D 6.3 Comparative analysis and recommendations on gender in international cooperation in STI

Deliverable Information	
Project acronym	GENDERACTION
Project name	GENDer equality in the ERA Community To Innovate policy implementatiON
Grant Agreement no.	741466
Project type	Coordination and Support Action
Start date of the project	01 / 04 / 2017
End date of the project	31 / 03 / 2021
Contributing WP	WP 6 Gender in international cooperation in STI
WP lead partner	7 UL – Tonie van Dam
Other partners involved	1 ISAS – Tereza Stöckelová, Averil Huck, Marcela Linková, Martina Hartl, members of the Advisory Board on gender in international cooperation in STI
Deliverable identifier	D6.3
Contractual delivery date	31 / 03 / 2020
Actual delivery date	31 / 03 / 2020
Deliverable type	REPORT
Dissemination level	PU
	This project is funded by the European Union's Horizon 2020 research and innovation programme under grant agreement No 741466.
Disclaimer: The views and opinions expressed in this document are solely those of the project, not those of the European Commission. The European Commission is not responsible for any use that may be made of the information it contains.	

Executive Summary

This report is prepared within the framework of Work Package (WP) 6 of the Horizon 2020 project GENDERACTION. It aims to identify major concerns with existing gender and related intersectional inequalities and supporting equal opportunities in knowledge and innovation processes in international STI cooperation between the EU and third countries[1]. It also seeks to provide as practical as possible guidance to policymakers and other relevant actors to avoid continuing or reinforcing inequalities.

The report responds to concerns formulated in the 2015 'Conclusions of the Council of the European Union on Advancing Gender Equality in European Research Area' that invited '*the Commission and Member States to consider including, among others, a gender perspective in dialogues with third countries in the area of science, technology and innovation (STI) (…) SFIC and the Helsinki Group to consider developing joint guidelines on a gender perspective for international cooperation in STI'*.

This report draws upon several sources of data and information. First, it builds on three online surveys of relevant actors that were designed and implemented by the research team in 2019: 1) a survey among women in STI organisations in third countries; 2) a survey among national research authorities in the EU and Associated Countries to Horizon 2020[2]; and 3) a survey among Research Funding Organisations (RFOs) in the EU and Associated Countries. In addition, it builds upon: the 2017 SFIC-SWG GRI survey; a review of the academic literature on STI gender equality issues in third countries and on international STI cooperation; a close reading and analysis of relevant EU policy documents; a mutual learning workshop with representatives of organisations from third countries concerned with women in science and gender equality issues in STI that took place in November 2019; and a mutual learning workshop with representatives of the Danube and Balkan regions that took place in March 2020.

It is well recognised that significant global inequalities exist not only in economic and political dimensions but also in the epistemic one, which concerns opportunities to produce and use knowledge and to have one's knowledge socially recognised as authoritative. These inequalities, often gendered, have been repeatedly shown to be a result of long-term historical, colonial, and postcolonial developments. International cooperation in STI does not remedy these historical inequalities automatically. On the contrary, it may in fact reinforce them. If researchers from non-Western countries and women in particular are engaged in research teams on unequal terms, international cooperation can turn into a dubious enterprise. Such outcomes are not only unfair and

[1] "*A country that is not a member of the European Union as well as a country or territory whose citizens do not enjoy the European Union right to free movement, as defined in Art. 2(5) of the Regulation (EU) 2016/399 (Schengen Borders Code)*" (Source: https://ec.europa.eu/home-affairs/what-we-do/networks/european_migration_network/glossary_search/third-country_en)
For the list of third countries as defined by the European Commission, see: https://ec.europa.eu/research/participants/data/ref/h2020/other/wp/2016-2017/annexes/h2020-wp1617-annex-a-countries-rules_en.pdf
A 'third country' is a broad name to refer to a specific relationship between the EU and those countries, that is, countries that are not members of the EU and whose citizens do not enjoy the European Union right to freedom of movement (Schengen). We would like to highlight that this term does not reflect the heterogeneity of these countries. By using this expression, it does not mean that they share the same characteristics. They do not have the same socio-economic status, political and cultural contexts and the development of sciences and education or gender equality is also not the same in all countries or within a region. However, from the results of the investigation we carried out through questionnaires, literature reviews, and workshops, only slight differences appear, while most problems and challenges related to gender equality issues in STI are shared among all regions. That is why, in this report, we are using this term with very little regional analysis. It also puts into light that our work is introductory, and that it needs to be developed with more accuracy in the different regions, especially by reaching the countries that could not be reached.

[2] For the list of Associate Countries as defined by the European Commission, see: https://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/3cpart/h2020-hi-list-ac_en.pdf

unjust in political terms, they may also be poor and inferior in epistemic terms, as they miss the opportunity to amend existing concepts and theories.

As well as reinforcing global inequalities, international cooperation in STI has also the power either to strengthen or, conversely, tack or address power and epistemic inequalities that exist in collaborating countries and institutions. It is necessary to make sure that European collaborations with third countries do not unreflexively plug into existing power and knowledge infrastructures, including ones relating to gender, whereby they collaterally reproduce them, and that instead there is an effort to develop new (kinds of) partnerships.

To date the policies of the EU, EU Member States, and Associated Countries on international STI barely reflect the existing academic literature on gender and epistemic inequalities. The survey among national authorities and research funding organisations in the EU Member States and Associated Countries carried out in 2019 and the comparison of the survey data with findings from the 2017 SFIC-SWG GRI survey, suggest the following conclusions:

- The degree of change in the efforts made to include gender aspects in international agreements was minimal between the 2017 and 2019 survey. The number of national authorities that make these efforts continues to be low after two years (6 in 31 in 2017 and 1 in 17 in 2019). The authorities also lack any motivation to do so in the future and they claim to be less interested in receiving support than they were in 2017. The number of national authorities monitoring gender aspects is still low (3) and only half of the 2019 respondents (5 out of 10) who do not monitor would be willing to take up monitoring in the future.
- A comparison of the 2017 and 2019 results shows that the ratio of responding RFOs monitoring gender aspects has slightly dropped (57% in 2017 and 40% in 2019 were monitoring) and that the number of RFOs willing to take up monitoring in the future has dropped (more than 70% in 2017, but only 30% in 2019). However, out of the four RFOs that took up monitoring in 2019, three were not monitoring gender issues in 2017, but had begun to do so in 2019 (Estonia, Poland, and Sweden). Efforts are being made by a majority of RFOs to formulate announcements, programmes, and calls in such a way that they do not discriminate against women or people with caring responsibilities. Less or no effort is made to declare gender equality as a criterion for research teams or for gender in research content. With regard to proposal evaluation and funding decisions, most efforts are focused on gender balance among evaluators, on evaluation panels and decision-making committees, and on gender equality as a horizontal evaluation criterion (still, only half of the respondents declare making these efforts). Very few countries (Estonia and Switzerland) address gender equality issues in financial rules and eligible costs.

In view of these findings, the main positive messages are: Gender equality in international STI cooperation received more attention in 2019 than in 2017 with its inclusion as a value and with the definition of several objectives to promote women in STI. A significant though still limited number of national authorities are willing to take action in the future with adequate support. Efforts are being made by a majority of RFOs to formulate their programmes and calls in such a way that they do not discriminate, directly or indirectly, against women or researchers with caring responsibilities.

Difficulties exist in relation to implementing the inclusion of gender aspects in bi- or multi-lateral agreements in STI cooperation. The main reason given is that this is addressed on the operational level of programmes and calls. The lack of examples, guidelines, and support for human resources and financial resources continues to make it difficult for national authorities to include a gender perspective in other types of STI cooperation (e.g. joint research calls, joint calls for proposals). Most national authorities and RFOs do not monitor or evaluate gender aspects in their international STI cooperation and few are willing to take up monitoring in the future (6 out of 17 claimed to be willing).

The survey among organisations from third countries focused on women and gender in STI affords a first glance at regions' challenges and insights on gender issues in international cooperation in STI.

The main messages could be summarised as follows:

- There are many obstacles to women's participation in international cooperation in STI that are shared among all the regions. These include stereotypes and toxic behaviours in schools and higher education, work–life balance, economic and material issues, and systemic gender discrimination.
- There is not much knowledge about whether actions are being taken in international cooperation. Indeed, 20.5% of the respondents believe gender issues are addressed in international cooperation in STI between the EU and their country but 43.2% of respondents are not aware whether gender is addressed in their countries' international cooperation in STI.
- When there are actions, either they are not suited to women's situations, there are not enough of them, or they tend to benefit privileged groups of women.

The participants made several propositions on how to improve the current situation:

- There is a need for more awareness raising and education among political representatives, industry, youth and society in general.
- Adequate funding and material support could ensure gender issues are considered at all levels (research content, research teams, projects, etc.)
- A grassroots and intersectional perspective is necessary to prevent the reproduction of discriminations in international STI cooperation.

Recommendations

Based on the analysis of the three surveys, outputs from the two workshops for third countries and literature reviews, recommendations related to six policy concerns are suggested to European stakeholders in international STI cooperation when concluding a framework agreement, launching a call for research collaboration or supporting a research project.

1) To avoid reproducing gendered inequalities and disadvantages common in third-country research systems:

- Make a special effort to reach women researchers for collaboration (see **Annex 3: List of relevant organisations** in different third countries and regions that can be approached).
- Consider anonymisation into hiring processes and funding applications.
- Include a provision in the framework agreement or contract that participating researchers in comparable positions be employed on the same salary terms regardless of their gender.
- If possible, international physical mobility should not be mandatory and funding should be provided for alternative modes of mobility, i.e. virtual mobility, as part of the programme and project budgets. This will benefit people with caregiving commitments whose flexibility and mobility may be limited. It also contributes to issues of safety, as international mobility may be putting women at particular risk of gender-based violence. In addition, it contributes to the environmental sustainability of academic practices (see section 4.6).

In the case of international mobility to the EU:

- Provide opportunities for and support good work–life balance arrangements for researchers, including the support for standard forms of childcare, if relevant.
- Do not apply strict age limits to mobility schemes, as researchers caring for children may only become more mobile in the later stages of their career trajectory.

- Provide effective assistance to researchers and their family with visa and immigration procedures once a researcher has been accepted for a position, including researchers' same-sex partners, who may not be officially recognised in the researcher's home country.
- Implement effective mechanisms to report and deal with sexual harassment and gender-based violence in foreign countries.

2) To articulate gender and the possible gendered impacts of research in content:

- Require an obligatory consideration of gender in research and innovation content in submitted research proposals.
- Provide funding to explore and monitor the unintended gendered aspects and consequences of research projects, as they may emerge in later stages of research.

3) To provide space for a proper negotiation of research objects and interests that would equally benefit all parties involved:

- Encourage and support project activities aimed at negotiating shared research objects across all parties involved (including different disciplines, academic and non-academic collaborators, and researchers with different cultural backgrounds). While these activities would probably be most relevant at the beginning of a project, they should also be iterated throughout to reflect its course. The encouragement and support should best be worded in the call for funding and in budgeting conditions, as well as in the proposal evaluation criteria.
- Do not evaluate the success of a project strictly based on established quantitative indicators. Facilitate and recognise publications in different languages for various relevant audiences as well as the possible impact on local communities.

4) To prevent the reproduction of subordinate integration of third countries' research teams in consortia and the reinforcement of unjustified global epistemic inequalities:

- In the wording of research calls, encourage appropriate forms of engagement of all research participants involved, taking into account their expertise and experience, to mobilise the full potential of the whole consortium for analytical and conceptual work.
- Make requirements for a clear statement on the appropriate and legitimate sharing of Intellectual Property Rights within the consortium defining a specific mechanism that could be used in the case of conflicts and disagreements. The guiding principles should include equitable access to data and fair authorship allocation within international research teams and consortia.

5) To strengthen the role of local communities and grassroots civil society organisations:

- Where appropriate, encourage the inclusion of actors from local communities and civil society organisations. This should constitute one of the criteria in the evaluation in relevant funding schemes.
- Where appropriate, reserve a designated share of the programme or project budget for actors from local communities and civil society organisations, including women's organisations.

6) To prevent the negative environmental and social impacts of academic mobility:

- Encourage researchers to always thoughtfully consider the purpose of travel, to weigh the benefits against the impacts on the environment and work–life balance, and to consider remote modes of participation and collaboration.
- Provide funding for the development and use of high-quality remote/virtual modes of communication, including, if possible, infrastructural and technical investments.

- In the case of physical mobility, support travel options that are not only economical but also generate fewer negative climate, environmental, and work–life balance impacts, such as direct flights.

History of Changes

Revision history			
Version	Date	Created/Modified by:	Comments
0.0	29. 12. 2019	Tereza Stöckelová	Draft report
0.1	30. 09. 2019	Averil Huck	Literature review (input for Annex 2)
0.2	31. 10. 2019	Averil Huck	Overview of relevant organisations (input for Annex 3)
0.3	30. 12. 2019	Martina Hartl	Gender in EU policy on international cooperation in STI (section 3.1)
0.4	15. 01. 2020	Marcela Linková	Comment on draft texts
0.5	07. 02. 2020	Averil Huck, Tereza Stöckelová	Revised version of the report, including results of surveys analysis
0.6	08. 02. 2020	Tereza Stöckelová	Executive summary
0.7	11. 02. 2020	Marcela Linková	Comment on draft texts
0.8	12. 02. 2020	Averil Huck, Tereza Stöckelová	Revised draft deliverable report, ready for submission to the consortium, for comment
0.9	09. 03. 2020	Averil Huck, Tereza Stöckelová	Revised draft deliverable, submitted to external reviews and the Advisory Board for review
1.0	31. 03. 2020	Averil Huck, Tereza Stöckelová, Marcela Linková	Finalisation of the report for submission after review by Advisory Board members Gloria Bonder, Elizabeth Pollitzer, and Gülsün Sağlamer
2.0	03. 01. 2022	Marcela Linková, Averil Huck	Revision of the report in line with the rejection letter (p. 11)

How to cite this report:

Stöckelová, Tereza, Averil Huck, Marcela Linková and Martina Hartl. 2020. Comparative analysis and recommendations on gender in international cooperation in STI, GENDERACTION deliverable 6.3.

Table of Contents

Executive Summary 2
History of Changes 7
Table of Contents 8
List of Abbreviations 9
Acknowledgements 9
1. Background 10
1.1 Policy background 10
1.2 Data and resources for this report 11
2. Addressing Inequalities in International Research and Development 13
3. The Current State of Policy 15
3.1 Gender aspects in European international STI cooperation policy documents 15
3.2 Gender aspects in EU Member States and Associated Countries international STI cooperation policies 17
3.3 Gender aspects in international cooperation in STI in third countries 31
4. Towards Fair and Progressive International STI Cooperation: Key Issues and Recommendations 33
4.1. Create equal opportunities for women to participate 34
4.2. Articulate gender in research and innovation content 35
4.3. Negotiate research objects 37
4.4. International division of teamwork and intellectual property rights 38
4.5. Engage local communities and grassroots organisations 39
4.6. Reduce negative impacts and hidden disadvantages implicated in academic mobility 39
5. References 41
Annex 1: Checklist 44
Annex 2: Literature review for different regions 46
Annex 3: List of relevant organisations 63

List of Abbreviations

RFO	Research Funding Organisations
R&D&I	Research, Development and Innovation
RRI	Responsible Research and Innovation
SFIC	Strategic Forum on International Cooperation in STI
STI	Science, Technology and Innovation
SWG GRI	Standing Working Group on Gender in Research and Innovation
WP	Work Package

Acknowledgements

We wish to express our thanks for the generous participation of our partners in third countries, and especially the participants in the Mutual Learning Workshops organised in November 2019 and in March 2020. Their insights and examples have been crucial for the formulation of the concerns and recommendations put forward here. We also wish to thank representatives of national authorities and research funding organisations for taking the time to complete the survey and allow at least a cursory view of the changes in the European landscape concerning gender equality issues in international cooperation in STI.

We also thank Gloria Bonder, Elizabeth Pollitzer, and Gülsün Sağlamer, members of the project's Advisory Board on Gender in International Cooperation in STI, for their external review of the deliverable report.

1. Background

This report is prepared within the framework of Work Package (WP) 6 of the Horizon 2020 project GENDERACTION. It is a policy-oriented project that brings together representatives appointed by national authorities in the Member States and Associated Countries in order to advance the implementation of gender equality and gender mainstreaming in European Research Area.

The objectives of WP 6 are:

- To give support to the Standing Working Group on Gender in Research and Innovation (SWG GRI), the Strategic Forum for International Cooperation in Science, Technology and Innovation (SFIC), and the contribution of (associate) partners to European science diplomacy by fostering the integration of gender equality and gender mainstreaming in international cooperation in STI;
- To review the current practices in the participating countries and assess the progress made in the course of the project and disseminate recommendations on gender equality and gender mainstreaming in international cooperation in STI;
- Establish contact and networking with relevant supranational and international bodies and stakeholders.

This report aims to identify major concerns with existing inequalities and to support equal opportunities in knowledge and innovation processes in international STI cooperation between the EU and third countries. It also intends to provide as practical as possible guidance to policymakers and other relevant actors to avoid continuing or reinforcing inequalities.

1.1 Policy background

In 2015, the Competitiveness Council adopted the 'Council Conclusions on Advancing Gender Equality in the European Research Area'.[3] In these conclusions, the Council of the European Union:

> *12. INVITES the Commission and Member States to consider including, among others, a gender perspective in dialogues with third countries in the area of science, technology and innovation (STI). INVITES SFIC and the Helsinki Group to consider developing joint guidelines on a gender perspective for international cooperation in STI.*

To this end, the then Helsinki Group on Gender in Research and Innovation (HG) and subsequently the SWG GRI and the SFIC decided to examine bilateral and multilateral international agreements as well as how international issues are addressed in research funding programmes. Two groups were identified as target groups: 1) governmental representatives in the field of research and innovation and 2) representatives from research-funding or programme-management organisations. The two ERA-related groups set up an ad hoc group in 2016 to carry out a survey among Member States and Associated Countries of the EU. The survey was carried out in 2017, and in January 2019 the Opinion of the two groups was published.[4] The Opinion notes that the uptake of gender issues in international cooperation is rather low and recommends Member States and Associated Countries to consider taking additional measures with a view to better integrating gender issues in international cooperation STI. It also encourages existing networks, expert groups, and projects to raise awareness of the issue and improve uptake at all levels.

In response to these recommendations, the GENDERACTION consortium included a Work Package 6 'Gender in International Cooperation' in the project proposal, with a view to raising awareness about the issue and distributing the findings and recommendations of the two groups, and to assess the

[3] http://data.consilium.europa.eu/doc/document/ST-14846-2015-INIT/en/pdf
[4] https://www.evropskyvyzkum.cz/cs/storage/857cdb8216ef585439b4deea5a5b5f8dc7717891?uid=857cdb8216ef585439b4deea5a5b5f8dc7717891

uptake of measures and build networks with third countries in order to improve the uptake of gender issues.

This Deliverable Report 6.3 Comparative Analysis and Recommendations on Gender in International Cooperation in STI provides a comparative analysis of gender and science structures globally at the national and regional levels by identifying the gaps, barriers, strengths, and opportunities in order to propose strategic actions to strengthen gender mainstreaming in STI systems. In line with the task description, the assessment is based on quantitative and qualitative methods and addresses the change in the uptake of gender issues in international cooperation in STI from the initial assessment carried out in 2017 by SWG GRI and SFIC and a second round of assessment carried out in 2019 by GENDERACTION. The report concludes with recommendations for further improvements that address both 1) the gender balance in research teams and decision-making and 2) the gender dimension in research content. A position brief has been developed together with this deliverable report that is addressed to EU and third-country policy makers and Research Funding Organisations as well as the Commission.

