

Applying gender lenses to the interlinkages and synergies between SDGs

Making sure that Agenda 2030 will not leave women behind



Editors: Heisook LEE & Elizabeth POLLITZER

December 2020



Title: **Applying gender lenses to the interlinkages and synergies between SDGs**
Making sure that Agenda 2030 will not leave women behind

Published: 31 December 2020

Publisher: Hee Young PAK

Publishing institute: Center for Gendered Innovations in Science and Technology Research

Editors	Heisook LEE	Elizabeth POLLITZER
Coordination and design	Jun Young LEE	Benjamin POLLITZER
Coordinating Institutes	Center for Gendered Innovations in Science and Technology Research (GISTeR)	Portia Ltd Co-founders of the Gender Summit
Addresses	Korea Science and Technology Centre, Teheran-ro 7-gil, Gangnamgu, Seoul 06130, Korea	Portia Ltd, 9 Bonhill Street, London, EC2A 4DJ
Tel:	+82-2-565-3701	
Email:	gister@kofwst.org	Team@gender-summit.com
Website	gister.re.kr	www.portiaweb.org.uk www.gender-summit.com
ISBN	979-11-85380-19-3	

SDG icons are taken from <https://www.un.org/sustainabledevelopment/news/communications-material/>

This report was supported by Support Program for Women in Science, Engineering and Technology through the Center for Women In Science, Engineering and Technology(WISET) funded by the Ministry of Science and ICT (No. WISET202003GI01)

Copyright © 2020. GISTeR, Korea and Portia Ltd, UK

Applying gender lenses to the interlinkages and synergies between SDGs

Making sure that Agenda 2030 will not leave women behind



Editors: Heisook LEE & Elizabeth POLLITZER

December 2020



Acknowledgements

The writing of this report was made possible through the funding from the Centre for Gendered Innovations in Science and Technology Research in the Republic of Korea, as well as from Elsevier and the Elsevier Foundation.

The need for this report became clear during the two days of discussions that have taken place in August 2020 as part of the 19th Gender Summit - Global for SDGs, where more than 60 international experts examined from a gender perspective the progress made during the first five years of SDG implementation efforts to establish what needs to be done during the remaining 10 years of Agenda 2030 to achieve its gender equality mission, and accelerate the realisation of all SDG targets.

The following 47 individuals have co-authored and/or helped review draft versions of the report, working either as independent experts, or as representatives of their organisation:

Elizabeth Pollitzer, Portia, Heisook Lee, Center for Gendered Innovations in Science and Technology Research (GISTeR), Jonathan Dawes, University of Bath, UK, David Griggs, Monash University, Australia, Eun Mee KIM, EWha Women's University, South Korea, Muneeza Mehmood Alam, World Bank, Karla Gonzalez Carvajal, World Bank, Karla Dominguez Gonzales, World Bank, Minu Hemmati, MSP Institute, Germany, Anna Holthaus, MSP Institute, Germany, Małgorzata Dębiak, German Environment Agency (UBA), Sophie Fichter, German Environment Agency (UBA), Katrin Groth, German Environment Agency (UBA), Marika Kolossa-Gehring, German Environment Agency (UBA), Arn Sauer, German Environment Agency (UBA), Rabia Ferroukhi, International Renewable Energy Agency (IRENA), Celia Garica-Banos, International Renewable Energy Agency (IRENA), Christine Lins, Global Women's Network for the Energy Transition (GWNET), Davina Ngei, Global Women's Network for the Energy Transition (GWNET), Jürg Luterbacher, World Meteorological Organisation (WMO), Assia Alexieva, World Meteorological Organisation (WMO), Olga Bogdan, World Meteorological Organisation (WMO), Catherine Power, World Wildlife Fund (WWF), Elaine Geyer-Allely, World Wildlife Fund (WWF), Nathalie Simoneau, World Wildlife Fund (WWF), Robert Ellis, University of Exeter, UK, Hale Ann Tufan, The GREAT Project, Margaret Mangheni, The GREAT Project, Brenda Boonabaana, The GREAT Project, Elizabeth Asiimwe, The GREAT Project, Elisabeth Garner, The GREAT Project, Devon Jenkins, The GREAT Project, Londa Schiebinger, Stanford University, Martina Schraudner, Fraunhofer Centre for Responsible Innovation (CERRI), Shalva Weil, Hebrew University of Jerusalem, Rebecca Blum, Nordic Centre for Gender in Military Operations (NCGM), Changmo SUNG, Green Technology Center, Republic of Korea, Chaewoon OH, Green Technology Center, Republic of Korea, Kye Young LEE, Green Technology Center, Republic of Korea, Inkyoung SUN, Korea Advanced Institute of Science and Technology, Miyoko Watanabe, Japan Science and Technology Agency (JST), Hee Young Paik, Gendered Innovations in Science and Technology Research (GISTeR), Holly-Falk Krzesinski, Gender Equity Taskforce & International Centre for Science Research, Elsevier, Rachel Herbert, International Centre for Science Research, Elsevier, Andrew Plume, International Centre for Science Research, Elsevier, Ylann Schemm, Gender Equity Taskforce Elsevier & Elsevier Foundation, Isabella Schmidt, UN Women, Nairobi.

The organisations that have influenced the content of this report either through their participation in the 19th Gender Summit and/or the direct involvement of their gender experts are:

Advanced Institute of Science and Technology, Republic of Korea
Elsevier Foundation, Netherlands
Elsevier International Centre for Science Research, USA
Gender Innovations in Science and Technology Research (GISTeR), Republic of Korea
German Environment Agency (UBA), Germany
Global Women's Network for the Energy Transition (GWNET), USA
Green Technology Centre (GTC), Republic of Korea
International Renewable Energy Agency (IRENA), United Arab Emirates
Japan Science and Technology Agency (JST), Japan
MSP (Multi-Stakeholder Processes) Institute, Germany
Nordic Centre for Gender in Military Operations (NCGM), Sweden
Portia, UK
Science and Technology Policy Institute (STEPI), Republic of Korea
The GREAT Project, USA and Uganda
UN Women, Nairobi
World Bank, USA
World Meteorological Organisation (WMO), Switzerland
World Wildlife Fund (WWF), International

Contents

Part 1: Executive Summary	6
Purpose of the report	6
Advancing gender knowledge for all SDGs	7
Gender gaps in evidence for interlinkages between SDGs	8
Benefits of including gender expertise in all SDG implementation efforts	13
Part 2: The first five years	15
Limited progress on gender equality	15
Disregard for the persistence of gender inequality	15
Gender gaps in analytical approaches	17
Gaps in knowledge when valuing interlinkages between SDGs	18
Gaps in scientific research for SDGs	18
Gaps in context analysis methods for SDGs	21
Gaps in strategic policy approaches	22
Missing on opportunities to add value to implementation outcomes for the SDGs/Targets silent on gender	23
Part 3: The next 10 years	28
Gender equality in the Decade of Action	28
The benefits of gender-proofing SDG implementation efforts	30
COVID-19 and Agenda 2030	31
Making Agenda 2030 more inclusive and responsive to gender issues	32
Improving gender knowledge for SDGs	33
Strengthening science-society-policy collaborations for SDGs implementation	34
Part 4: Expert contributions	37
Formal analyses of SDGs interlinkages	38
Science knowledge for SDGs	40
Transport and mobility	45
Chemicals and waste management	54
Human biomonitoring	59
Energy transformations	64

Weather and climate	73
Natural environment	81
Marine ecosystems	88
Food and nutrition security	95
Digitalisation and ICTs	103
Urgent gender inequalities: femicide	108
Peace and security	110
Green technology and industry	112
Part 5: Additional perspectives	117
Gender gaps in the UN Global Compact/KPMG industry perspectives on SDGs	117
Focus on the Mining Industry	119
Part 6: Reading list recommended by the Experts	122
Part 7: Common gender phrases used in SDG-related research	151
Part 8: Mainstreaming gender into projects	154
SEI guidance on including women’s needs in energy projects: asking the right questions	154
SEI guidance on including women’s needs in projects for access to resources: asking the right questions	155
Part 9: APPENDIX	156
Details of contributing experts	156
Details of this report’s production partners	169
Programme of 19 th Gender Summit	170

Part 1: Executive Summary

Purpose of the report

In September 2019, the UN Secretary General, Antonio Guterres, launched the Decade of Action to accelerate delivery of the Sustainable Development Goals. He urged all actors to dramatically increase the pace and scale of SDGs implementation efforts.¹⁾ With regard to gender, he stated that:

No country is on track to meeting the goal of gender equality – without which none of the others will be met, and in fact, the gap in several [of them] is growing.²⁾

The persistence of gender inequalities can be better understood if gender is thought of as an institutionalised system of differences between women and men that advantages men over women (in material resources, power, status, authority, etc.)³⁾, and which operates as the “invisible hand” to maintain the status quo.⁴⁾ In the context of Agenda 2030, this means that not one SDG can be assumed to be free of the influence of gender on the outcomes of implementation efforts, and, therefore, SDG5 (*gender equality and empowerment of women*) must not be overlooked in the analyses of interlinkages between different SDGs, as has been the case during the first five years.

Informed by contributions from 47 international academic and development experts from across 14 thematic areas, this report shows that to realise gender equality through the SDGs requires transformation in how gender is understood when SDGs are analysed for implementation, and in particular how SDG5 is treated compared to other SDGs. Examined in this way, the first five years of implementing Agenda 2030 could be summarised as:

- Disappointing in terms of progress on SDG5 and on the gender equality related targets scattered across several other SDGs
- Gender biased in the strategic approaches and analyses used to prioritise Goals and Targets for implementation, e.g. excluding or very narrowly perceiving the influence of SDG5 in the models of SDG interactions⁵⁾
- Oblivious of, or disconnected from gender research and expertise when assessing co-benefits and trade-offs

1) UN News, Sustainable Development Summit, <https://news.un.org/en/story/2019/09/1047302>

2) UN Secretary-General's remarks to High-Level Political Forum, 24 September 2019
<https://www.un.org/sg/en/content/sg/statement/2019-09-24/secretary-generals-remarks-high-level-political-forum-sustainable-development-bilingual-version-delivered-scroll-down-for-all-english>

3) Cecilia L. Ridgeway, Interaction and the conservation of gender inequality: considering employment, *American Sociological Review*, 1997, Vol. 62 (April:218-235)

4) *ibid*

5) Heleen L. van Soest, Detlef P. van Vuuren, Jerome Hilaire, Jan C. Minx, Mathijs J.H.M. Harmsen, Volker Krey, Alexander Popp, Keywan Riahi, Gunnar Luderer, Analysing interactions among Sustainable Development Goals with Integrated Assessment Models, *Global Transitions* 1 (2019) 210e225

of implementation options, e.g. overlooking the benefits of mainstreaming gender into institutions that are co-operating and partnering for implementation actions

- Not recognising biological (sex) characteristics as an important factor in the maintenance of environmental wellbeing by controlling species reproduction and interspecies dynamics, and overlooking how sex in combination with gender impact on the management of natural environments⁶).

Advancing gender knowledge for all SDGs

The experts contributing to this report⁷) explain interconnections between SDGs against the background of different knowledge domains:

- Formal analyses of SDG interlinkages
- Science knowledge for SDGs
- Transport and mobility
- Chemicals and waste management
- Human Biomonitoring
- Weather and climate
- Energy transformations
- Natural environment
- Marine ecosystems
- Food and nutrition
- Digitalisation and ICTs
- Femicide
- Peace and security
- Green technology and industry

They were asked to critically reflect on:

- How they, as gender and development/SDGs experts, perceive connections between different SDGs?
- Which actors and stakeholders should be included in partnerships for SDGs implementation?
- Which reports or research papers best capture the underlying gender issues?
- What knowledge is still missing?
- Which keywords can help guide new research for the relevant SDGs?
- What indicators are needed to improve monitoring of progress?

The answers to these questions call for urgent improvements to how data to monitor gender equality is collected and gender knowledge produced and applied to inform SDGs analyses and implementation strategies. Making these improvements during the Decade of Action will be essential to achieving better progress in Agenda 2030.

6) United Nations, Economic and Social Commission for Asia and the Pacific (2017). Gender, the Environment and Sustainable Development in Asia and the Pacific. Sales No. E.17.II.F.18, <https://www.unescap.org/sites/default/files/publications/SDD-Gender-Environment-report.pdf>

7) Listed in the Appendix

Gender gaps in evidence for interlinkages between SDGs

Analysis by Bennich et al. (2020)⁸⁾ shows that the main sources of information when analysing SDGs are: scientific literature, statistical information, and expert knowledge, as shown in Figure 1, below.

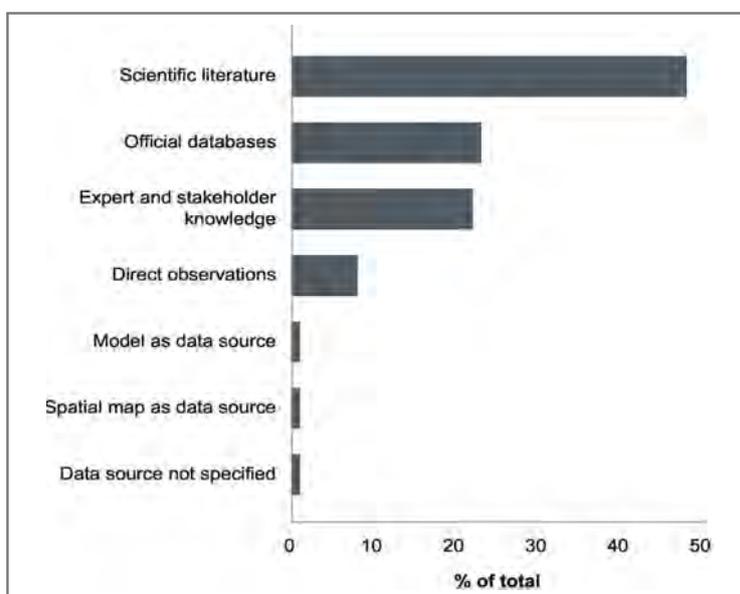


Figure 1. The sources of evidence used to underpin analyses of SDG interactions, from Bennich et al. 2020

At present, gender evidence for SDGs is limited in scope and quantity, and gender is understudied in all three sources. For instance, only four out of ten countries collect comparable gender statistics for SDG5⁹⁾; the available scientific research is ‘gender blind’ for half of the SDGs¹⁰⁾; and gender expertise is rarely found among SDG analysts and model builders.¹¹⁾

This has important consequences for how SDG5 is perceived and how it is compared to other SDGs when interactions between SDGs are analysed.¹²⁾ For example, analysis of Integrated Assessment Models (IAM) by van Soest et al. (2019)¹³⁾ shows that model builders are most confident about their model’s accuracy to quantify targets of SDG7 (*energy*), SDG9

8) Therese Bennich, Nina Weitz, Henrik Carlsen, Deciphering the scientific literature of SDG interactions: A review and reading guide, *Science of the total environment*, 728, 1 August 2020, 138405
<https://www.sciencedirect.com/science/article/pii/S0048969720319185>

9) <https://unstats.un.org/sdgs/report/2020/The-Sustainable-Development-Goals-Report-2020.pdf>

10) Herbert, Rachel and Falk-Krzesinski, Holly J. and Plume, Andrew, Sustainability Through a Gender Lenses: The Extent to Which Research on UN Sustainable Development Goals (SDGs) Includes Sex and Gender Consideration (September 8, 2020). <https://ssrn.com/abstract=3689205>

11) Heleen L. van Soest, Detlef P. van Vuuren, Jerome Hilaire, Jan C. Minx, Mathijs J.H.M. Harmsen, Volker Krey, Alexander Popp, Keywan Riahi, Gunnar Luderer, Analysing interactions among Sustainable Development Goals with Integrated Assessment Models, *Global Transitions* 1 (2019) 210e225

12) Therese Bennich, Nina Weitz, Henrik Carlsen, Deciphering the scientific literature of SDG interactions: A review and reading guide, *Science of the total environment*, 728 (2020) 138405

13) Heleen L. van Soest, Detlef P. van Vuuren, Jerome Hilaire, Jan C. Minx, Mathijs J.H.M. Harmsen, Volker Krey, Alexander Popp, Keywan Riahi, Gunnar Luderer, Analysing interactions among Sustainable Development Goals with Integrated Assessment Models, *Global Transitions* 1 (2019) 210e225

(*industry*) and SDG13 (*climate action*), and are not at all confident about their model's capacity to quantify targets of SDG5 (*gender equality, empowerment of women*). The model builders put their confidence in SDG7 at 4.4 (on the scale of 0-5), in SDG13 (*climate action*) at 3.8, in SDG9 (*industry*) at 3.6 but **only 0.2** in SDG5, see Figure 2, below.

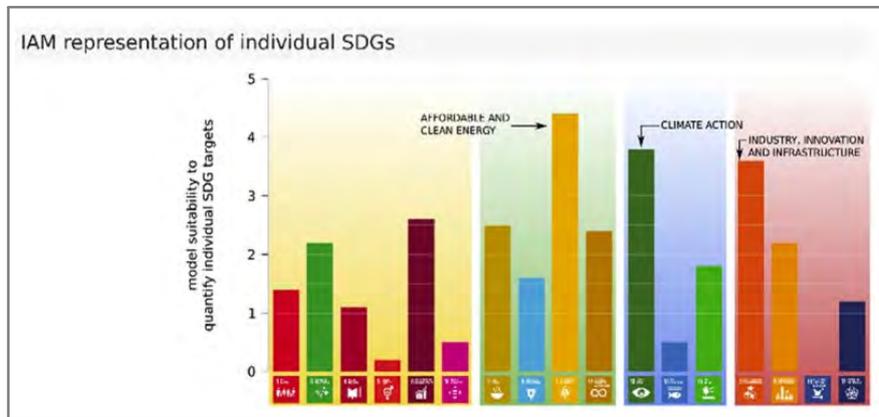


Figure 2. Modelers were asked to assign a score between 0 and 5 to each SDG, based on the ability of their model to quantify individual targets, and provide key indicators (van Soest et al., 2019)

A different but equally significant gender gap in knowledge has been identified by the group of UN-appointed 15 independent scientists in the body of evidence examined for their 2019 Global Sustainable Development Report (GSDR)¹⁴, shown in Figure 3 below. Overall, the influence of SDG5 on other SDGs is perceived as weak for half of the Goals. For the other half, the influence of SDG5 appears to be entirely overlooked, specifically for SDGs: 6 (*safe water*), 7 (*energy*), 9 (*industry*), 11 (*cities*), 12 (*responsible consumption*), 13 (*climate action*), 14 (*life under water*) and 17 (*partnerships*).

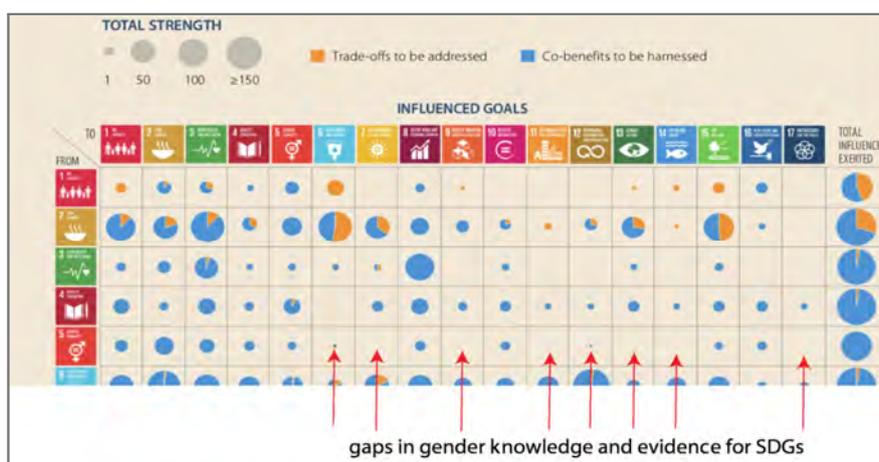


Figure 3. Gender gaps in knowledge resources for SDGs showing that SDG5 is assumed to have no, or very limited influence on half of the SDGs: adapted from 2019 Global Sustainable Development Report (GSDR), p6

14) UN Global Sustainable Development Report. The Future is Now. Science for Achieving Sustainable Development, 2019, https://sustainabledevelopment.un.org/content/documents/24797GSDR_report_2019.pdf

Similar pattern of undervaluing the importance of SDG5 (*gender equality and empowerment of women*) and favouring more technically oriented SDGs for implementation such as SDGs 7 (*energy*), 9 (*industry*) and 13 (*climate*) is found elsewhere. For instance, analysis by SLoCaT (2019)¹⁵ of how transport has been connected to each SDG in the body of 156 voluntary national reports shows that 73 reports have focused on SDG 9 (*industry and innovation*), 69 chose SDG11 (*cities*), 51 prioritised SDG7 (*energy*), and only 6 have connected transport to SDG5 (*gender equality and empowerment of women*). See Figure 17, p.45 in this report.

Since scientific literature is the most important source of evidence to guide analyses of SDGs for implementation, it is imperative that any gender gaps and biases in research for SDGs are recognised and corrected. Figure 4 shows the extent to which sex and/or gender considerations are being addressed in the current research for SDGs. It is significant that the SDGs most often prioritised in implementation strategies have research with the lowest proportion of studies with sex and/or gender dimensions: only 1% in the case of SDG7 (*energy*), 2% for SDG9 (*industry*), and 4% for SDG13 (*climate*), which may partly explain why SDG5 has been marginalised in the models of SDGs interactions that favour technically-oriented Goals.

