore, gender awareness needs to be the focus of most research projects. There should be a reference to gender mainstreaming, with a clear guideline on how we will do it and also having the gender perspective already included in their work methodology. In addition, incorporating gender equality goals from the beginning of the formulation of actions, as well as developing courses to implement the gender perspective in projects and formulate qualitative gender indicators, are viewed as relevant steps to be considered.

Moreover, assessing gender diversity to establish new policies (regional, national, and international) that promote and condition women's participation, establishing a policy of awareness-raising activities, and incorporating more women in the definition of policies seem to be key measures. Actions aimed at inducing a broad institutional change to attract, retain and promote women and girls working in STI, especially by awakening and flourishing STEM vocations in women, will empower them to develop long-life careers in STI. Furthermore, providing them with broad supportive state laws and regulations to ensure that they will have opportunities equal to those of their male counterparts.

Finally, it is important to draw attention to the fact that for many countries, an important reference point has been the work carried out in the framework of international actions. This is where they have begun to work on gender mainstreaming in their actions, programs, and projects. In this sense, gender mainstreaming has been a lesson learned along the way. Following on from this, many countries have observed and followed the gender equality measures proposed by foreign partners in their joint project proposals. Gender issues are not yet at the core of scientific international cooperation agreements, but the importance of the subject at the national level

and, as we have seen in Horizon Europe, at the European level, will certainly translate into multiple opportunities.

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