1.2 Data and resources for this report

This report draws upon several sources of data and information. First, it builds on three online surveys of relevant actors which were designed and implemented by the research team in 2019:

- **Survey among women in STI organisations in third countries**

The internet survey was launched on 12 June 2019. The data set generated by 30 July consisted of answers from 116 respondent organisations. These organisations were identified through extensive internet search for organisations involved in supporting women researchers and academics and/or supporting girls in STEM outside the EU. However, only 65 (56%) of the respondent organisations submitted response sets which were relevant and usable. Of these, 12 organisations were from the region of Sub-Saharan Africa (one of which is based in the USA). There are 14 organisations from the region of Asia and the Pacific (but one is based in Austria), 12 organisations from the region of Central and South America and the Caribbean, and 5 organisations are from the Middle East and North Africa, 1 from Armenia, 2 from Egypt, 2 from Jordan, and 1 from Russia. The reasons for the limited fullness of the answers received, rests in several reasons: 1. Many were empty answers which suggests that a person opened the questionnaire but in the end did not complete the answers; this may suggest that the focus of the questionnaire was not relevant to the given organisation. 2. Some organisations that answered were located in the EU or North America, were governmental organisations or organisations that had nothing to do with STI; these were kept in a separate file for additional insight but not included in the analysis of the organisations from third countries. 3. In some instances (26.6% of the total answers) did not contain country information, which limited the regional analysis. 4. There was a gap between the concerns of the given task, focused on international cooperation in STI from the policy perspective, including policy design, implementation and coordination, and the concern and missions of the responding organisations. It has been noted that the responding organisations did not have experience or were not involved at this level and hence did not have information about international agreements in their respective countries and whether they address gender issues.

- **Survey among EU and Associated Countries' national research authorities**

The internet survey was launched on 11 September 2019. By 21 January 2020 we had received answers from eighteen countries: Austria, Belgium, Bosnia and Herzegovina, the Czech Republic, Estonia, Finland, Germany, Greece, Israel, Lithuania, Luxembourg, Malta, Norway, Poland, Portugal, the Slovak Republic, Spain, and Switzerland. The answers are from representatives of institutions

such as ministries of science and technology, ministries of education and higher education, national agencies for innovation and science, Councils of science, *etc*.

- **Survey among EU and Associated Countries' research funding organisations (RFOs)**

The internet survey was launched on 11 September 2019. By 21 January 2020 we had received answers from ten countries: Belgium, Cyprus, Estonia, Greece, Ireland, the Netherlands, Poland, Portugal, Sweden, and Switzerland. These answers are from representatives of research funding organisations such as agencies, foundations, national centres for STI, research councils, *etc*.

In addition, the report builds upon:

- the 2017 SFIC-SWG GRI survey;
- a review of the academic literature on gender issues in third countries and on international STI cooperation;
- a close reading and analysis of relevant EU policy documents;
- a mutual learning workshop with representatives of organisations from third countries concerned with women in science and gender issues that took place in November 2019 in La Valletta, Malta.

It should be noted that, despite the extensive efforts invested in obtaining appropriate contacts for the online surveys, we could not systematically identify and reach all relevant organisations. Moreover, the response rate was not always high and/or the information acquired from respondents was limited. The results presented in this report thus offer more of an indication of the scale of the problem than an exhaustive mapping of current global conditions and developments.

2. Addressing Inequalities in International Research and Development

In today's complex and globalised world, our problems and concerns and the solutions that research strives to offer are translocal and transdisciplinary. Be it climate change, migration, or the spread of veterinary diseases, such as African swine flu, all these issues require global but locally situated and contextualised inquiry, knowledge, and innovation. In this context, international and trans-sectoral STI cooperation is needed more than ever. If implemented well, it has the potential to contribute to social development and produce benefits in all collaborating regions. However, for this to happen, international cooperation has to be well designed and set up. If designed and implemented poorly, not only can it can ultimately be ineffective but it may also sustain many existing problems and inequalities – both global ones and those that exist in the participating countries and organisations.

It is well-recognised that significant global inequalities exist not only in economic and political dimensions but also in the epistemic one, which relates to the opportunities to produce and use knowledge and to have one's knowledge socially recognised as authoritative (see e.g. Blagojevic 2014; Czerniewicz 2013; Stöckelová and Vostal 2017). This concern was strongly expressed by participants of the survey addressed to women in science organisations in third countries. These inequalities have repeatedly been shown to result from long-term historical – colonial and postcolonial – developments. In such settings, the knowledge produced outside of Europe and North America (or the West) has been deemed inferior, while the Western-based canon has sedimented and has been strongly shaping the majority of the current scientific disciplines (Cota, 2019; Hatem, 2013; Mama, 2006; Mukherjee, 2011).

International STI cooperation does not remedy these historical inequalities automatically. On the contrary, it can even reinforce them. If researchers from non-Western countries are engaged in a research team on unequal terms – for example, if they are only in the position of supplying data, which are then to be interpreted by ready-made theories established in the Western canon, or if they have no say in the research agenda-setting or have no or a limited share in the intellectual property rights – international cooperation can turn into a dubious enterprise (see e.g. Pobłocki 2009; Stöckelová 2012, 2016). It is important to note that outcomes from such cooperation are not only unfair and unjust in political terms, they may also be poor and inferior in epistemic terms, as they miss the opportunity to amend existing concepts and theories. Given the current Anthropocene deadlock, which Western Cartesian-based science massively contributed to, it is crucial to recognise that radically different modes of *doing* science are needed to address the complex pressing issues which humanity is currently facing. Other *ways of knowing* have to be (re)invented. In this respect, there is significant potential in recognising and crediting non-Western knowledge and ways of knowing.

As well as reinforcing global inequalities, international cooperation in STI has also the power either to strengthen or, conversely, tack or address power and epistemic inequalities that exist in collaborating countries and institutions. It is necessary to make sure that European collaborations with third countries do not unreflexively plug into existing power and knowledge infrastructures, including ones relating to gender, whereby they collaterally reproduce them, and that instead there is an effort to develop new, 'unexpected', and promising partnerships. This may require additional, careful, and dedicated work. It is a well-established observation from European contexts that various biases and disadvantages in science do not easily go away and they require targeted, long-term, and systemic actions.

This report focuses on the (geo)political aspects and context of international STI cooperation. Notably, it identifies key areas of concern that need to be carefully considered and practically addressed in international STI cooperation, if we want to avoid reinforcing unjustified global inequalities between countries and regions as well as inequalities within countries and institutions, which are often

gendered in different ways. Importantly, these inequalities are not only unjust to unprivileged social groups and individuals but often harm research productivity and may result in limited knowledge forms and contents and effectively prevent us from enhancing shared public goods.

To date the EU and EU Member States' policy documents on international STI barely reflect the existing academic literature on gender and epistemic inequalities. This is evident from the results of the benchmarking exercise and from the survey among relevant EU member states' policy bodies carried out by SFIC and SWG GRI in 2017 and later repeated, in a slightly amended form, in 2019 by the GENDERACTION project.

Concerns about global inequalities vary between different countries and regions. They are most salient in those cases where the economic and epistemic inequalities between the cooperating countries are high and long-term, such as in the case of the EU and most African countries. This is why the present report is mainly concerned with such highly unequal relations. The issue of addressing internal inequalities within the collaborating country through international STI is even more sensitive as it may be perceived as an attempt to interfere with domestic affairs in the cooperating country. In this context, it is important to stress that the provisions in cooperation agreements and particular projects should *open up new opportunities* rather than imposing definite configurations or solutions. Moreover, we need to emphasise that only recently did the significant gender and other epistemic inequalities in EU countries start to be addressed through various gender support actions and public engagement. Therefore, international cooperation can be considered a *mutual learning* opportunity rather than a one-way transfer of (good) practice.

3. The Current State of Policy

3.1 Gender aspects in European international STI cooperation policy documents

International cooperation is an important element of the EU research and innovation policy and related communication. A strategic document titled *Enhancing and Focusing EU International Cooperation in Research and Innovation: a Strategic Approach* (European Commission 2012a) was been published in September 2012 and is accompanied by a Commission staff working document (European Commission 2012b). The communication identified the following objectives for international cooperation:

(a) Strengthening the Union's excellence and attractiveness in research and innovation as well as its economic and industrial competitiveness – by creating win-win situations and cooperating on the basis of mutual benefit; by accessing external sources of knowledge; by attracting talent and investment to the Union; by facilitating access to new and emerging markets; and by agreeing on common practices for conducting research and exploiting the results;

(b) Tackling global societal challenges – by developing and deploying effective solutions more rapidly and by optimising the use of research infrastructures;

(c) Supporting the Union's external policies – by coordinating closely with enlargement, neighbourhood, trade, Common Foreign and Security Policy (CFSP), humanitarian aid and development policies and making research and innovation an integral part of a comprehensive package of external action.

"Science diplomacy" will use international cooperation in research and innovation as an instrument of soft power and a mechanism for improving relations with key countries and regions. Good international relations may, in turn, facilitate effective cooperation in research and innovation' (European Commission 2012a: 4).

As regards the specific mention of gender as an aspect for international cooperation, the only reference in this document can be found in the chapter on 'Promoting common principles for the conduct of international cooperation':

> '*Guided by its principles for external action (Art 21 TEU), the Union is well placed to play a leading role in promoting common principles for the conduct of international research and innovation activities in order to create a level playing field in which researchers and innovators from across the globe feel confident to engage with each other. These principles will deal with issues such as responsible research and innovation, research integrity; peer review of proposals;* ***promotion of the role of women in science and the gender dimension in research****, research and innovation; research careers (building on the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers); fair and equitable treatment of IPR; and open access to publicly funded research publications*.' (European Commission 2012a: 9)

However, no reference to gender aspects is made in the Commission staff working document and the indicators set out for measuring progress in international cooperation (cf. European Commission 2012b: 40). Three implementation reports and related country roadmaps were published in 2014, 2016, and 2018, respectively. Although activities relating to framework conditions are mentioned – for example, in relation to IPR, open access, and co-funding mechanisms – hardly any specific actions concerning gender have been reported. The only exception is the 2016 report, where the EC attended the meetings of the G7 Ministers of Science 'who agreed to step up cooperation in research on global health, the future of the seas and oceans, research infrastructures, inclusive innovation, gender and

open science, and to cooperate on clean energy in the context of Mission Innovation' (European Commission 2016a: 6).

The country-specific roadmaps 2014 do not include references to gender aspects, while the 2016 edition makes reference to gender in the chapter of the enlargement countries stating under framework conditions that '[o]n gender equality, all countries are close to gender parity although women are still underrepresented in management functions' (European Commission 2016b: 4).

In 2018 country and regional roadmaps were developed. The below table gives an overview of the gender aspects mentioned in those documents:

Country / Regional Roadmap	Gender aspects mentioned
Africa	• *African Union Research Grants (20 million euros between 2008 and 2013; 17.5 million euros in 2016-2018). This action provides funding to the African Union Commission (AUC) to organise calls for proposals for collaborative research projects and to fund the selected projects. It has two objectives: 1) to support collaborative research that contributes to the sustainable development of African countries and the fight against poverty**, while respecting** ethical and **gender issues** (through the calls, the African Union Commission supported research in post-harvest agriculture, renewable and sustainable energy and water, and sanitation). (page 2)* • *With respect to **gender equality** in R&I, Sub-Saharan Africa, with women constituting 30% of all researchers, is among the regions with the highest shares of female researchers.*
Western Balkans	• *On **gender equality** all countries are close to gender parity but lack gender equality plans. Women are still underrepresented in management functions.*
South East Asia, Eastern Partnership, Latin America and Caribbean, Mediterranean and Middle East,	No reference to gender aspects
USA, South Africa, Russian Federation, New Zealand, Mexico, Republic of Korea, Japan, India, China, Canada, Brazil, Australia	No reference to gender aspects

To implement international cooperation with respective partner countries, mainly within the instruments of the EU Framework Programme for Research and Innovation, the European Union has concluded association agreements with 16 countries, namely Albania, Armenia, Bosnia & Herzegovina, Faroe Islands, Georgia, Iceland, Israel, Moldova, Montenegro, Norway, Serbia, Switzerland, North Macedonia, Tunisia, Turkey, and Ukraine. These agreements, in general, are structured in similar ways and refer to the general conditions of participation, participation in committees, forms and means of cooperation, intellectual property rights and obligations, financial provisions and regulations relating to financial contributions and financial controls etc. They are quite technical by nature and do not contain references to framework conditions such as gender, open access, or ethics.

The EU has also negotiated bilateral S&T agreements with individual third countries, namely Algeria, Argentina, Australia, Brazil, Canada, Chile, China, Egypt, India, Japan, Jordan, Republic of Korea, Mexico, Morocco, New Zealand, Russia, South Africa, and the USA[5]. These agreements constitute a framework to identify common interests, priorities, policy dialogue, and the necessary tools for S&T collaboration. The main articles of the agreements usually refer to the purpose, scope, and principles of the respective agreement and can be found in similar ways throughout the agreement texts:

Article 1[6]

Purpose

The purpose of this Agreement is to encourage and facilitate cooperation between the Community and Canada in fields of common interest where the Parties are supporting research and development activities to advance science and/or technology relevant to those fields of interest.

Article 3

Principles

Cooperation shall be conducted on the basis of the following principles:

a) mutual benefit;

b) timely exchange of information which may affect the actions of participants in cooperative activities;

c) within the framework of applicable laws and regulations, effective protection of intellectual property and equitable sharing of intellectual property rights, as set out in the Annex, which forms an integral part of this Agreement;

d) balanced realization of economic and social benefits by the Community and Canada in view of the contributions made to cooperative activities by the respective participants and/or Parties.

Again, the texts are quite technical in nature and no specific references to framework conditions such as gender, open access, or ethics are made. In conclusion, it can be stated that due to the general nature of the agreements hardly any reference is made to framework conditions, with the exception of articles relating to intellectual property rights.

3.2 Gender aspects in EU Member States' and Associated Countries' international STI cooperation policies

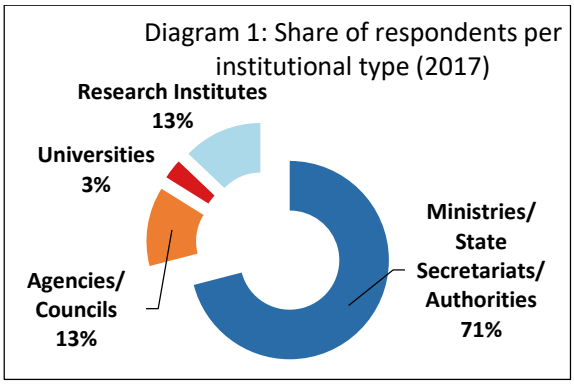
This section reports the findings of the survey we carried out in 2019 among national authorities and RFOs in the EU Member States and Associated Countries. Where relevant and possible, we provide a comparison with the findings from the 2017 SFIC-SWG GRI survey among the same respondents.

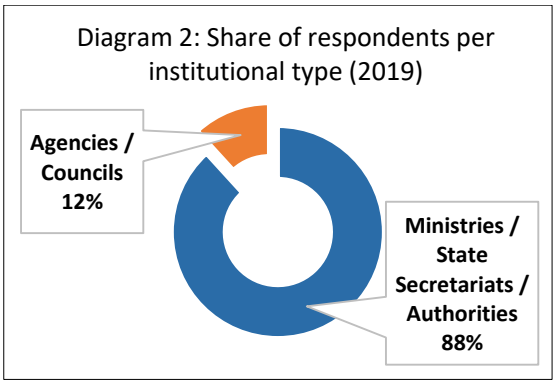
3.2.1 Analysis of the survey conducted among national research authorities

The response rate for the 2019 survey was lower than the 2017 HG/SFIC survey. In 2017, 31 government representatives from 22 countries submitted responses to the survey, whereas only 17 government representatives from 17 countries submitted responses in 2019. This somewhat constrains the possibilities for comparison, since only 10 out of 31 submitted responses to both surveys.

The composition of the dataset in terms of the types of institutional actors is as follows:

[5] Please see https://ec.europa.eu/research/iscp/index.cfm?pg=countries for the links to the different agreements.
[6] Example taken from the EU-Canada agreement 1996.





Summary of main findings:

- The degree of change in the efforts made to include gender aspects in international agreements was minimal between the 2017 and 2019 surveys. The number of national authorities that make these efforts continues to be low (6 out of 31 in 2017 and 1 out of 17 in 2019). It is worth noting that the countries are not identical. The authorities also seem to lack any motivation to make these efforts in the future and, compared to the 2017 results, are not especially interested in receiving support.
- As to the inclusion of gender aspects in STI-related activities that go beyond agreement level, only four (or 13%) national authorities answered positively in 2017, whereas in 2019 six (or 35.3%) answered positively.
- National authorities address gender aspects in different ways, whether just as a value or as gender equality objectives for different research areas. It seems that the project level or call level makes it more manageable to include gender aspects than inter-governmental agreements.
- The number of national authorities monitoring gender aspects is still low (3) and only half of the respondents who were not monitoring in 2019 (5 out of 10) would be willing to take up monitoring in the future.

The inclusion of equality in international agreements

There are **no significant differences** between the two surveys concerning the fact that **gender aspects are not part of bi- or multi-lateral agreements** (25/31 in 2017 and 16/17 in 2019). The only national authority to include gender in agreements is the Flanders region in Belgium. The same is true for the reasons stated for why gender issues are not implemented in international STI agreements. In 2017, 46% of respondents and in 2019 a figure of 50% answered that the agreement level is not the right one on which to introduce gender aspects, and that this is done on the **operational level** (Work Programmes, Calls, etc.); 35% in 2017 and 30% in 2019 considered gender issues to be of **limited relevance** for the overall programme goals. As for comments, two representatives stated that their programmes needed to be revised because some of them dated back over 30 years and that implies that their agreements are of a general nature (the Federal Ministry of Education and Research of Germany and the Ministry of Education and Research of Norway).

There has been a shift in the **willingness to include gender aspects in international agreements in the future**. We observed a **drop from 60% (18/31)** in 2017 **to 53% (9/17)** in 2019 in the willingness to include gender aspects and a **rise from 10% (3/31)** in 2017 **to 35.3% (6/17)** in 2019 in the number of countries that **would not include gender aspects**. However, given the fact that the base of responding countries was not identical for the two surveys, we should be wary of over-interpreting the

results. A deeper understanding of the reasons behind the drop would require additional qualitative information from the countries.

In 2017, the national authorities were asked if they would be willing to receive **support** to help them integrate gender issues into their countries' international STI cooperation agreements, to which **70%** answered positively. They were mostly interested in receiving **guidelines for best practices and examples**. In the 2019 survey, we wanted to know whether some of them did receive support. It turns out that only **four** national authorities received support, and these are not the ones that were surveyed in 2017 (Belgium, Bosnia and Herzegovina, Israel, and Lithuania).

When asked what has or would stimulate them to include a gender perspective in their bi- or multi-lateral agreements in 2019, the recipients answered:

- getting **guidelines for best practices** (Belgium, Bosnia and Herzegovina, Estonia, Greece, Israel, Lithuania, Malta, the Slovak Republic, and Switzerland);
- getting a **dedicated in-house human resource responsible for the topic** (Finland, Greece, Israel, and Portugal);
- having **relevant staff members with a gender expertise** (Belgium, the Czech Republic, Finland, and Portugal).

Norway commented that including a gender perspective would '*require other forms of agreements. From our side, we have no plans to change the format'*. **Austria** believes that a '*joint political will'* would motivate the inclusion of a gender perspective in bi- or multi-lateral agreements. In **Germany**, '*the Federal Ministry of Education and Research (BMBF) supports projects to implement equal opportunities for women in education and research. One aspect is the integration of the gender dimension in research. Furthermore, the Federal Ministry of Education and Research is actively involved in cooperation with third countries and regards such cooperation as imperative, particularly in view of today's global challenges. Gender aspects can be included in cooperation schemes with non-European states aimed at achieving solutions in science and society'*.

When asked if the national authorities would be willing to receive this kind of support in 2019 to integrate a gender perspective into their international STI agreements, only **8 answered positively** (Belgium, the Czech Republic, Estonia, Greece, Israel, Lithuania, Portugal, and Switzerland). They would especially welcome guidelines for best practices, gender competence trainings, and support for human resources. Concerning the countries that received support, the Czech Republic and Israel stated that their country would still need all of the above plus financial support. This leaves **six countries that are not interested in receiving any kind of support**, namely: Austria, Finland, Malta, Norway, Poland, and the Slovak Republic. Austria underscored the fact that there is a need for '*stronger political commitment … For Austria the participation of women in the research teams is always an evaluation criterion but not all partner countries take the same approach'*.