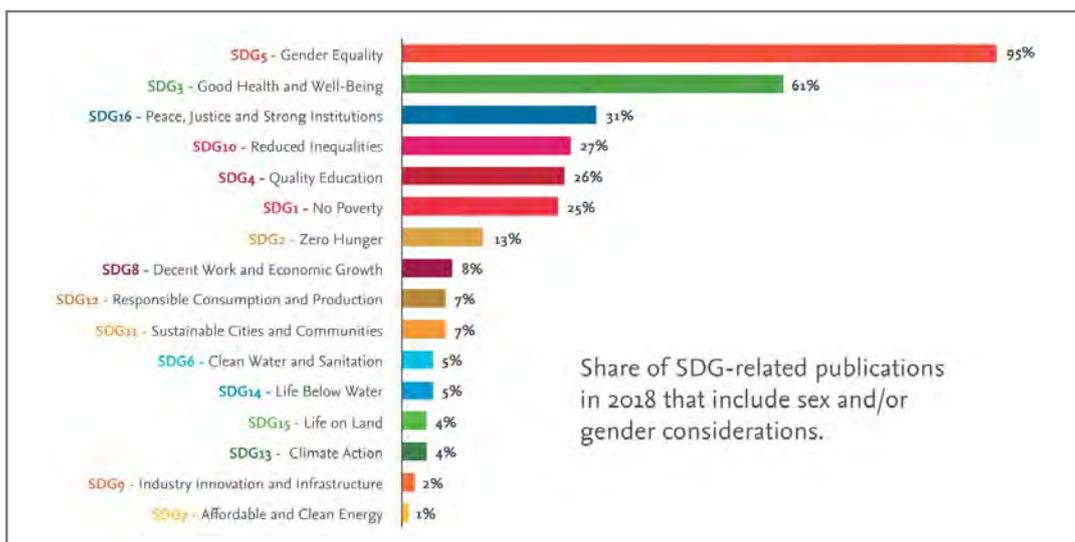


Figure 4. Share of SDG publications that include sex and/or gender. Results of bibliometric analysis by Elsevier¹⁶

Of additional concern is the bias in the expert reports produced by UN agencies shown in Figure 5, with gender equality being most frequently connected to SDG5, due to historical focus on socio-economic problems, and much less to the technical areas such as energy and infrastructure. Notable gaps exist in relation to SDGs 7 (*energy*), 9 (*industry*), 12 (*cities*), 14 (*life under water*) and 15 (*life on land*).¹⁷

15) SLoCaT, (2019). Sustainable Transport: A Critical Driver to Achieve the Sustainable Development Goals. Available at: www.slocat.net/vnr

16) Herbert, Rachel and Falk-Krzesinski, Holly J. and Plume, Andrew, Sustainability Through a Gender Lenses: The Extent to Which Research on UN Sustainable Development Goals (SDGs) Includes Sex and Gender Consideration (September 8, 2020). Available at SSRN: <https://ssrn.com/abstract=3689205>

17) *ibid*

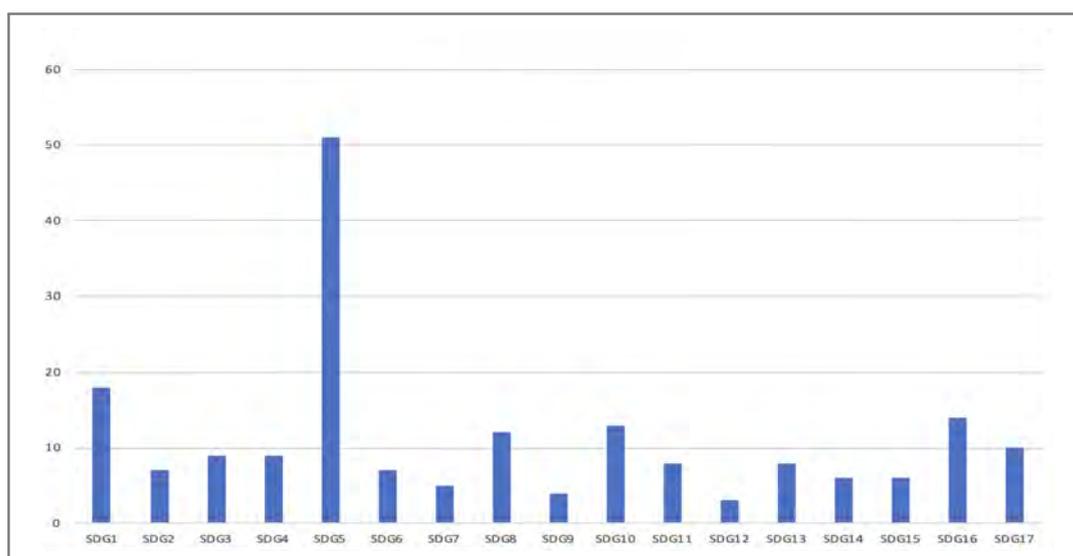


Figure 5. 51 UN entities include a focus on SDG5 in their main strategic plans, 18 on SDG1 (*no poverty*); 13 on SDG10 (*inequalities*), 12 on SDG8 (*decent work*), and 14 on SDG16 (*peace and justice*). Notable gaps are in relation to SDGs 7, 9, 12, 14, and 15. From: Report of the Secretary-General, E2019/54

As noted in the 2019 report on the UN System-wide Action Plan on Gender Equality and Women’s Empowerment: “the incorporation of gender perspectives in more technical thematic areas, such as infrastructure, energy and new technologies, remains weak relative to other areas of work”.¹⁸⁾

“The sheer volume of existing infrastructure that has been designed in a manner that fails to consider the specific needs of women and girls is alarming.”¹⁹⁾

An example of gender-blind infrastructure intervention is the often accepted premise that improving access to electricity will automatically deliver empowerment of women. In reality, whilst a household may benefit, women and men may not benefit equally. For instance, a household may gain by having five lightbulbs installed but none is placed in the kitchen.²⁰⁾ Therefore, unless gender equality is specifically targeted, sustainability interventions for energy transitions (SDG7) will not produce energy systems that are fairer, more inclusive, or just, when compared to the conventional systems they are designed to displace, as explained later in this report by the gender and energy transition experts (p.61), and analysed in a study examining energy connection among SDGs.²¹⁾

18) UN April 2019, Mainstreaming a gender perspective into all policies and programmes in the United Nations system Report of the Secretary-General, E2019/54

19) Morgan G, Bajpai A, Ceppi P, Al-Hinai A, Christensen T, Kumar S, Crosskey S & O’Regan N. Infrastructure for gender equality and the empowerment of women. UNOPS, Copenhagen, Denmark.
<https://content.unops.org/publications/UNOPS-Infrastructure-for-Gender-Equality-and-the-Empowerment-of-women.pdf?mtime=20200701120805>

20) Rosenberg, M, Armanios, DE, Aklin, M., Jaramillo, P. 2019. “Evidence of Gender Inequality in Energy Use from a Mixed Methods Study in India”, *Nature Sustainability*, vol 3, February 2020, p110-118

21) Oliver W. Johnson, Jenny Yi-Chen Han, Anne-Louise Knight, Sofie Mortensen, May Thazin Aung, Michael Boyland, Bernadette P. Resurrección, Intersectionality and energy transitions: A review of gender, social equity and low-carbon energy, *Energy Research & Social Science* 70 (2020) 101774, <https://www.sciencedirect.com/science/article/pii/S2214629620303492?via%3Dihub>

An important mission of this report is to raise awareness of the gaps in knowledge for SDGs where biological sex interacts with gender equality issues, because sustainability of natural ecosystems and of ecosystem services depends on the ability of species to effectively reproduce and interact with other species. Disruptions in reproduction may be relevant to 44 of the 169 SDG targets, because of their focus on improving the environment.

Understanding the relationships between sex, reproduction, and sustainability is important for implementation strategies that include interactions with SDG14 (*Life under water*) and SDG15 (*Life on land*). This report illustrates the SDG-related interdependency between sex and gender through the examples of sustainability in the context of Marine Ecosystems, Human Biomonitoring, Natural Environment, and Chemicals and Waste Management, but also in relation to the COVID-19 pandemic (p.31) because of the zoonotic origins of the disease.

In the case of Marine Ecosystems, climate change effects, combined with human action, can disrupt the reproduction and survival rates of individual species in a way that current models of interspecies dynamics cannot predict. These impacts can result in systemic instability, induced by the different sensitivities of female and male organisms to environmental stress, or through environmentally determined shifts in the proportion of females and males in a population (such as increasing proportions of male fish²²) or female turtles²³) in species where sex determination is impacted by warming). Where climate change or anthropogenic disturbance causes an alteration in the interaction between organism sex and its environment, this can therefore threaten a species' survival, and, eventually, harm how species co-exist in an ecosystem, as well as ability of humans to continue to sustainably exploit the goods and services those ecosystems provide.^{24) 25)}

The main anxiety underpinning this report is that gender gaps in knowledge for SDGs (in the scientific literature, data and statistics, and among SDG analysts and modellers) contribute to the marginalisation of the needs of women when SDGs are analysed for implementation with the ambition of Agenda 2030 to not leave anyone behind subsequently not being realised for women.

The knowledge gaps include methodological shortcomings. Bennich et al. (2020) have identified important limitations in the methods used to analyse SDGs (although not from a gender perspective), such as the lack of consideration how the actors responsible for implementing SDGs interact with one another.²⁶⁾ This report contributes:

22) Ospina-Alvarez, N. & Piferrer, F. (2008) Temperature-dependent sex determination in fish revisited: prevalence, a single sex ratio response pattern, and possible effects of climate change. *PLoS One* 3, e2837

23) Jensen, M. P. et al. Environmental warming and feminization of one of the largest sea turtle populations in the world. *Curr. Biol.* 28, 154-159 (2018).

24) UN Decade of Action on Biodiversity, 2015-2020, Tanya McGregor, Gender and Biodiversity Linkages and Considerations for Action, <https://biodivcanada.chm-cbd.net/sites/biodivcanada/files/inline-files/Gender%20and%20Biodiversity%20-%20Tanya%20McGregor%20CBD.pdf>

25) Jan Lindstrom and Hanna Kokko, Sexual Reproduction and Population Dynamics: The Role of Polygyny and Demographic Sex Differences, *Proceedings: Biological Sciences* Vol. 265, No. 1395 (Mar. 22, 1998), pp. 483-488

26) Therese Bennich, Nina Weitz, Henrik Carlsen, Deciphering the scientific literature of SDG interactions: A review and reading guide, *Science of the total environment*, 728 (2020) 138405

-
- a reading list of gender resources recommended by the experts
 - a collection of gender keywords to guide new research
 - suggestions for new gender indicators
 - advice where new research with gender dimension is still needed, and
 - specific recommendations how to improve knowledge for SDGs by adopting methods of sex/gender analysis.

Benefits of including gender expertise in all SDG implementation efforts

In summary, the report shows that during the next 10 years, the scope and impact of future SDG implementation efforts can be greatly improved by:

- Including gender expertise when identifying interconnections and synergies between different SDGs, and undertaking a comprehensive mapping of interactions between SDG5 and the other SDGs using the International Council for Science SDG interactions methodology²⁷⁾.
- Improving existing approaches to gender analysis for SDG²⁸⁾, and advancing new methods to integrate gender into research and interventions for all SDGs, especially to strengthen interlinkages between SDG5 and other SDGs.
- Advancing understanding of when, why and how biological (sex) characteristics in combination with socio-cultural (gender) factors can influence SDG implementation outcomes.
- Improving science-society-policy partnerships for SDGs by including diverse range of partners, stakeholders and institutions, especially those with already existing commitments to gender equality and sustainability.
- Applying gender lenses to how interactions between different SDGs are conceptualised; what types of data sources are used; what methods of analysis are deployed; and how implementation strategy is operationalised.

The expected benefits are:

- Improved measurement and monitoring of progress on SDG5, and on the gender equality and empowerment of women targets scattered across several other SDGs
- Fresh perspectives on how Goals and Targets interact and influence one another through their gender dimensions
- Gender-bias-free evidence for prioritisations of SDGs

27) ICS, A Guide to SDG Interactions: from Science to Implementation, <https://council.science/publications/a-guide-to-sdg-interactions-from-science-to-implementation/>

28) Some methods are already available, e.g. differences between women and men in food security (SDG2) and issues around energy (SDG7), see <https://unstats.un.org/sdgs/report/2020/The-Sustainable-Development-Goals-Report-2020.pdf>, also very useful for research is <http://genderedinnovations.stanford.edu/>

-
- Improved models of environmental sustainability with capacity to represent inter-species interactions under different conditions
 - Recognition that gender equality can be a co-benefit of implementation strategies involving SDGs silent on gender
 - End to the unjustified beliefs that women will be equal partners as societies become richer²⁹⁾
 - Shared and consistent gender terminology, indicators and keywords to guide future sustainability research and SDGs analyses.

29) Esther Duflo, Women Empowerment and Economic Development, *Journal of Economic Literature* 2012, 50(4), 1051-1079 <http://dx.doi.org/10.1257/jel.50.4.1051>

Part 2: The first five years

This section of the report provides a summary of how, and to what extent, gender issues are represented in the SDGs-related knowledge base, and how gender has been considered in the analyses of SDGs during the first five years of Agenda 2030. The aim is to demonstrate and explain the consequences of gender gaps in the knowledge used to underpin implementation strategies and context analysis, and when deciding on possible co-benefits and trade-offs. The shortcomings identified in this section will provide the basis for recommending actions to make improvements during the Decade of Action, which are discussed in Part 3.

Limited progress on gender equality

The UN 2020 SDG Progress Report³⁰⁾ identifies a number of problems in achieving SDGs. Although some advancements are being made in certain areas: global poverty; maternal and child mortality; access to electricity; international agreements for environmental protection, in many other areas advancement has been very slow, or even reversed: hunger was on the rise; climate change was occurring much faster than anticipated; and inequality continued to increase within and among countries. With regard to gender equality, the UN report states that³¹⁾:

“the commitment to advancing gender equality has brought about improvements in some areas, but the promise of a world in which every woman and girl enjoys full gender equality and all legal, social and economic barriers to their empowerment have been removed, remains unfulfilled”.

So far, SDG5 (*gender equality*) has been seriously under measured and under monitored. An analysis of the indicators in the Global SDG³²⁾ Indicators Database reveals that for 4 of the 17 goals, less than half of 194 countries, or areas, have internationally comparable data. This lack of country-level data is particularly worrisome for Goal 5 where on average only about 4 in 10 countries have data available.³³⁾

Disregard for the persistence of gender inequality

“Gender inequality stands out because it is so pervasive in both developed and developing countries, and over time, compared to other forms of inequality. If the SDGs’ motto “Leave No One Behind” is to be achieved, gender equality is essential. A much more concerted and coordinated effort must be prioritised by international organisations, individual

30) <https://sdg.iisd.org/news/un-secretary-general-releases-2020-sdg-progress-report/>

31) <https://unstats.un.org/sdgs/files/report/2020/secretary-general-sdg-report-2020--EN.pdf>

32) <https://unstats.un.org/sdgs/indicators/database>

33) <https://unstats.un.org/sdgs/report/2020/The-Sustainable-Development-Goals-Report-2020.pdf>

governments and other stakeholders. ‘Business as usual’ will not achieve gender equality” (*Eun Mee Kim, contributing expert, and member of UN Group of Independent Scientists*).

The universality and persistence of gender inequality is most starkly brought home in the phenomenon of “missing women”, or femicide, a term that covers female fetuses that are never born, girls in early childhood who vanish, women in their reproductive years, and older women who disappear³⁴). For those women who live, many throughout their lives are treated differently than their brothers, lagging behind men in many domains. For each missing woman, there are many more women who fail to get an education, a job, or a political responsibility that they would have obtained if they had been men³⁵).

Gender inequalities are rooted in legal and social norms, which impose unequal access to education, economic opportunities and decision making. Gender inequalities are also embedded in gender-differentiated roles and responsibilities, which dictate how (and if) women and men access and have control over land and resources related to forests, agriculture, water and fisheries. Evidence and experiences in the context of land and natural resources show that gender based violence (GBV) is often employed as a way to maintain these power imbalances, violently reinforcing sociocultural expectations and norms and exacerbating gender inequality.³⁶

The OECD’s Social Institutions and Gender Index (SIGI)³⁷, Figure 6 below, offers critical insights into the key obstacles to women’s empowerment and equality created by discriminatory laws, social norms and practices that perpetuate gender inequalities.



Figure 6. Conceptual framework of the SIGI 2019 (OECD 2019)

34) EU Gender Action Plan (GAP) III - An ambitious agenda for gender equality and women’s empowerment in EU external action, Brussels, 25.11.2020 JOIN (2020) 17 final, https://ec.europa.eu/international-partnerships/system/files/join_2020_17_en_final.pdf

35) Esther Duflo, Women Empowerment and Economic Development, *Journal of Economic Literature* 2012, 50(4), 1051-1079 <http://dx.doi.org/10.1257/jel.50.4.1051>

36) <https://portals.iucn.org/library/sites/library/files/documents/2020-002-En.pdf>

37) OECD 2019, Social Institutions and Gender Index, <https://www.oecd.org/publications/the-social-institutions-and-gender-index-sigi-2019-022d5e7b-en.htm>

The SIGI uses 16 indicators and 4 dimensions: discrimination in the family, restricted physical integrity, restricted access to productive and financial resources, and restricted civil liberties.³⁸⁾ SIGI is one of the official data sources for monitoring SDG Target 5.1.1 “*Whether or not legal frameworks are in place to promote, enforce and monitor gender equality and women’s empowerment*”.³⁹⁾ However, in the absence of specific indicators of inequality, SIGI could be used as a gender sensitive ‘short-hand’ representation of the social context for SDG implementation strategies, especially in situations where effective methods of context analysis are not available.

Gender gaps in analytical approaches

The method most widely used to organise interdependencies between different SDGs is the 7-point scale developed by the International Council for Science (ICS)⁴⁰⁾, shown in Figure 7 below.

Interaction label	Interpretation
+3 Indivisible	Progress on one target automatically delivers progress on another
+2 Reinforcing	Progress on one target makes it easier to make progress on another
+1 Enabling	Progress on one target creates conditions that enable progress on another
+/- Consistent	There is no significant link between the progress of the two targets
-1 Constraining	Progress on one target constrains the options for how to deliver on another
-2 Counteracting	Progress on one target makes it more difficult to make progress on another
-3 Cancelling	Progress on one target automatically automatically leads to a negative impact on another

Figure 7. The 7-point scale developed by the International Council for Science (ICS)⁴¹⁾

A detailed demonstration of the tool’s use for mapping how SDGs interact with each other is explained in the ICS report⁴²⁾ for four SDGs: 2 (*hunger*), 3 (*health*), 7 (*energy*), 14 (*life under water*). The key interactions identified for SDG2 involve SDGs 1,3,5,6,7,13,15; for SDG3 these are 2,3,8,11,13; for SDG7 these are 1,2,3,6,8,13, and for SDG14 these are 1,2,8,11,12,13. It is surprising that for SDG3 (*health*) the important interlinkages exclude SDG5 (*gender equality and empowerment of women*), since extensive scientific literature exists on sex and gender differences in health, including the growing field of gender medicine. On the same basis, it is not surprising that SDG5 was not included in the most important interlinkages for SDG7 and SDG14 since, as discussed above (Figure 4, p.10), current research for these

38) OECD Working Paper 342, The Social Institutions and Gender Index (SIGI) 2019: A revised framework for better advocacy, <https://www.oecd-ilibrary.org/docserver/022d5e7b-en.pdf?expires=1604140729&id=id&accname=guest&checksum=61381594C1E2C73F5C3A5093A92D50CF>

39) <https://www.genderindex.org/>

40) A Guide to SDGs Interaction: From Science to Implementation, ICS 2017, <https://council.science/wp-content/uploads/2017/05/SDGs-Guide-to-Interactions.pdf> Nilsson, Måns, et al.

41) Nilsson, Måns, et al. A guide to SDG interactions: from science to implementation. Paris, France: International Council for Science (ICSU), 2017

42) <https://council.science/publications/a-guide-to-sdg-interactions-from-science-to-implementation/>

SDGs is ‘gender blind’, with only 1% of studies that include sex and/or gender for SDG7 (*energy*) and only 5% for SDG14 (*life under water*).⁴³⁾

Gaps in knowledge when valuing interlinkages between SDGs

The Group of Independent Scientists identified an important “gap in knowledge” in the body of the publications they consulted for the Global Sustainable Development Report (GSDR), which consisted of 65 global assessments comprising United Nations flagship reports and international scientific assessments, as well as 112 scientific articles published since 2015 with explicit reference to the Sustainable Development Goals.⁴⁴⁾ The gap in question is demonstrated in Figure 3 on p.9 in terms of the perceived influence of SDG5 on other SDGs, which is assessed as weak for half of the Goals, and missing when discussing SDGs: 6 (*safe water*), 7 (*energy*), 9 (*industry*), 11 (*cities*), 12 (*responsible consumption*), 13 (*climate action*), 14 (*life under water*) and 17 (*partnerships*).

A different gender gap in knowledge exists in the UN reports, as shown in Figure 5, p.11. It relates to how UN entities consider gender equality in connection to each SDG in their strategic plans. 51 agencies focus on SDG5, 18 on SDG1 (*no poverty*), 13 on SDG10 (*inequalities*), 12 on SDG8 (decent work), and 14 on SDG16 (*peace and justice*). Notable gaps exist in relation to SDGs: 7 (*energy*), 9 (*industry*), 12 (*cities*), 13 (*climate action*), 14 (*life under water*) and 15 (*life on land*)⁴⁵⁾, demonstrating historical low concern over gender equality issues in technical thematic areas such as energy and infrastructure.⁴⁶⁾

Gaps in scientific research for SDGs

Herbert et al. (2020)⁴⁷⁾ show that gender research is largely absent in interaction science for SDGs 6, 7, 8, 9, 11, 12, 13, 14, and 15 (Figure 4, p.10), which may explain the gaps in knowledge identified by the Group of Independent Scientists for SDG5 (Figure 3, p.9). A bibliometric analysis also shows the narrow methodological scope of the currently available scientific research for SDGs in terms of the limited number of disciplines contributing the evidence needed. Although overall the body of gender research for SDGs is growing⁴⁸⁾ the range of disciplines contributing knowledge to advance gender equality targets is very narrow, as revealed in Figure 8 for SDG5 (*gender equality*) and Figure 9 for SDG10 (*societal inequalities*), below.