In both surveys, the **number of institutions taking up gender aspects in their agreements** is quite **low** (**7/31** in 2017 and **6/17** in 2019, including Belgium, Bosnia and Herzegovina, the Czech Republic, Greece, Israel, Portugal). However, there has been a change reported as to how the aspects are covered. In 2017 institutions covered gender equality as '*a basic principle, but also female participation in evaluation panels is encouraged, as are – to a lesser degree – the participation in research teams, a gender balance in management boards and the inclusion of gender in evaluation criteria'*. In 2019 gender perspectives were covered by their organisations' bi- or multi-lateral agreements or by policy dialogues with third countries in various areas:

- **as an objective for the encouragement of women leadership** in decision-making bodies, e.g. management boards, scientific boards, review panels (all except Bosnia and Herzegovina and Israel);

- as an objective for **gender balance in decision-making bodies** (Belgium and the Czech Republic);
- **as an objective for the participation of qualified women in research teams** (Belgium and the Czech Republic), **as a value** in international agreements (Portugal).
- Only two countries include a gender perspective in the **research content** where relevant (Bosnia and Herzegovina and Israel).
- Only Bosnia and Herzegovina **maintain a plan for the exchange of good practices** between partners in international cooperation in STI.

Three more countries (Germany, Norway, and Switzerland) have **other ways** of covering gender perspectives in their agreements:

- In **Norway**, '*gender perspectives in STI are covered in national policy documents. The agreements refer to national priorities as such, without detailing specific topics/areas'*.
- In **Germany**, '*it has been possible to introduce gender aspects in individual measures. On the whole, however, the focus has been on the development and expansion of collaborations. In many cases, it is not advisable to consider gender aspects for the time being in view of the other serious challenges being faced. Gender aspects will be covered, if they complement the overarching goals of the STI cooperation activities such as networking, promoting excellence, supporting young researchers or developing capacity'*.
- In **Switzerland**, '*[t]he Ministry (SERI) mandates the Swiss National Science Foundation and the Swiss higher education institutions to implement the international agreements. They all have a large autonomy. They do have strategies and guidelines regarding gender equality. For example, if there is a call for joint research projects, they will pay attention to the gender of the researchers in the selection process'*.

Contrary to the 2017 survey, the 2019 respondents offered a few examples of agreements:

Austria: '*As said for the BMBWF it is not part of the Agreement, but part of the Call text, there the passage reads as follows: These experts will evaluate each proposal based on the following criteria:*

• Scientific value of the intended research project (Points 0-25)

• Feasibility of the joint research plan and adequacy of the scientific method (Points 0-15)

• Competence, expertise and complementarity of the scientists/research teams involved (Points 0-20)

• Added value expected from the multilateral research collaboration (Points 0-15)

• Potential for further or future European and international cooperation (Points 0-15)

• Participation of young (5 Points) and female (5 Points) research talent (Points 0-10)

A maximum of 100 points can be achieved.'

Belgium: *'Maximum of 2/3 of the board of the industrial research fund may be of the same gender.'*

Israel: *'The text is a translated version of the Horizon 2019 explanation about integrating the gender dimension in research. So far, it has only been introduced into 1 bilateral research call*.*'*

Gender aspects in STI cooperation

In 2017, the questions in the section on the inclusion of gender aspects in their STI-related activities that go beyond the level of legally binding contractual agreements did not receive much attention, whereas it did receive attention in the 2019 survey. Indeed, in 2017, *'only 4 respondents (13%) have answered the section on the inclusion of gender aspects in their STI related activities that go beyond*

agreement level (Q10 –Q15), so no statement can be made in this respect. The lack of responses, however, suggest that government representatives are not systematically involved in the implementation of activities in international STI cooperation but that this is handled on a different level'.

In 2019, only 2 out of 17 national authorities did not answer this section, whereas some of those who did clearly declared gender was included:

- **as a value** in draft international agreements on, e.g. joint research programmes or joint proposal calls (the Czech Republic, Germany, and Portugal);
- **as an objective for the participation of qualified women in research teams** (Austria, the Czech Republic, and Germany);
- **as an objective for gender balance in decision-making bodies**, e.g. management boards, scientific boards, review panels (the Czech Republic);
- as an objective for **encouraging female leadership on the above boards** (the Czech Republic and Greece).
- Only two countries' representatives included a gender perspective in the **research content** where relevant (Bosnia and Herzegovina and Portugal).
- Only **Germany** supports **gender-specific research topics**.
- Again, **Bosnia and Herzegovina's national authority** seems to be the only one that maintains a plan for the **exchange of good practices** between partners in international cooperation in STI.

When asked why gender perspectives were not integrated into their organisation's policy, national authorities indicated:

- its **lack of relevance for overall goals** (Austria, Estonia, Lithuania, Poland, Portugal, the Slovak Republic, and Switzerland);
- that it has been **implemented at the operational level** (Austria and Switzerland),
- that it is **complicated to introduce** (Austria and Greece);
- the **lack of guidance on best practices** (Greece and Portugal).
- **Israel** stated that it **lacks the resources** to implement gender perspectives in calls.

Half of the national authorities consider or would be willing to consider a gender perspective in their future international STI cooperation activities (Bosnia and Herzegovina, the Czech Republic, Finland, Germany, Greece, Israel, Malta, and Portugal), whereas **Austria** and **Norway**'s representatives **would not** and the other countries are **not sure** whether they would or not, either for the same reasons as those given for the bi- or multi-lateral agreements, or because, for the **Lithuanian** national authority, a *'gender perspective in the international cooperation agreements is more relevant on a project level than intergovernmental agreement level'*. Poland's and Spain's national authorities did not answer.

LIST OF INDICATORS

N°1 - Programme monitoring and evaluation data are collected and reported in a sex-disaggregated manner
N°2 - The application and success rates for women and men Principal Investigators
N°3 - The budgets allocated to women and men Principal Investigators
N°4 - Budget cuts for women and men Principal Investigators
N°5 - The gender composition of research teams during programme evaluation
N°6 - The gender composition of administrative roles
N°7 - The gender composition of evaluation panels
N°8 - The gender composition of management boards
N°9 - The gender composition of scientific boards
N°10 - The integration of sex/gender analysis into the content of research proposals/funded projects

Programme monitoring and evaluation

In 2017, national authorities were asked whether they were monitoring and evaluating gender issues in international STI cooperation. At the time, almost **68%** of the respondents from 16 countries stated that **no** such monitoring takes place. In 2019, **3 out of 17** national authorities stated that they were monitoring (Austria, the Czech Republic, and Germany), of which two were not monitoring in 2017 (the Czech Republic and Germany) but do so now. Austria is still monitoring and added a new indicator compared to 2017.

These **three** national authorities **monitor gender perspectives** in their international STI cooperation with the following indicators (suggested in the questionnaire to the respondents):

- The **Austrian** national authority uses indicators **n°1** and **n°5** in the **programme evaluation**.
- The **German** national authority uses indicators **n°2, 7 and 10** in the **programme evaluation**.
- The **Czech** national authority uses Indicators **n°2, 5, 6, 7, 8, and 9** in the **final review of funded projects** and the **programme evaluation**.

Conversely, the following countries were **not** monitoring gender issues in 2019: Belgium, Bosnia and Herzegovina, Estonia, Finland, Greece, Israel, Lithuania, Malta, Portugal, the Slovak Republic and Switzerland. It should be noted that Malta has been pursuing efforts to develop its monitoring system since 2017. The reasons why institutions do not monitor are the same in both surveys. The first reason is that **gender aspects are not an important focus in cooperation or agreements** (Belgium, Finland, Israel, Lithuania, Portugal, the Slovak Republic, and Switzerland), that monitoring gender aspects is **not perceived** as **relevant** (the Slovak Republic), and that following up on these issues is too complicated (Switzerland). In Bosnia and Herzegovina, there is a **lack of knowledge** about the subject in the organisation.

In 2017, 60% of the respondents that were not monitoring were willing to take up monitoring and evaluation in the future and the rest were not sure they would. They *'would need support related to: harmonised rules and joint guidelines (also between EU and Member States or on an international level), best practice examples, resources and training as well as the general introduction of these issues into their monitoring portfolio'*.

In 2019, of the 11 national authorities that were not monitoring, **half would be interested in introducing monitoring in the future** (Bosnia and Herzegovina, Greece, Lithuania, Malta, and Portugal) with the following indicators:

- **gender balance** in **research teams** (Bosnia and Herzegovina, Greece, Malta, Lithuania, Portugal),
- **gender balance** in **evaluation panels** (Lithuania, Portugal), in management boards (Lithuania, Portugal),
- **gender balance** in **scientific boards** (Greece, Lithuania, Portugal), in research teams (Lithuania, Portugal),
- **gender aspects in research proposals** (Malta, Lithuania, Portugal),
- **women's leadership** in **decision-making** bodies (Bosnia and Herzegovina, Portugal).

The **Czech** national authority noted that although they were already monitoring, they would like to take up a new indicator, which is gender aspects in research proposals.

The other half (Belgium, Finland, Israel, the Slovak Republic, and Switzerland) were **not interested in taking up monitoring in the future** for the following reasons:

- it is not relevant (the Slovak Republic),
- it is the responsibility of other stakeholders (Belgium and Switzerland),
- Israel answered that they would not take up monitoring in the future but commented that *'We checked "no" but really the answer is "unknown". We have yet to ask the relevant authorities about it'*. Thus they might take up monitoring in the future, but nothing is planned for now.

In 2019, 12 out of 17 countries indicated they would be willing to receive support to help them integrate monitoring into their country's international STI cooperation:

- **guidelines for best practices** (7/12: Austria, Estonia, Greece, Lithuania, Malta, Portugal, and the Slovak Republic),
- **support in HR** (7/12: Bosnia and Herzegovina, the Czech Republic, Finland, Malta, Portugal, and Switzerland),
- **gender aspects in research proposals** (4/12: Estonia, Greece, Israel, and Portugal),
- Israel, Malta, and Portugal would need **financial resources**.

Good practice and additional information

Only **Switzerland** gave an example of a good practice relating to international STI cooperation:

'The Swiss Agency for Development and Cooperation SDC cooperates with the University of Berne to address the gender equality issues in its international collaboration projects (which do not only concern research, but also all questions related to development and cooperation)'. They have a project called 'Quality Assurance and Monitoring on Gender Equality'[7] that *'supports the gender officers of the Directorate for Development and Cooperation (SDC) in strengthening their accountability. This goal is pursued by developing a sound monitoring system as the basis for reporting gender equality results and publishing the annual status report on gender equality. The activities of the IZFG include:*

- *the development of a monitoring and reporting system for gender equality results within SDC-funded projects (including indicators)*
- *collection and analysis of relevant data*
- *preparing an annual status report on gender equality.'*

The highlights of developments since 2017 with regard to gender perspectives in international STI cooperation are:

Austria: *'Some reverse tendencies with regard to the gender dimension were observed. In a multilateral call text we had to take out the gender criterion on the request of one of the partners.'*

Spain: *'A new indicator was included in the last edition of the national periodical report on Women & Science statistics, "Científicas en Cifras 2017" (published in 2018): Percentage of universities and national level public RPOs that have adopted measures on the promotion of the gender perspective in the international cooperation carried out by the organisation in the field of Science, Technology and Innovation with institutions outside of the European Union (available at http://www.ciencia.gob.es/stfls/MICINN/Ministerio/FICHEROS/UMYC/Cientificas_cifras_2017.pdf).*

Additionally, in new inter-ministerial Observatory of Women, Science and Innovation (OMCI), set up in 2019, one of the working groups is aimed at incorporating the gender perspective in the upcoming

[7] https://www.izfg.unibe.ch/forschung/gender_and_development/quality_assurance_and_monitoring_on_gender_equality/index_ger.html

Spanish Strategy of Science, Technology and Innovation as well as in the Spanish International Cooperation in STI.

In the June 2019 meeting of the 5+5 Dialogue at Rome, the Spanish Minister expressed support to including the gender perspective.

The Network of Spanish Researchers Abroad (RAICEX, set up in 2018), which includes 16 associations in different countries worldwide, has recently started a new working group on Women and Science.

Previously, inspired by the Council Conclusions 2015 on advancing gender equality in the ERA, and the subsequent collaborative work between the HG and SFIC groups, the Spanish II NAP on Women Peace and Security (adopted at the end of 2017) included the following measure: to incorporate the gender dimension into the Spanish international cooperation in STI (promoting gender balance in the participation of women and men, as well as the integration of gender analysis into the content of programmes, projects and actions).

That II NAP on WPS is available at https://www.boe.es/diario_boe/txt.php?id=BOE-A-2017-10517.'

3.2.2 Analysis of the survey conducted among Research Funding Organisations

The survey from 2017 received responses from 38 funding agencies and programme managers in 20 countries, whereas the 2019 survey received responses from 10 Research Funding Organisations, representing different kinds of such organisations, in 10 countries. Out of the 38 RFOs that answered in 2017, 8 of them also responded to the 2019 survey, which allows for a limited comparison. The findings and conclusions that follow should therefore be read with these limitations in mind.

Summary of main findings:

• A comparison of the 2017 and 2019 results shows that the ratio of responding RFOs monitoring gender aspects slightly dropped (57% were monitoring in 2017 and 40% in 2019) and that the number of RFOs willing to take up monitoring in the future also dropped (more than 70% in 2017 but only half that at 30% in 2019). However, out of the four RFOs that took up monitoring in 2019, three were not monitoring gender issues in 2017, but have begun to do so in 2019 (Estonia, Poland and Sweden). The new questions in the 2019 survey show that:

- Efforts are being made by a majority of RFOs to formulate announcements, programmes and calls in such a way that they do not discriminate against women or people with caring responsibilities. However, less or no effort is being made to declare gender equality a criterion for research teams or for research content (only Cyprus, Ireland, and Sweden are making this effort).
- Concerning proposal evaluation and funding decision, most efforts are focused on ensuring a gender balance among evaluators, on evaluation panels, and on decision-making committees (Ireland, the Netherlands, Poland, Sweden, and Switzerland) and at gender equality as a horizontal evaluation criterion (Cyprus, Estonia, Ireland, Poland, and Switzerland).
- Concerning financial rules and eligible costs, not much is being done in this area either, except by a few RFOs (Estonia, Sweden, and Switzerland). They include among the eligible costs of a programme: **coaching**, **mentoring,** or **supervision** for **female team members** and **caring** services or other family support services, particularly in mobility support schemes.

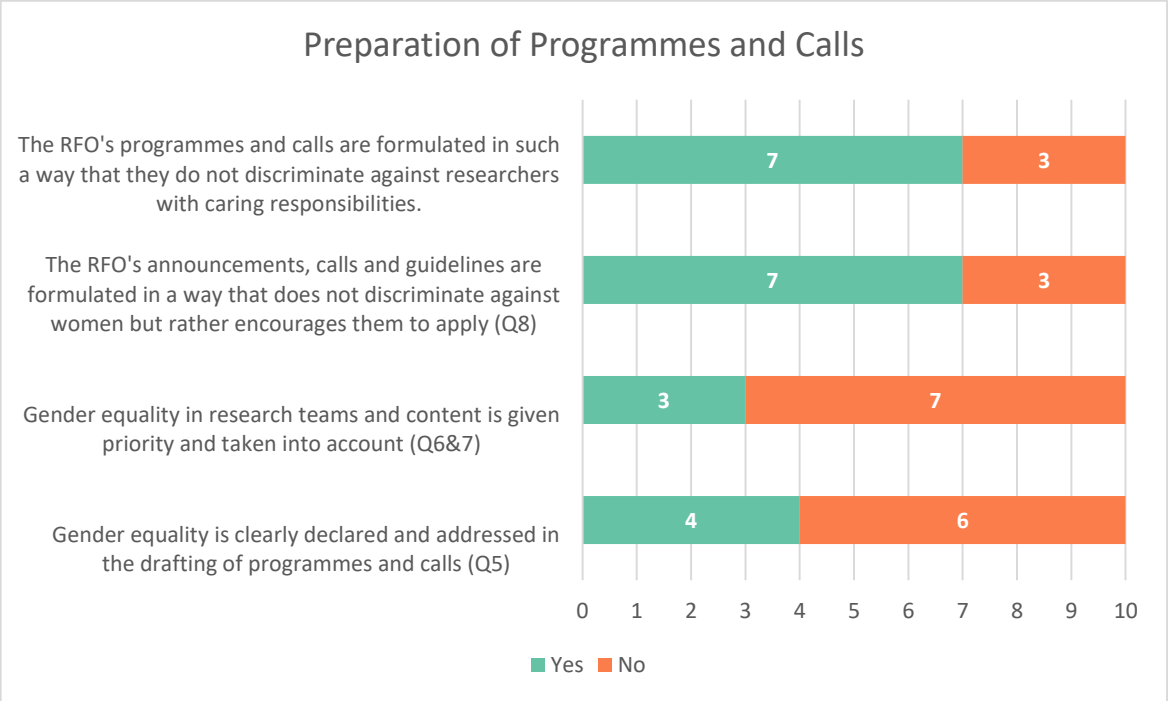
The Preparation of Programmes and Calls

As the chart below shows, in 2019, **6 out of 10 RFOs** (Belgium, Estonia, Greece, Poland, Portugal, and Switzerland) confirmed that **gender equality** is **not clearly declared** and **addressed** in the **drafting** of the **programmes** and **calls,** whereas the other **four** RFOs (Cyprus, Ireland, the Netherlands and Sweden) **clearly declared or addressed** it.

Gender equality in **research teams** and in **research content** is given priority and taken into account in programmes and calls prepared in **Cyprus, Ireland, and Sweden**.

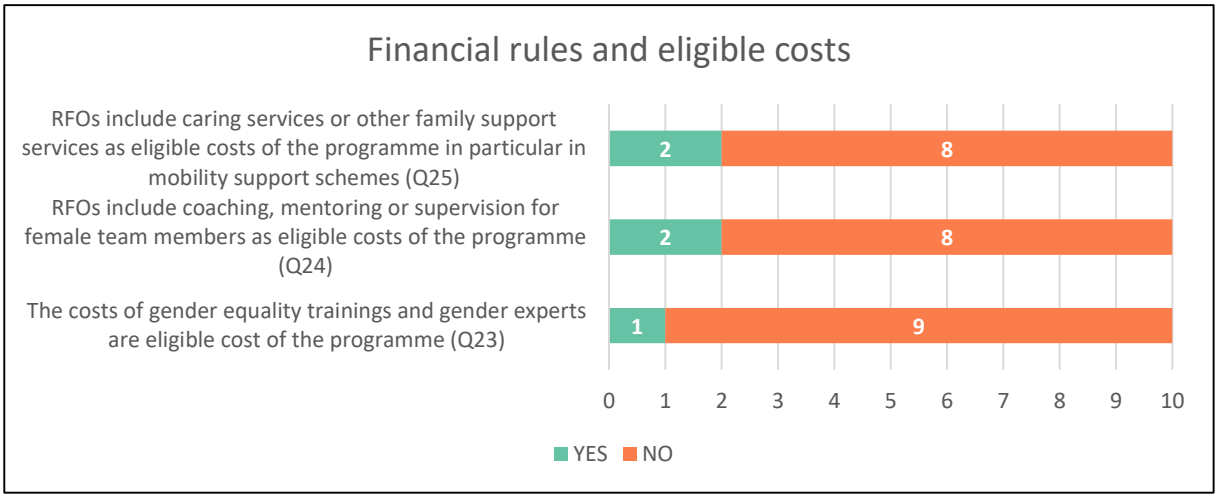
7 out of 10 RFOs (Cyprus, Estonia, Ireland, the Netherlands, Poland, Sweden, and Switzerland) ensure that their programme announcements, calls, and guidelines for applicants **are formulated in a way that they do not discriminate against women** and instead encourage women to apply. The three other RFOs are not making such efforts (Belgium, Greece, and Portugal).