43) Herbert, Rachel and Falk-Krzesinski, Holly J. and Plume, Andrew, Sustainability Through a Gender Lenses: The Extent to Which Research on UN Sustainable Development Goals (SDGs) Includes Sex and Gender Consideration (September 8, 2020). Available at SSRN: <https://ssrn.com/abstract=3689205>

44) UN Global Sustainable Development Report. The Future is Now. Science for Achieving Sustainable Development, 2019, https://sustainabledevelopment.un.org/content/documents/24797GSDR_report_2019.pdf

45) *ibid*

46) UN, Mainstreaming a gender perspective into all policies and programmes in the United Nations system Report of the Secretary-General, 5 April 2019. <https://undocs.org/E/2019/54>

47) Herbert, Rachel and Falk-Krzesinski, Holly J. and Plume, Andrew, Sustainability Through a Gender Lenses: The Extent to Which Research on UN Sustainable Development Goals (SDGs) Includes Sex and Gender Consideration (September 8, 2020). Available at SSRN: <https://ssrn.com/abstract=3689205>

48) The power of data to advance SDGs, https://www.elsevier.com/__data/assets/pdf_file/0004/1058179/Elsevier-SDG-Report-2020.pdf

In the case of SDG5, gender-related studies are most prominent within Social Sciences and Medicine, and tend to focus on a particular range of topics, while links to Environmental, Agricultural and Biological Sciences are often neglected, and in the case of SDG10 studies on gender inequalities are most prominent in Business, Economics, Social Sciences and Health areas.

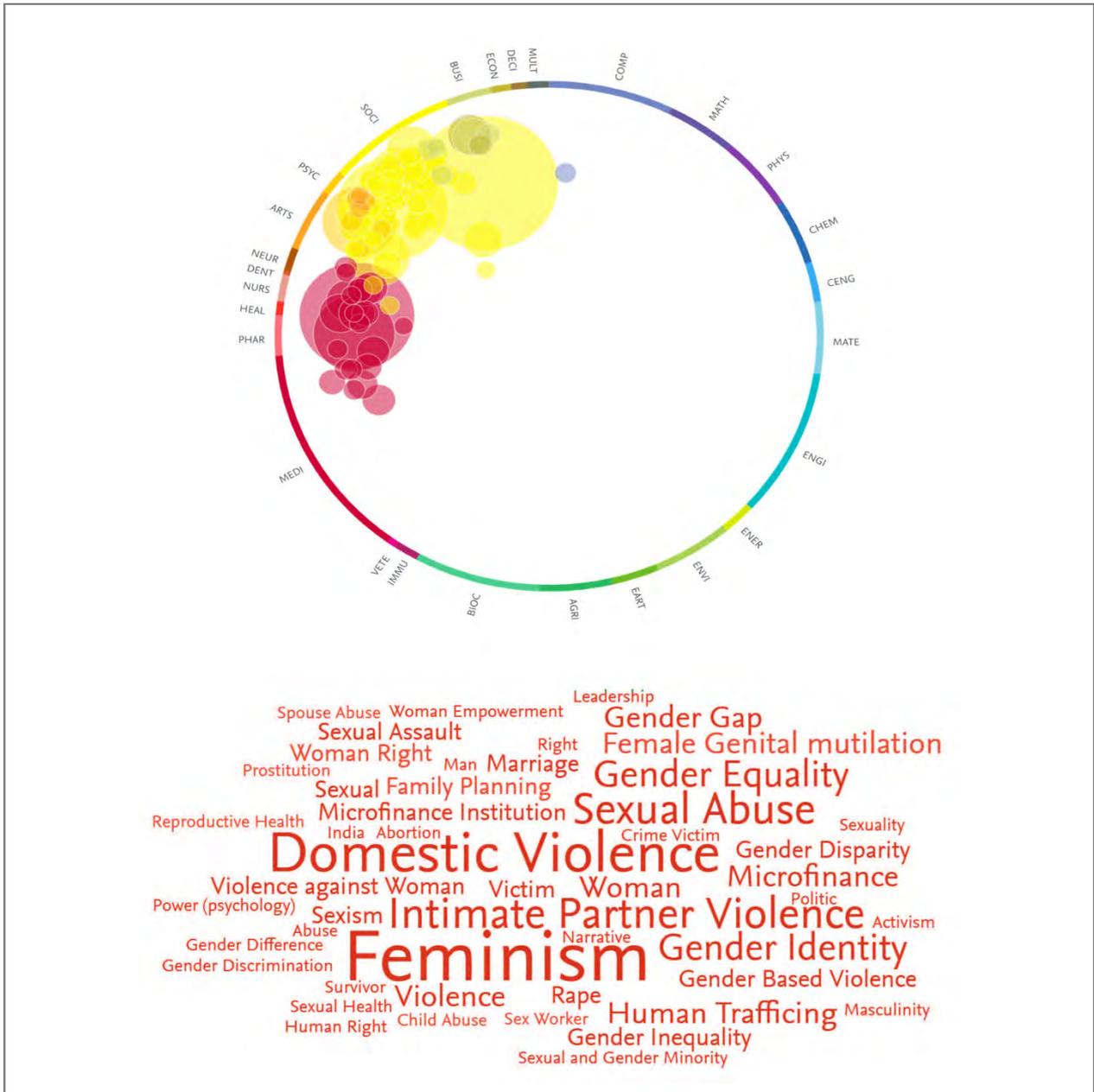


Figure 8. The Topic Wheel presents clusters of disciplines and publications for 2010-2019 and the unique research topics based on citation patterns. Research linked to SDG5 is most prominent within Social Sciences and Medicine. Links to Environment, Agriculture and Biological Sciences are often neglected. ⁴⁹⁾

49) Topic Wheels and word clouds are representative of publications from 2010-2019 indexed in Elsevier's Scopus™ database that were analysed in SciVal™ using the Overview and Trends modules.

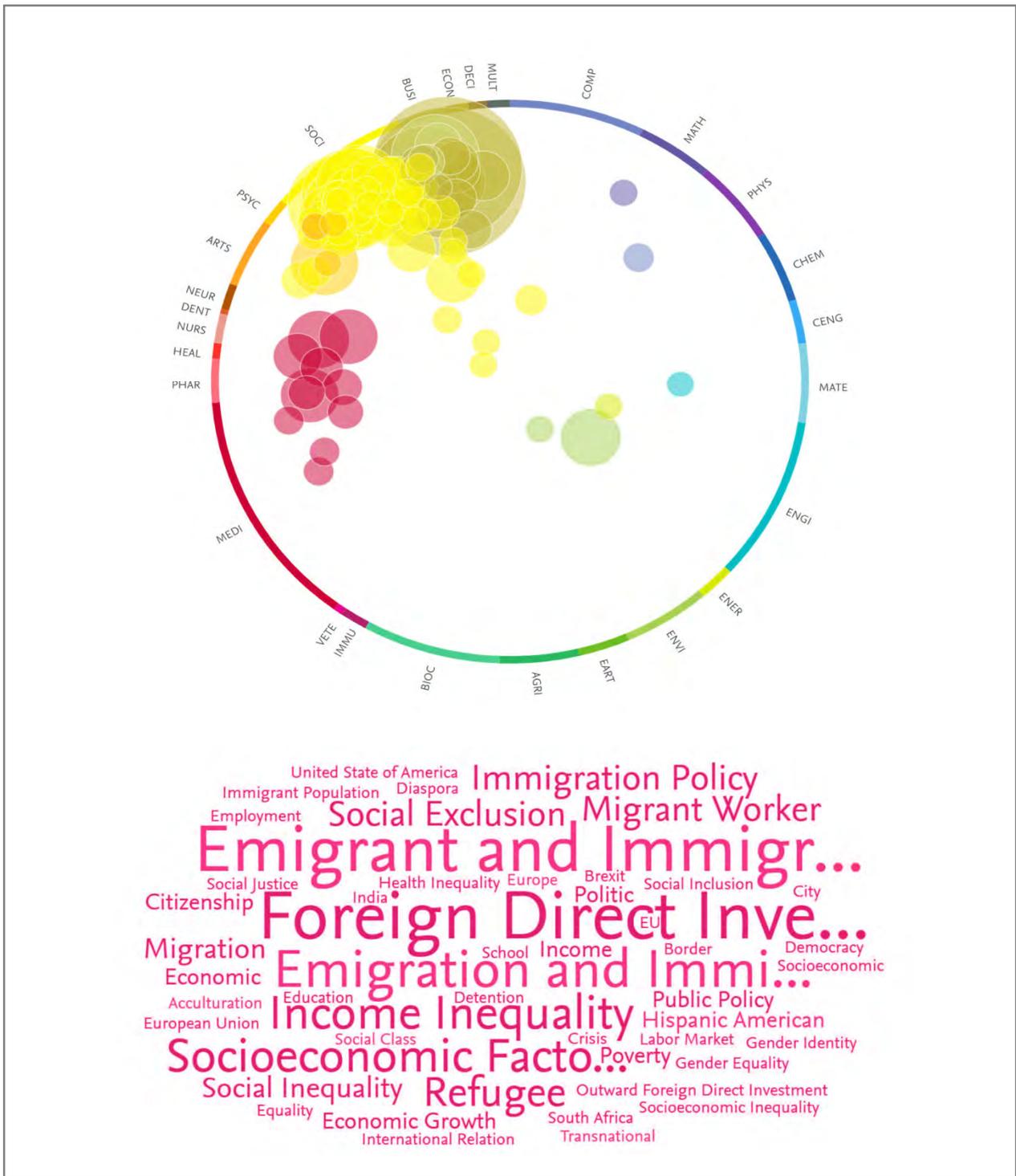


Figure 9. Research linked to SDG10 is most prominent within Business, Social Sciences and Medicine. The word cloud showcasing the top 50 key phrases by relevance.⁵⁰⁾

50) Topic Wheels and word clouds are representative of publications from 2010-2019 indexed in Elsevier's Scopus™ database that were analysed in SciVal™ using the Overview and Trends modules.

Gaps in context analysis methods for SDGs

The dominant approach to modelling interactions between different SDGs and between different targets is to treat the 2030 Agenda as a whole (i.e., not focusing on one specific policy area, goal or target as the entry point, but considering their role within the system, to see how all targets interact).

In contrast, since the effects targets may have on one another is highly contextual⁵¹⁾, it is necessary to situate the assessment in a particular context identified in a gender sensitive way. The majority of the available analyses tend to focus on national policy needs and system-level synergies when identifying implementation co-benefits and trade-offs, and, in general, pay less attention to the dynamics of how exactly goals or targets interact in different contexts.⁵²⁾

The importance of understanding context was strongly recommended by the Group of Independent Scientists who observed that:

“it is only through their context-dependent combinations that it will be possible to bring about the transformations necessary for balancing across the dimensions of sustainable development and achieving the 2030 Agenda”

An illustration of a gender-thoughtful context analysis of SDGs is provided by Agarwal (2018)⁵³⁾ who shows that household food security problem can be reframed as a two-fold problem: women’s access to land and property and their access to natural resources. Secure land rights, she argues, can enhance the productivity of women farmers whose proportions are growing with the feminisation of agriculture, and also improve intra-household nutritional allocations since owning property increases women’s bargaining power within families. Access to natural resources, such as forests and fisheries, can provide important additional sources of nutritional diversity, since women are the main gatherers of food from forests and the principal producers in small-scale and inland fisheries. Translating this into interconnections between SDGs means that SDG5 alone is not enough, because goals that bear on food security as important providers of nutrition, such as SDGs 14 and 15 are silent on gender, as is SDG13, which fails recognise vulnerabilities of women farmers.⁵⁴⁾

Developing systematic, gender-sensitive context analysis methods for SDGs should be a priority for researchers and practitioners during the Decade of Action. The guidelines for conducting context analysis produced by UNDP⁵⁵⁾, originally intended for national programme-level context analysis, were recently revised to support SDG implementation. The guidelines recommend to focus the evaluation on institutional factors: actors, stakeholders, rule

51) Nilsson M, Griggs D, Visbeck M (2016) Map the interactions between sustainable development goals. *Nature* 534:320-322

52) Nilsson M, Griggs D, Visbeck M (2016) Map the interactions between sustainable development goals. *Nature* 534:320-322

53) Bina Agarwal, Gender equality, food security and the sustainable development goals, *Current Opinion in Environmental Sustainability*, 34, October 2018, Pages 26-32, <https://www.sciencedirect.com/science/article/abs/pii/S1877343517302415>

54) UN Global Sustainable Development Report. *The Future is Now. Science for Achieving Sustainable Development*, 2019, https://sustainabledevelopment.un.org/content/documents/24797GSDR_report_2019.pdf

55) <https://www.undp.org/content/undp/en/home/librarypage/sustainable-development-goals/institutional-and-context-analysis-for-the-sustainable-developm.html>

systems, household and family structures, and kinship and patronage systems; and on “what there is” rather than “what should be there”.⁵⁶⁾ This suggests that it is not only necessary to establish from a gender perspective what there is at national level but also, as shown in the examples on pages 24-27, at local level⁵⁷⁾ where different sets of criteria may govern the selection of targets for implementation.

Gaps in strategic policy approaches

It is implicit in the SDG logic that the goals depend on each other, but it is open to interpretation of exactly how these dependencies are to be defined for implementation. It has been generally imagined that by identifying functional connections between SDGs⁵⁸⁾ it will be possible to establish coherence in policy decisions and in the planning tools to guide implementation efforts⁵⁹⁾. In search for strategic policy coherence, the prominent approach is to organise SDGs into clusters, as in these two examples:

i) People (1,2,3,4,5,6) - Peace (16) - Planet (13,14,15) - Prosperity (7,8,9,10,11,12) - Partnerships (17); and

ii) Human development (1,3,4,5,8,10) - Earth systems (13,14,15) - Resource Use (2,6,7,12) - Governance and infrastructure (9,11,16,17).

From a gender perspective, the weakness of implementation strategies based on clustering is that gender equality becomes isolated within the “People” and “Human development” clusters. This creates the risk of overlooking opportunities to advance gender equality through the SDGs in other clusters, especially with regard to the Goals and Targets that are silent on gender but which, nevertheless, have the potential to achieve gender equality benefits. Furthermore, implementation strategies based on clusters of SDGs may be harder to contextualise in the way advised by UNDP, because “what is there” at national level may not be directly relevant to implementation actions at local level, which may focus on specific targets rather than SDGs. In addition, implementation strategies based on SDGs clusters may miss useful in-between-clusters functional interdependencies among the targets because they are unlikely to ask crucial questions about when and how gender issues might impact on outcomes⁶⁰⁾. They may also fail to consider how the trends that they are modelling (such as the worsening water scarcity) might affect particular groups, men or women, differently over time, or fail to examine problems that disproportionately affect women, especially the poor and those from marginalised ethnic groups.⁶¹⁾

56) *ibid*

57) Amanda Jimenez-Aceitono et al, Local lenses for SDGs implementation: lessons from bottom up approaches in Africa, *Sustainability Science* (2020), 15:729-743

58) Matteo Pedercini, Steve Arquitt, David Collste and Hans Herren, Harvesting synergy from sustainable development goal interactions, *Proc. Natl. Acad. Sci. U.S.A.* 116, 23021-23028, October 30, 2019; 10.1073/pnas.1817276116

59) David Collste, Matteo Pedercini, Sarah E. Cornell, Policy coherence to achieve the SDGs: using integrated simulation models to assess effective policies, *Sustain Sci* (2017) 12:921-931

60) David Le Blanc, Clovis Freire, and Marjo Vierros, Mapping the linkages between oceans and other Sustainable Development Goals: A preliminary exploration, *DESA Working Paper No. 149 ST/ESA/2017/DWP/149* February 2017

61) UN Mainstreaming gender in water resources management. Why and how. <https://www.un.org/womenwatch/daw/forum-sustdev/francis%20paper.pdf>

TARGET 5.5 (women's participation)

Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision making in political, economic and public life

Achievement and trends

Proposed indicators for assessing women's participation and leadership look primarily at representation in government, judiciary and company boards. Formal representation of women in the public sector, Parliament and government offices is good in Sweden but lags behind in the private sector.

Further, opportunities for leadership and full and effective participation extend beyond holding seats; ensuring actual influence is an issue that would be relevant to Sweden. In 2014, women constituted 44% of members of parliament and more than half of government ministers. The gender balance has also shifted in government offices from being almost exclusively male in the 1970s to a majority of posts now being held by women. The government further reached, in 2003, its target of 40% women on the boards of state-owned companies. A majority of managers in the public sector are also female (66% in 2013). However, senior management positions still tend to be held by men, suggesting that opportunities for leadership are still unequal (Statistics Sweden 2013a) (Statistics Sweden 2013b).

Academia lags behind the public sector, with 76% of professors being male. In the private sector, in 2013 less than 30% of members of company boards and management teams in Sweden were women (22% and 27% respectively, and yet an increase compared to 2002) and only 35% of private companies had any female representation on their boards (Statistics Sweden and Swedish Government Office 2013). (Statistics Sweden 2014b).

Regarding political engagement, women and men participate equally in voting in parliamentary (Statistics elections: 86% and 85% respectively in the 2014 elections)

Policies in place

Sweden does not apply direct measures such as quotas to stimulate women's representation, instead it integrates a gender perspective into all policy areas.

The overall objective of the Swedish gender equality policy is that men and women shall have equal power to shape society and their lives. One of dual division of power and influence and states that: "Women and men are to have the same rights and opportunities to be active citizens and to shape the conditions for decision-making" (Government Offices 2014c).

The 2008 Discrimination Act includes measures to prevent discrimination due to gender, ethnicity, religion, disability, age or sexual preferences, including in public employment.

Figure 11. Example of gender sensitive context analysis (from Weitz et al 2018)

Example 2: Wetlands

The literature on wetland conservation, management and restoration projects shows the necessity to be gender sensitive by recognizing the differentiated knowledge, roles, needs and vulnerabilities of men and women, and contributing to empowering women in governance and decision making.⁶⁵⁾ For example, in Burkina Faso women play a leading role in local water committees ensuring that their needs related to water collection and management are met. Ignoring issues related to how women and men interact and manage wetlands may prevent effective and efficient conservation, sustainable use and equitable access to benefits of these protected areas. These conditions are not always given the attention they need in the analyses of SDGs to guide implementation policy.

For example, Jaramillo et al (2019)⁶⁶⁾ provided information and perceptions on 45 wetlandscapes worldwide by 49 wetland researchers of the Global Wetland Ecohydrological Network (GWEN). As shown in Figure 12 below, three high priority targets were identified across the wetlandscapes: Target 6.3—*improve water quality*; Target 2.4—*sustainable food production*; and Target 12.2—*sustainable management of resources*. The most consistent reinforcing interactions were the influence of Target 12.2 on 8.4—*efficient resource consumption*; and that of Target 6.3 on 12.2. The experts categorised wetlandscapes by differentiating between four bundles of distinctive priority SDG-targets: “basic human needs”, “sustainable tourism”, “environmental impact in urban wetlands”, and “improving and conserving environment”.

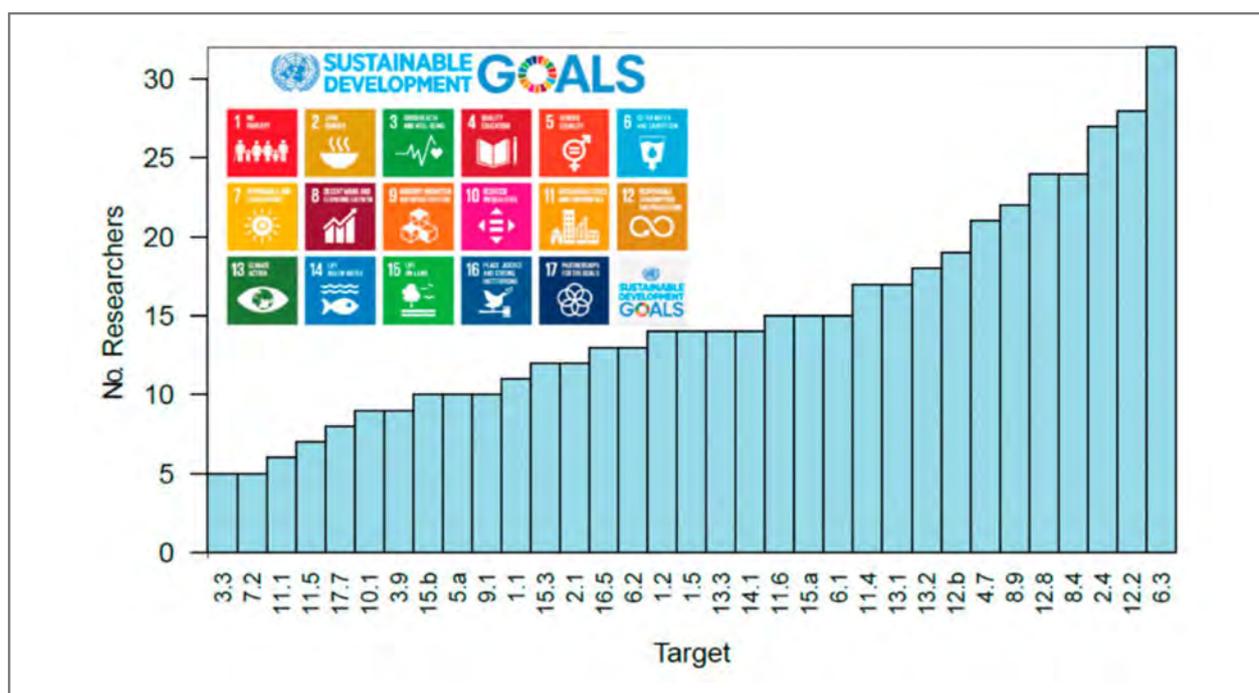


Figure 12. Number of times each SDG target has appeared in the wetlands expert survey as one of the top 10-SDG target priorities for the 45 wetlandscapes examined, from Jaramillo et al (2019)⁶⁷⁾. [Note: only two targets for inequality have been selected by the experts: Target 5.a and 10.1, both scored as of low priority.]