7 out of 10 RFOs (Cyprus, Estonia, Greece, Ireland, the Netherlands, Sweden, and Switzerland) ensure that their programmes and calls **are formulated in such a way that they do not discriminate, directly or indirectly, against researchers with caring responsibilities**. They address issues related to pregnancy, maternity/paternal/parental leave for Principal Investigators and members of research teams. The three other RFOs are not making such efforts (Belgium, Poland, and Portugal).



Financial Rules and Eligible Costs

Only the **Estonian RFO** makes the **costs of gender equality trainings** and **gender experts eligible costs**. Only **2 out of 10 RFOs** (Estonia and Switzerland) include **coaching, mentoring, and supervision for female team members among a programme's eligible costs**. **Two out of 10 RFOs** (Sweden and Switzerland) include as **eligible costs caring** services or other family support services, particularly in mobility support schemes.



Proposal Evaluation and Funding Decisions

In 2019, concerning the inclusion of gender aspects in proposal evaluation and funding decisions, **most efforts** are being made to:

- include **gender equality** as a **horizontal evaluation criterion** (5 out of 10 RFOs: Cyprus, Estonia, Ireland, Poland, and Switzerland);
- ensure that there is a **gender balance** among **evaluators, on evaluation panels, and on decision-making committees** (5 out of 10 RFOs: Ireland, the Netherlands, Poland, Sweden, and Switzerland);
- make sure that **evaluation form templates** contain a **clearly formulated question on** whether the proposal **adequately** addresses the **gender dimension in research** (4 out of 10 RFOs: Cyprus, Ireland, Sweden, and Switzerland).

LIST OF INDICATORS

N°1 - Programme monitoring and evaluation data are collected and reported in a sex-disaggregated manner
N°2 - The application and success rates for women and men Principal Investigators
N°3 - The budgets allocated to women and men Principal Investigators
N°4 - Budget cuts for women and men Principal Investigators
N°5 - The gender composition of research teams during programme evaluation
N°6 - The gender composition of administrative roles
N°7 - The gender composition of evaluation panels
N°8 - The gender composition of management boards
N°9 - The gender composition of scientific boards
N°10 - The integration of sex/gender analysis into the content of research proposals/funded projects

Fewer efforts are being made to:

- require applicants to address **the gender dimension in research** and **explain why they have not** (3 out of 10 RFOs: Cyprus, Ireland, and Sweden);
- **train staff members** and specifically programme managers, evaluators, and members of evaluation panels and decision-making committees **in gender equality** (3 out of 10 RFOs: Cyprus, Ireland, and Switzerland). Only **the Netherlands** envisions **future trainings**.
- clearly indicate **gender equality in the evaluation form template as a criterion of project evaluation** (2 out of 10 RFOs: Ireland and Sweden);
- clearly indicate **gender equality as a criterion in the evaluation report prepared by evaluation committees** and clearly indicate the **gender dimension in research as a criterion in the evaluation report** prepared by evaluation committees, especially in the case of programmes and calls explicitly addressing the gender dimension in research (2 out of 10 RFOs: Ireland and Sweden).
- Only **Switzerland** set up a system whereby evaluation moderators are made internally accountable for ensuring evaluators are properly briefed on the gender issues to be addressed in the evaluation.
- Only the **Polish RFO** gives a scoring penalty in the Excellence section that assesses the research design to those proposals that do not address the gender dimension in research even though the call topics and programmes explicitly mention gender.

No efforts were made by the RFOs to:

- include a **member with gender expertise** on **evaluation panels** and **decision-making committees**,
- give an **evaluation scoring advantage** to projects that envisions its research team members undergoing **gender training.**

Programme monitoring and evaluation

In **2017** *'around **57%** of respondents (from 12 different countries) indicated that they **do monitor** gender issues in their international STI cooperation activities'* whereas **40%** (4 out of 10) of the respondents did so in **2019** (Estonia, Poland, Sweden, and Switzerland). It is important to note that out of these four RFOs, **three** were not monitoring gender issues in 2017 but were doing so in 2019 (Estonia, Poland, and Sweden). It should be noted that the Polish RFO was the only one in 2019 to state that it would be willing to take up more monitoring and evaluation in the future.

The RFOs **monitor gender perspectives in their international STI cooperation** with the following indicators:

- The **Estonian RFO** uses Indicator **n°2** in its **mid-term review of funded projects** and **final review of funded projects.** It also uses Indicator **n°5** in its **final review of funded projects.** For Indicators **n°3 and n°4**, it *'observed it in 2013-2017 but as of 2018 the grants that can be applied for are fixed'*. For Indicator **n°7**, it *'observe[d] it when choosing new members to the evaluation panels'*.
- The **Polish RFO** uses Indicator **n°5** in its **mid-term review of funded projects**, **final review of funded projects,** and the **programme evaluation.** It also uses Indicator **n°7** in its **programme evaluation.**
- The **Swedish RFO** uses indicator **n°1** (Programme monitoring and evaluation data are collected and reported in a sex-disaggregated manner) at different stages: in the **final review of funded projects**, in the **programme evaluation**, when the **applications are evaluated** and **when a decision is made**. It uses **all other indicators except n°6** when the **applications are evaluated** and **when a decision is made**.
- The **Swiss RFO** uses Indicators **n°1 and n°2** in both its **final review of funded projects** and in its **programme evaluation.** It uses Indicator **n°7** in its **mid-term review of funded projects**, **final review of funded projects,** and the **programme evaluation**.

The Belgian RFO, by contrast, was monitoring in 2017 but stopped doing so in 2019 and is not willing to take up monitoring in the future because *'[g]ender indicators are already monitored in [their] main internal calls'*. The Irish RFO was also monitoring in 2017, for example, using the *'[p]ercentage of female award holders and share of female evaluators [as] the primary indicators'*. However, in 2019, the RFO seemed to have stopped monitoring but wrote that they planned to start again in the future. Out of the other RFOs that are not monitoring or evaluating gender issues (Cyprus, Greece, the Netherlands, and Portugal), the situation did not change for Cyprus, which is still not interested in taking up monitoring in the future because it is not considered important. There was a change in perspectives for the Portuguese RFO, which in 2017 wasn't willing to take up monitoring in the future but in 2019 became willing to do so. As for the two other RFOs, they were not in the 2017 survey and did not answer all questions.

The three RFOs that are not monitoring but would be willing to do so in the future would be interested in the following indicators:

- gender balance on **evaluation panels** (Ireland, Poland, and Portugal),
- gender balance on **management boards** (Ireland, Portugal),
- gender balance in **research teams** (Ireland and Poland),
- **gender aspects in research proposals** (Ireland and Portugal),
- **women's leadership in decision-making bodies** indicator (Ireland).

In 2017, *'organizations would need [support] for monitoring gender issues, responses included **best practice examples** and examples of **relevant indicators** as well as additional **human resources**,*

***guidelines**, a wide **discussion on gender related issues**, an internati**onal methodology and formal frameworks** for monitoring and **financial incentives** for reaching the targets'*.

In 2019, the RFOs would welcome support to help them integrate monitoring into their country's international STI cooperation in these different ways:

- receive **guidelines for best practices** (**7 out of 10**, all except Belgium, Greece, and the Netherlands),
- receive support in HR (**5 out of 10 RFOs**: Cyprus, Estonia, Ireland, Poland, and Switzerland),
- receive support with **gender aspects in research proposals** (**3 out of 10 RFOs**: Estonia, Ireland, and Portugal),
- the **Estonian** and the **Irish RFOs** would need **financial support**.

The **Swiss RFO** commented that they would need *'definitions of indicators to be used by different institutions across countries. (Comparability among countries)'*.

Additional information

When asked about developments regarding gender aspects in international STI cooperation since 2017, the following responses were received:

- The **Belgian National Fund for Scientific Research** tries to *'ensure gender balance among evaluators, as much as possible when we manage the calls. In some calls which are not international, when two proposals have the same score, gender equality is an asset to make the funding choice'*.
- The **Cyprus Research and Innovation Foundation** is making sure that in all their *'Call for Proposals, Guides for Evaluators and Submission Forms (not only for International STI Cooperation), there is explicit mention to gender perspectives'*.
- The **Estonian Research Council** (Department of R&D Analysis) organised *'a seminar for the employees of our organization on gender inequality'* in October 2018 and they are currently working on a Gender Equality Plan.

Good practices

Here we wish to present two examples of good practice: the **Science Foundation Ireland,** and the **Swedish Energy Agency**, which make the most efforts to implement gender equality in all of their activities.

The **Irish RFO** has a Gender Strategy[8] that deals with the participation of women in STEM careers, and sex / gender dimensions are considered in the Research and Maternity Leave policy. The **Swedish RFO** has since 2016 included objectives[9] for gender equality in STI activities.

We'd also like to highlight the efforts made by the Swiss National Science Foundation that started a programme in 2019 entitled *'SPIRIT*[10] *- Swiss Programme for International Research by Scientific Investigation Teams'*, a new funding instrument that explicitly includes a gender strategy.

Here are a few of the gender aspects developed in the programme:

[8] https://www.sfi.ie/funding/sfi-policies-and-guidance/gender/
[9] https://www.energimyndigheten.se/en/about-us/objectives-for-gender-equality-in-the-activities-for-research-and-innovation/
[10] http://www.snf.ch/en/funding/programmes/spirit/Pages/default.aspx

- *'SPIRIT finances original, relevant and team-oriented research that is to the benefit of all concerned. One of its top priorities is to support young researchers. If two or more applications are deemed to be of equal quality,* ***applications by women or applications that show better gender awareness are given preference****. Twelve projects are funded per year based on a competitive funding procedure.'*
- *'The Specialised Committee International Cooperation appoints the SPIRIT Evaluation Commission (SEC), which is composed of a pool of permanent international members from the humanities and social sciences, mathematics and the natural and engineering sciences, and medicine and biology. High importance is attached to* ***balancing the percentage of female and male researchers on the Commission at no less than 40% each****. In addition to promoting gender balance, t****he Specialised Committee International Cooperation appoints a gender equality expert as a member of the SEC****.'*

The **Swiss RFO** also took over the AcademiaNet,[11] a database of profiles of excellent female researchers from all disciplines in Europe from Robert Bosch Stiftung since 1.1.2019.

3.2.3 Main messages

In view of these findings, the main positive messages are:

- Gender equality in international STI cooperation received more attention in 2019 than in 2017 with its inclusion as a value and with the definition of several objectives to promote women in STI.
- Many national authorities are willing to take action in the future if adequate support is provided.
- Efforts are being made by a majority of RFOs to formulate their programmes and calls in such a way that they do not discriminate, directly or indirectly, against women or researchers with caring responsibilities.

However, many difficulties persist:

- Difficulties persist in terms of including gender aspects in bi- or multi-lateral agreements in STI cooperation. The main reason given is that this is addressed on the operational level (AT, BH, CH, CZ, and GR) of programmes and calls.
- The lack of examples, guidelines, and support for human resources and financial resources still make it difficult for national authorities to include a gender perspective in other types of STI cooperation (e.g. joint research calls, joint proposal calls).
- Most national authorities and RFOs still do not monitor or evaluate gender aspects in their international STI cooperation and few are willing to take up monitoring in the future (6 out of 17 stated this).

3.3 Gender aspects in international cooperation in STI in third countries

This section reports on the findings of a survey among organisations in third countries that focus on women and gender in STI, carried out in 2019. A total of 116 answers were received. After sorting out the incomplete or empty answers, there were 65 answers (56%) left. Of these, we could identify the countries of 42 respondents:

- 12 organisations from the region of Sub-Saharan Africa (one of which is based in the USA);

[11] http://www.academia-net.org/

- 14 organisations from the region of Asia and the Pacific (one of which is based in Austria);
- 11 organisations from the region of Central and South America and the Caribbean;
- 5 organisations from the Middle East and North Africa [MENA] (1 from Armenia, 2 from Egypt, and 2 from Jordan)
- 1 organisation from Russia.

We analysed each question across the whole sample and with a regional focus when relevant.

3.3.1 Priority areas for gender equality in research and innovation

We first started by analysing the priority areas for gender equality in research and innovation. The most salient concerns relating to the participation of women in STI were quite similar among the different regions. Indeed, stereotypes and toxic behaviours in schools and higher education, work–life balance, economic and material issues, and systemic gender discrimination were cited as obstacles to women's participation in STI.

To ensure that gender issues are considered in research content, the organisations recommended implementing a gender and intersectional organisational research culture by, for instance, including gender in the research design and during all phases of the project, including the points of view of local women, or introducing anonymisation into hiring processes and funding applications. They also highlighted the importance of raising awareness, developing data-based policies, putting women in higher positions, and making sure funds are available for gender-related projects or for women students and researchers.

Further, the main research areas in which a gender dimension should be explicitly addressed are Economy/Work–Life Conditions (77.8%), Education (75.6%), and Health (65.1%). Around half of the recipients think that the areas of Peace, Democracy & Governance (60%) and Climate Change (48.9%) should address gender. Fewer recipients think that the areas of Poverty, Urban and Rural Planning, Digitisation, Migration and Sustainable Consumption should address gender (between 35.6% and 42.2%). A regional-level analysis reveals some differences. For the Asia and the Pacific region and the MENA region, Economy/Work–Life Conditions is the more important area for including a gender perspective. For the Central & South America and the Caribbean region and the Sub-Saharan Africa region, a gender perspective in Education is more important. The research areas of Health and Peace and Democracy and Governance are in Asia and the Pacific considered the second most important areas in which a gender perspective should be addressed.

3.3.2 Gender aspects in international cooperation provisions

We also asked about gender aspects in international cooperation provisions. The most effective ways in which international agreements and funding programmes between the EU countries and third countries could promote gender-related concerns are raising awareness among political representatives, industry, youth, and society. Local needs should be considered, and local experts should be consulted during the design of agreements. Specific areas that match women's needs in terms of work–life balance and empowerment should be funded.

Only 20.5% of our respondents have information about gender issues being addressed as part of international cooperation in STI between their country and the EU and EU member states. In addition, 36.4% believe that gender issues are not addressed, while 43.2% of the respondents are not aware whether any action has been taken for gender equality in international cooperation in STI.

In the case of the outbound international mobility of researchers, the most challenging issues for the researchers are material and economic issues, work–life balance, and adapting to other research conditions, and 47.8% of our respondent believe that these issues are gender-related.

Finally, the last two items allowed the respondents to express other concerns relating to gender in international cooperation in STI and other issues. This again revealed many concerns relating to work–life balance, creating equal opportunities for women in STI, adopting an intersectional approach, and dealing with material issues.

3.3.3 Main messages

With 65 complete answers received, this survey is a first glance at regional challenges and insights on the implementation of a gender perspective in international cooperation in STI and, as such, it cannot be generalised. We decided to divide the sample into four regions only: Asia and the Pacific, Central and South America and the Caribbean, the Middle East and North Africa, and Sub-Saharan Africa. The regions are not all equally represented.

The main messages can be summarised as follows:

- There are many obstacles to women's participation in international cooperation in STI that are shared among all the regions;
- There is not much knowledge about whether actions are being taken in international cooperation;
- When there are actions, they are not suited to the situation women are in, or there are not enough of them, or they tend to benefit privileged groups of women.

Suggested improvements include:

- There is a need for more awareness raising and education among political representatives, industry, youth, and society in general;
- Adequate funding and material support could ensure gender issues are considered at all levels (research content, research teams, projects, etc.);
- A grassroots and intersectional perspective is necessary to prevent the reproduction of discriminations in international STI cooperation.

4. Towards Fair and Progressive International STI Cooperation: Key Issues and Recommendations

In this section, we discuss six issues to consider when concluding an international STI cooperation agreement, launching a call, or collaborating on a specific project. We provide a concise discussion of the matter, based on the data and sources identified above, and, where possible, propose practical recommendations to tackle the problem.

4.1. Create equal opportunities for women to participate

It is well established in the academic gender studies literature that formally identical conditions do not necessarily create the same opportunities for all. Most studies show that the normative scientific career path, work-rhythms, and teamwork patterns tend to suit researchers without extensive caring commitments in their private lives. Thus, they tend to prioritise men, who in many cultural and social contexts are expected to perform less care work in the family (Alutu and Ogbe, 2007; Dajani, 2012; Maxwell *et al.*, 2015; Priyatna, 2013; Prozeski and Mouton, 2019; Yamazaki *et al*, 2017). Also, regarding the tacit 'soft' rules of contemporary research environments and cultures, we should not underestimate the fact that science and rationality have been historically coded as masculine matters and the fact that research has mostly involved men (Cota, 2019; Hartley and Dobele, 2009; Liccardo and Bradbury, 2017; Mukherjee, 2011; Zhang, 2011). Even today, there is a lack of women in positions of power in many academic contexts, both inside and outside the EU (Khosrokhavar and Ghaneirad, 2010; Maphalala and Mpofu, 2017; Mukherjee, 2011; Njenga et al., 2011; Noronha, 2013; Prozeski and Mouton, 2019; Santos et al., 2019; Sinha and Sinha, 2011).

Drawing upon the literature review, a survey among women in science organisations in third countries, and the GENDERACTION mutual learning workshop in Malta, we can conclude that **women researchers in third countries face similar obstacles and require similar support mechanisms to tackle gender disadvantages as many European female researchers and/or researchers with extensive caring commitments in their private lives**. Representatives of the women in science organisations from third countries who participated in the survey mainly pointed to the following hindrances to women's participation in STI:

Stereotypes and toxic behaviours • Science perceived as a male discipline • Cultural & societal expectations on women • Machismo in higher education • Lack of a support system & women mentors **Work–life balance** • Women are torn between the role of caregiver and work	• Research work conditions are not family-friendly **Economic and material issues** • Lack of funding • Unattractive wages **Systemic gender discrimination** • Discriminatory hiring practices • Leaky pipeline • Lack of opportunities

Source: Survey among women and research organisations from third countries.

When concluding a framework agreement, launching a call for research collaboration, or supporting a research project, European partners should consider the following measures to avoid reproducing existing gendered inequalities and disadvantages in third countries' research systems:

- Make a special effort to reach women researchers for collaboration (see Annex 3 of this report for a list of relevant organisations in different third countries and regions that can be approached).

- Consider introducing anonymisation into hiring processes and funding applications.
- Include a provision in the framework agreement or contract that participating researchers in comparable positions are employed on the same salary terms regardless of their gender.
- If possible, international physical mobility should not be mandatory and funding should be provided for alternative modes of mobility, i.e. virtual mobility, as part of the programme and project budget. This will benefit people with caregiving commitments whose flexibility and mobility may be limited. It also contributes to issues of safety, as international mobility may be putting women at particular risk of gender-based violence. In addition, it contributes to the environmental sustainability of academic practice (see section 4.6).

In the case of international mobility to the EU:

- Provide opportunities for and support good work–life balance arrangements for researchers, including support for standard forms of childcare, if relevant.
- Do not apply strict age limits to mobility schemes as researchers caring for children may only become more mobile in the later stages of their career trajectory.
- Provide effective assistance to researchers and their family with visa and immigration procedures once a researcher has been accepted for a position, including researchers' same-sex partners, who may not be officially recognised in the researcher's home country.
- Implement effective mechanisms to report and deal with sexual harassment and gender-based violence in foreign countries.

4.2. Articulate gender in research and innovation content

In the EU, gender in research content is now considered as a relevant aspect of the responsible research and innovation (RRI) concept. It has been shown that knowledge production and outcomes are shaped by assumptions either about essential differences between different sex and/or gender categories or, on the contrary, disregard any (possible) sex and/or gender differences.[12] The requirement to consider gender in research and innovation content in the case of EU-funded research has become a good practice which should be included in international STI cooperation with third countries.

[12] See Gendered Innovations at http://genderedinnovations.stanford.edu/index.html and European Commission (2013) for concrete examples of where sex gets overemphasised.

In the survey, we asked the representatives of women in research organisations from third countries in which research areas a gender dimension was relevant in terms of content. They highlighted the topic areas of the economy, work and work conditions (77%), education (75%), and health (65%). The following table shows the regional distribution in the research areas emphasised.