65) https://www.ramsar.org/sites/default/files/documents/library/wetlands_sdgs_e.pdf

66) Fernando Jaramillo et al 2019, Priorities and Interactions of Sustainable Development Goals (SDGs) with Focus on Wetlands, *Water* 2019, 11, 619; doi:10.3390/w11030619

67) *ibid*

The 49 wetlands experts in this study identified only two targets related to inequalities, Target 5.a and Target 10.1, which suggests that gender expertise was missing in this group of experts, even though gender expertise for wetlands is available as part of the Ramsar Convention adopted in 2018⁶⁸⁾. The Convention explicitly recognises that women play a crucial role in the provision, management and safeguarding of wetland resources, especially water, as well as in conserving the culture, folklore, music, mythology, oral traditions, customs, and traditional knowledge around wetlands, among other things, and that special attention should be paid to the specific needs of women because they are disproportionately affected by inadequate water facilities.⁶⁹⁾ Furthermore, in July 2020 the Ramsar Convention announced that it is developing a guidance document on how to integrate gender-responsive approaches into the implementation of the Convention in accordance with Resolution XIII.18 on Gender and wetlands to recognize the importance of addressing gender equality and women’s empowerment.⁷⁰⁾

Example 3: Local initiatives in Africa implementing SDGs targets

Locally implemented interventions for SDGs can be an important source of evidence to advance empirical analyses of how actions on SDGs are actually decided upon and how these interventions perform on different targets. Jimenez-Aceituno et al (2020)⁷¹⁾ explore how such bottom-up approaches are contributing to Agenda 2030, taking into account the specific features of the local initiatives, measured in terms of which goals are more likely to be addressed, and the perceived and achieved degree of interaction between and among targets and goals. Figures 13 below shows the most frequent targets selected by the observed local implementation initiatives. Significantly, gender equality targets were not among the most frequently selected.

Rank	Goal	Target	% of implementation actions with the Target
1	 4 QUALITY EDUCATION	4.7	Education for sustainability (42%)
2	 10 REDUCED INEQUALITIES	10.1	Employment for the poor (35%)
3	 2 ZERO HUNGER	2.4	Sustainable food production systems (33%)
4	 12 RESPONSIBLE CONSUMPTION AND PRODUCTION	12.5	Prevention, reduction, recycling and reuse (32%)

68) https://www.ramsar.org/sites/default/files/documents/library/xiii.18_gender_e.pdf

69) *ibid*

70) <https://www.ramsar.org/news/call-for-case-studies>

71) Amanda Jimenes-Aceituno, Local lenses for SDG implementation: lessons from bottom-up approaches in Africa, *Sustainability Science*, 2020, 15:729-743

Rank	Goal	Target	% of implementation actions with the Target
5		6.3	Improve water quality (30%)
		10.2	Empowerment and inclusion (30%)
		1.4	Equal rights for the poor and vulnerable (30%)
6		8.6	Youth employment/education (29%)
		4.4	Relevant skills for employment (29%)
7		2.3	Agricultural productivity of small-scale producers (25%)

Figure 13. Top 10 most frequent targets selected by the local SDG implementation initiatives in Africa, observed in Jimenez-Aceituno et al (2020)⁷². [Note SDG5 targets have not been prioritised]

Significantly, the study observed that locally implemented interventions for SDGs were often narrowly conceived in scope for gender-related implementation objectives. For instance, only addressing one or a few gender equality-related targets rather than many, for example, prioritising percentage of women participants in the project, giving micro-credits for fostering women entrepreneurship, creating green-business opportunities for women to work or developing business skill training programs for women, rather than attempting to interconnect several gender targets for an integrated strategy.⁷³

The study concluded that:

achieving the goals of the 2030 Agenda will require diversity and alignment of bottom-up and top-down approaches. On the one hand, development agencies should identify, recognise and support the creation of polycentric systems around a variety of ‘seeds’ that are contributing to SDGs achievement in different ways, and target work on those SDGs left behind, or those that require higher level action.

72) ibid

73) Amanda Jimenes-Aceituno, Local lenses for SDG implementation: lessons from bottom-up approaches in Africa, Sustainability Science, 2020, 15:729-743

Part 3: The next 10 years

In this chapter, the report looks towards the next ten years of implementation efforts in Agenda 2030, aiming in particular to show how better understanding of gender will improve the scope of SDGs analyses and implementation strategies by transforming how interlinkages between Goals and Targets are identified and co-benefits decided on.

Gender equality in the Decade of Action

In September 2019, the Secretary General of the UN, Antonio Guterres, launched the Decade of Action to accelerate the delivery of Sustainable Development Goals. He urged all actors to dramatically increase the pace and scale of SDG implementation efforts. He appointed a group of 15 independent scientists to examine the role of science in helping achieve Agenda 2030. The Group presented their conclusions in the Global Sustainable Development Report (GSDR), published in 2019⁷⁴). With regards to gender equality, they observed (p.6 in GSDR) that in the body of evidence they examined:

SDG5's influence on other SDGs is unacknowledged for SDGs 7, 9, 11, 13, 14 (energy, industry, cities, climate, life below water) or significantly weak (but nevertheless positive, i.e. requiring no trade-offs) for SDG 6, 12, 17 (safe water, responsible consumption, partnerships),

This report has been put together as an output from the 19th Gender Summit - Global for SDGs, which took place in August 2020 in Seoul, but because of the COVID-19 pandemics it was also delivered as a global virtual event. The event brought together 60 international experts with knowledge of SDGs and gender to help improve progress and quality of implementation efforts and to create greater impact during the Decade of Action, especially on SDG5 and gender equality targets.

The Gender Summit community's concerns that the implementation of the UN SDG agenda might fail women, society and environment if the role and influence of gender was restricted to SDG5, and especially the empowerment of women, were communicated in August 2015 in a letter sent to the then UN Secretary General, Ban Ki Moon, advising that

74) Independent Group of Scientists appointed by the Secretary-General, *Global Sustainable Development Report 2019: The Future is Now - Science for Achieving Sustainable Development*, (United Nations, New York, 2019).

Gender inequality issues created through biological and socio-cultural differences between women and men are intrinsically intertwined with poverty, hunger, health and wellbeing, maternal death, climate change adaptation, environment, and peaceful societies. We must ask, therefore, when planning interventions to achieve the SDGs: Will these interventions work equally for women? Will they work equally for men? We must use the best scientific evidence when formulating solutions to ensure this.



Figure 14. Peter Piot⁷⁵⁾ speaking at 5th Gender Summit: “We must ask when planning interventions to tackle societal challenges: *Will it work equally for women? Will it work equally for men? And, use when formulating solutions, the best scientific evidence to ensure that this is so. Otherwise, we are wasting our time*”

The letter was followed with the publication of the first expert report, *The Role of Gender-based Innovations for the UN Sustainable Development Goals: Toward 2030: Better Science and Technology for All*, in January 2016.⁷⁶⁾ That report identified 170 examples of gender knowledge already applicable to SDG targets, across all the 17 goals, as well as 200 examples of research still needed. That report was further supplemented during the 10th Gender Summit in Tokyo in May 2017 by a call to action, which urged all actors and stakeholders in the world of science to adopt the GS10 BRIDGE Recommendations (Better Research and Innovation for Development through Gender Equality)⁷⁷⁾, which state the following:

- 1. Gender equality is an essential determinant of societal sustainability and wellbeing and affects how science, technology and innovation can improve people's lives. It is realized through interventions to create equal opportunities between women and men; and implementing scientific understanding of gender, and of related differences, as important and intersecting factors in creating societal benefits for all.*

75) Peter Piot, co-discoverer of Ebola virus, at the Gender Summit 5 - Africa, Cape Town, 28-29 April, 2015

76) https://gender-summit.com/images/GS6Docs/SDG_Report_FINAL.Jan13.pdf

77) <https://gender-summit.com/tokyo-recommendation-bridge>

2. Gender equality should be integrated into the implementation of all 17 SDGs, because gender equality within science, technology and innovation provides a BRIDGE through which targets of all 17 SDGs can be connected to enhance implementation success of the UN SDG agenda.

3. Gender equality in the context of SDG targets must recognize the influence of human and societal diversities, and, in particular, how science and societies define and BRIDGE the roles and attitudes to women, girls, men, boys, ethnicity, race, cultures etc. Gender Equality 2.0 should be adopted by all stakeholders, including industry when planning and implementing actions to achieve sustainability.

The benefits of gender-proofing SDG implementation efforts

Gender proofing interventions for socio-economic development by applying gender analysis when planning and evaluating impact can help prevent incorrect assumption influencing decisions about who will gain from the planned actions. For instance, development through improved access to electricity is widely assumed to create several benefits, such as enabling students spend more time studying (SDG4), improving access to ICTs (SDG9), reducing the use of bio-fuels (SDG7), and lowering indoor air pollution (SDG3)⁷⁸. However, when the impact of introducing electricity supply to villages in India was assessed to see how women and men in newly electrified village households used energy, the stark conclusion was that women are neither the sole nor primary beneficiaries of access to electricity⁷⁹. Even when appliances that would particularly benefit women are affordable, the intrahousehold dynamics prioritise the energy uses and interests of men. For instance, the household may have benefited from the intervention measure by having five light bulbs installed but none was placed in the kitchen.⁸⁰

Similarly, gender analysis applied to the Goals that are silent on gender can help add value to the outcomes by identifying opportunities to achieve gender equality co-benefits, as in these examples:

- Jaramillo et al 2019⁸¹ found that Target 12.2 (*sustainable management and efficient use of natural resources*) is particularly important in the context of identifying SDG linkages focused on sustainability of wetlands⁸². A gender expert would see here an opportunity to enhance implementation outcomes by including in the intervention measures the objective to improve the participation of women in decision making on how resources should be managed.
- Weitz et al 2018⁸³ identified influential connections between (5.5) *women's participation* and (16.6) *effective institutions* in the context of developing SDG implementation strategy for Sweden. A gender expert

78) Collste D., Pedercini M., Cornell SE., Policy coherence to achieve the SDGs: using integrated simulation models to assess effective policies, *Sustain Sci* 12:921-931

79) Rosenberg, M, Armanios, DE, Aklin, M., Jaramillo, P. 2019. "Evidence of Gender Inequality in Energy Use from a Mixed Methods Study in India", *Nature Sustainability*, vol 3, February 2020, p110-118

80) *ibid*

81) Fernando Jaramillo et al 2019, Priorities and Interactions of Sustainable Development Goals (SDGs) with Focus on Wetlands, *Water* 2019, 11, 619; doi:10.3390/w11030619

82) *ibid*

83) Nina Weitz, Henrik Carlsen, Måns Nilsson, Kristian Skanberg, Towards systemic and contextual priority setting for implementing the 2030 Agenda, *Sustain Sci* (2018) 13:531-548

would recognise an opportunity to enhance policy impact by promoting gender mainstreaming efforts into the institutions and partnerships involved in the delivery of the prioritised strategy. Something that could be relatively easy to achieve because of Sweden’s commitment and extensive experience of mainstreaming gender into publicly funded institutions.⁸⁴⁾

COVID-19 and Agenda 2030

In this report, WWF (2020) make a plea for taking a holistic view of the consequences in how humans interact with natural environment.⁸⁵⁾ They point out that the COVID-19 pandemic has been a painful wake-up call to our fractured relationship with nature. The virus was most likely transmitted from wild animals to humans, also known as a zoonotic disease. Alarming, this phenomenon is on the rise. Of the new diseases that have emerged in human beings in the past 30 years, 60–70 percent have a zoonotic origin. Zoonotic diseases are driven by the same activities that are causing nature loss: illegal wildlife trade, the trade and consumption of high-risk live wild animals, deforestation, habitat loss, and large-scale land conversion for food and livestock production. Environmental degradation increases the risk of future pandemics and weakens our resilience against climate change and other disasters.

For the humans, the novel coronavirus disease 2019 (COVID-19) pandemic is revealing profound differences between men and women in disease outcomes worldwide as exemplified in Figure 15.⁸⁶⁾

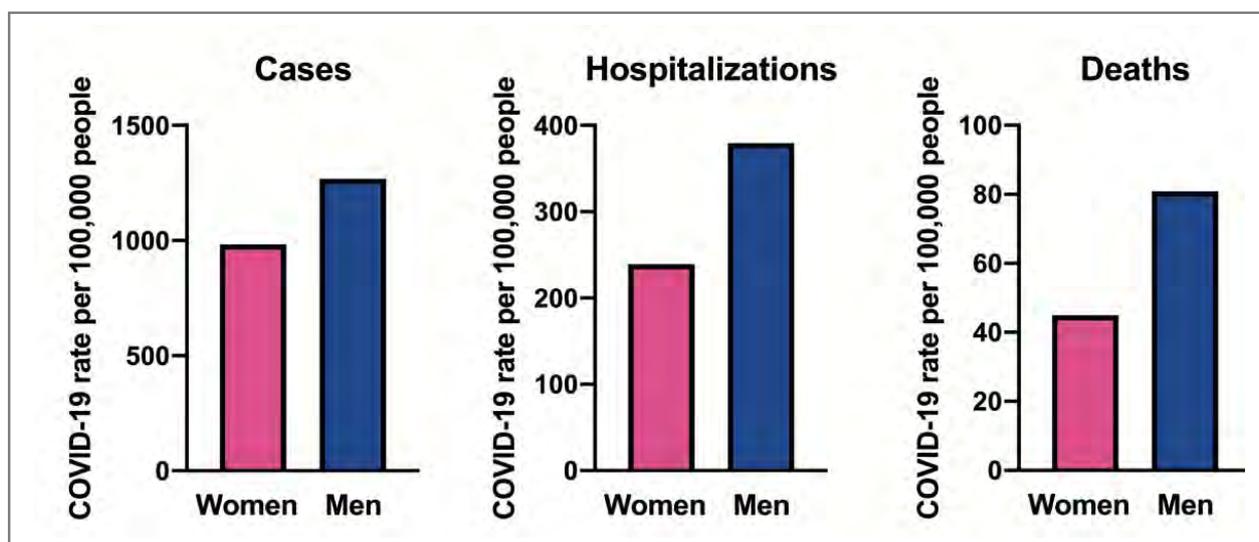


Figure 15. Sex Disaggregated numbers for COVID-19 cases, hospitalizations, and deaths per 100,000 people in NYC, (with permission) from, Klein SL et al. (2020)

84) Swedish Secretariat for Gender Mainstreaming, 2016, <https://www.jamstalldhetsmyndigheten.se/wp-content/uploads/2017/12/Guidelines-for-Gender-Mainstreaming-in-Academia.pdf> also <https://www.jamstalldhetsmyndigheten.se/en/gender-mainstreaming/government-agencies-higher-education-institutions/government-agencies-in-the-gmga-programme-2>

85) WWF (2020), Nature in all Goals 2020: Building a new relationship between people and nature for the Sustainable Development Goals

86) Klein SL, Dhakal S, Ursin RL, Deshpande S, Sandberg K, Mauvais-Jarvis F (2020) Biological sex impacts COVID-19 outcomes. *PLoS Pathog* 16(6): e1008570. <https://doi.org/10.1371/journal.ppat.1008570>

Disruption to health and vaccination services and limited access to diet and nutrition services have the potential to cause hundreds of thousands of additional under-5 deaths and tens of thousands of additional maternal deaths in 2020.⁸⁷⁾ Moreover, women are likely to take on most additional care work owing to the closure of schools and day-care centres. They are also on the front lines in fighting the coronavirus, since women account for nearly 70 per cent of health and social workers globally.⁸⁸⁾ Women also face high risks of job and income loss, and of increased risks of violence, exploitation, abuse or harassment during times of crisis and quarantine.⁸⁹⁾

UNOPS (2020)⁹⁰⁾ draws attention to the fact that “many women have less job security and less access to social protection than men, making their livelihoods more likely to be affected by lay-offs, which in many countries have concentrated on the services sector, where the majority of workers are women. This reduces their opportunities to support their families. The pandemic is also causing a rise in gender-based violence, increased demand for domestic and unpaid work (largely carried out by women and girls), and may impact the availability of sexual and reproductive health services as well. These effects are further intensified for women and girls in disadvantaged positions, such as those living in fragile settings. UNOPS draws attention to how poor infrastructure can worsen the impact of crises like the COVID-19 pandemic by limiting access to critical resources such as clean water, proper health and sanitation services, and digital communications technology”⁹¹⁾.

Combined with local norms and restrictions, gender-blind infrastructure can deepen inequalities, leave women and girls more vulnerable, and potentially put their lives at risk during times of upheaval⁹²⁾

Making Agenda 2030 more inclusive and responsive to gender issues

The general lack of interest in SDG5 during the first five years is illustrated in Box 1, below, with the explanation contributed by one of the invited experts, Jonathan Dawes. Reflecting on the findings of the Global Sustainable Development Report, he observes that:

87) https://sustainabledevelopment.un.org/content/documents/26298HLPF_2020_impact_COVID19.pdf

88) <https://globalhealth5050.org/wp-content/uploads/October-2020-The-COVID-19-Sex-Disaggregated-Data-Tracker-Update.pdf>

89) OECD, Women at the core of the fight against COVID-19 crisis

http://www.oecd.org/coronavirus/policy-responses/women-at-the-core-of-the-fight-against-covid-19-crisis-553a8269/?mod=article_inline

90) Morgan G, Bajpai A, Ceppi P, Al-Hinai A, Christensen T, Kumar S, Crosskey S & O'Regan N. Infrastructure for gender equality and the empowerment of women. 2020, UNOPS, Copenhagen, Denmark, <https://content.unops.org/publications/UNOPS-Infrastructure-for-Gender-Equality-and-the-Empowerment-of-women.pdf?mtime=20200701120805>

91) <https://www.unops.org/news-and-stories/news/infrastructure-for-gender-equality-and-the-empowerment-of-women>

92) Morgan G, Bajpai A, Ceppi P, Al-Hinai A, Christensen T, Kumar S, Crosskey S & O'Regan N. Infrastructure for gender equality and the empowerment of women. 2020, UNOPS, Copenhagen, Denmark, <https://content.unops.org/publications/UNOPS-Infrastructure-for-Gender-Equality-and-the-Empowerment-of-women.pdf?mtime=20200701120805>

“From the 177 reports, a total of 5,758 interactions at the Goal level were identified: 4,976 positive influences and 782 negative. Of these 5,758 interactions, only 79 (1.4%) were instances in which SDG 5 influenced another SDG (always a positive influence). This level of influence...of SDG 5 is in fact the lowest of any of the Goals, with Goals 7, 6 and 15 achieving vastly higher positive out-degrees of 768, 604 and 512 respectively.

Improving gender knowledge for SDGs

As part of their task to help improve gender knowledge for SDGs, gender experts have recommended new gender indicators for SDGs, relevant to their domain of expertise. The current list of gender-related indicators composed by the UN Inter-Agency and Expert Group on Gender Statistics (IAEG-GS) contains 80 statistics.⁹³⁾ Listed below are the indicators for SDGs that have at present the lowest levels of gender sensitive research, i.e. SDGs 6,7,8, 9,11,12,13,14,15.⁹⁴⁾ Critically, SDGs 12 (*responsible consumption*), 13 (*climate action*), 14 (*life under water*), 15 (*life on land*) have no gender-related indicator, whilst SDGs 6 (*clean water*), 7 (*energy*) and 9 (*industry innovation*) have just one:

- a. SDG6 (*clean water*): Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water
- b. SDG7 (*energy*): Proportion of population with primary reliance on clean fuels and technology
- c. SDG8 (*decent work*): Proportion of informal employment in non-agriculture employment, by sex; Average hourly earnings of female and male employees, by occupation, age and persons with disabilities; Unemployment rate, by sex, age and persons with disabilities; Proportion of youth (aged 15-24 years) not in education, employment or training; Proportion and number of children aged 5-17 years engaged in child labour, by sex and age; Frequency rates of fatal and non-fatal occupational injuries, by sex and migrant status; Level of national compliance of labour rights, by sex and migrant status
- d. SDG9 (*industry innovation*): Researchers (in full-time equivalent)
- e. SDG11 (*sustainable cities*): Proportion of population that has convenient access to public transport, by sex, age and persons with disabilities; Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population; Average share of the built-up area of cities that is open space for public use for all, by sex, age and persons with disabilities; Proportion of persons victim of physical or sexual harassment, by sex, age, disability status and place of occurrence, in the previous 12 months

93) https://unstats.un.org/unsd/demographic-social/gender/documents/14Mar2018_Gender_relevant_SDG_indicators_MB-HSS.pdf, March 2018

94) Herbert, Rachel and Falk-Krzesinski, Holly J. and Plume, Andrew, Sustainability Through a Gender Lenses: The Extent to Which Research on UN Sustainable Development Goals (SDGs) Includes Sex and Gender Consideration (September 8, 2020). <https://ssrn.com/abstract=3689205>

f. SDG12 (*responsible consumption*): None

g. SDG13 (*climate action*): None⁹⁵⁾

h. SDG14 (*life under water*): None

i. SDG15 (*life on land*): None

Strengthening science–society–policy collaborations for SDGs implementation

The UN 2019 Global Sustainable Development Report recommends that the science–society–policy collaboration should be strengthened⁹⁶⁾. The Decade of Action needs more holistic, non-linear, collaborative and co-productive forms of decision making, involving multiple actors and stakeholders, see Figure 16, below⁹⁷⁾. The co-creation, co-evolution and co-operation approaches to implementation will help establish how the people (women and men)—as individuals, as families and as communities—are engaged and may be affected in the process of development, and how each benefits from the outcomes, and how to integrate different perspectives (women’s and men’s), different knowledge systems, and diverse data collections, together with their agencies and stakeholders, and make better progress in achieving Agenda 2030.