It is interesting to note that even though in the survey most emphasis was globally given to 'softer'

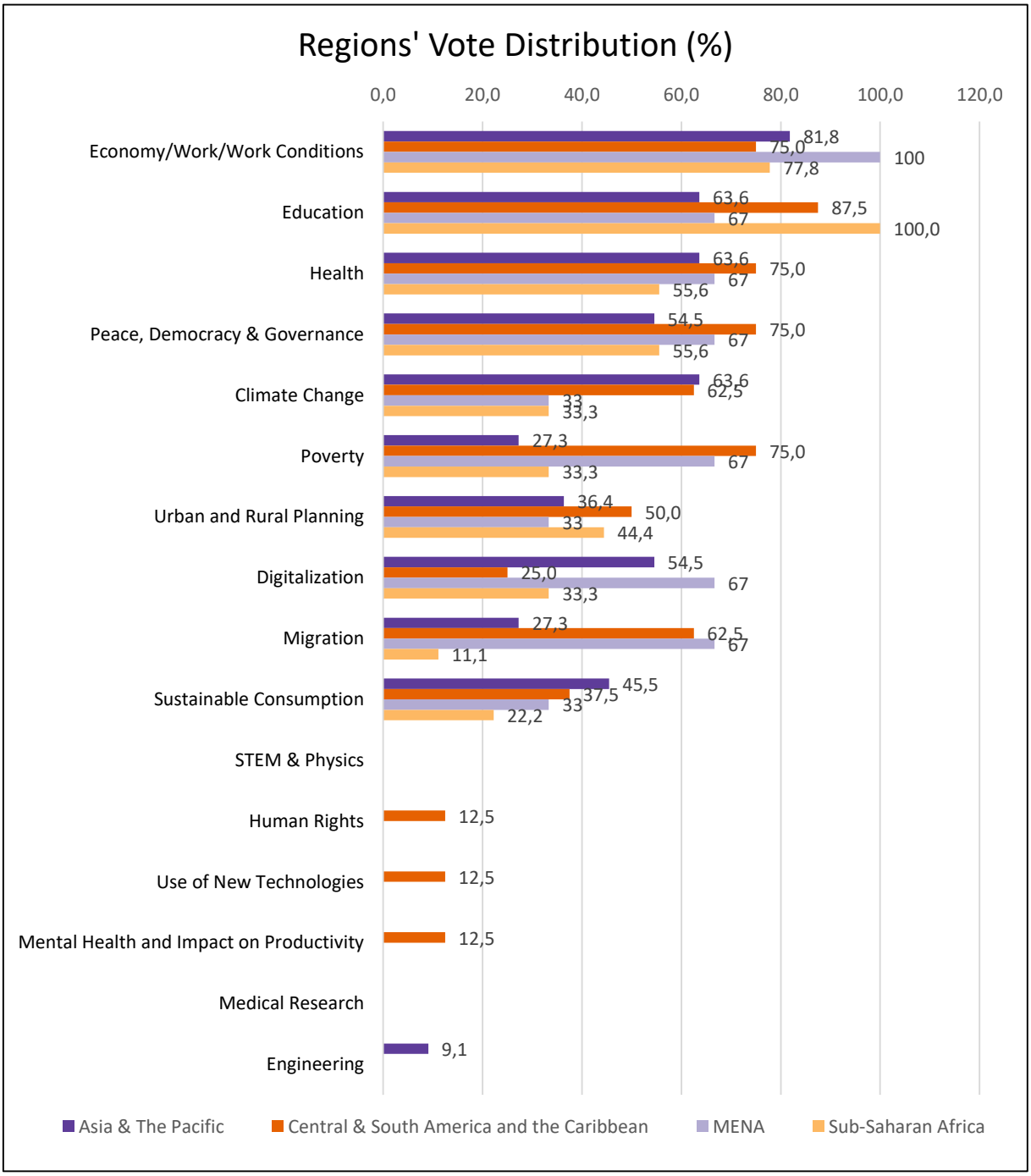


Figure 1 – Regions vote distribution from the survey among women and research organisations from third countries

topics, related mostly to the social sciences, during discussions at the GENDERACTION mutual learning workshop in Malta various sex- and/or gender-related implications were articulated. One participant gave the example of a bean that was developed as an agricultural innovation: It can grow in the desert with almost no water but takes more time to cook. This implies a need for more wood

and water for cooking it. As women are usually responsible for getting the wood and water, the consequences of this innovation are that women will have to walk further to fetch it and will have to carry heavier loads. Thus, they spend more time and effort fetching supplies and cooking. As this example shows, some gendered impacts may be cumulative rather than resulting from a complete and radical change in practice; this, however, does not mean they are less consequential. Sometimes, the gender aspects and gendered impacts of research may be fully unexpected and unintentional and may emerge only later in the STI trajectory.

When concluding a framework agreement, launching a call for research collaboration or supporting a research project, European partners should consider the following measures to articulate gender in context and the possible gendered impacts of the research:

- Require an obligatory consideration of gender in research and innovation content in submitted research proposals.
- Provide funding to explore and monitor the unintended gendered aspects and consequences of research projects, as they may emerge in later stages of research.

4.3. Negotiate research objects

International research cooperation takes place across different languages and cultural and natural environments, and these may significantly differ. As such, it involves a series of translations, both in the literal and the metaphorical sense of the word. If these translations are not carefully negotiated, they may easily result in the reproduction of existing inequalities and hegemonic realities (Lin, Law 2019). As social anthropologists acutely realise, the same words do not necessarily mean the same things or denote the same research objects. For this reason, Eduardo Viveiros de Castro (2004) speaks about *'controlled equivocation'* rather than translation. By proposing this concept, he stresses that the translation cannot ever be perfect. We can also learn much from the gaps in and between realities, as they are culturally and materially grounded.

Differing languages, scientific cultures, and experimental arrangements characterise not only countries and regions but also scientific disciplines. These characterisations impinge on how their research objects are practically constructed (in labs, in texts, or during fieldwork). In the context of existing hierarchies in the academic field – with STEM disciplines typically getting much stronger recognition and funding in research systems – interdisciplinary translations also risk asymmetrically reproducing hidden disciplinary assumptions and agendas if they are not properly negotiated within particular research projects.

It is important to note that the research assessment frameworks, which have now been implemented in many countries worldwide to back up research policies, are often based primarily on quantitative indicators, such as Journal Impact Factors (JIF), which tend to prioritise STEM disciplines, specific research strategies, and specific geopolitical regions. As noted, for example, by Meriläinen *et al*. when they sought to publish their research results in an established international journal, they were pushed by the reviewers to compare 'deviant' Finnish data to the British 'standard' (2008: 591-594). Similar dynamics were observed within EU-funded international consortia, which included partners from Central and Eastern Europe (Stöckelová, 2016). The version of 'internationality' inscribed into these instruments might thus be biased towards reproducing the knowledge, credit, and interests of those countries, regions, and/or researchers who are already recognised on the global scientific scene.[13]

When concluding a framework agreement, launching a call for research collaboration, or supporting an actual research project, European partners should consider the following measures to provide

[13] For a systematic critical discussion of the use of quantitative indicators in research evaluation see Hicks *et al*. (2015).

space for a proper negotiation of research objects and interests, which would equally benefit all involved parties:

- Encourage and support project activities aimed at negotiating shared research objects across all parties involved (including different disciplines, academic and non-academic collaborators, and researchers with different cultural backgrounds). While these activities would probably be most relevant at the beginning of the project, they should also be iterated throughout to reflect its course. The encouragement and support should best be worded in the call for funding and in budgeting conditions, as well as in the proposal evaluation criteria.
- Do not evaluate the success of a project strictly based on established quantitative indicators. Facilitate and recognise publications in different languages for various relevant audiences as well as the possible impact on local communities.

4.4. International division of teamwork and intellectual property rights

Feld and Kreimer, who investigated the forms and effects of FP6-funded collaborative projects involving Latin American teams, concluded that *'whereas scientific relations are becoming more complex and Latin American research groups' participation in international consortia is on the rise, the basic structure of these relations is still organised around 'subordinate integration' modalities: the activities most frequently undertaken by Latin American researchers in the research consortia's division of labor are data production, organization and systematization'* (Feld, Kreimer 2019: 166). Even if beneficial for all parties, international collaboration can still reinforce historical asymmetries in the global research system, which may prevent the realisation of the full potential of cooperation for knowledge production and innovation.

The unequal division of work in the research teams and consortia may result in unequal data ownership, authorship, and intellectual property rights both within (national) research teams and between the teams in the international consortium. Moreover, given the current gender structure in academic hierarchies, these inequalities may be strongly gendered – disadvantaging (academically junior) female researchers. It is then important that all arrangements regarding data ownership and rules of authorship are inclusively negotiated within the team and the consortium and/or made transparent to newcomers to the team during any stage of the research process (e.g. when hiring a postdoc for a particular post). The basic principles to follow should include a commitment to equitable access to data and fair authorship allocation in the team after taking into consideration the specificities of each research project.

When concluding a framework agreement, launching a call for research collaboration, or supporting an actual research project, European partners should consider the following measures to prevent the reproduction of the subordinate integration of third countries' research teams within consortia and prevent the reinforcement of unjustified global epistemic inequalities:

- In the wording of research calls, encourage appropriate forms of engagement for all research participants involved, taking into account their expertise and experience, to mobilise the full potential of the whole consortium for analytical and conceptual work.
- Make requirements for a clear statement on the appropriate and legitimate sharing of Intellectual Property Rights within the consortium defining a specific mechanism that could be used in the case of conflicts and disagreements. The guiding principles should include equitable access to data and fair authorship allocation within research teams and consortia.

4.5. Engage local communities and grassroots organisations

Public involvement and citizen science have become a fundamental part of the EU responsible research and innovation policy. Research and innovation processes in this view benefit from including non-academic research participants and potential users – grassroots civil society organisations, patients' organisations, local communities, or the general public – not only to strengthen the political and democratic legitimacy of the research but also to strengthen its epistemic value. The forms of participation may be diverse – from consultation on research priorities to participation in data collection, analysis and social innovation. Also, the Sustainable Development Goals agenda emphasises a community-based approach as key.

> *'With reports indicating that current efforts to achieve the Sustainable Development Goals are being undermined by climate change and sharply rising inequalities, the High-Level Political Forum on Sustainable Development concluded [on 18 July 2019] with calls for an increased critical role for local communities and civil society in getting the world back on track to achieving the Sustainable Development Goals by 2030.'*[14]

In this context, it is highly relevant that the provisions facilitating or even requiring the participation of relevant societal stakeholders in the research and innovation process become part of the EU research policy with third countries. There are indeed some good elements of such participation inscribed into some Member States' policies. For example, the Dutch research fund NWO stresses the *'collaboration in broadly composed consortia with societal parties'* and includes a separate category of *'stakeholder engagement'* in its application (budget) for research grants in the Merian funding scheme aimed at collaboration with Brazil, China, India, Indonesia, and South Africa.[15]

When concluding a framework agreement, launching a call for research collaboration, or supporting an actual research project, European partners should consider the following measures to strengthen the role of local communities and grassroots civil society organisations:

- Where appropriate, encourage the inclusion of actors from local communities and civil society organisations. This should constitute one of the criteria of evaluation in relevant funding schemes.
- Where appropriate, reserve a designated share of a programme or project budget for actors from local communities and civil society organisations, including women's organisations.

4.6. Reduce negative impacts and hidden disadvantages implicated in academic mobility

Science today is global in nature. It involves many modes and forms of international collaboration as well as knowledge and technology transfers. As such, it currently involves a large volume of mobility of people, materials, technologies, and ideas. Researchers travel to do fieldwork, to work in collaborating labs, to attend conferences. While this cosmopolitanism in science is beneficial in many respects, it also produces significant negative climate and environmental impacts (cf. Arsenault *et al.* 2019; Ciers *et al.* 2019). This has recently started to cause concerns in academic communities (e.g. Kalmus 2019) and research institutions and individuals have started to question the imperative of extensive academic mobility (which often serves as an important proxy for research quality) and to develop alternative modes of mobility, exchange and cooperation with fewer negative impacts. This

[14] https://www.un.org/sustainabledevelopment/blog/2019/07/increased-community-based-engagement-seen-as-critical-to-build-climate-action-and-achieve-the-sustainable-development-goals
[15] https://www.nwo.nl/en/research-and-results/programmes/wotro/merian-fund/background.html

concern was raised during the workshop in Malta and in the survey among women in science organisations in third countries.[16]

In addition to the negative climate and environmental impacts, the current imperative of mobility hides indirect discrimination of those who cannot travel – whether for health, family, or economic reasons. As the report by the ERA-SGHRM Working Group on Innovative Transnational Research Mobility and Welcoming Researchers to Europe suggests in its discussion of the merits of virtual mobility,

> *'[v]irtual mobility options support inclusion, e.g. of researchers with disabilities, equal opportunities for researchers from less favoured regions and help those on parental leave to maintain contact with their national and international networks. Additionally, virtual mobility can be combined with part-time positions to attract frontline researchers who want to collaborate, but do not want to leave their main position or family for a longer period'.* (Cabello, Skarmeta *et al.* 2016: 30)

Moreover, virtual mobility options may also contribute to the development of combined part-time positions, which would help

> *'to counteract brain drain and link the emerging research institution to front-line institutions for future continuous collaboration. Combined and part-time positions are attractive for women researchers, as they might be easier to combine with family life. This might increase recruitment of women for leading research positions and thus make better use of the potential in both genders, as well as contribute to greater scientific quality and innovation through greater gender diversity. Mobilising the potential of women senior researchers would also be a key element in increasing the number of researchers in Europe'.* (Cabello, Skarmeta *et al*. 2016: 30)

For both environmental and work–life balance reasons, the established forms and imperatives of mobility should not be taken for granted within international cooperation. On the contrary, the benefits of the physical travel of researchers and materials should always be weighed against the negative environmental and social impacts (and not only in relation to the economic costs). When relevant, support alternative modes of mobility, including virtual mobility and non-flying options.[17]

When concluding a framework agreement, launching a call for research collaboration, or supporting an actual research project, European partners should consider the following measures to prevent the negative environmental and social impacts of academic mobility:

- Encourage researchers to always thoughtfully consider the purpose of travel, to weigh the benefits against the environmental and work–life balance impacts, and to consider remote modes of participation and collaboration;
- Provide funding for development and relation of high quality remote/virtual modes of communication, including – if possible – infrastructural and technical investments;
- In case of physical mobility, support travel options that are not only economical but also generate fewer negative climate, ecological and work–life balance impacts, such as direct flights.

[16] See e.g. https://businesstravelroundtable.ac/about; https://noflyclimatesci.org; https://www.epfl.ch/campus/mobility/plane.
[17] See e.g. the Guidelines for sustainable travel of the École polytechnique fédérale de Lausanne.

5. References

Alutu, A. N. G., and F. M. Ogbe. 2007. 'Men's View of Female Scientists Work/Life Balance at the University of Benin, Nigeria.' *Journal of Human Ecology* 22 (4): 303–308, https://doi.org/10.1080/09709274.2007.11906038.

Arsenault, J., J. Talbot, L. Boustani, R. Gonzalès, K. Manaugh. 2019. 'The Environmental Footprint of Academic and Student Mobility in a Large Research-Oriented University.' *Environ. Res. Lett.* 14 (9).

Blagojevic, M. 2014. 'Creators, Transmitters, and Users: Women's Scientific Excellence at the Semiperiphery of Europe.' *European Education* 36 (4):70-90.

Czerniewicz, L. 2013. 'Inequitable Power Dynamics of Global Knowledge Production and Exchange Must Be Confronted Head On.' Available at: https://blogs.lse.ac.uk/impactofsocialsciences/2013/04/29/redrawing-the-map-from-access-to-participation

Cabello, C., A. Skarmeta *et al*. 2016. *Innovative Transnational Research Mobility and Welcoming Researchers to Europe. Report of the ERA-SGHRM Working Group*. Available at: https://cdn3.euraxess.org/sites/default/files/policy_library/final_era-sghrm_innovative_transnational_research_mobility_and_welcoming.pdf

Ciers, J., A. Mandic, L. D. Toth, G. Op 't Veld. 2019. 'Carbon Footprint of Academic Air Travel: A Case Study in Switzerland.' *Sustainability* 11: 80-87.

Dajani, R. 2012. 'How Women Scientists Fare in the Arab World.' *Nature* 491 (7422): 9.

European Commission. 2012a. *Enhancing and Focusing EU International Cooperation in Research and Innovation: A Strategic Approach*. Available at: https://ec.europa.eu/research/iscp/index.cfm?pg=strategy

European Commission. 2012b. *Enhancing and Focusing EU International Cooperation in Research and Innovation: A Strategic Approach. Commission Staff Working Document*. Available at: https://ec.europa.eu/research/iscp/pdf/policy/staff_working_paper_com_2012_497.pdf#view=fit&pagemode=none

European Commission. 2013. *Gendered Innovations. How Gender Analysis Contributes to Research*. Luxembourg: Publications Office of the European Union. Available at https://ec.europa.eu/research/science-society/document_library/pdf_06/gendered_innovations.pdf

European Commission. 2016a. *Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Implementation of the Strategy for International Cooperation in Research And Innovation*. Available at: https://ec.europa.eu/research/iscp/pdf/policy/progress_report_oct-2016.pdf#view=fit&pagemode=none

European Commission. 2016b. *Priorities for International Cooperation in Research and Innovation*. *Commission Staff Working Document*. Available at: https://ec.europa.eu/research/iscp/pdf/policy/annex_roadmaps_oct-2016.pdf#view=fit&pagemode=none

Feld, A., P. Kreimer. 2019. 'Scientific Co-operation and Centre-Periphery Relations: Attitudes and Interests of European and Latin American Scientists.' *Tapuya: Latin American Science, Technology and Society* 2 (1): 149-175.

Hartley, N. and A. Dobele. 2009. 'Feathers in the Nest: Establishing a Supportive Environment for Women Researchers.' *Australian Educational Researcher* 36 (1): 43–58, http://dx.doi.org/10.2190/WR.13.4.b.

Hatem, M. 2013. 'What Do Women Want? A Critical Mapping of Future Directions for Arab Feminisms.' *Contemporary Arab Affairs* 6 (1): 91–101, http://dx.doi.org/10.1080/17550912.2012.756631.

Hicks, D., P. Wouters, L. Waltman, S. de Rijcke, I. Rafols. 2015. 'The Leiden Manifesto for Research Metrics.' *Nature* 520: 429-431.

Kalmus, P. 2019. 'Fly Less to Convey Urgency.' *Science* 365 (6460): 1355. http://science.sciencemag.org/content/365/6460/1355

Khosrokhavar, F. and M. A. Ghaneirad. 2010. 'Iranian Women's Participation in the Academic World'. *Iranian Studies* 43 (2): 223–38, http://dx.doi.org/10.1080/00210860903542093.

Liccardo, S. and J. Bradbury. 2017. 'Black Women Scientists: Outliers in South African Universities'. *African Journal of Research in Mathematics, Science and Technology Education* 21 (3): 282–292, https://doi.org/10.1080/18117295.2017.1371980.

Lin, W., J. Law. 2019. Where Is East Asia in STS? *East Asian Science, Technology and Society: An International Journal*, 13: 115–136.

Mama, A. 2006. 'Pursuing gender equality in the African University'. *International Journal of African Renaissance Studies - Multi-, Inter- and Transdisciplinarity* 1(1): 53–79 http://dx.doi.org/10.1080/18186870608529706.

Maphalala, Mncedisi C. and N. Mpofu. 2017. 'Are We There yet? A Literature Study of the Challenges of Women Academics in Institutions of Higher Education'. *Gender & Behaviour* 15 (2): 9245–9253.

Maxwell, T. W., M. Mohamed, N. Mohamed, B. Naseer, A. Zahir, and A. Nasheeda. 2015. 'Becoming and Being Academic Women: Perspectives from the Maldives.' Edited by Y. Xian-han Huang. *Cogent Education* 2 (1): 1121062, http://dx.doi.org/10.1080/2331186X.2015.1121062.

Méndez Cota, G. 2019. 'Structural Violence and Scientific Activism in Mexico: A Feminist Agenda.' *Women's Studies* 0 (0): 1–21, https://doi.org/10.1080/00497878.2019.1593843.