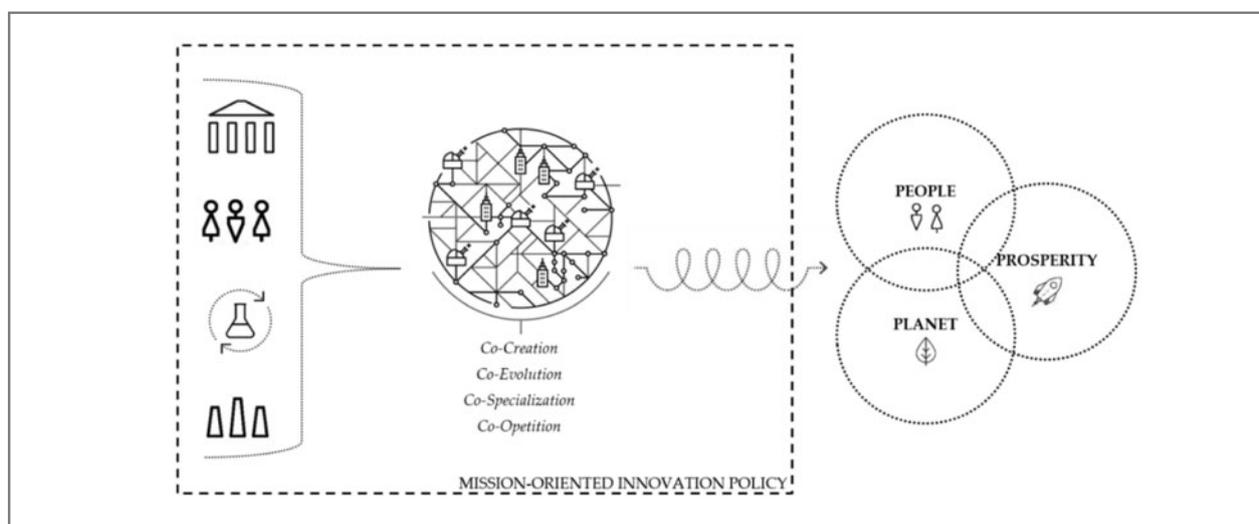


Figure 16. Integrating different gender perspective, knowledge systems, actors and agencies to achieve Agenda 2030 (adapted from Jütting, 2020)

95) During the April 2020 IAEG-SDG meeting this indicator was changed and it no longer refers to women.

96) UN 2019 Global Sustainable Development Report, http://un.am/up/library/SDG_Report_2019.pdf

97) Malte Jütting, Exploring Mission-Oriented Innovation Ecosystems for Sustainability: Towards a Literature-Based Typology, *Sustainability* 2020, 12, 6677; doi:10.3390/su12166677, <https://www.mdpi.com/2071-1050/12/16/6677>

The key priorities for the Decade of Action are:

1. Improving availability of quantitative data and gender indicators; coverage of gender issues in sustainability research; evidence led practice; tools for SDG context analysis; mobilising interest in gender issues among energy, climate and industry research and development communities.
2. Applying gender lenses to the analysis of SDGs and targets to help locate opportunities to advance gender equality when implementing SDGs that appear silent on gender. For instance, the impact of Target 16.6 (*effective institutions*) can be enhanced by incorporating well-established and tested measures for mainstreaming gender into the processes and practices of the involved institutions.
3. Recognising the significance of biological (sex) as a key factor in maintaining ecological sustainability of natural environments (e.g. through physiological processes controlling reproduction and sexual maturation of species); and improving the power of ecological models to predict the effects of climate change on the dynamics of interspecies interactions, as exemplified later in this report for Marine Ecosystem (Ellis 2017⁹⁸).
4. Identifying and eliminating gender biases and gaps in stakeholder flagship reports⁹⁹) used routinely as evidence for policy and decision making, is particularly needed for implementation strategies involving SDGs 7, 8, 9, 11, 12, 13, 14, 15.
5. Developing gender sensitive contextual analysis methods for SDGs to help recognise local and national institutional gender equality conditions that can act as enablers or barriers for the selected implementation efforts; and identifying relevant actors, stakeholders and agencies to involve in co-creation and co-production of solutions.
6. Re-examination of conceptual frameworks that advocate clustering of SDGs and targets as tools for achieving policy coherence from a gender perspective to identify cross cutting opportunities to advance gender equality.
7. Increasing cooperation arrangements with industry and private sector to widen the scope of their gender equality ambitions¹⁰⁰), and for co-creation of technological innovation for SDGs¹⁰¹) with equal benefits for women and men¹⁰²).
8. Developing and applying methods of gender analysis for application in sustainability science¹⁰³), and

98) Ellis, R.P., Davison, W., Queirós, A.M., Kroeker, K., Calosi, P., Dupont, S., Spicer, J.I., Wilson, R.W., Widdicombe, S. & Urbina, M.A. Does sex really matter? Explaining intraspecific variation in ocean acidification responses. *Biology Letters* 13(2), 2017

99) <https://unstats.un.org/unsd/statcom/51st-session/documents/BG-Item3a-Interlinkages-Workstream-E.pdf> and <https://unstats.un.org/sdgs/report/2020/The-Sustainable-Development-Goals-Report-2020.pdf>

100) UN Global Compact, SDG Industry Matrix, <https://www.unglobalcompact.org/library/3111>

101) Malte Jütting, Exploring Mission-Oriented Innovation Ecosystems for Sustainability: Towards a Literature-Based Typology, *Sustainability* 2020, 12, 6677; doi:10.3390/su12166677, <https://www.mdpi.com/2071-1050/12/16/6677>

102) Elizabeth Pollitzer, Creating a better future, *Journal of International Affairs*, Vol. 72, No. 1, THE FOURTH INDUSTRIAL REVOLUTION (Fall 2018/Winter 2019), pp. 75-90

103) Rachel Herbert, Holly Falk-Krzesinski and Andrew Plume, Sustainability Through a Gender Lenses: The Extent to Which Research on UN

advancing gender mainstreaming into science-society-policy collaborative partnerships.¹⁰⁴⁾

9. Learning from the COVID-19 pandemic that “our health, our economies, animal health and the natural environment are all interlinked”¹⁰⁵⁾ and co-benefits and trade-offs should be analysed in a holistic way.
10. Advancing more intensive and systematic collection of gender data for comparative statistical analyses, at country, region, and global levels, especially at the cross section between economic and environmental development ideals.¹⁰⁶⁾

Sustainable Development Goals (SDGs) Includes Sex and Gender Consideration (September 8, 2020). Available at SSRN:
<https://ssrn.com/abstract=3689205>

104) Marisa Escobar, Laura Forni, Emily Ghosh and Marion Davis, Guidance Materials for Mainstreaming Gender Perspectives into model-based policy analysis, Stockholm Environmental Institute, US Centre, 2017

105) Advice from WWF, this report p72

106) <https://sdg.iisd.org/news/unep-iucn-propose-18-gender-environment-indicators/#:~:text=The%20proposed%20gender%2Denvironment%20indicators,decision%2Dmaking%20at%20all%20levels.>

Part 4: Experts contributions

In this chapter, the report brings together 14 thematically based analyses of interlinkages between SDGs developed from a gender perspective by international experts and scholars with knowledge and experience of gender, development, and SDGs. Through different gender lenses they reveal the systemic and institutionalised nature of socio-cultural gender differences and inequalities across the 14 themes, and the variety of ways in which gender sensitive implementations of SDGs can significantly transform the lives of women and men, without disadvantaging one or the other. The experts also expose the essential need to consider the influence of biological factors and male-female differences in non-human species in maintaining the wellbeing of natural environments, and of the ecosystem services on which humans depend. The 14 themes are:

1. Formal analyses of SDG interlinkages
2. Science knowledge for SDGs
3. Transport and mobility
4. Chemicals and waste management
5. Human Biomonitoring
6. Energy transformations
7. Weather and climate
8. Natural environment
9. Marine ecosystems
10. Food and nutrition
11. Digitalisation and ICTs
12. Femicide and human rights
13. Peace and security
14. Green technology and industry

The experts have been asked to consider the following questions:

- How they, as gender and development experts, perceive connections between SDGs?
- Which actors and stakeholder should be included in partnerships for SDGs implementation?
- Which reports or research papers best capture the underlying gender issues?
- What knowledge is still missing?
- Which keywords can help guide new research for the relevant SDGs?
- What indicators are needed to improve monitoring of progress?

The content of each expert contribution has been only minimally edited to help maintain the contextual originality of the explanations and examples provided in each case.

1. Formal analyses of SDGs interlinkages

Jonathan Dawes, University of Bath

Box 1: Analysing interlinkages connecting SDGs from the SDG5 perspective

Key reports by international bodies continue to highlight the lack of analysis of the influence of SDG 5 on other SDGs, and indeed vice versa. This is illustrated in a compelling fashion by the Global Sustainable Development Report 2019 (Independent Group of Scientists, 2019; Pham-Truffert et al, 2019) which presents a meta-analysis of a total of 177 global scientific assessments, UN flagship reports and scientific articles on interlinkages between the SDGs. From these 177 reports, a total of 5,758 interactions at the Goal level were identified: 4,976 positive influences and 782 negative. Of these 5,758 interactions, only 79 (1.4%) were instances in which SDG 5 influenced another SDG (always a positive influence). This level of influence (or ‘*out-degree*’ in network science terminology) of SDG 5 is in fact the lowest of any of the Goals, with Goals 7, 6 and 15 achieving vastly higher positive out-degrees of 768, 604 and 512 respectively. (Note that this excludes the three self-referential cases in the literature analysis in which target 5.1 was identified as reinforcing 5.5, i.e. where SDG 5 reinforced itself).

The disparity between the low influencing score (out-degree) for SDG 5 and that for other SDGs illustrates quantitatively how the current literature on SDG interlinkages fails to provide sufficient commentary on gender equality. It is of interest that, looking more broadly, a similar remark holds for Goal 10 on Inequalities; with 127 positive influences and nine negative influences on other SDGs, Goal 10 is fourth lowest in total influence after gender inequality, SDG1 (No poverty) and SDG4 (Education).

The situation would be better though, at least in network terms, if the other 16 Goals had significant influence on SDG 5; if that were so, then one could conclude that progress would be made on SDG 5 almost as a by-product of progress elsewhere. The GSDR 2019 analysis indicates that there were 168 instances (2.9%) in which SDG 5 was itself positively influenced by another SDG (and five negative influences). Although this ‘influenced by’ score (i.e. an ‘*in-degree*’ in network terms) is higher than the out-degree for SDG 5, it again is a very low score compared to other Goals, in particular Goals 1, 2 and 3 (concerned with No Poverty, Zero Hunger, and Healthy Lives) which achieved positive in-degrees of 560, 551 and 497 respectively. We can conclude that at least on the evidence of this large literature survey, SDG 5 does not play a significant role in the interlinkage network between the SDGs.

Taken together, these results indicate that SDG 5 is somewhat detached from the core of the SDG network as represented by this literature review. In part, of course, this is due to the specific data collection process undertaken for the GSDR. The lack of engagement with SDG 5 becomes a little less surprising when one observes that, as the authors point out (Pham-Truffert et al, 2020), half of the SDG interactions described were derived from just five sources. It is self-evident that none of these sources has a specific focus on gender equality. While in itself this could be seen merely as a reflection of kind of source material available for such a meta-analysis, it should also be seen as the way in which, by omitting discussion and analysis of gender, flagship reports themselves may tend to perpetuate these data gaps. For example, the report *A Guide to SDG Interactions: From Science to Implementation*

(Nilsson et al, 2017) presented detailed analysis of interlinkages focussing on just four Goals: 2 (Zero Hunger), 3 (Health), 7 (Energy) and 14 (Life Below Water) because these are the communities that volunteered their time to undertake the analysis. The analysis presented in this report should be replicated for SDG5 (as is also recommended by Griggs and Kim in Box 2, section 3).

Mathematical analysis (Dawes, 2020a) of the GSDR 2019 interaction network shows that in overall structure it has strong similarities to the initial ICSU-ISSC analysis of SDG interlinkages (ICSU, 2015). This confirms underlying consistencies in the remarks above, i.e. that gender equality is poorly connected into the network of the SDGs. The basis for the ICSU-ISSC report is expert elicitation rather than literature review, and so the interpretation of this lack of connection to SDG 5 should be a little different in the two cases, although since the ICSU-ISSC analysis is one source considered in GSDR 2019 the two reports are not independent of each other.

As well as pointing to the need for significant additional discussion of the impact of gender equality across the SDG agenda (the literature reviewed for tGSDR 2019 identified no influences of Goal 5 on any parts of Goals 7, 9, 11, 13, 14 and 17, for example) analysis of the interaction network suggests where interlinkages should be reinforced in order to produce the optimal system-wide improvements in the SDG network, rebalancing it away from over-emphasis on Goals 1, 2 and 3 towards the whole of Agenda 2030.

Perhaps surprisingly, such rebalancing can be assisted enormously through targetting individual network connections. While the details of which network interlinkages are most useful for this rebalancing task depend on the interlinkage network itself, for the ICSU-ISSC interlinkage network one useful recommendation, which emerges from the mathematical analysis, is to connect progress on Goal 3 (Health) more strongly to the achievement of gender equality. The selection of the specific interlinkage from Goal 3 to Goal 5 - rather than any other pair of Goals - emerges directly from the network science analysis. Naturally, its implementation in any particular local context through policy initiatives demands detailed thought, but models of interlinkages are at least able to offer a set of initial suggestions for policy action, using insights gleaned by considering the SDGs at the whole system level (Dawes, 2020b)

Dawes, J.H.P. (2020a). Are the Sustainable Development Goals self-consistent and mutually achievable? *Sustainable Development*, 28, 101-117. <https://doi.org/10.1002/sd.1975>

Dawes, J.H.P. (2020b). SDG interlinkage networks: analysis, robustness, sensitivities, and hierarchies. Working Paper.

Independent Group of Scientists appointed by the Secretary-General. (2019). *Global Sustainable Development Report 2019: The Future Is Now - Science for Achieving Sustainable Development*. New York, NY: United Nations.

Nilsson, M., D. Griggs, D. McCollum, and A. Stevance. 2017. "A Guide to SDG Interactions: From Science to Implementation." International Council for Science (ICSU). <https://dx.doi.org/10.24948/2017.01>.

Pham-Truffert, M., Rueff, H., Messerli, P. 2019. Knowledge for Sustainable Development: Interactive repository of SDG interactions. CDEdatablog, Bern, Switzerland: CDE.

<https://datablog.cde.unibe.ch/index.php/2019/08/29/sdg-interactions/>

Pham-Truffert M, Metz F, Fischer M, Rueff H, Messerli P. Interactions among Sustainable Development Goals: Knowledge for identifying multipliers and virtuous cycles. Sustainable Development. 2020; 1-15.

<https://doi.org/10.1002/sd.2073>

2. Science knowledge for SDGs

David Griggs, Monash University and Eun Mee Kim, EWha Women's University

Box 2. Gender knowledge needed for the Decade of Action

(1) Understanding the comprehensive inequalities (intersectionality) among gender and other forms of inequality

Gender inequality is often compounded with other forms of inequality, and thus the impact on women/girls appear to be multiplied and make it impossible for women/girls to extricate themselves out of intergenerational poverty. Thus, a study that examines how multiplicity of inequalities (intersectionality) affect women/girls would be an important point in understanding how different forms of inequality are related. For example, women/girls, in remote areas, and with disabilities are reported as the most vulnerable to poverty and climate change. Empirical research should be done in different countries with different economic/social status for a comparative study, which would lead to important policy recommendations for protection and empowerment.

(2) COVID-19 Response and Gender

There are many examples of anecdotal evidence about gender dimensions (inequality) in terms of COVID-19 as well as emerging studies in different contexts. In science, a bibliometric analysis of Elsevier journals¹⁰⁷ identified gender differences in academic journal article submission and review rates since the COVID-19 outbreak, in which men showed no difference while women across the world have shown a statistically lower submission. This will no doubt have longer lasting impact on women in academia. There are many other reports about gender inequality in terms of health and care-giving responsibilities¹⁰⁸ that have fallen disproportionately to women across the world; family violence and violence against women¹⁰⁹; breakdown of families; loss of jobs for women who worked in the service industry (so-called pink collar jobs)¹¹⁰, etc. Thus, a study on gender and COVID-19 world should be done as in addition to the negative impacts of COVID-19 on women already emerging, for example in the Sustainable Development Goals Report 2020, there are also opportunities that can be exploited. For example, a) COVID-19 has shown how subject matter experts can be better integrated into decision making, b) The

comprehensive nature of COVID-19 has forced silo based departmental structures to be supplemented by more integrated, interdisciplinary structures, and c) It is well known how difficult it is to break habitual behaviour and that major discontinuities in personal circumstances, when habits are forced into change, are the best time to seek further change. COVID-19 is probably the first global scale discontinuity and hence presents the first global opportunity to change habitual behaviours on a global scale.

(3) Undertaking a comprehensive mapping of gender interlinkages with other SDGs using the ISC methodology

In order to understand how gender issues affect climate change and vice-versa it is first necessary to understand the interlinkages between gender and climate change. These interlinkages are pervasive and complex, they usually involve linkages to other SDGs and most importantly they are not well understood. In theory it is necessary to understand these interlinkages for every decision and policy, which would require a full system analysis every time. However, Nilsson et al (2016) and the International Science Council (ISC) (2017) have developed a simple tool to assist with mapping interlinkages between SDGs. The ISC report looked in detail at four SDGs, but gender was not one of them.

Brody et al 2008 in their report “Gender and Climate Change: Mapping the Linkages - A Scoping Study on Knowledge and Gaps”¹¹¹⁾ produced an excellent summary of climate change and gender research needs. In addition to many specific recommendations the following suggested areas for research that they recommend are listed below:

- **Identifying the gendered impacts, coping strategies and adaptation priorities of women and men in contexts where this has currently been under-researched**

Women and men, girls and boys, should be involved in a participatory capacity to inform climate change responses at a local level. This will enable the specific experiences and voices of people most affected by climate change to inform understandings of climate change impacts, adaptation and mitigation. This is critical if policy and practice is to respond appropriately to people’s needs in specific contexts and be informed by their everyday knowledge of coping with these phenomena. The ActionAid/IDS research provides a best practice model which can be replicated and applied in other global contexts and situations, since impacts are often socially and culturally specific.

- **Identifying the gendered impacts, coping strategies and adaptation priorities of women and men in urban contexts**

Notably, much of the existing research on gender and climate change focuses on rural communities. More participatory research is needed into the impacts of climate change in urban settings, particularly in terms of gender in/equality, and the coping strategies and priorities of women and men in urban contexts.

-
- **Identifying the impacts of climate change on gender roles and relations at the household level**

Little research has currently been done into the impacts of climate change on gender relations at the household and community levels. Research is needed to determine where women's and men's priorities conflict and where there is consensus, and how policies and programmatic responses to climate change can best respond to the differing vulnerabilities, needs and priorities of women and men.

(4) Identifying how gender affects people's consumption and lifestyles

More research is needed to document the different energy consumption patterns of men and women to inform targeted mitigation and technological adaptation strategies, such as awareness raising campaigns for the purposes of behaviour change. Further research is also required into how involving women in using environmentally sound technologies could improve mitigation and adaptation at the community level.

(5) Identifying best practices for gender-sensitive responses to climate-change related disasters, conflict and displacement

Research is needed to highlight existing models of best practice for communities in disaster prone areas - such as the provision of gender-sensitive training and involving women and men equally in hazard management activities. Sensitive qualitative research is also needed to explore the links between climate change and violence against women. The particular concerns and needs of girls and adolescents should be central to this.

- Urgent research is required on how to manage environmental migration in a gender-sensitive way. This includes recognising and responding to gender roles and responsibilities around natural resources and may include ensuring that scarce resources are available for receiving communities, and that water is provided for in-migrants.
- Research is needed to establish how best to respond to violent conflict over natural resources in a gender-sensitive way, taking into account the needs of women and girls, boys and men.
- Finally, it is essential that research is undertaken into the impacts of natural resource depletion and limited access on intra-household conflict. This is in order to establish policies and practices which lessen the likelihood of arguments over scarce natural resources which may result in violence.

(6) Identifying the gender implications of long-term drought and starvation in Sub-Saharan Africa

Research on the gender implications of disasters and related policy also needs to be more responsive to the long-term disaster of drought and starvation in Sub-Saharan Africa, which is less prominent in the media than recent events such as the Asian Tsunami, but whose impacts are equally if not more damaging to the lives and livelihoods of women and men. For example, what are the gender implications of drought and starvation in Sub-Saharan Africa? How should the development industry respond to these challenges at all levels?

(7) As identified by the World Health Organisation (2011), there remains a general lack of research on sex and gender differences in vulnerability to, and impacts of, climate change especially health-related impacts.

Key words

Climate adaptation, climate mitigation, climate finance, natural disasters, climate migration, sustainable development, SDGs, gender inequality, disaggregated data, multiple forms of inequality, intergenerational poverty, SDGs, gender inequality, disaggregated data, multiple forms of inequality, intergenerational poverty, Disaggregated data on gender and different forms of inequalities.

New indicators

- Disaggregated data on gender and different forms of inequalities.
- Measure the gap in climate impacts between men and women;
- Measure the differences in roles, responsibilities and access to resources for climate related issues
- Require climate adaptation data to be disaggregated by sex, age and other variables;
- Encourage the integration of gender equality issues from the planning of a climate policy, programme or project right through to implementation, monitoring and evaluation.

Key references

UN, 2019. The Future is Now: Science for Achieving Sustainable Development. 2019 Global Sustainable Development Report.

Alverado, Facundo, et al., eds. 2018. World Inequality Report 2018. Belknap Press.

Asian Development Bank. 2013. Gender Equality and Food Security: Women's Empowerment as a Tool against Hunger. Manila.

Beaman, Lori, et al. 2012. Female Leadership Raises Aspirations and Educational Attainment for Girls: A Policy Experiment in India. Science. Vol. 335: 6068 (February 2012).

International Council for Science (ICSU), 2017. A guide to SDG interactions: from science to implementation [Griggs, D.J., Nilsson M., Stevance, A., McCollum, D (eds)] International Council for Science, Paris.

Brody, A., Demetriades, J. and Esplen, E., 2008, 'Gender and Climate Change: Mapping the Linkages - A Scoping Study on Knowledge and Gaps', BRIDGE, Institute of Development Studies, Brighton

Habtezion, Senay (2013). Overview of linkages between gender and climate change. Gender and Climate Change. Asia and the Pacific. Policy Brief 1 (PDF). United Nations Development Programme.

Nilsson M., Griggs D., and Visbeck M. 2016. Map the interactions between Sustainable Development Goals Nature, Vol 534, p. 320

World Health Organization, Gender, Climate Change and Health (2011); UNDP, Note 1, 2011.