Meriläinen, S., J. Tienari, R. Thomas, A. Davies. 2008. 'Hegemonic Academic Practices: Experiences of Publishing from the Periphery.' *Organization* 15 (4): 584-597.

Mukherjee, M. 2011. 'Women and Science in India: A Reader, Edited by Neelam Kumar.' *Crystallography Reviews* 17 (1): 75–78.

Njenga, M., N. Karanja, G. Prain, D. Lee-Smith and M. Pigeon. 2011. 'Gender Mainstreaming in Organisational Culture and Agricultural Research Processes.' *Development in Practice* 21 (3): 379–391, http://dx.doi.org/10.1080/09614524.2011.558061.

Noronha, V. 2013. 'The X Factor: An Indian Perspective on Women in Academic Oncology.' *Journal of Cancer Research and Therapeutics* 9 (4): 552–555, https://doi.org/10.4103/0973-1482.126431.

Pobłocki, K. 2009. 'Whither Anthropology without Nation-state? Interdisciplinarity, World Anthropologies and Commoditization of Knowledge.' *Critique of Anthropology* 29: 225–52.

Priyatna, A. 2013. 'Negotiating and Rethinking Local Culture: The Narratives of Indonesian Women Juggling Higher Education, Work, and Domestic Roles.' *Asian Journal of Women's Studies* 19 (4): 95-123, http://dx.doi.org/10.1080/12259276.2013.11666167.

Prozesky, H. and J. Mouton. 2019. 'A Gender Perspective on Career Challenges Experienced by African Scientists.' *South African Journal of Science* 115 (3/4): 40–44, https://doi.org/10.17159/sajs.2019/5515.

Santos, N. C. F., M. Valli, and V. da Silva Bolzani. 2019. 'A Brief Overview on Brazilian Women in Chemistry.' *Pure and Applied Chemistry. Chimie Pure et Appliquee* 91 (4): 743–749, https://doi.org/10.1515/pac-2018-1002.

Sinha, U. B. and D. Sinha. 2011. 'Are Indian Women Scientists Victims of the "Glass Ceiling"?' *Current Science* 100 (6): 837–840.

Stöckelová, T. 2012. 'Immutable Mobiles Derailed: STS and the Epistemic Geopolitics of Research Assessment.' *Science, Technology & Human Values*, 37(2): 286-311.

Stöckelová, T. 2016. 'Frame Against the Grain: Asymmetries, Interference, and the Politics of EU Comparison.' Pp. 166-186 in J. Deville, M. Guggenheim, Z. Hrdličková (eds.): *Practising Comparison*. Mattering Press. http://matteringpress.org/news/first-books-practising-comparison.

Stöckelová, T., F. Vostal. 2017. 'Academic Stratospheres-Cum-Underworlds: When Highs and Lows of Publication Cultures Meet.' *Aslib Journal of Information Management* 69(5): 516-528. https://doi.org/10.1108/AJIM-01-2017-0013

Viveiros de Castro, E. 2004. ; Perspectival Anthropology and the Method of Controlled Equivocation.' *Tipití: Journal of the Society for the Anthropology of Lowland South America*, 2(1): Article 1. http://digitalcommons.trinity.edu/tipiti/vol2/iss1/1

Yamazaki, Y., T. Uka, and E. Marui. 2017. 'Professional Fulfillment and Parenting Work-Life Balance in Female Physicians in Basic Sciences and Medical Research: A Nationwide Cross-Sectional Survey of All 80 Medical Schools in Japan.' *Human Resources for Health* 15 (1), https://doi.org/10.1186/s12960-017-0241-0.

Zhang, L. 2010. 'A Study on the Measurement of Job-Related Stress among Women Academics in Research Universities of China.' *Frontiers of Education in China* 5 (2): 158–176, https://doi.org/10.1007/s11516-010-0011-4.

Annex 1: Checklist

This annex provides a guide to addressing a gender perspective in international cooperation in STI in the form of a basic checklist. It was developed within the WP6 of GENDERACTION as part of the Deliverable report 14.

A. Preparation of International Agreements

1. Is gender equality clearly declared as a value in the draft international agreement?
2. Are the three main objectives of gender equality included in the draft international agreement?
    a. Is a gender balance in research teams incorporated in the draft international agreement?
    b. Is a gender balance in decision-making incorporated in the draft international agreement?
    c. Does the draft international agreement take into account the gender dimension of the focus and content of the research?
3. Is there a plan for the exchange of good practices between partners in international cooperation in STI?

B. Preparation of Programmes and Calls

4. Is gender equality clearly declared and addressed in the drafting of the programmes/calls?
5. Is gender equality in research teams given due priority in the draft programmes/calls?
6. Is the gender dimension in research content taken into account and promoted in the draft programmes/calls?
7. Are programme announcements, calls, and guidelines for applicants formulated in such a way that they do not discriminate against women but rather encourage women to apply?
8. Are programmes and calls formulated in such a way that they do not discriminate, directly or indirectly, against researchers with caring responsibilities? Do programmes address issues related to pregnancy, maternity/paternal/parental leave for Primary Investigators and members of research teams?
9. Is a specific programme in place to support gender research as a self-standing research area?

C. Proposal Evaluation and Funding Decisions

10. Is gender equality included among horizontal evaluation criteria?
11. Are applicants explicitly required to address the gender dimension in research proposals, especially in any calls involving humans?
12. If a programme or call explicitly mentions the gender dimension in research, are applicants required to provide an explanation of why they have not addressed the gender dimension in their research design?
13. Are there provisions in place to ensure a gender balance among evaluators, on evaluation panels, and on decision-making committees?
14. Is there a provision to include a member with gender expertise on evaluation panels and decision-making committees?
15. Is a system in place whereby evaluation moderators are made internally accountable for ensuring that evaluators are properly briefed on the gender issues to be addressed in the evaluation?
16. Are staff members and specifically programme managers, evaluators, and members of evaluation panels and decision-making committees trained in gender equality? Is the provision of gender training to all new staff members, and specifically to programme managers, evaluators and members of evaluation panels, envisioned in the future?

17. Is gender equality clearly indicated in the evaluation form template as a criterion of project evaluation?
18. Does the evaluation form template contain a clearly formulated question whether the proposal adequately addresses the gender dimension in research?
19. For call topics and programmes explicitly mentioning gender, do proposals that do not address the gender dimension in research receive a scoring penalty in the Excellence section that assesses the research design?
20. Is gender equality clearly indicated in the evaluation report prepared by evaluation committees?
21. Is the gender dimension in research clearly indicated in the evaluation report prepared by evaluation committees, especially in the case of programmes and calls explicitly addressing the gender dimension in research?
22. Is there an evaluation scoring advantage given to projects when the provision of gender training is envisioned for members of the research team?

D. Financial Rules and Eligible Costs

23. Are the costs of gender equality trainings and gender experts an eligible cost of the programme?
24. Are coaching, mentoring, or supervision for female team members included as eligible costs of the programme?
25. Are the costs for caring services or other family support services eligible costs of the programme, particularly in mobility support schemes?

E. Programme Monitoring and Evaluation

26. Are all programme monitoring and evaluation data collected and reported in a sex-disaggregated manner, especially with respect to the application and success rates for women and men applicants, the budgets allocated to women and men Principal Investigators, and the budget cuts for women and men Principal Investigators?
27. Is there a detailed system in place for collecting statistical data on the workforce of Principal Investigators/Coordinators and teams that distinguishes between research and administrative roles?
28. Are the three priorities of gender equality part of the mid-term and final review of projects?
29. Are the three priorities of gender equality a dimension of the programme evaluation?
30. Is the impact of gender equality measures assessed as part of the programme evaluation?

Annex 2: Literature review for different regions

The annex offers concise reviews of existing academic studies dealing with women and/or gender in science in the regions of Asia and the Pacific; Latin America and the Caribbean; Middle East and North Africa; and Sub-Saharan Africa. The reviews can be consulted when designing an agreement or a call for projects in order to gain specific insights into the situation in a particular region.

Introduction

This literature review was made between April 2019 and January 2020 as part of the WP6 'Gender in International Cooperation in Science, Technology and Innovation (STI)' of the GENDERACTION project. Sixty-five references were analysed. The aim was to gain a better understanding of the concerns and needs of women researchers and students in STI outside Europe and North America, and to find out whether the implementation of a gender perspective in STI was an issue in those regions.

Methodology

A decision was made to divide the regions as followed:

- Asia and the Pacific (which includes Australia, New Zealand and all the Pacific islands),
- Latin America and the Caribbean,
- the Middle East and North Africa, and finally,
- Sub-Saharan Africa.

We focused our research on these publishing platforms: Ebscohost, Jstor, Google Scholar, ProQuest, and Taylor & Francis. We conducted systematic searches using the following keywords: 'women', 'gender', 'research', 'science', 'STI'. We also chose to set a date limit from 1990 to now because this subject is quite recent and is evolving quickly. Indeed, retaining articles from the 1980s or earlier could have led us to take into account articles that are no longer relevant. Another criterion for our research was that the articles had to be written or co-written by researchers from the region in question because we value local points of view and wanted to prevent ourselves from perpetuating a North-South reading. In that perspective, we asked our colleagues from different regions to comment on our literature reviews.

Limits

This literature review is not exhaustive. Indeed, we found articles in every region, but they are not all well represented. Out of the 65 references, 26 deal with Asia and the Pacific, 11 with Latin America and the Caribbean, 10 with the Middle East and North Africa, and 18 with the Sub-Saharan Africa. Because of the lack of time and access, we could not read books available in our bibliography. We also believe that the language barriers prevented us from accessing relevant articles or books on the subject. We were able to find and read articles in English, French, Portuguese, and Spanish.

Asia and the Pacific

Introduction: The literature review on Asia and the Pacific is based on 26 references that were published between 2002 and 2019. Out of the 26, 3 are books that are not covered in this review but can be found in the references below. There are 10 countries represented, but almost half of the literature is on or from India (9). The other articles are from Australia (2), Japan (2), Malaysia (2), China (2), Hong Kong (1), Indonesia (1), New Zealand (1), the Maldives (1), South Korea (1), and Taiwan (1).

The word cloud produced by the keywords for scientific articles suggests that the main topics for the region are how women researchers deal with their careers, productivity, and performance, and how gender affects research and funding. Some of these studies also address the issue of the identity of being a researcher and specifically a woman.

Literature review

To start with, we present the positive developments over recent decades concerning women and gender in science, technology, and innovation. Six articles recognise the increased participation of women in STI studies (Hatchell and Aveling, 2008, Ip, 2011, Noronha Vanita. 2013, Rani and Luthra, 2011, Sinha and Sinha, 2011, Sood and Chadda, 2010). The authors who recognise this fact are from Australia, Hong Kong, and India. Indeed, *'by the middle of the first decade of the 21st century, more females than males were completing science degrees (in the category of natural and physical sciences) in Australia and* […] *the number was increasing at a faster rate (at an average of 30% to 37% more females than males)'* (Hatchell and Aveling, 2008, p. 357). This increase is mostly noticeable in psychiatry, medical sciences, and the life sciences in other countries of the region (Rani and Luthra, 2011, Sood and Chadda, 2010). In the Maldives, *'there is no institutional discrimination along gender lines in access to education and health services or for jobs in the public sector'* (Maxwell *et al.*, 2015, p. 2). Education for all has been reached. In India, in animal, plant, and medical sciences, women tend to fare better than men in getting grants, even though they apply less (Rani and Luthra, 2011, p. 39). In addition, the strong growth of the biosciences in Asia has stopped the *brain drain* they were facing. There are more opportunities for women now in their own countries. Indeed, *'countries in the region have placed a strong emphasis on establishing and developing their own homegrown industries. Research innovations, capabilities, output, and advances within the region are now on par with Western Europe and the US'* (Ip, 2011, p. 1029). This is due to the will on the part of the government and industry to develop their countries and *'these initiatives are opening up educational, training, and career opportunities in the region in areas such as basic and translational research, drug discovery, clinical research and development, regulatory affairs, biopharmaceutical manufacturing, and marketing and sales'* (p. 1029). One article from Australia focuses on the positive influences and factors that lead women researchers to be successful. They focus on research success and the strategies adopted. The results show that *'a women researchers' reason for conducting research, their marital status, their partner's level of involvement in research, levels of personal organisation by women researchers, their working partnerships and their perceptions of aspects such as their age and cultural background have been significantly identified as impacting upon current measures of academic effectiveness'* (Hartley and Dobele, 2009, p. 55). One last positive aspect is the following

result: in Malaysia, there is no difference between men's and women's journal publication rates (Kumar, 2016, p. 79).

Although this is encouraging, the authors also recognise that gender segregation when choosing what study programme to major in and when choosing a career still exists. The leaky pipelines, both during the period of study and a person's career, and the glass ceiling are also discussed in the articles. Research productivity is also a challenge.

Indeed, as proof of the gender segregation phenomenon, in the Kashmir area in India there is a smaller degree of discipline diversity among women than there is among men (8 disciplines against 18). More importantly, these 8 disciplines are all in the life sciences and technology sciences, which is consistent with what is said above. Moreover, there is gender segregation in the Maldives' higher education system because women cluster in education studies and health sciences, both as study choices and careers. In Malaysia, non-traditional careers for women are *'labour-intensive, scientific/technical, and supervisory'* types of career (Ismail *et al*. 2017, p. 20), meaning that less than 25% of women work in these fields. On the other hand, traditional careers are *'nurses, secretaries and schoolteachers'* (p. 20). On the other hand, in India men researchers form the majority in the *'basic sciences, i.e. physics, chemistry and mathematics'* (Sinha and Sinha, 2011, p. 839).

Leaky pipelines are a colossal issue in the region as they are for the rest of the world. In India, *'the representative data for biology department in some central universities show that the proportion of women faculty ranges from 10% to 22%, and there are proportionately more women at the junior level than at the senior level'* (Rani and Luthra, 2011, p. 39). They continue by explaining that *'unlike many Western countries, the problem in India is twofold: (1) getting more women to study science and technology and (2) ensuring that those who study are able to pursue a career in science and technology'* (p. 39). Indeed, after a PhD, women *'constitute only 15.6% of the total manpower employed in R&D establishment and 12.7% of the total personnel performing R&D activities'* (pp. 39-40). In South Korea, 22% of women participate in science and engineering doctorate, which is quite good, but it seems hard to gain entry into the workplace. The author talks about a *'clogged pipeline'* (Shin, 2012, p. 31). In Australia, despite the increase of women, the 'pipeline effect' did not work and *'turned out to be very leaky indeed'* (Hatchell and Aveling, 2008, p. 357).

Nancy Ip shares this point as she notes that women in Asia choose to study science but not to pursue a career: *'While efforts are being made to increase the participation of women in science at all levels, from recruiting more female graduate students to the appointment of women as senior research fellows and other high-level positions, the number of women in senior level positions is still very low (Ip, 2008, p. 1030).*

In Indonesia, 6.62% of women attain a university degree compared to 7.12% of men. There is a difference between rural (2.90% of women and 2.95% of men) and urban areas (10.24% of women and 11.20% of men). Additionally, more women than men enrol at university but more men than women finish their degrees (Priyatna, 2013, p. 99). The leaky pipeline is accompanied also by the issue of the glass ceiling or 'glass corridor'. Indeed, many countries face difficulty in promoting women in leadership positions or awarding them. There is extensive literature on India's glass ceiling, which applies especially in the case of doctors and psychiatrists. *'A study on the career trajectories of male and female recipients of a career development award, found that women were significantly less likely to attain success'* (Noronha, 2013, p. 552). In addition, *'women are significantly less likely to receive research funding'* (p. 552) and they have lower salaries (*'average $30,000 less in annual salary'*). Another example shows that the Indian Psychiatric Society has only had four women presidents since 1947. They do not have women editors of journals or on the editorial boards. A statistical study shows that *'southern Indian states seem to encourage women's participation in engineering and technology education'* (Mukherjee, 2011, p. 77), but there are disparities in earnings and employment (p. 78).

Women hold only 15% of faculty positions and only 14 women (3%) have earned the most prestigious award in the country (Sinha and Sinha, 2011, p. 837).

Another aspect that is reviewed in the literature is research productivity because it is seen as a marker of research excellence. While almost all Indian articles show that women are less productive than men, one article is confident in the fact that this is changing: *'In [a] nutshell, men, comparatively throughout their careers, remain more productive than women in research. However, the positive trend derived from the literature is that despite the continued existence of the gender differences in research productivity, patent creation, funding, and collaboration, women's research activity has been clearly improving, and gender gap in research is gradually disappearing with the passage of time, though not completely eradicated as many obstacles hinders their performance'* (Loan and Hussain, 2017, p. 6).

In addition, research productivity is seen as a stress factor for women in China (Zhang, 2010, p. 168).

All these challenges faced by women in STI in the region are due to different factors such as the life–work imbalance, the political, cultural, or religious context, and organisational aberrations that support discrimination, etc.

Indeed, the most important obstacle explaining the difficulties faced by women researchers is life–work management. Attending late meetings and working long hours can sometimes be complicated for women who have children (Matsui *et al.*, 2019; Noronha, 2013). It is also hard for them to attend workshops and conference and engage in networking outside their regions because of the incompatibility between the remoteness of these events and the women's household and family duties (Sinha and Sinha, 2011, p. 839). When they do spend a lot of time at work, women tend to feel a sense of guilt and an inner conflict *'between their career demands and their family responsibilities; and finally between the conflict of traditional and modern thinking on women'* (Zhang, 2010, p. 160). This is very strong in China, Japan, and Indonesia. An interesting article about doctors in Japan shows that women before marriage feel a conflict between being a good doctor and being a woman who is dating. Plus, they feel the social pressure to start a family. After marriage and childbirth, women feel a conflict between being a doctor and being a woman/mother. They feel guilt and shame if they are unable to work nightshifts for a while and are criticised by their colleagues, especially by the ones who do not have children (Matsui *et al.*, 2019, p. 6). In Indonesia, the social norms on motherhood are also very strong. Therefore, when women decide to pursue a higher education degree or a career in STI, it may happen that they need to persuade their partner and family. This can lead to a competition with the husband who does not want to have a lower degree qualification. The women interviewed for the study also noted that some women were punished for wanting to continue studying: some men had affairs or sought a divorce (Priyatna, 2013, p. 110). In North-East India, there is a lack of data on the life management of women in STI. On paper, there is no glass ceiling because there is no salary difference, but the data do not take into account the double burden (Sinha and Sinha, 2011, p. 839). The fact that women scientists in the Kashmir region of India face more challenges than others can be explained by the fact that this region is a conflict zone. There is a curfew for women, they are usually the caregivers and have home duties. In addition, they stay in their labs rather than in the field because of the dangers outside (Kaw and Ahmad, 2014, pp. 692-694).

Other aspects that impede women's participation and career growth in STI are institutional and organisational aberrations. The globalisation and privatisation of education and research are then seen as factors that do not help increasing women in sciences. In India, '*reduced government aid coupled with the increasing cost of education are the key factors affecting women's enrolment in science'* (Mukherjee, 2011, p. 77). Also, poor recruitment and selection policies, the lack of mentors and role models, and insufficient career development and promotion policies are cited as structural

barriers to gender equality in academia by different authors, whether in Australia, China, India, Japan, Malaysia or South Korea (Hartley and Dobele, 2009; Ip, 2011; Shin, 2012).

We wish to highlight another explanation that authors investigated, which is the *'inadequate appraisal system and male dominance in institutional power'* (Hartley and Dobele, 2009, p. 46). The idea that antidiscrimination legislation is crucial but does not adequately address overt and covert discrimination was expressed by Australian researchers (Hatchell and Aveling, 2008). Overt discrimination is sexual and verbal harassment, which occurs not only in Australia, as showed Ismail *et al*. (2017, p. 21). Covert discrimination is about sexism and racism at the workplace, *'stereotype threat'* (Ismail, 2017, p. 23), and the consequences of these phenomena, such as difficulty gaining entry into the 'boys club' and into networks. The scientists interviewed by Hatchell and Aveling *'were able to clearly identify many instances of covert discrimination in the form of sexual discrimination, sexualization, male privileging, and the existence of an obvious glass ceiling'* (p. 368). In China, women are not supposed to be too aggressive in their work, otherwise they are judged to be a 'superwoman', the connotations of which are negative (Zhang, 2011). The author also denounces *'the double standard in behavior expectations of males and females, which evaluate, reward and punish identical behavior of women and men differently'* (p. 171). An article from New Zealand shows that Maori women scientists feel prejudged just because of the way they look, *'through having the visual markers of being a "Maori woman" and that this interferes with her identification as a "scientist"'* (McKinley, 2002, p. 6).

The different religious and geopolitical contexts can also affect women scientists and students. Here we present the findings of Monika Mukherjee in her book review of *Women and Science in India: A Reader*, edited by Neelam Kumar. Her review shows that, in India, during colonial times, *'the identification of science with masculinity and Western culture played a key role in the neglect of both education and medical facilities for Indian women'* (p. 76, Geraldine Forbes). Religion and political institutions also had an impact on male medical professionals accessing Indian women because of the secluded spaces and prevented women to access knowledge on their own bodies (Antionette Burton). The Dufferin Fund was also analysed as a Western fund that reinforced colonialism through the need for Western medicine, but, on the other hand, it allowed women to become *'female health care workers'* for Indian women (Maneesha Lal). An interesting article reports that, during pre-independence, when there were a lot of movements happening, research institutions *'perpetuated their own gender bias'* (p. 76), which meaning that in labs women were still facing discrimination (Abha Sur). In contemporary times, researchers call into question the applicability of Western theories of gendered science to Indian contexts: *'importing American cultural models of gender, schooling and career choices would be inappropriate to the Indian setting, since post-independence India had a longer and stronger history of public commitment to gender equality than that in the United States or in other developed Western countries'* (p. 77, Carol C. Mukhopadhyay). The problem of women scientists and feminism is that *'women academicians have kept themselves completely dissociated from'* feminist movements although they are aware of their situation as women (Lalita Subrahmanyan).

We can also find many recommendations from these articles. To fix the inequalities and prevent others from happening, the authors recommend the organisation of mentorship and the promotion of more women in leadership positions through, for example, quotas of 30% of women in governing bodies as a five-year goal (Ananth, 2014, p. 1366; Sinha and Sinha, 2011). Also, when looking at promotion and selection strategies, *'whole-hearted efforts are required to bring about radical changes in recruitment policies like doing away with the age bar, and ignoring the gaps in career while making selection of deserving women candidates'* (Rani and Luthra 2011, p. 42). Teaching needs to be considered so that the grants do not rely only on research merit. Moreover, *'to consider her for promotion along with her batch of recruits but associate a 3/2 multiplicative factor to the work she completed during the period considered for evaluation'* (Ananth, 2014, p. 1366). This would prevent

women from having a delayed promotion or no promotion at all just because of maternity leave and would reassure them of the fact that they do not need to choose between work and a family. Family-friendly measures should be implemented, such as having crèches and qualified child-care workers. *'This will allow faculty to leave their children in a safe environment and focus on research, teaching and attending meetings, they would otherwise be forced to skip'* (Ananth, 2014, p. 1366). Vanita Noronha agrees with this and proposes the ideas of *'creation of part-time career options, onsite childcare facilities, elimination of after-hour meetings, and other methods, to encourage and support the women faculty'* (2013, p. 554).

Higher education institutions should also take responsibility by creating diversity and/or gender committees, being transparent (Ip, 2011, p. 1932), and addressing sexual harassment proactively rather than reactively (Hatchell and Aveling, 2008, p. 372). Researchers should cooperate with *'development agencies and women's federations to promote gender equality and justice together and especially focus on influencing policy-making and leaders in the higher education system'* (Fangqin, 2005, p. 16). The need for interdisciplinarity was also cited several times in the articles (Fangqin, 2005; Rani and Luthra, 2011).

References

- Articles:

Ananth, S. 2014. 'Women Leaders in Indian Science.' *Current Science* 107 (9): 1366–1366.

Fangqin, D. 2005. 'Developing Women's Studies at Universities in China: Research, Curriculum and Institution'. *Asian Journal of Women's Studies* 11 (4): 35–71.

Hartley, N. and A. Dobele. 2009. 'Feathers in the Nest: Establishing a Supportive Environment for Women Researchers'. *Australian Educational Researcher* 36 (1): 43–58, http://dx.doi.org/10.2190/WR.13.4.b.

Hatchell, H. and N. Aveling. 2008. 'Those Same Old Prejudices? Gendered Experiences in the Science Workplace'. *Journal of Workplace Rights* 13 (4): 355–375.

Ip, N. Y. 2011. 'Career Development for Women Scientists in Asia'. *Neuron* 70 (6): 1029–1032, https://doi.org/10.1016/j.neuron.2011.06.008.

Ismail, M., N. Zulkifli, and S. R. Hamzah. 2017. 'Insights on Engineering as a Non-Traditional Career Field for Women'. *Global Business and Management Research* 9 (4): 17–36.

Kaw, M. A. and S. Ahmad. 2014. 'Gender Prejudice in the Research World: Female Researchers in a Conflict Zone, Kashmir'. *Library Review* 63 (8/9): 684–699, https://doi.org/10.1108/LR-04-2013-0051.

Kumar, S. 2016. 'Effect of Gender on Collaborative Associations of Researchers in Malaysia'. *The Electronic Library* 34 (1): 74–82, https://doi.org/10.1108/EL-09-2014-0162.

Loan, F. A. and M. Hissain. 2017. 'Gender Variations in Research Productivity: Insights from Scholarly Research'. *Library Philosophy and Practice (e-journal)*: 1–12.

Matsui, T., M. Sato, Y. Kato, and H. Nishigori. 2019. 'Professional Identity Formation of Female Doctors in Japan – Gap between the Married and Unmarried'. *BMC Medical Education* 19 (55): 1–9, https://doi.org/10.1186/s12909-019-1479-0.

Maxwell, T. W., M. Mohamed, N. Mohamed, B. Naseer, A. Zahir, and A. Nasheeda. 2015. 'Becoming and Being Academic Women: Perspectives from the Maldives.' Edited by Y. Xian-han Huang. *Cogent Education* 2 (1): 1–11, http://dx.doi.org/10.1080/2331186X.2015.1121062.

McKinley, E. 2002. 'Brown Bodies in White Coats: Maori Women Scientists and Identity'. *Journal of Occupational Science* 9 (3): 109–116, http://dx.doi.org/10.1080/14427591.2002.9686498.

Mukherjee, M. 2011. 'Women and Science in India: A Reader, Edited by Neelam Kumar'. *Crystallography Reviews* 17 (1): 75–78, https://doi.org/10.1080/08893111003707419.

Noronha, V. 2013. 'The X Factor: An Indian Perspective on Women in Academic Oncology'. *Journal of Cancer Research and Therapeutics* 9 (4): 552–555, https://doi.org/10.4103/0973-1482.126431.

Priyatna, A. 2013. 'Negotiating and Rethinking Local Culture: The Narratives of Indonesian Women Juggling Higher Education, Work, and Domestic Roles'. *Asian Journal of Women's Studies* 19 (4): 95-123, http://dx.doi.org/10.1080/12259276.2013.11666167.

Rani, K. and R. Luthra. 2011. 'Are Research Grants Free from Gender Bias: An Overview of Funding Pattern of CSIR Extramural Research Projects in Life Sciences'. *Current Science* 100 (1): 38–42.

Shin, H. J. 2012. 'On Raising the Work Profile of South Korean Women Scientists and Engineers'. *Gender, Technology and Development* 16 (1): 29–47, https://doi.org/10.1177/097185241101600102.

Sinha, U. B. and D. Sinha. 2011. 'Are Indian Women Scientists Victims of the "Glass Ceiling"?' *Current Science* 100 (6): 837–840.

Sood, M. and R. Chadda. 2010. 'Women Psychiatrists in India: A Reflection of Their Contributions'. *Indian Journal of Psychiatry, suppl. Suppl* 3 (52): 396–401, https://doi.org/10.4103/0019-5545.69277.

Yamazaki, Y., T. Uka, and E. Marui. 2017. 'Professional Fulfillment and Parenting Work-Life Balance in Female Physicians in Basic Sciences and Medical Research: A Nationwide Cross-Sectional Survey of All 80 Medical Schools in Japan'. *Human Resources for Health* 15, https://doi.org/10.1186/s12960-017-0241-0.

Zhang, L. 2010. 'A Study on the Measurement of Job-Related Stress among Women Academics in Research Universities of China'. *Frontiers of Education in China* 5 (2): 158–176, https://doi.org/10.1007/s11516-010-0011-4.

Zxyyann J. L. 2017. 'Female Identity in Science: Memories of the Visit of Dr. Evelyn Fox Keller'. *East Asian Science, Technology & Society* 11 (3): 433–436, https://doi.org/10.1215/18752160-3916745.

- Books:

Gu, D. Y. 2016. *Chinese Dreams? American Dreams?: The Lives of Chinese Women Scientists and Engineers in the United States*. Rotterdam: Brill | Sense.

Krishna, S. and G. Chadha. 2017. *Feminists and Science : Critiques and Changing Perspectives in India*. Los Angeles [California]: Sage Publications Pvt. Ltd.

Neelam K. 2012. *Gender and Science: Studies across Cultures*. Delhi: Cambridge University Press India Pvt Ltd.

Latin America and the Caribbean

Introduction: The literature review is based on 11 references that were published between 2001 and 2019, but 10 of them were published after 2014, so we have a recent point of view on the region. The articles are from Brazil (1), Chile (1), Colombia (2), Mexico (4), Venezuela (1), and regional collaborations (2) and those were written by authors coming from Argentina, Colombia, Mexico, and Spain. It gives an idea of what is the status of women scientists in South America and of one country of Central America (Mexico), but not of the Caribbean. Finally, one reference is a book that has not been reviewed (Arenas *et al.*, 2001).

The word cloud suggests that the main topics are gender and women in STEM, feminism, and the challenges women can face in terms of participation and productivity. Compared to the other regions, a new aspect emerges, which is transgenderism in science.

Literature review

The literature review of the 10 articles indicates that the situation is quite similar in every country represented. The most salient issues are the leaky pipeline, gender segregation, and women's publishing productivity.

They face a leaky pipeline both in academic positions and in student degrees. This issue is dealt with by 5 articles out of 10. Women students usually outnumber men students at the bachelor level but not at the master's or PhD levels (Rojas *et al*., 2015). In Venezuela, there are more women researchers than men (53% vs 47%). In Brazil, the share of women leaders of chemistry research groups surpassed that of men (52% vs 48%), but the prizes, awards, and high positions still belong to men (Santos *et al.*, 2019). Women make up only 15% of the members of the Brazilian Academy of Science and 22% of young affiliated researchers. Overall, women remain at the bottom, meaning in a junior or assistant researcher status (Avila *et al.*, 2015, Efrain *et al.*, 2014, Medina *et al.*, 2016).

They also face gender segregation regarding the disciplines in which women are more important. Indeed, in Venezuela, we find that women make up more than 60% of people in medical sciences, paediatrics, economy, linguistics, law, psychology, and ethics and men more than 60% of people in physics, maths, earth sciences, philosophy, astronomy, and astrophysics (Efrain *et al.*, 2014). That is something that is shared in the world.

There is also an interest in women researchers' publishing rates, as an indicator of their success, like in Middle East and North Africa. In Venezuela, for instance, the study shows that there are more women researchers than men researchers, but that men publish 8.35% more.

We can find some partial explanations for all this in the articles. For instance, work–life imbalance is cited as a factor that prevents women to spend as much time as they would like to on their career. Although, Gonzales *et al.* (2018) show that the use of information and communication technologies has been a great help in fighting this. Indeed, the women researchers studied largely used mobile phones and laptops, allowing them to work remotely wherever they want and while commuting. This also allows them to have instant access to information and knowledge and to participate in collaborative work using qualitative and quantitative software, for example. It gives them flexibility for managing their personal life. However, it has benefits only on the condition of having access to these

ICTs, and it also reinforces asymmetrical gender relations since the time they gain with ICTs is mainly used to take care of their family or partnership.

On the other hand, two articles called into question the assumption that work–life imbalance is one of the main factors that holds women back in their professional life. In fact, concerning publication productivity, the results show that there is a significant difference between professional categories in terms of the number of publications but not between gender (Efrain *et al.*, 2014, p.111). Thus, the most important variable is professional status. Concerning emotional burnout syndrome, *'although there are references to the role conflict with women's traditional roles, these are not presented as the most important in the development of research, because the frequency of expressions on the issue was minimal'* (Medina, 2016, p. 63). It is rather structural and administrative issues that trigger EBS. *'The results indicate the presence of emotional distress syndrome in the study population, which goes beyond a gender issue, it refers to problems of organizational structure, widely studied in the literature and that relate the multiplicity of tasks that generates an overload of functions, such as the main factors that trigger emotional exhaustion, depersonalization and a progressive decline of the sense of personal fulfilment'* (Medina *et al.*, 2016, p. 63). Sexual harassment (Cota *et al.*, 2019) and an overall lack of professional skills are also cited as factors (Avila *et al.*, 2015).

Authors also refer to the presence of structural violence against women in research. This is due to the Western way of doing science. *'In so far as the "gender perspective" in Mexican science policy does not question the neoliberal dynamics of global knowledge production, it renaturalizes Eurocentrism and effects a remasculinization of "science" by turning the ideal of "women in science" into a cog of capitalist subjectivation, by means of which competition and profit displace long-standing feminist concerns with social justice, cooperation, and care'* (Cota, 2019, p. 12). Authors criticise western feminism as a State feminism that cooperates with neoliberal values. This feminism is a *'calculative individual and entrepreneurial subjectivity [that] has become the mark of contemporary feminism'* (p. 12). The notion of 'autonomy' is more important for Mexican women than the home/work division issues that Western second-wave feminists lived. Most women in the region are working-class or rural and indigenous women. This implies different needs and different solutions.

Authors thus try to find adapted solutions such as raising self-confidence in women and standing up against discrimination or **"***implement[ing] laws to decrease the disparities of time taken to take care of infants'* (Santos *et al.*, 2019, p. 748). Efforts should be made to bring more women leaders into the areas that will become important for fulfilling sustainable goals such as *'energy, engineering, transportation, information technology and computing'* (Santos *et al.*, 2019, p. 749).

Concerning publication productivity, Rojas *et al.* came up with four recommendations: **"***1. To enhance the relationship between women researchers and their lines of research through web-based tools or specific social networks (Google groups, blogs and Facebook, for example). 2. To create a common code in the Spanish language that unifies quality and visibility criteria. 3. To obtain from UNESCO a specific code for communication, independent from Sociology and other social sciences or humanities. 4. To improve access to indexing systems.'* (Rojas et al, 2015, p. 465)

Another aspect that is highlighted in the articles is the importance of diversity and subversion in science. One author takes the example of the success story of a Colombian transgender woman biology researcher who became the directress of a national institute (Pérez-Bustos, 2014 & 2016). This shows that we can do science differently and that the presence of trans scientists can change society's vision about trans people and about science. This trans researcher participates in the vulgarisation of science by using caring practices. She *'creatively undertake[s] the pedagogical negotiations through which to reach a variety of publics, understand their needs and fears, and familiarize them with science'* (Pérez-Bustos, 2014, p. 858).

The subversion not only comes from gender subversion but also from another way of being a feminist in

science, as expressed by Cota (2019), and by Sued (2018) and her literature review of the reception of cyberfeminism in the Spanish-speaking world. The post-feminism of Donna Haraway is supposed to unify all women and all feminists. However, it works well only from a white Western point of view because English is the main technology language, and everything happens in the West/North. Feminism in Latin America *'demands respect for diversity and for staying together to confront the sad extreme adversities of violence and social exclusion, which are obstacles to women's control of their own bodies, among other sources of oppressions'* (Sued, 2018, p. 100).

References

Arenas, J. L. de, J. Valles. 'Women Pioneers of Mexican Health Sciences Research.' *Proceedings of the 8th International Conference on Scientometrics and Informetrics*, 2001, 411–417.

Ávila, A., L. Meza-Montes and S. Ponce-Dawson. 2017. 'The First Latin American Workshop on Professional Skills for Young Female Scientists.' *AIP Conference Proceedings* 1697, 1: 1–3.

Efraín G., Preiddy, C. García Zorita and E. Sanz Casado. 2014. '¿Paridad Equivale a Igualdad? Eficiencia de La Producción Científica de Las Investigadoras Venezolanas'. (Is parity the same as equality: Efficiency of scientific output of Venezuelan female researchers). *Investigación Bibliotecológica*. 28 (62): 101–122, https://doi.org/10.1016/S0187-358X(14)72568-7.

González, G. G. M. and C. I. Torres. 2018. 'Las Mujeres y La Sociedad Del Conocimiento: Uso y Aplicabilidad de Las TIC Por Las Investigadoras'. *Revista de Estudios de Género. La Ventana* 6 (48): 208–235, https://doi.org/10.32870/lv.v6i48.6662.

Medina, D. E. M., E. G. S. Pérez and N. A. Morales. 2016. 'Emotional Burnout Syndrome in Women Researchers. the Case of the Juárez Autonomous University of Tabasco'. *Vivat Academia* 19 (136): 52–67.

Méndez Cota, G. 2019. 'Structural Violence and Scientific Activism in Mexico: A Feminist Agenda'. Women's Studies 0(0): 1–21, https://doi.org/10.1080/00497878.2019.1593843.

Pérez-Bustos, T. 2014. 'Of Caring Practices in the Public Communication of Science: Seeing through Trans Women Scientists' Experiences'. *Signs: Journal of Women in Culture & Society* 39 (4): 857–866, https://doi.org/10.1086/675540.

Pérez-Bustos, T. 2016. 'La personificación de la ciencia del cuidado: análisis etnográfico de las prácticas comunicativas en los medios de una científica trans colombiana' (Embodying a Caring Science: An Ethnographic Analysis of the Communicative Practices of a Colombian Trans-Woman Scientist in the Media). 82 (82): 429–459, https://doi.org/10.11144/Javeriana.uh82.ecse.

Rojas, C. F. del Valle, D. Caldevilla Domínguez, and C. Pacheco Silva. 2015. 'The Presence of Chilean Women Researchers in Spanish-Language Journals'. *Revista Latina de Comunicación Social* (70): 451–467, https://doi.org/10.4185/RLCS-2015-1054en.

Santos, N. C. F., M. Valli, and V. da Silva Bolzani. 2019. 'A brief overview on Brazilian women in chemistry'. Pure and Applied Chemistry. Chimie Pure et Appliquee 91 (4): 743–749, https://doi.org/10.1515/pac-2018-1002.

Sued, G. E. 2018. 'The Cyborg Metaphor in Ibero-American Science, Technology and Gender Literature'. *Tapuya: Latin American Science, Technology and Society* 1 (1): 95–108, https://doi.org/10.1080/25729861.2018.1501242.

Middle East and North Africa

Introduction: The literature review is based on 10 articles that were published between 2006 and 2017. It is important to note that the MENA countries are not all well represented. The articles come from Iran (4), Israel (1), Kuwait (1), Turkey (1), and the Middle East as a region (3). North African countries are not represented at all here. Moreover, the researchers that wrote about the Middle East as a region are from Jordan, Egypt, and Israel. This offers a better representation but still not enough. Note also that there was one article, in Turkish, that the authors of this report thus could not read.

The word cloud suggests that the main concerns of the region are about the participation of women scientists in research and article collaborations. There seem to be a specific concern about linking feminism, science, gender studies, and Islamic religion.

Literature review

The main concern for the region seems to be women researcher's productivity. Women researchers seem to be less productive than men researchers in terms of the number of publications, in their participation in conferences, and in different patterns of research. The authors of one article evidenced that Iranian *'women are more active in the areas of chemistry, clinical medicine, general social sciences, psychology, molecular biology and genetics, engineering, neuroscience and behaviour and plant and animal science'* (Davarpanah and Moradi Moghadam, 2012), a finding that is backed by Khosrokhavar and Ghaneirad (2010). Furthermore, *'a high proportion of female authored papers (81.79 per cent out of the total) are the result of collaboration#* rather than individual publications (less than 1% in Khosrokhavar and Ghaneirad's study), and that there are more local than international collaborations. *'It is yet to be seen whether the rise of women in higher education will change a genuine change in the current scholarly publication growth, or if it will simply lead to the continuation of the same or less growth'* (Davarpanah and Moradi Moghadam, 2012, p. 269).