Bonnet, Florence, Joanne Vanek and Martha Chen. 2019. Women and Men in the Informal Economy: A Statistical Brief. Manchester: UK: Women in Informal Employment: Globalizing and Organizing (WIEGO).

Council on Foreign Relations. Girls' STEM Education Can Drive Economic Growth (16 June 2017).

Dufo, Esther. 2012. Women Empowerment and Economic Development. Journal of Economic Literature. Vol. 50: 4 (December 2012).

GSM Association. 2018. The Mobile Gender Gap Report.

Kimmel, Jean. 2006. Child Care, Female Employment, and Economic Growth. Community Development, Vol. 37: 2 (June 2006).

Krause, Jana, Werner Krause and Piia Branfors. Women's Participation in Peace Negotiations and the Durability of Peace. International Interactions. Vol. 44: 6 (November 2018).

World Economic Forum. Various years. Global Gender Gap Report.

107) https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3712813

108) <https://globalhealth5050.org>

109) <https://interactive.unwomen.org/multimedia/infographic/violenceagainstwomen/en/index.html>

110) <https://www.mckinsey.com/featured-insights/future-of-work/covid-19-and-gender-equality-counteracting-the-regressive-effects>

111) http://www.bridge.ids.ac.uk/sites/bridge.ids.ac.uk/files/reports/Climate_Change_DFID.pdf

3. Transport and mobility

Overview

Transport plays vital role in contributing to all SDGs¹¹². The analysis of 156 Voluntary National Reports (VNRs) from 143 countries to establish how transport has been connected to different SDGs¹¹³ shows that the relevance of transport to SDG5 has been largely ignored, see Figure 17 below. The majority of the references in this body of evidence focus on transport infrastructure development in the context of passenger and freight activities (SDG 9), all-season rural roads (SDG 15), and accessible public transport systems (SDG 11). Significant attention has also been given to increasing the share of renewable energy and reduce final energy consumption in the transport sector (SDG 7); curbing mobile-source GHG emissions (SDG 13) and reducing traffic fatalities and injuries (SDG 3). The lack of attention to gender and other inequality issues in this collection of VNRs demonstrates that transport has to be understood as means to an end - rather than an end in itself.¹¹⁴ However, even if developing transport infrastructure and services are seen as the priority to enable the ease of reaching destinations in terms of proximity, convenience and safety, overlooking gender issues makes transport infrastructures gender blind and clearly disadvantaging women, as demonstrated in the reports from World Bank¹¹⁵, UNOPS (2020)¹¹⁶ report on gender and infrastructures, and by the Case Study contributed to this report by the gender and transport experts in World Bank, in Box 3, below.

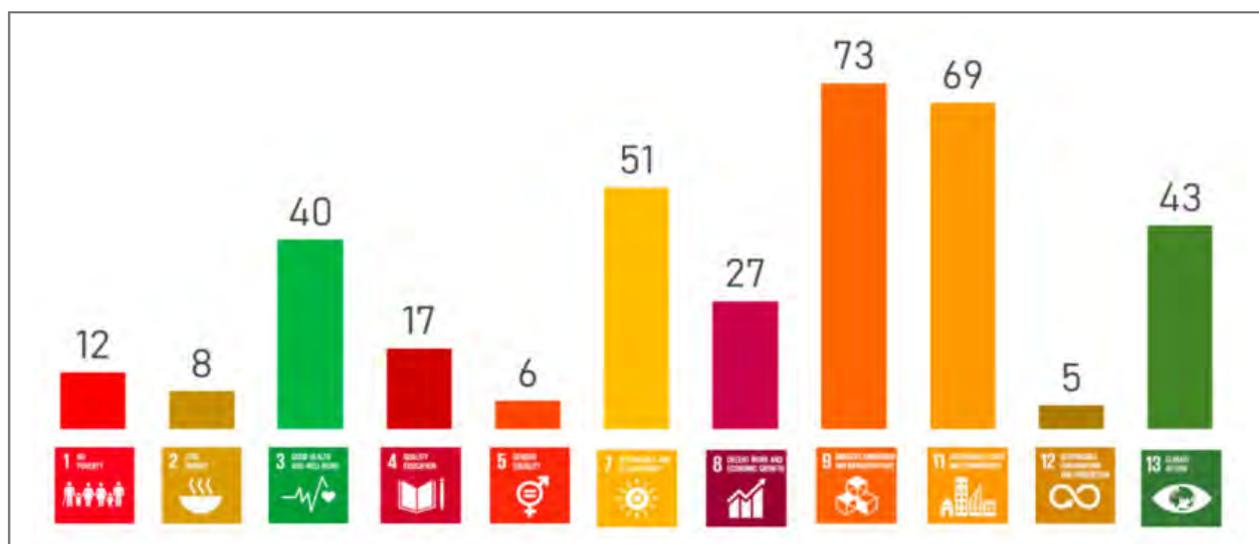


Figure 17. Proportion of voluntary national reports with connections between transport to SDGs, as identified in SLoCaT¹¹⁷ [Note the very low interest in SDG5 (gender equality) and no result for SDG10 (social inequalities)]

112) <https://sustainabledevelopment.un.org/content/documents/8656Analysis%20of%20transport%20relevance%20of%20SDGs.pdf>

113) SLoCaT, (2019). Sustainable Transport: A Critical Driver to Achieve the Sustainable Development Goals. Available at: www.slocat.net/vnr

114) http://siteresources.worldbank.org/INTWDRS/Resources/477365-1327599046334/WDR_00_book.pdf

115) Ferguson, Lucy and Harman, Sophie, Gender and Infrastructure in the World Bank (September 2015). Development Policy Review, Vol. 33, Issue 5, pp. 653-671, 2015, Available at SSRN: <https://ssrn.com/abstract=2639420> or <http://dx.doi.org/10.1111/dpr.12128>

116) Morgan G, Bajpai A, Ceppi P, Al-Hinai A, Christensen T, Kumar S, Crosskey S & O'Regan N. Infrastructure for gender equality and the empowerment of women. UNOPS, Copenhagen, Denmark.

117) SLoCaT, (2019). Sustainable Transport: A Critical Driver to Achieve the Sustainable Development Goals. Available at: www.slocat.net/vnr

Gender perspective

Muneeza Mehmood Alam, Karla Gonzalez Carvajal, Karla Dominguez Gonzales, World Bank

Box 3. Transport infrastructure and services from a gender perspective

On average, female headed households tend to be poorer than male headed households. Access to economic opportunities is critical for bringing people out of poverty. Lack of safe and secure transport impacts women's mobility more than men, thus limiting their access to jobs and markets. (This is relevant to SDGs 8, 10 and 11). While household surveys collect household level expenditure on transportation and ownership of transportation assets, they often don't disaggregate transport expenditure and ownership or usage of transportation assets by sex.

Access to transport services and the presence of road connectivity has been linked to improved health care outcomes for women. A study in India found that improved road access resulted in increased use of preventive health care (women were more likely to use antenatal care and modern contraceptives and households more broadly were more likely to get health insurance and treat water) (Banerjee & Sachdeva, 2015). The same study also found that improved rural connectivity resulted in (a) increased availability of health care supplies and (b) increased likelihood of trained medical professionals being available in India. This was particularly beneficial to women due to increased availability of midwives, and mother and child health workers.

This increase in medical facility usage is particularly pronounced in the case of pregnant women. In Pakistan, pregnant women living in villages reachable by roads (compared to those living in unconnected villages) were 14 percentage points more likely to have had prenatal consultation and 19 percentage points more likely to give birth in the presence of a skilled attendant (Babinard & Roberts, 2006) (similar results in Majid (2013)). Long distances can be particularly prohibitive for pregnant women - Stekelenburg et al (2004) find that in Zambia majority of the women interviewed had to walk over two hours to get to a clinic—these women were also 36 percentage points less likely to deliver at a medical facility relative to pregnant women who lived closer to such a facility. To this end, in Malawi providing bicycle ambulances was found to reduce the rate of deliveries at home, reducing it from 37 percent to 18 percent in treatment villages (Lungu, Kamfosa, Hussein, & Ashwood-Smith, 2001). In contrast, access to motorized transport proved to be instrumental in improving perinatal health in rural Kenya (Ondimu, 2001).

Transport improves both teacher and student attendance at schools, thus impacting the schooling of both girls and boys. In many instances the impact on girl's educational attainment has been found to be higher. This is because safety and security is a heightened concern for them. For example, girls were found to pay almost a third more than boys for their daily commutes to school in Bosnia & Herzegovina due to safety and security considerations (Babinard and Scott, 2011). A recent study in Delhi has found that women are willing to pay more for a safer route to college than men and that they are willing to choose a lower quality college if it as a safer route (Borker, 2018).

In the same vein, providing bicycles to girls in rural India improved their secondary school enrolment significantly

(reducing the gender gap in enrolment by 40 percent) and improved their test participation and scores (Muralidharan & Prakash, 2017). These impacts, found almost entirely for girls living at least 3 km from school who often had to commute to other villages for their schooling, are attributed to a reduction in travel time and increased safety during their commutes as girls would often bike in groups. A report on Guinea finds that when schools are located far from villages in rural areas, better transportation services may help retain girls in school. (WB, 2019)

This goal refers to women's empowerment, establishing the objective of eliminating discrimination and violence against women and girls, in public and private spheres, including trafficking, sexual, and other types of exploitation. It also refers to providing women with equal opportunities and to promote their empowerment. It points for the recognition of unpaid household work, balance within the household and provision of public services.

Several transport interventions have been successful in curbing the harassment that women face in public transportation. In India, organizations like Saftipin are performing safety audits of public transit stations as well as public areas to identify the safety risks so that the relevant authorities can address the identified gaps. In Mexico, the Hazme el Paro campaign was launched to ensure safety of women in public busses by developing an approach that: (a) trained bus drivers on appropriate response to sexual harassment, (b) launched a marketing campaign to empower the community, (c) developed a smartphone application that could be used to report harassment on buses, and (d) trained the police on how to respond to complaints of harassment. An impact evaluation was conducted, and it showed increased awareness and more willingness for people to intervene in cases of sexual harassment, specifically young men. In Quito, Ecuador, a similar approach has been put into place with the *Bajale al Acoso* Strategy.

Evidence around the world shows that women's mobility patterns are dictated by the economy of care. Women are also using slower transport modes and even if they might have the same travel time as men, they are traveling shorter distances (Peralta, et.al, 2014; Alam et. al, 2020). Women also walk more than men. In this sense, given that women are time poor because of unpaid and unbalanced distribution of household work, providing them with access to more rapid, safer and efficient transport modes in many instances incentivize them to access better job opportunities, plus contribute to their time saving (in both developed and developing countries). For example, in Barcelona and Madrid, women are more likely to be unemployed than men as a result of there not being enough jobs that can be accessed by public transport, which implies a further widening of gender inequalities (Matas, Raymond and Roig, 2010). In Lima, Peru, a BRT line and an elevated light rail (Metro Line 1) connecting peripheral areas of the city to major employment centres increased employment rates for women (but not men) living near the new infrastructure (Martinez et al. 2020). A metro bus system in Lahore, Pakistan, with subsidized fares, has increased the percent of commuters taking public transit by 24 percent (including women) (Majid, Malik and Vyborny 2018). Another way for transport to respond to household burdens could be by using public infrastructure to provide care and breastfeeding services. other activities (work or leisure).

The promotion of cleaner energy transportation technologies (like electric vehicles) provide an opportunity to engage women in the conceptualization and production of these new technologies (in a sector that has traditionally been male dominated). While, increasing women and girls' education contributes to higher economic growth, gains in education have not translated into better labour market outcomes for most women. A key

contributor to this disparity is the safety and security considerations in mobility as they limit women's access to employment opportunities. A recent study shows that "limited access to and safety of transportation is estimated to be the greatest obstacle to women's participation in the labour market in developing countries, reducing their participation probability by 16.5 percentage points". This is not surprising since 80 percent of women have experienced harassment in public spaces during their lifetime and globally only 32 economies prohibit sexual harassment in public places (including public transportation). Therefore, the safety and security of mobility can have a huge impact on women's socio-economic wellbeing. See SDG 5 for examples of how harassment of women and girls can be reduced.

Better connectivity can especially improve labour market outcomes for women. For example, in rural Ethiopia better transport connectivity increased labour force participation, particularly for youth and females in remote communities working as wage workers (Nakamura, Nuru, & Bundervoet, 2018). This states that building resilient infrastructure, promoting inclusive and sustainable industrialization, and fostering innovation is required, with a focus on affordable and equitable access for all. Women should also play a significant role in the provision of this infrastructure and services. At the moment women's participation is low in the transport sector. In developed countries, less than 25% of transport workers are women, while in developing countries the share is even lower (less than 10%).

Several examples exist on how to improve women's participation in the provision of transport infrastructure and the gains that accrue to them. In Jordan, codes of conduct have been developed to regulate passenger, driver and operator conduct in public transport under a World Bank project. In Bangladesh, under another World Bank project, there are plans to provide onsite day care services for children of workers engaged in civil work (thus providing working mothers a suitable childcare option) under a World Bank project. In Turkey, under another World Bank project, education-employment pathways are being created in the rail sector for women by combining internship opportunities and partnerships between the relevant transport entity and local universities. Examples are also available on how the gender lenses can be used to identify the locations of investments. For example, a World Bank project in Bangladesh has used/applied expected gains to women (as one of the five metrics) in prioritizing and identifying the location of rural markets/logistics hubs that will be improved.

Parliaments are key to develop policy and to crash legal barriers that impede women from accessing transport/infra jobs. Jordan, Azerbaijan and Saudi Arabia are examples of changes that included congress approval. For example, in Azerbaijan, the labour code and the subsidiary legislation currently reserve 674 occupations across many sectors of the economy or tasks for men only. These job restrictions are a remnant of a Soviet Union law that carried over into countries' national legislation after the collapse of the Union. These restrictions also affect Azerbaijan's score on the Bank's Women, Business and the Law index. The Ministry of Labour and Social Protection of the Population (MLSP) is interested in removing these restrictions and World Bank is supporting the ministry in generating the evidence base to make this possible. While there is willingness at the Ministerial level to make these reforms, the final reform has to be passed by the parliament for the change to be possible. Equally, connectivity can improve, educations, health and economic outcomes for lagging regions within a country and also balance the scales across countries, it also has an important gender dimension.

As cited elsewhere, improving transport connectivity, and the provision of safe and secure transportation, often impacts women's mobility more than men and consequently improves their health, educational, and economic outcomes much more than men's.

For example, research shows high levels of violence, sexual harassment and sexual abuse directed at women and girls in public transport and adjacent public spaces in many cities around the world. For example, in Cairo and Alexandria, Egypt, as high as 99.3 per cent of women surveyed reported having experienced sexual harassment, most commonly in the form of touching or groping. The study showed that streets and public transport are where women are most at risk. Almost twice as many women as men surveyed in London, UK said they do not feel safe using London public transport. However, only one in ten surveyed said they would report sexual harassment.

An important dimension of inequality is urban vs. rural. Women in rural areas often do not have access to private motorized forms of transport such as cars, with men using this mode as much as three times more than women on average. The most predominant mode of travel for women in many rural areas remains walking. (World Bank, 2010) Thus, improving walkability of rural areas would disproportionately benefit women. This goal clearly acknowledges the role of transport in promoting gender equity. It aims to make human settlements of all sizes inclusive, safe, resilient, and sustainable. Urban transportation is considered a key component of inclusive cities. SDG 11.2 requires, by 2030, "the provision of access to safe, affordable, accessible, and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities, and older persons." For example, in Sao Paulo, a segregated bike lane is being developed for a new BRT line in the Aricanduva Corridor, which will take into account the needs of female cyclists.

Evidence shows that in many countries' women are less likely than men to adopt new transport technologies (partly due to lack of asset ownership and cultural norms). A study in Mumbai finds that women less likely to use motorized two wheelers, even when the level of satisfaction with public transit falls (Alam et al, 2020). Similarly, Urban Mobility Daily states (based on survey data) that for both bicycles and e-scooters, most users are male. Similarly, while several measures have been taken to reduce motor vehicle trauma over the past decades; the benefits are equally realized by the vehicle users of either sex. Several studies have found that advances in occupant safety technology do not provide equal injury protection for drivers of either sex involved in a serious or fatal crash.

Mobility as a service (MaaS), as with any new solution, runs the risk of replicating the same gendered inequalities in access and usage that exist in transportation as whole. The gains to women of MaaS platforms will depend on whether these platforms are used to collect gender disaggregated data on usage and use these data to modify the service to cater to the needs of all. For example, ride hailing services are one MaaS solution that have provided women with new ways of accessing opportunities, but the associated costs of ride hailing imply that only more affluent women are able to access these services. Ride-hailing has helped many women meet complex transportation needs driven by household management responsibilities. It has increased women's mobility and sense of independence as riders (helping them reach previously inaccessible places or travel at night). However, the cost of mobility as a service tends to be outside the reach of many women.

Thus, tailoring mobility as a service solution to make them more affordable, while ensuring safety and coverage will be critical in providing women access to economic and social opportunities (IFC, 2018). This goal aims to ensure sustainable consumption and production patterns and extend understanding of household consumer expenditures beyond disaggregation by purpose (energy, transport, housing, food) to understand consumption by individual household members to specific purposes, such as caregiving work, commuting, and personal consumption. This is important from a gender equity perspective.

Here two issues are salient: (a) who is the survey respondent—asking males vs. females have been shown to yield different results; and (b) the nature of questions asked (traditionally there has been a greater focus on documenting expenditure on utilities than on capturing mobility expenditures). Promoting public transportation and high occupancy travel are important ways of mitigating the carbon footprint of the transport sector. Falling ridership due to COVID-19 has put many transport operators at financial risk. This risk also provides an opportunity to build back better and reimagine public transportation. Given that women typically depend more on public transportation options, transport operators should view women as allies to reimagine a public transportation that works equally well for all.

The first and foremost knowledge gap vis-à-vis gender and transport is the lack of sex-disaggregated mobility and employment data for the transport sector. This gap limits the ability of transport practitioners to design gender inclusive transport infrastructure and services, but also researchers to study how improved transport impacts men and women differently.

COVID-19 has impacted public transport substantially. It is important to understand: (a) how this has impacted women (who tend to rely more on public transport than men in many countries); (b) how to bring back female riders to use public transport after the COVID crisis; and (c) how technology and multimodality (including micro-mobility) can together support women's mobility needs under the recovery phase of COVID-19. While women are major users for public transport, they tend to use micro mobility options (as bike, scooters and motorcycles etc.) less than men. The COVID-19 recovery provides an opportunity to understand and design multimodal transport solutions (combining, public transport, micro-mobility, and private transport) in a way that they cater to the needs of both men and women.

There are also two specific long-standing areas of research that require significant attention:

- Understanding the role that transport barriers play in women's decision to participate in the labour force, and it how transportation interacts with women's traditional caregiving roles
- Quantifying the various mobility barrier's faced by men and women along four dimensions— affordability, availability, accessibility and acceptability (including issues of security).

In addition, there is a limited understanding of the heterogeneous impacts of transport (and he mechanisms and additional constraints that result in these heterogeneous impacts). In this context several areas require additional inquiry.

- There is a limited understanding of how changes in transport connectivity interact with race, class and gender and lead to different economic and social outcomes.
- The literature that looks at heterogenous impacts of changes in transport connectivity on men and women does not investigate how this change in connectivity impacts women in different situations differently (for example, those who are active in the labour market vs. those who are not, those with children vs. those who don't, and so on). In this manner the literature treats men and women as black boxes.

Furthermore, from a policy viewpoint the field would also benefit from a meta-analysis (and robust literature review) that: (a) identifies and quantifies logical pathways that explain women's mobility choices and patterns; (b) identifies the role that transport plays in women's access to health and education facilities (human capital acquisition), access to jobs, markets and other economic activities, and other broader development outcomes; (c) identifies the barriers that women face in transportation and ways in which these barriers can be alleviated.

Related Bibliography:

Alam M, M Cooper, P Suri, and M Herrera Dappe (2020). Closing the Gap: Gender, Transport and Employment in Mumbai, Working Paper.

Borker, G. (2018). Safety First: Perceived Risk of Street Harassment and Educational Choices of Women, Working Paper.

Babinard, J., & Roberts, P. (2006). Maternal and Child Mortality Development Goals: What Can the Transport Sector Do? *Transport Papers*, 12.

Babinard, J., & Scott, K. (2011). What Do Existing Household Surveys Tell Us About Gender and Transportation in Developing Countries? *Transportation Research Board. Women's Issues in Transportation*, 2. Retrieved from <http://hdl.handle.net/10986/16949>

Banerjee, R., & Sachdeva, A. (2015). Pathways to Preventive Health, Evidence from India's Rural Road Program. *USC-INET*, 15-19. Retrieved from <https://ssrn.com/abstract=2636999>

IFC (2018). Driving Toward Equality: WOMEN, RIDE-HAILING, AND THE SHARING ECONOMY. Washington, DC. https://www.ifc.org/wps/wcm/connect/62a2871b-271b-4256-b426-65b2012d00f7/00418+IFC+DTE+Report_Complete_Layout+Final2-pxp.pdf?MOD=AJPERES&CVID=m9ksr4q

Levy, H. (2004). Rural Roads and Poverty Alleviation in Morocco. *Scaling Up Poverty Reduction: A Global Learning Process and Conference*. Shanghai: The World Bank.

Lungu K., V M Kafosa, J Hussein and H Ashwood-Smith. (2001). Are bicycles ambulances and community transport plans effective? *Malawi Medical Journal*. Vol. 13 No. 2 (2001)

Majid, H. (2013, September). Increased Rural Connectivity and its Effects on Health Outcomes. *The Lahore Journal of Economics*, 18(SE), 271-282.

Majid, H, A Malik, and K Vyborny. (2018) "Infrastructure Investments and Public Transport Use: Evidence from Lahore, Pakistan" Working Paper.

Matas, A.; Raymond, J.-L.; Roig, J.-L. (2010). "Job accessibility and female employment probability: The cases of Barcelona and Madrid", in *Urban Studies*, Vol. 47, No. 4, pp. 769-787.