One article (Al-Enezi, 2007) suggests that Kuwaiti women scientists have more trouble accessing funds than men, but the article dates from 2007 and analyses data from 1990 to 2005. His literature review is based on articles from the 1980s and 1990s, so his results might not be relevant anymore. Al-Enezi studies different dimensions that can have an impact on the ability of researchers to access university-funded research. One of them is Dimension B, the *'characteristics of the faculty members'*, and there are six such characteristics, including 'gender differences'. This factor is reported as the fourth one out of the six in a questionnaire aimed at faculty members. He concludes from this number that *'gender differences play a role in the being involved in research work'* (p. 722). He forgets to say, however, that 54.5% of his interviewees either feel neutral about or disagree or strongly disagree with this statement. It moreover feels like he is trying to make his point using the literature review he conducted rather than his own results, and he then talks about women researchers being less productive and having different research and teaching patterns – which are not things he studied with his questionnaire.

A few other articles deal with science and feminism. There were two articles focusing primarily on geography and they found that this discipline was showing a great deal of resistance to including a gender and feminist perspective. *'To a large extent, gender blindness in Israeli geography results*

from compliance with the national ethos and its myth of women's equality – one of its most important keystones' (Blumen and Bar-gal, 2006, p. 343). Their literature review and study of the past thirty-two annual meetings of the Israeli Geographical Society show that *'the IGS conference offers more space for professional women than the departments in research universities offer to female faculty'* (p. 350), but that *'the majority of the professional women are clustered in the less prestigious parts of the conference, despite their growing numbers. This reveals the tension stemming from two organizing principles of the academic conference, solidarity and hierarchy'* (p. 350). A more recent article about gender and geography and other social and political sciences in the Middle East indicates that *'there is extensive work in Egypt, Israel, Palestine and Turkey whereas less or no research or teaching in these fields in Qatar, Oman, Iraq, Jordan, Saudi Arabia and Syria'* (Fenster and Hamdan-Saliba, 2013, p. 530-531). Most researchers on these topics are women and they are mainly in the social and political sciences rather than geography or urban studies, which echoes the situation in the rest of the world. Also, the main geography topics found in the journals they studied refer to women in the private/public space, migration, diasporas, refugees, and the veil. The veil is a subject that has been particularly studied by researchers outside the Middle East. Women's bodies have been *'a battleground between the colonist and the colonized'* (p. 538). As Mervat Hatem (2013) argues, the veil is a big issue in Arab Feminism. She defends the idea that secular feminists have internalised Western feminist values and tend to diminish women who choose to wear the hijab, whereby they *'monopolize the agency for themselves and deny it to their Islamist counterparts'* (Hatem, 2013, p. 99). According to her, there can be a women-friendly reinterpretation of the Koran, which until now has been interpreted only by men and in a patriarchal way, and that could lead to an improvement in the situation of women in the Middle East. However, *'the danger may come from the attempt by some Islamic feminists to reproduce the old objectionable attitude of some secular feminists who wished to monopolize the right to speak for all women and to silence dissenting feminist voices. If Muslim feminists deny the secular feminists their place at the table in the discussion, then we are doomed to repeat history instead of moving forward'* (Hatem, 2013, p. 100).

There seems to be an argument about the fact that women's access to education and especially the sciences is no longer the priority, but rather the issue is women's access to PhDs and professorships (and other academic positions) as well as decision-making positions. This necessitates institutional and cultural change. In Iran, *'[t]he number and the proportion of women who are members of academia and institutions of higher education are low and the situation has not changed drastically during the last two decades'* (Khosrokhavar and Ghaneirad, 2010, p. 229). In 2005, 20% of university professors were women, with women making up 8% of full professorships, 11% of associate professors, 17% of assistant professors, and 23% of lecturers. The resistance is even more present in government universities than in private or semi-private universities. Additionally, women researchers win fewer prizes than men in Iran: *'2.3 percent of the academic prize-winners of the Kharazmi Scientific festival were women, only 6.3 percent in the applied sciences, 3.4 percent in the development research and zero in innovation and invention'* (Khosrokhavar and Ghaneirad, 2010, p. 235). Women made up only 5% of those honoured with the 'Distinguished Professor of the Year' prize over the years. Finally, there are also fewer women than men in management and decision-making positions in HEI. Indeed, *'the proportion of women presidents in public universities in Iran is insignificant: in 2005 it was 1.8 percent and the proportion of vice-presidents was only 3.9 percent'* (Khosrokhavar and Ghaneirad, 2010, p. 236). There are none in research centres and only one in a non-governmental HEI. Around only 5% of positions in journal editorial boards are occupied by women.

Rana Dajani (2012, p. 9) argues that Arab women face similar problems to the rest of the world, such as having to work a double shift (work and family), but one difference from other countries is that *'most will not give up home for work'*, and that taking care of their family can be a choice and should be respected. Although, the scientific system is not adapted for this choice (for example, the L'Oréal UNESCO award is based on a male scale; you have to be under 40 to apply for the fellowship: *'This*

is biased, and based on metrics from a male-dominated world, in which if a man doesn't make it by 40 he is a failure'). They then do not have time to network, lobby, mentor, or be mentored. She insists on mentorship programmes that the Arab world apparently lacks and the possibility of doing this online, which would be more accessible from home. Women in the Arab world also face specific challenges that do not call for the same solutions as in Western countries, such as the wish to not work more, or the idea that covering one's hair or face for religious or tradition reasons is seen as oppression. She then recommends that these challenges *'must be identified, studied and solved by Arab women themselves'* and that *'one must not fall into the trap of transferring solutions from one culture to another'*, which echoes what Hatem says in her article.

Finally, one article (Rahmani, Azam *et al*. 2015) suggests that sexuality-related researches can face several challenges in Iran. Indeed, for such research the ethics committee did not want them to use focus group methodology but rather individual interviews because the committee was afraid that having group conversations about these topics would motivate the young women to have more premarital sexual experiences, so the researchers had to explain the benefits of this method. Second, recruitment was hard because of the 'language of silence'. In Iran, they do not talk about sexuality and especially not with young women. There were also privacy concerns from the interviewees, so the researchers had to adapt how they behaved and did things gradually and always with their consent. There was also the problem of the sex segregation policy (the fact that a single woman was not welcome to interview young men about sexuality), so they finally decided not to study men.

References

Al-Enezi, A. K. 2007. 'Why Academics Fail to Utilize Academic-Funded Research Opportunities? An Empirical Study'. *International Journal of Management* 24 (4): 712-726.

Blumen, O. and Y. Bar-Gal. 2006. 'The Academic Conference and the Status of Women: The Annual Meetings of the Israeli Geographical Society'. *The Professional Geographer* 58 (3): 341–355, https://doi.org/10.1111/j.1467-9272.2006.00572.x.

Dajani, R. 2012. 'How Women Scientists Fare in the Arab World.' *Nature* 491 (7422): 9–9.

Davarpanah, M. R. and H. M. Moghadam. 2012. 'The Contribution of Women in Iranian Scholarly Publication'. *Library Review* 61 (4): 261–271, https://doi.org/10.1108/00242531211267563.

Fenster, T. and H. Hamdan-Saliba. 2013. 'Gender and Feminist Geographies in the Middle East'. *Gender, Place & Culture* 20 (4): 528–546, http://dx.doi.org/10.1080/0966369X.2012.709826.

Hatem, M. 2013. 'What Do Women Want? A Critical Mapping of Future Directions for Arab Feminisms'. *Contemporary Arab Affairs* 6 (1): 91–101, http://dx.doi.org/10.1080/17550912.2012.756631.

Khosrokhavar, F. and M. A. Ghaneirad. 2010. 'Iranian Women's Participation in the Academic World'. *Iranian Studies* 43 (2): 223–238, http://dx.doi.org/10.1080/00210860903542093.

Körükmez, L. 2016. 'Kadin Arastirmacilarin Erkek-Dominant Sahada Çalismasi Mümkün mü?/Is it possible for women researchers doing fieldwork in male-dominated site?' *Fe Dergi* 8 (2): 62–72.

Nourmohammadi, H. and F. Hodaei. 2014. 'Perspective of Iranian Women's Scientific Production in High Priority Fields of Science and Technology'. *Scientometrics* 98 (2): 1455–1471, https://doi.org/10.1007/s11192-013-1098-1.

Rahmani, A., E. Merghati-Khoei, L. Moghaddam-Banaem, F. Zarei, A. Montazeri and E. Hajizadeh. 2015. 'Sexuality Research in Iran: A Focus on Methodological and Ethical Considerations'. *Iranian Journal of Public Health* 44 (7): 979–986.

Sub-Saharan Africa

Introduction: The literature review is based on 18 articles that were published between 2005 and 2019. Just like the MENA region, this literature review does not represent the Sub-Saharan African region in its diversity because the articles are from a few countries only: Cameroon (1), Kenya (1), Nigeria (5), Senegal (1), South Africa (6), and Africa as a continent (4). These countries each represent one sub-region of Africa (western, central, eastern, southern). In addition, researchers from those same countries wrote the articles about Africa as a continent so this really shows that we would need more articles from other countries to have a better idea of the region's concerns. In addition, they are also either former British or German colonies and thus have English as an official language, so that may be another reason why we are able to find articles in English more easily than in Central or North Africa, where Arabic, French, or other national languages are more frequent.

The keywords from the articles in the word cloud provide an initial idea of the main topics. It suggests that the main issues are gender and women scientists in higher education in relation to work–life balance issues and the impact it can have on both family life and career. When we look more closely, we can find groups of topics: research life and the problems of productivity (bibliometrics, publication, and scientometrics), and Sub-Saharan Africa's challenges (representation, diversity, digital divide, gender mainstreaming, MDGs, *etc*.).

Literature review

The most recent articles in the review seem to suggest that the situation has changed over the last 15 years. The problem is no longer just the access of women to science studies and research life, it is also about transforming institutions and attitudes in the direction of diversity and gender equality in higher education institutions (HEI). *'Transformation means radically changing the institution from one that has inherent institutional and intellectual tendencies to reproduce and perpetuate gender inequalities and exclusions, to one that is not only more inclusive, but leads and advances the expressed commitment to gender equality - of access, in process and of outcome'* (Mama, 2006, p. 76).

One issue that is more specific to non-EU and non-North American countries and especially to Africa is what Maphalala and Mpofu (2017) call the 'double burden of womanhood', that is, being a black woman in science. In their literature review of the challenges faced by women in higher education institutions (HEI) in South Africa, they cite the fact that Africa has a long history of Western colonialism, slavery, and apartheid in South Africa, and that these situations shaped HEI with racist and sexist structures that thus need to be changed. Liccardo and Bradbury (2017) agree about the specific experience of African black women scientists, who live with both sexism and racism. This racialised gender gap is rooted in South Africa's colonial and apartheid legacies. Those articles show that even though women are protected by law or by institutions' policies (which is not the case in every Sub-Saharan African country), they still experience discrimination and unfair treatment.

Several articles presented results suggesting that African women scientists were less productive than men scientists because of the bad conditions of their work, the difficulties they face obtaining funding

and accessing ICT facilities, the difficulties they have in achieving a work–life balance, and harassment (Alutu and Ogbe, 2007; Ikhizama and Lawal, 2006; Olatokun, 2007; Prozesky, 2006). However, the most recent articles, published between 2017 and 2019, seem to call this into question. Indeed, one case study of one South African science faculty (Opesade et al, 2017) and one continental study (Prozeski and Mouton, 2019) showed that women are not less productive than men. *'The study shows that while female lecturers are significantly less represented in the faculty and publish in journals having lower impact factors, their research productivity in terms of number of publications and citation impact are significantly not different from those of their male counterparts'* (Opesade et al, 2017, p. 1). Prozeski and Mouton also found that *'contrary to expectations, […] African women scientists do not report experiencing career challenges to a larger extent than men and have been more successful at raising research funding in three of the six major scientific fields'*, which are the humanities, the social sciences, and the health sciences. A large study on the career challenges experienced by African women nevertheless highlights *'the significance of the challenge that balancing work and family poses to the majority of African women scientists'* (Prozeski and Mouton, 2019, p. 40). This is supported by Maphalala and Mpofu (2017), who explain that women obtain PhDs later than men and usually start a family while they are post-doctoral graduates, a factor that can inhibit their research.

In order to end these inequalities based on gender and race, Amina Mama asserts that Africa needs to gather its resources and minds and to apply itself to addressing Africa's problems. Thus, the issue of the *brain drain* from Africa to Europe or the USA is still a problem nowadays, as is the import of Western science values. Indeed, the cultural development of Africa demands the development of intellectual capacities *'that refuse to be constrained by the received disciplinary boundaries and hierarchies of knowledge production'* (Mama, 2006, p. 54). The author advocates for local and regional responses to the specific problems Africa is facing in connection with gender and science. *'We are still displaying a tendency to rely on foreign funding and import technical experts to assist us in "doing gender". However, I would suggest that the local response to these practical and intellectual challenges is far more important, and deserves to be locally supported and sustained, and this means mainstreaming it into the central budgeting and planning processes, and not irresponsibly "outsourcing" such core business because it is attractive to a few donors, only to let it die when it no longer brings in the money'* (p. 75).

Other researchers elaborated various recommendations for improving the situation of African women and for implementing the gender perspective in science. The most important one is the idea of giving a voice to women scientists in decision-making bodies and committees (Maphalala and Mpofu, 2017; Njenga *et al*, 2011; Prozeski and Mouton, 2019), including their perspective in the design of programmes in science and ICT deployments (Olatokun, 2007), and encouraging women (and not men researchers) to write and study on their career challenges from their own perspective (Maphalala and Mpofu, 2017).

Almost all of them agree on the fact that a focus should be placed on balancing work and family life – for instance, by setting up *'maternity, child-care and domestic-support provisions, as well as family-responsibility leave'* (Prozeski and Mouton, 2019, p. 43).

The authors stress the importance of tools that have proved their worth for building self-reliance, self-sufficiency, self-confidence, and leadership skills in women, such as mentorship programmes (Kwedi Nolna *et al.*, 2017; Maphalala and Mpofu, 2017; Njenga and Pinto, 2011) and training in capacity-building for both women researchers and HEI staff (Ikhizama and Lawal, 2006; Maphalala and Mpofu, 2017; Njenga *et al.*, 2011).

Changes in attitudes towards women are also asked for. Indeed, *'women students are assumed to be primarily seeking husbands rather than degrees; female students are expected to provide domestic and sexual services for male students; lecturers assume dating rights over women students;*

women academics are expected to exhibit maternal and feminine behavior' (Mama, 2006, p. 65), but these attitudes can change with trainings, awareness raising, and strong political will (Prozeski and Mouton, 2019; Recke and Ngugi, 2005).

Finally, an important factor of change is the dissemination of their research results to governments and society in general in order to be able to better shape future R&D projects and policies (Njenga *et al.*, 2011). John and Das (2019, p. 31) recommend *'setting up of a taskforce to coordinate the collection of detailed research profiles of researchers and research outputs. This initiative will assist in meaningful consolidation of R&D data to understand the status quo, and to identify locations for interventions as appropriate, to provide tangible inputs to help make the African Renaissance a reality'*.

To conclude this review, *'from a regional perspective, efforts to address women scientists' career-related challenges should be directed first and foremost towards North African and Western African countries'* (Prozeski and Mouton, 2019, p. 44) that tend to have more difficulties than East, Central, and Southern African countries. In fact, one article from Senegal, which is one of the most developed West African countries, shows that the focus with respect to women in STI is on increasing the number of women in science and on concentrating funding on teaching rather than on research (Hanlin and Sawadogo, 2017).

References

Alutu, A. N. G., and F. M. Ogbe. 2007. 'Men's View of Female Scientists Work/Life Balance at the University of Benin, Nigeria'. Journal of Human Ecology 22 (4): 303–308, https://doi.org/10.1080/09709274.2007.11906038.

Hanlin R. and S. Natéwindé. 2017. 'The political economy of the Senegalese science granting councils'.

Ikhizama, B. O., and B. O. Lawal. 2006. "Women Scientists' Involvement in Agricultural Development in Southwest Nigeria." *Journal of Agricultural & Food Information* 7 (4): 11–22, https://doi.org/10.1300/J108v07n04_03.

John, J. and S. Das. 2019. 'State of African Research: Snapshot of Abstracts for the 2018 Women in Science Without Borders Indaba'. *South African Journal of Science*, Academy of Science of South Africa, 27–32, https://doi.org/10.17159/sajs.2019/5876.

Kwedi Nolna, S. K., P. E. Essama Mekongo, et R. G. F. Leke. 2017. 'Mentoring for Early-Career Women in Health Research: The HIGHER Women Consortium Approach'. *Global Health, Epidemiology and Genomics* 2. https://doi.org/10.1017/gheg.2016.20.

Liccardo, S. and J. Bradbury. 2017. 'Black Women Scientists: Outliers in South African Universities'. *African Journal of Research in Mathematics, Science and Technology Education* 21 (3): 282–292, https://doi.org/10.1080/18117295.2017.1371980.

Madichie, N. O. 2009. « Breaking the Glass Ceiling in Nigeria: A Review of Women's Entrepreneurship ». *Journal of African Business* 10 (1): 51-66, https://doi.org/10.1080/15228910802701361.

Mama, A. 2006. « Pursuing gender equality in the African University ». *International Journal of African Renaissance Studies - Multi-, Inter- and Transdisciplinarity* 1 (1): 53-79, http://dx.doi.org/10.1080/18186870608529706.

Maphalala, M. C., and N. Mpofu. 2017. 'Are We There yet? A Literature Study of the Challenges of Women Academics in Institutions of Higher Education'. *Gender & Behaviour* 15 (2): 9245-9253.

Njenga, M., N. Karanja, G. Prain, D. Lee-Smith and M. Pigeon. 2011. 'Gender mainstreaming in organisational culture and agricultural research processes'. *Development in Practice* 21(3): 379–391, http://dx.doi.org/10.1080/09614524.2011.558061.

Njenga, M., Y. Pinto. 2011. ‘Commentary: building science and leadership skills in African women in agricultural research and development’. *International Journal of Agricultural Sustainability* 9 (4): 479-483, http://dx.doi.org/10.1080/14735903.2011.607609.

Olatokun, W. M. ‘Availability, Accessibility and Use of Icts by Nigerian Women Academics.’ 2007. *Malaysian Journal of Library & Information Science* 12 (2): 13–33.

Opesade, A. O., K. F. Famurewa, and E. G. Igwe. 2017. ‘Gender divergence in academics’ representation and research productivity: a Nigerian case study’. *Journal of Higher Education Policy and Management* 39 (3): 341-357, http://dx.doi.org/10.1080/1360080X.2017.1306907.

Prozesky, H. 2006. ‘Gender differences in the journal publication productivity of South African academic authors’. *South African Review of Sociology* 37 (2): 87-112, http://dx.doi.org/10.1080/21528586.2006.10419149.

Prozesky, H. and J. Mouton. 2019. ‘A Gender Perspective on Career Challenges Experienced by African Scientists’. *South African Journal of Science* 115 (3/4): 40–44, https://doi.org/10.17159/sajs.2019/5515.

Recke, H. et J. N. Ngugi. 2005. ‘Introducing a Gender Perspective into Agricultural Research in Kenya: Lessons learned at the Kenya Agricultural Research institute’. *Gender, Technology and Development* 9 (3): 395-418, https://doi.org/10.1177/097185240500900304.

Shambare, R. 2011. ‘MDGs and Gender Equity in Higher Education in South Africa’. *International Journal of Management and Innovation* 3 (2): 46-55.

Annex 3: List of relevant organisations

The Annex provides a table with contact details of organisations in particular countries and regions concerned with women and/or gender in science to be consulted and invited to collaborate.