Martinez, D., Mitnik, O.A., Salgado, E. et al. (2020) Connecting to Economic Opportunity: the Role of Public Transport in Promoting Women's Employment in Lima. *J Econ Race Policy* 3, 1-23.

<https://doi.org/10.1007/s41996-019-00039-9>

Muralidharan, K., & Prakash, N. (2017). Cycling to School: Increasing Secondary School Enrollment for Girls in India. *American Economic Journal: Applied Economics*, 9(3), 321-350. Retrieved from

<https://doi.org/10.1257/app.20160004>

Nakamura, S., Nuru, M., & Bundervoet, T. (2018). *Review of Ethiopian Rural Roads Program: Welfare Impacts of Recent Rural Road Development in Ethiopia*. The World Bank, Washington DC.

Ondimu, K. N. (2001). Determinants of perineal health problems in Kisumu district, Kenya. *International Journal of Health Care Quality Assurance*, 14(5), 200-211.

Stekelenburg, J., Kyanamina, S., Mukelabai, M., Wolffers, I., & van Roosmalen, J. (2004, March). Waiting too long: low use of maternal health services in Kalabo, Zambia. *Tropical Medicine and International Health*, 9(3), 390-398. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/14996369>

World Bank (2010). Mainstreaming Gender in Road Transport: Operational Guidance for World Bank Staff. Transport Papers.

<http://documents1.worldbank.org/curated/en/669831468330934298/pdf/569540NWP0Tran10Box353751B01PUBLIC1.pdf>

World Bank. (2019). Guinea : The Economic Benefits of a Gender Inclusive Society. World Bank, Washington, DC. © World Bank. <https://openknowledge.worldbank.org/handle/10986/32507> License: CC BY 3.0 IGO.

Which actors and stakeholders to include in partnerships for SDGs implementation

Urban Municipal Corporations

Ministry of Transport

Ministry of Housing and Urban Affairs

Ministry of Poverty Alleviation

NGOs; Transport Operators (buses, BRTs, metro etc.)

Bureau of Statistics

Ministry of Planning (they normally run the policy and SDGs interventions)

International Financial Institutions¹¹⁸⁾

Which reports or research papers best capture the underlying gender issues

The following recent reports/papers are linked to important sustainability issues:

- Global Roadmap of Action Towards Sustainable Mobility—Gender (available here)
- Joint World Bank and UN Women, e-learning training course on Gender Equality and Transportation
- Why Does She Move: A Study of Women’s Mobility in Latin American Cities
- Assessment of barriers and opportunities using Gender and Roma lenses in North Macedonia
- Lifting legal barriers to women’s employment in Azerbaijan
- Closing the Gap: Gender, Transport and Employment in Mumbai
- Gender-Segregated Transportation in Ride-Hailing

Which keywords can help guide new research for the relevant SDGs?

- Pink tax on women’s mobility
- Women’s safety in public transport
- Sexual harassment in transport
- Gendered transport
- Engendering transport
- Differences in men and women’s mobility patterns
- Women’s mobility
- Rural connectivity for women, Inclusion

What indicators are needed to improve monitoring of progress?

SDG 1:

- Share of population below poverty line (\$1.9 a day) that lives within a 30 minute walk of public transport stop

118) https://assembly.thegef.org/sites/default/files/file_attach/Joint-IFI-Transport-GHG-Accounting.pdf

SDG 3 and 4:

- Share of rural population living within 5 km of a school (primary, middle, secondary)
- Share of rural population living within 5 km of a basic health facility (primary, middle, secondary)

SDG 5

- Time saved by women for using faster and more efficient transport modes
- Percentage of women that have shifted to faster and more efficient transport modes

SDG 8 and 9

- Ratio of women to men employed in the transport sector [broken down by: (a) subsectors—road, rail, air, maritime; and (b) skill level—unskilled, skilled technical, skilled managerial, skilled decision maker]
- Wage gap between women and men within the transport sector [broken down by: (a) subsectors—road, rail, air, maritime; and (b) skill level—unskilled, skilled technical, skilled managerial, skilled decision maker]

SDG 9 and 11

- Share of secondary, and tertiary road infrastructure with gender responsive design (sidewalk, guard rails, etc)
- Share of urban population within a country/city living within a public transport stop (bus, rail, metro etc.)
- Share of public transport stations within a city/country that have a gender responsive design (lighting, openness, visibility, walking/access path)
- Existence of well functioning (operational) mechanisms to respond to harassment of public transport users (Y/N).
- Existence of Response Protocols to cases of sexual harassment in Public Spaces (Y/N)
- Average response time for security officers/police to distress calls from public transport users.
- Ratio of women to men public transport users
- Percentage of women satisfied with safety conditions of public transport/infrastructure (by transport mode)
- Attitude of men and women towards women travelling alone (by day and night)
- Perception of safety when using public transportation (by men and women)

4. Chemicals and waste management

OVERVIEW

According to the Global Gender and Environment Outlook (GGEO)¹¹⁹ the importance of the gender- and-environment nexus was scarcely recognized until recently but is today getting a growing acknowledgement, including in the Sustainable Development Goals (SDGs)¹²⁰, see Figure 18 below. Chemicals and waste management play an important and increasingly significant role in every economic and social sector. Sound management of chemicals throughout their lifecycle is essential to avoiding complex risks to human health and ecosystems, and substantial costs to national economies and for this it is necessary to mainstream gender into projects on chemicals and waste.¹²¹ Similarly, sound

119) <https://www.unep.org/resources/report/global-gender-and-environment-outlook-ggeo>

120) UNEP 2016. Global Gender and Environment Outlook. UN Environment, Nairobi, Kenya.

121) <https://www.undp.org/content/dam/undp/library/Environment%20and%20Energy/Chemicals%20and%20Waste%20Management/UNDP>

management of chemicals and waste is necessary to maximize the potential benefits of their contribution to human well-being. Either as an input to or consequence of activities, sound management of chemicals and waste can provide practical solutions to achieve sustainable development.¹²²⁾



Figure 18. Connections between sound management of chemicals and SDGs (ICOM 2018)

Chemicals and waste management are reflected explicitly in a number of goals and targets, including those addressing health, water, cities and human settlements, and responsible consumption and production. Moreover, they relate implicitly to the goals on poverty, agriculture, oceans, decent work, climate change, and while less pronounced, their contribution is also important in areas such as education and gender equality.

%20Guidance%20Document%20Gender%20and%20Chemicals-ENGLISH.pdf

122) IOMC Chemicals and Waste Management: essential to achieving the Sustainable Development Goals (SDGs), 2018 https://www.who.int/iomc/ChemicalsandSDGs_interactive_Feb2018_new.pdf?ua=1

Gender perspective

Minu Hemmati and Anna Holthaus, MSP Institute - Multi-Stakeholder Processes for Sustainable Development eV

Box 4. Chemicals and waste management from a gender perspective

“The WHO estimated the burden of disease from selected chemicals at 1.6 million lives in 2016 (this is likely to be an underestimate)” and “the size of the global chemical industry is projected to double by 2030” (UNEP 2019¹²³), which makes chemical pollution a major concern for sustainable development. On the other hand, chemical innovations are an important driver of change (ibid.). That’s why current gender research and data is essential. But until now very few studies on gender and chemical exposures and chemical management have been carried out, and the studies for gender diverse persons are virtually non-existent. The few studies focus on biological differences and vulnerability of women, women’s role as agents of change hardly receives any attention. Reasons for this might be a lack of intention and funding for the management of chemicals in (inter)national policy and the crossing-cutting character of chemicals in the Agenda 2030 itself. As a result, concepts and methods for the integration of gender in policies, programs and projects on chemicals and waste management are very rare and the implementation of gender mainstreaming in chemicals management is lacking. We hope that with the adoption of a new, ambitious and gender-responsive framework at the 5th International Conference on Chemicals Management (ICCM5) in 2021 as well as a future science-policy interface for international chemicals management these massive research gaps might be filled in the future.

- Men die significantly more often from selected chemicals (UNEP 2019¹²⁴); one reason is that due to gender roles and the gendered division of labour men tend to engage in more risky behaviours and perform more riskier tasks;
- ii) females are at particularly high-risk during child bearing years and pregnancy; even low doses might elicit dramatic and irreversible effects (UNEP 2019¹²⁵, ILO 2013¹²⁶, UNDP 2011¹²⁷)
- the promotion of gender equality and the empowerment of women and girls must be an integral part of the international and national management of chemicals and waste (SAICM Secretariat, 2018¹²⁸; MSP Institute 2019¹²⁹)
- the medical and toxicological knowledge is still based on the male body due to discrimination against women/girls and gender diverse people (Baggio et al. 2013¹³⁰)
- women have specific hygiene needs on water quality during menstruation, pregnancy (UN Water¹³¹)
- personal protective equipment has been traditionally designed for the male body (ILO 2013¹³²)
- men tend to work in industries that include exposures to carcinogenic, substances (ILO 2013¹³³; Scarselli et al. 2018¹³⁴)
- many chemical workplace hazards can affect the reproductive health of men, women and gender diverse people. It is important that both in national and workplace policies a gender-sensitive approach is adopted and the wider reproductive health of all workers is considered (ILO 2013)
- women in the informal economy are more vulnerable to chemical exposure; the formalization of informal

activities can contribute to better conditions for workers and achieve more inclusive and more sustainable development (UNEP 2019¹³⁵); transformation of the chemical industry might be an opportunity for creating new jobs in green and sustainable chemistry (ibid.) and the empowerment of women and girls in STEM fields;

- in many countries women still do not participate in all aspects of decision-making related to the sound management of chemicals and waste; supporting women's role as agents of change in waste management and recycling/reuse is key (SAICM secretariat 2017¹³⁶, UNEP 2019¹³⁷)
- there are differences in human health impacts due to biological and physical differences between women, men and gender diverse people (ibid., UNEP 2016¹³⁸, UNDP 2011)
- there is a widespread lack of gender-disaggregated data at national level and research on chemical exposure and chemicals management (UNEP 2016¹³⁹, UNDP 2011¹⁴⁰)
- there is lack of sex-disaggregated data and research on chemicals exposure at national level (UNEP 2016¹⁴¹, UNDP 2011¹⁴²);

Which actors and stakeholder to include in partnerships for SDGs implementation?

Health sector, environment sector, labour sector, industry, IGOs, science, women's organizations, gender experts, national and local governments, NGOs

123) UNEP (2019): Global Chemicals Outlook II. From Legacies to Innovative Solutions: Implementing the 2030 Agenda for Sustainable Development.

124) UNEP (2019): Global Chemicals Outlook II. From Legacies to Innovative Solutions: Implementing the 2030 Agenda for Sustainable Development.

125) UNEP (2019): Global Chemicals Outlook II. From Legacies to Innovative Solutions: Implementing the 2030 Agenda for Sustainable Development.

126) ILO (2013): http://ilo.ch/safework/info/publications/WCMS_324653/lang--en/index.htm

127) UNDP Environment & Energy Group (2011): Chemicals and gender.

128) SAICM Secretariat (2018): Gender and the sound management of chemicals and waste. Policy Brief.

129) MSP Institute (2019): Gender & SAICM Beyond 2020. How to create a gender-just healthy planet.

130) Baggio G, Corsini A, Floreani A, Giannini S, Zagonel V (2013): Gender medicine: a task for the third millennium.

131) UN Water: Water and Gender. <https://www.unwater.org/water-facts/gender/>

132) ILO (2013): http://ilo.ch/safework/info/publications/WCMS_324653/lang--en/index.htm

133) ILO (2013): http://ilo.ch/safework/info/publications/WCMS_324653/lang--en/index.htm

134) Scarselli A, Corfiati M, Di Marzio D, Marinaccio A, Iavicoli S. 2018. Gender differences in occupational exposure to carcinogens among Italian workers. BMC Public Health 18:413-413.

135) UNEP (2019): Global Chemicals Outlook II. From Legacies to Innovative Solutions: Implementing the 2030 Agenda for Sustainable Development.

136) SAICM secretariat (2017): Gender and the sound management of chemicals and waste.

137) UNEP (2019): Gender and waste nexus. Experiences from Bhutan, Mongolia and Nepal.

138) UNEP (2016): Global Gender and Environment Outlook.

139) UNEP (2016): Global Gender and Environment Outlook.

140) UNDP (2011): Chemicals and gender.

141) UNEP (2016): Global Gender and Environment Outlook.

142) UNDP (2011): Chemicals and gender.

Which reports or research papers best capture the underlying gender issues?

- MSP Institute (2017): Gender and Chemicals. Questions, Issues and Possible Entry Points. http://gender-chemicals.org/wp-content/uploads/2017/12/2017-12-04-Gender_and_Chemicals_IssuePaper_MSP_Institute.pdf
- UNDP (2011): Chemicals and gender. https://www.undp.org/content/undp/en/home/librarypage/environment-energy/chemicals_management/chemicals-and-gender.html
- United Nations Environment Programme (2016): Global Gender and Environment Outlook. https://wedocs.unep.org/bitstream/handle/20.500.11822/14764/Gender_and_environment_outlook_HIGH_res.pdf?sequence=1&isAllowed=y
- United Nations Environment Programme (2019): Gender and waste nexus. Experiences from Bhutan, Mongolia and Nepal. <https://www.unenvironment.org/resources/report/gender-and-waste-nexus-experiences-bhutan-mongolia-and-nepal>
- United Nations Environment Programme (2019): Global Chemicals Outlook II. From Legacies to Innovative Solutions: Implementing the 2030 Agenda for Sustainable Development. <https://www.unenvironment.org/resources/report/global-chemicals-outlook-ii-legacies-innovative-solutions>
- WECF (2017): Gender dimensions of hazardous chemicals and waste policies under the Basel, Rotterdam and Stockholm Conventions. <https://www.wecf.org/gender-dimensions-of-hazardous-chemicals/>
- WECF (2017): Women and Chemicals The impact of hazardous chemicals on women. A thought starter based on an experts' workshop. <https://www.wecf.org/77912/>

What knowledge is still missing?

- different health impacts of chemicals and waste on women, men, girls, boys and gender diverse people due to biological and physical differences
- different exposures to chemicals and waste among women, men, girls, boys and gender diverse people due to gender roles and the gendered division of labour
- strategies and instruments for gender mainstreaming and the empowerment of women and girls in the management of chemicals and waste as well as in the chemicals industries and sciences
- potentials and effects of the desired transformation of the chemical industry on women and gender relations, especially in the field of green and sustainable chemistry

Which keywords can help guide new research for the relevant SDGs?

Chemicals, Chemistry, Sustainable Chemistry, Green Chemistry, Toxicology, Toxics, Highly Hazardous Chemicals, SAICM, the Basel, Rotterdam and Stockholm Conventions, the Minamata Convention on Mercury, chemical exposure, chemically intensive, chemical industry, harmful chemicals, pesticides, exposure, reproductive health, infertility, fertility rates, abortion, abnormalities, cancer rates, carcinogens, health impacts, health effects, vulnerable, vulnerability, biological differences, human biomonitoring, chemical use, occupational exposures, occupational health, occupational

injuries, industrial accidents, informal sector, personal protective equipment, safety training, safety instructions, cleaning products, cosmetics, agriculture, textiles, toys, mining, construction, electronics, domestic exposures, indoor pollution, electronic waste, e-waste, recycling, lead, mercury, highly hazardous pesticides, chemicals in products, nanotechnology, nanomaterials, endocrine-disrupting chemicals, non-communicable diseases, bioaccumulation, hormone systems, environmentally persistent pharmaceutical pollutants, perfluorinated chemicals.

What indicators are needed to improve monitoring of progress?

- Human biomonitoring data: rate of change for foreign substances in blood, urine, saliva, breast milk - by sex, age, income, geographic location, profession - SDG 3
- Indoor pollution rates disaggregated by sex, age, income, geographic location, profession - SDG 3, 8
- Unintentional poisoning during pregnancy and childhood, by sex, age, income, profession, geographic location - SDG 3, 8
- Infertility rates; disaggregated by sex, age, income, geographic location, profession - SDG 3; 8
- Cancer rates; disaggregated by sex, age, income, geographic location, profession - SDG 3, 8
- Proportion of women's participation in chemicals and waste management - SDG 5, 8, 12
- Proportion of women in STEM fields (chemistry science and chemicals related industries) - SDG 5, 8

5. Human biomonitoring

Małgorzata Debiak, Sophie Fichter, Katrin Groth, Marike Kolossa-Gehring, Arn Sauer, German Environment Agency (Umweltbundesamt - UBA)

Box 5. Human biomonitoring from a gender perspective

The German Environment Agency (Umweltbundesamt - UBA) is Germany's environmental governmental protection agency at the federal level, pursuing the aim of ensuring a healthy environment for citizens with clean air and water, free of pollutants, to the greatest extent possible (UBA, 2020). Within its tasks UBA is conducting, and is engaged in national and international human biomonitoring (HBM) programs

HBM involves the analytical determination of chemicals and/or their metabolites in human body fluids or tissues, mostly blood and urine (WHO 2015). The chemical body burden is determined for individual study participants, and in populations, to identify and estimate the potential health risks linked to chemical exposure. The level of internal exposure is dependent on the extent of environmental chemical deposition, as well as on the individual lifestyle and consumer behaviour.

In terms of policy making, HBM can be used to prioritise actions, identify highly exposed subgroups of the population, and to measure and evaluate the effectiveness of past legislations (Ganzleben 2017).

The high and direct contributions of HBM to SDG3 are obvious. There are, however, more SDGs that benefit from HBM data. The environmental chemical monitoring of drinking water, indoor air and noise are part of the German Environmental Survey studies (GerES, 2020), as there can be no human health without a healthy environment and water supply, thus strengthening SDGs 1, 6, 14 and 15.

Regulatory and policy making activities support SDGs 9 and 12. The analysis of HBM data in the context of environmental justice provides input to SDG 10.

Since 2014, UBA intensified efforts to implement gender into the German HBM studies. The initial exemplary studies showed that a more detailed consideration of sex and gender as well as related biological and behavioural differences in studies on chemical exposure was beneficial (Bolte, 2018, Sauer, 2019).

Additionally, sensitivity for a more differentiated view on sex and gender might bring additional value for the SDG implementation. On the one hand the observed differences might be better explained, on the other hand new chemical effects might be recognized (Debiak, 2019). Both might increase the health and risk assessment of chemicals (SDG3) and allow equal access to health protection, independent of sex and gender (SDG 5 and 10). The better scientific basis for data collection and analysis would additionally support SDG 3 and 10.

UBA - as one of the pioneers among the scientific regulatory agencies - recognized the importance and added-value of sex and gender perspectives in research and introduced the first pilot research project on gender relations and sustainability in 2000. (UBA, 2017).

The key lesson for UBA was that its HBM experts have to acquire additional expertise for including gender in their research. What the integration of gender in HBM studies actually means and how to implement it were the most urgent questions. Due to the complexity of HBM comprising of epidemiology, toxicology, statistics, chemistry and sociology the available guidelines and case studies from biomedicine and life science were not applicable for our case and additional research projects were needed to elaborate the respective methodology.

The financial and work capacities were provided by two third-party projects funded by the German Ministry for Education and Research: GeUmGe-Net¹⁴³) and INGER¹⁴⁴) (Bolte, 2018; Bolte 2019). With this financial support the effort of the complex project could be approached, starting with reviewing the state of the art, defining the categories of sex and of gender for HBM studies, choosing and testing appropriate tools and finally incorporating these into the running HBM studies.

The initial literature research revealed (not surprisingly) that sex and gender aspects in environmental health studies had up to this point been not sufficiently covered. Solely the importance of sex and gender for human chemical exposure and the exemplary description of sex differences in chemical sensitivity was acknowledged (Bolte, 2018, Sauer, 2019). Systematic implementation of sex and gender in HBM studies has not taken place either so far (Groth, 2020). The INGER consortium took on the challenge of providing a working definition of sex and gender, as well as developing and testing a new questionnaire for the assessment of sex/gender variables in environmental health surveys as a guideline for future studies (Bolte 2019).

The strength of GeUmGe-Net and INGER is that they are collaborative interdisciplinary networks, combining gender theory with environmental health studies and connecting different levels of gender experience, from elementary knowledge to long standing experience. UBA has strongly benefited from the input from partners experienced in working in gender research. This allowed us to build on the gender expertise needed for applied studies in a relatively short time, all while providing a practical field of action for practical implementation of gender theories.

Our experience shows that such a network, bringing together gender researchers with scientists not experienced in this field is beneficial for the integration of gender aspects in health-related exposure studies. Public and environmental health researchers can offer insights into health and environmental research that might be important to look at separately under gender aspects, while gender experts provide other necessary competences for the implementation of gender aspects and the development of appropriate methods. Such platforms for interdisciplinary discourse and gender knowledge transmission might speed up the discourse on gender acceptance and understanding remarkably. The decision makers at the institutional level, research funding institutions and research societies are the key players that should be requested to establish and support such platforms.

There is a great amount of literature indicating the necessity of incorporating gender into other fields of science, providing evidence for the added value of the category gender in research and suggesting innovative ways for the implementation. Being asked to do so we would point to the article by Cara Tannenbaum and colleagues (Tannenbaum, 2019). Not because it is an excellent review (although it definitely is) and neither because it is written by the world's first-class gender scientists (although it is) but because of where it has been published. It is a part of the 150th anniversary collection of *Nature* exploring the past, present and future of *Nature* and of science. This prominent place lets us hope that gender will finally be recognized as an integral part of science and research. The further progress concerning integration of gender will never be made if gender remains self-contained to gender journals, gender meetings and gender networks. It belongs to the mainstream of scientific discussion.

In order to introduce gender into HBM studies we have invested five years of research and it is not completed yet. The involvement of the considerable amount of staff, time and financial resources might be justified in big institutional projects, but it is not affordable for smaller projects on a daily basis. More targeted research aiming at the development of ready-to-use tools that can be used without the need for expert gender knowledge has to be of the highest priority. The interdisciplinary networks connecting gender scientists with those of other areas of expertise could support the fitted application of these pre-designed tools for the specific research questions assuring scientific correctness, knowledge transmission and development as well as quality control.

Our literature review of HBM studies based on the terms "sex" and "gender" resulted exclusively in papers using biological sex for data stratification or investigating differences between "man" and "woman" (Groth, 2020). In other words, just a fraction of possible variables for 'sex' and 'gender' were detected (Gendered Innovations, 2020). The majority of biological, sociological, cultural and behavioural differences remained undetected by the search. Taking into consideration the huge range of factors involved in sex and gender it seems hardly possible to translate them into key words sufficiently reflecting the full meaning. For our area of work the message "Assessing and considering the individual differences of continuously changing societies in order to assure equal access and distribution of

resources” was much more suitable.

In contrast to other scientific disciplines the awareness of the importance of assessing differences due to the biological sex in HBM studies was acknowledged already by many detailed studies. Collecting and analysing information from males and females has been a longstanding part of sampling, interviews and analyses. ‘Gender’, however, is a very different matter. Our current investigation (Groth, 2020), analysed the questionnaires of the leading international HBM studies with regard to the amount and type of sex and gender variables as well as assessing missing information and depth of debate with gender theory. Our review revealed that although a lot of sex- and gender-relevant variables were incorporated, there was still no comprehensive gender assessment. Sex was only assessed in binary male/female form and the gender-based variables were designed to collect socio-economic data rather than gender itself. Horizontal comparisons between the studies also showed a lack of standardization for the sex and gender surveys.

Based on this experience, even in studies that intrinsically already contain sex and gender attributes (such as HBM) more sophisticated performance indicators are needed. The lack of standardization and an underdeveloped discussion about the approach of sex and gender variables are indicators that these aspects were not part of the study design. Additionally, the awareness of and the knowledge on accessibility for the sex and gender issues in this area of research is not common among experts in environmental health studies.

The essential indicator for an adequate implementation of gender issues are the availability of predesigned and tested ready-to-use tools. Such tools are prerequisite for the further low-cost dissemination of sex and gender in the research discipline. The lack of easy-to-translate tools for gender non-experts is the critical obstacle for the application into research.

References

Bolte G, David M, Dębiak M, Fiedel L, Hornberg C, Kolossa-Gehring M, Kraus U, Lätzsch R, Paeck T, Palm K, Schneider A. (2018). Integration von Geschlecht in die Forschung zu umweltbezogener Gesundheit. Ergebnisse des interdisziplinären Forschungsnetzwerks Geschlecht - Umwelt - Gesundheit (GeUmGe-NET). Bundesgesundheitsblatt-Gesundheitsforschung-Gesundheitsschutz 61 (6): 737-746.

Bolte G, Kraus U, Jacke K, Groth K, Dandolo L, Palm K, Kolossa-Gehring M, Dębiak M, Schneider A,. (2019) New approaches for integrating sex/gender into environmental health research: the interdisciplinary research project INGER, ISEE Conference, Utrecht, The Netherlands, 26.08.2019

Dębiak M, Groth K, Kolossa-Gehring M, Sauer A, Tobollik M, Wintermeyer D,. (2019) Sex and gender approaches in environmental health research: two exemplary case studies of the German environment agency Interdisciplinary Science Reviews, 44:2, 114-130,

Ganzleben C, Antignac J-P, Barouki R, Castaño A, Fiddicke U, Klánová J, Lebret E, Olea N, Sarigiannis D, Schoeters G, Sepai O, Tolonen H, Kolossa-Gehring M,. (2017) Human biomonitoring as a tool to support chemicals regulation

in the European Union. *Int J Hyg Environ Health* 220 (2 Pt A): 94-97.

Gendered Innovations 2020 Sex and gender are different terms. Stanford University
<http://genderedinnovations.stanford.edu/terms/distinct.html> Accessed 11th November 2020

GerES (German Environmental Survey), 2020. Dessau-Roßlau UBA
<https://www.umweltbundesamt.de/en/topics/health/assessing-environmentally-related-health-risks/german-environmental-survey-geres> Accessed 11th November 2020

Groth K, Kolossa-Gehring M, Dębiak M, on behalf of the INGER study group (2020) Sex and gender in human biomonitoring: state of the art, challenges and future perspectives ISEE Conference, Online, 21. - 22. 09.2020

HBM4EU (The European Human Biomonitoring Initiative science and policy for a healthy future) (2020) Berlin
<https://www.hbm4eu.eu/> Accessed 11th November 2020

Kolossa-Gehring M, Becker K, Conrad A, Schröter-Kermani Ch, Schulz Ch, Seiwert M,. (2012) Environmental surveys, specimen bank and health related environmental monitoring in Germany. *Int J Hyg Environ Health*. 215 (2): 120-126

Sauer A, Arning J, Conrad A, Dębiak M, Kolossa-Gehring M, Steinkühler N (2019) Toxic gender? The role of sex and gender in chemicals management Gender & SAICM Beyond 2020 - How to create a gender-just healthy planet MSP Institute e.V. 2019
<http://gender-chemicals.org/toxic-gender-the-role-of-sex-and-gender-in-chemicals-management>

Tannenbaum C, Ellis R, Eyssele F, Zou J, Schiebinger L, (2019) Sex and gender analysis improves science and engineering. *Nature* 575:137-146

UBA (Umweltbundesamt) (2017) Geschlechterverhältnisse und Nachhaltigkeit. Dessau-Roßlau: UBA.
https://www.umweltbundesamt.de/sites/default/files/medien/1410/publikationen/2017-09-25_gender_nachhaltigkeit_0.pdf

UBA (Umweltbundesamt) (2020) About us. Dessau-Roßlau: UBA.
<https://www.umweltbundesamt.de/en/the-uba/about-us> Accessed 11th November 2020

WHO (World Health Organisation) (2015) Human Biomonitoring: Facts and Figures. Copenhagen: WHO Regional Office for Europe.

143) The Research Network Geschlecht - Umwelt - Gesundheit (GeUmGe-NET) was funded by the Federal Ministry of Education and Research (Proj. Nr. 01FP1443)

144) The collaborative research project INGER [<https://www.uni-bremen.de/en/inger/>] is funded by the Federal Ministry of Education and Research (Proj. Nr. 01GL1713)

6. Energy transformations

OVERVIEW

McCollum et al 2018¹⁴⁵⁾ performed in-depth analysis of the interactions between energy and non-energy SDGs using literature review and established methods to prioritise impacts. They concluded that positive interactions between SDG7 (Energy) and the other SDGs clearly outweigh the negative ones, both in number and magnitude. A key aspect of the socio-political nature of energy transitions is the embedded gender and social inequalities in energy systems. Inequalities can constitute and persist in low-carbon energy systems; they may not be any fairer, inclusive or just than the conventional systems they displace.¹⁴⁶⁾ The expert contributions below help close important gap in the literature by explicitly discussing the gendered dimensions of renewable energy leadership and how that may influence implementations and transitions related to social equity. Poor women from rural regions often hold central roles in energy-related work. However, this perspective is severely lacking in the current gender-blind decision-making processes of renewable energy projects.

The discussions on the barriers or opportunities for women's *active role* in shaping transitions has also been limited, including in the implementation of gender concerns within renewable energy decision-making structures, the designs of alternative energy technologies, and the value chain of renewable energy technologies.¹⁴⁷⁾

Gender Perspectives

6.1 Women in Modern Renewable Energy

Rabia Ferroukhi and Celia García-Baños, International Renewable Energy Agency (IRENA)

Box 6.1. Transformations of energy systems from a gender perspective

Now more than ever, we understand that a fundamental transformation of the energy system is needed to avoid climate disruption, preserve the natural environment and protect human health. In particular, the expansion of renewable energy needs to accelerate to allow far-reaching reductions in fossil fuel use. This momentous energy transition also needs to be socially inclusive and provide sustainable energy for all.

The Sustainable Development Goals (SDGs) related to sustainable energy access (SDG 7), gender equality and empowerment (SDG 5), and decent work (SDG 8) are strongly



145) <https://iopscience.iop.org/article/10.1088/1748-9326/aaafe3/pdf>

146) Oliver W. Johnson, Jenny Yi-Chen Han, Anne-Louise Knight, Sofie Mortensen, May Thazin Aung, Michael Boyland, Bernadette P. Resurrección, Intersectionality and energy transitions: A review of gender, social equity and low-carbon energy, *Energy Research & Social Science* 70 (2020) 101774

147) *ibid*

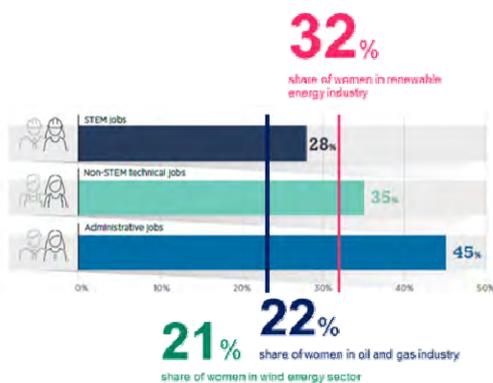
interlinked. Renewable energy is vital for achieving sustainable livelihoods, economic well-being and increasing social equity and inclusion.

There is growing recognition that the gender dimension should be placed at the core to ensure that both women and men are able to participate in the process.

As the global energy transition gathers pace, the renewable energy sector will generate growing numbers of jobs and livelihoods. Employment has already expanded from 7.1 million jobs in 2012 to 11.5 million in 2019 (IRENA, 2020). The number is expected to grow almost four times, to 42 million jobs, by 2050. If the right policies are put in place, this will be possible even despite the pandemic disruption (IRENA, 2020b; 2020c).

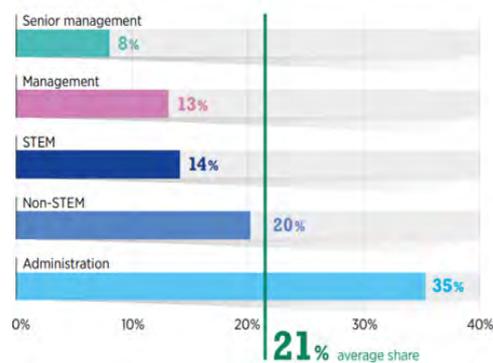
The deployment of renewables brings job opportunities across the value chain and demands a broad array of occupations and skills - including both technical and non-technical knowledge. Countries can leverage their existing domestic capacities but should also adapt and expand their educational and training programmes to maximise their ability to develop a skilled workforce.

While women account for almost half of the population, they have traditionally been underrepresented in the global workforce, with some sectors being far more unbalanced than others. This includes the energy industry, where men vastly outnumber women whose share barely reaches a quarter of the total.



Source: IRENA, 2019a

Figure 1. Women's share of STEM, non-STEM and administrative positions in all renewables



Source: IRENA, 2020d

Figure 2 Shares of women by role in the wind sector

The renewable energy sector, however, fares better than the conventional energy sector. According to a global survey conducted by the International Renewable Energy Agency (IRENA) in partnership with the Global Women's Network for the Energy Transition (GWNEN) that gathered insights from over 1 500 individuals (women and men) and representatives of organisations working in the sector, 32% of the workforce are women (IRENA, 2019). A later study by IRENA in partnership with GWNEN and the Global Wind Energy Council (GWEC) with over 920 women, men and organisations participating, found that women's talents and insights are even more under-utilised in the wind energy sector, where women represent only 21% of the workforce (IRENA, 2020d).

The global overall renewable energy survey results also suggest that the lack of gender equity is particularly pronounced in technical, managerial, and policy-making positions. IRENA's survey finds that women account for 28% of STEM¹⁴⁸) positions and 35% of non-technical professionals -- a much lower share than the 45% in administrative jobs. The disparity could be explained by the observation that, in general, degrees in the STEM fields remain male-dominated, which eventually carries through and translates in the lower representation of females in STEM jobs - whether in the renewable energy sector or in other industries.

While women are generally more attracted to the multidisciplinary dimensions of renewable energy than to traditional energy in general, the energy sector is primarily perceived as a male dominated sector. This behaviour is more acute in the wind sector, where women only represent 14% of the STEM-positions (half of the share of the renewable-wide industry). Overall, women are still a minority in the renewable energy workforce, particularly among technical staff and management. Among the critical constraints flagged by respondents in the surveys are issues related to cultural and social norms that perpetuate the perception of gender roles.

Within the renewable energy industry itself, barriers to women's entry and retention in the workforce relate not only to ingrained views and attitudes - which eventually influence many of the fundamental decisions people make, including hiring practices - but also to the way that workplaces are organised and affect the work/life balance. In regard to career progression, in both surveys, women flagged not only the importance of the perception of gender roles and the cultural norms that drive them but also the burden of the glass ceiling. In fact, in almost half of the participating private sector firms that responded to the renewable sector-wide survey, men accounted for at least three-quarters of boards of directors.

In areas where there is limited electricity access, or it is still expanding, engaging women as active agents of change in deploying off-grid renewable energy solutions is known to improve sustainability and gender outcomes. Renewable solutions bring energy choices to the household and community level, where women tend to have a greater voice. In terms of employment, the distributed nature of off-grid renewable energy solutions offers tremendous employment opportunities for women's engagement along multiple segments of the value chain. Women can participate in consultation and planning, in construction, operation, and through the development of productive uses.

A great share of the skills needed to benefit of those opportunities can be developed locally, and women are ideally placed to lead and support the delivery of off-grid renewable energy solutions. Several initiatives suggest how women's engagement brings essential improvements in their own self-perception and empowerment within the community (see Box 1 below).

Box 1. Benefits derived from women's engagement in the access context

There are plenty examples where women have been engaged in different ways with renewable energy solutions, that have brought amazing dividends to their own wellbeing. For example, the initiative **Barefoot College**, is an example of the transformative potential of training women in rural areas. In this case, female trainees receive

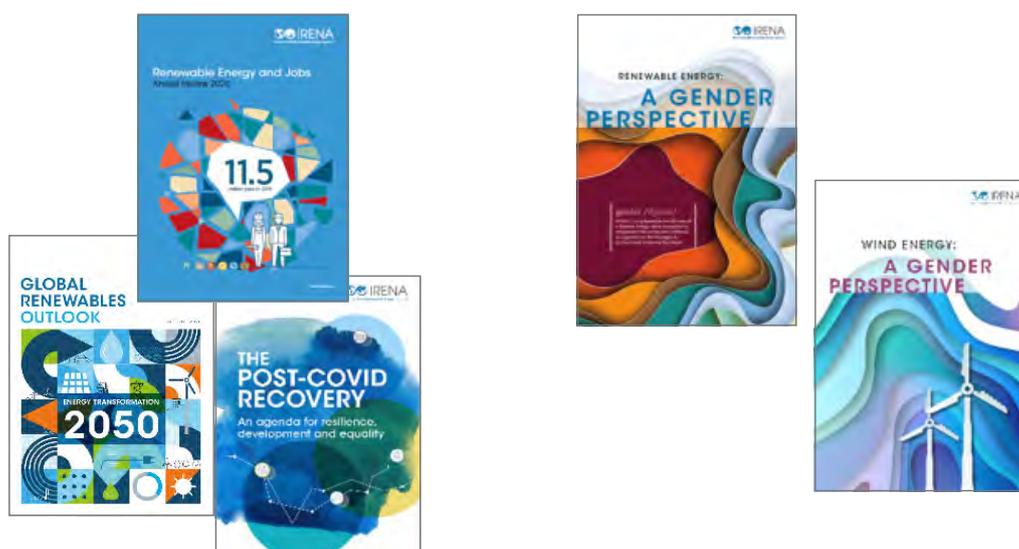
instruction on different duties and activities such as assembly and installation, regular operation and maintenance of devices including solar lanterns, lamps, parabolic cookers, water heaters for around six months. Over 1 000 women from more than 80 countries were trained, which resulted in the deployment of at least 18 000 solar systems.

Another success story is the 500 “wonder women” from Indonesia, who have been trained as social entrepreneurs, selling clean energy technologies that have reached over 250 000 people. It is estimated that around 20% of women became more empowered within their families - taking on a greater role in household decision making - and almost half of them perceived an improvement in their status.

Source: Barefoot College, n.d.; IRENA, 2018.

The inclusion of the gender perspective in energy strategies, particularly in renewables, and the empowerment of women in energy decisions can have a multiplier effect in terms of renewable energy co-benefits, particularly those related to access, household consumption and micro-enterprises, where women are primary actors. Especially in the access context, women typically allot a significant amount of their time to household work, childcare and elderly care responsibilities and consequently have limited time to build work skills and engage in formal, paid activities that predominantly employ men. Renewable energy solutions offer benefits such as reducing the labour-time spent on chores and enabling gains for women and girls in education, social capital and well-being.

In addition, benefits result from mitigating risks of injuries, rape and life-threatening incidents during some of the activities required in areas with limited availability of electricity for lighting, such as the search for wood. Moreover, access to clean and easy cooking technologies improve women’s and children’s health by substantially reducing indoor air pollution associated with traditional cooking techniques (IRENA, 2016).



Conclusions

Achieving greater gender diversity in the renewables sector is an issue of fairness, however, it is also crucial for several other reasons. First, a more balanced workforce allows the rapidly expanding renewables sector to draw on a greater pool of talent and diverse skills. Second, having more women included at all levels, including in higher management positions, has been proved to generate additional co-benefits for organisations in terms of growth, culture and sustainability. Finally, in the access context, women, who are often also the primary energy decision-makers at the household-level, are, along with children, the ones mostly affected by the use of traditional energy sources. Therefore, the transition to renewables needs to engage them actively.

Women, through renewables, can be agents of change to challenge the cultural and social norms established. Consolidating the visibility of the various roles that women are playing in the energy transition and helping them become agents of socio-economic transformation in their communities can exert a strong influence on perceptions of gender roles in any context.

References

- IRENA (2020a), Renewable Energy and Jobs. Annual Review 2020, IRENA, Abu Dhabi, <https://www.irena.org/publications/2020/Sep/Renewable-Energy-and-Jobs-Annual-Review-2020>.
- IRENA (2020b), Global Renewables Outlook: Energy Transformation 2050, Abu Dhabi, <https://www.irena.org/publications/2020/Apr/Global-Renewables-Outlook-2020>.
- IRENA (2020c), The Post-COVID Recovery: An Agenda for Resilience, Development and Equality, Abu Dhabi, https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Jun/IRENA_Post-COVID_Recovery_2020.pdf.
- IRENA (2020d), Wind Energy: A Gender Perspective, Abu Dhabi, https://irena.org/-/media/Files/IRENA/Agency/Publication/2020/Jan/IRENA_Wind_gender_2020.pdf.
- IRENA (2019), Renewable Energy: A Gender Perspective, Abu Dhabi, https://irena.org/-/media/Files/IRENA/Agency/Publication/2019/Jan/IRENA_Gender_perspective_2019.pdf.
- IRENA (2018), Indonesia's 'superheroines' empowered with renewables, IRENA, Abu Dhabi, <http://irena.org/newsroom/articles/2018/Apr/Indonesias-Superheroines-Empowered-with-Renewables>.
- IRENA (2016), Renewable Energy Benefits: Decentralised solutions in the agri-food chain, IRENA, Abu Dhabi, <https://irena.org/publications/2016/Sep/Renewable-Energy-Benefits-Decentralised-solutions-in-agri-food-chain>.

6.2 Women in Energy Transition

Christine Lins and Davina Ngei, Global Women's Network for the Energy Transition (GWNET)

Box 6.2 Energy transitions from a gender perspectives

Gender equality has proven to be an indispensable factor in reaching sustainability. Gender diversity drives innovation, opens new pathways for technology deployment, brings fresh perspectives to the development of societies and attracts and retains a richer pool of talent.

Despite this, the energy sector continues to be male dominated, with the absence of gender equality apparent around the world.

SDG7 interacts along the gender dimension with:

- SDG 1 - No poverty
- SDG 3 - Good health and wellbeing
- SDG 4 - Quality education
- SDG 5 - Gender equality
- SDG 8 - Decent work and economic growth
- SDG 10 -Reduced inequalities
- SDG 11 - Sustainable cities and communities
- SDG 13 - Climate action

Health & Safety

As primary home caretakers in most cultures, women and girls are most impacted by household air pollution (HAP) caused by cooking with inefficient and harmful fuels. HAP can cause serious health difficulties such as asthma and pneumonia, and for 4 million each year, HAP leads to death - women and girls make up the majority. Additionally, women (especially those from poorer/vulnerable communities) are disproportionately affected by the impacts of climate change (caused by emissions from unclean fuels like petroleum), though they are not major emissions contributors. Furthermore, extreme weather events can have major impact on food, fuel (cooking, heating & lighting) and water collection, which in many communities are the responsibility of women. We also acknowledge the vulnerability of women as climate refugees, subject to poverty as well as physical and sexual violence. Despite this, women hold key insights which are critical for climate change mitigation and adaptation as well as clean energy adoption.

Energy Poverty

Women and girls spend up to 5 hours each day looking for fuel for cooking, taking away time that could be used for school, work, and leisure - each of these has an impact on the economic and mental wellbeing of women and girls.

Workforce Participation

While women's participation in the energy workforce has steadily increased over the last few years, there is still a large gender and pay gap in favour of men, as well as a lack of equal representation in decision making roles. Additionally, many women work in the informal sector, in jobs which are easily disrupted by new technologies, taking away job security. This is despite numerous evidence which shows that women's participation in the workforce has a positive and significant economic impact.

Barriers to women's equal participation in the workforce includes but is not limited to lack of supportive parental leave as well as lack of childcare provision. Having a child(ren) can hinder women's progress within the sector, setting them behind their male peers who may also have children but are not held to the same childcare responsibilities.

Which actors and stakeholder to include in partnerships for SDGs implementation

Private sector

1. Eliminate barriers for women's engagement and implement gender-inclusive policies.
2. Support capacity building of women through training, mentoring, and skills development.

Financial Institutions

1. Provide working capital for women energy entrepreneurs and finance women-led ventures.
2. Offer financial advisory services to women entrepreneurs.
3. Offer results-based financing to incentivise private sector companies to hire/engage more women in their workforce.

Academia

1. Support gender-disaggregated research which can be used to inform programme decisions and support increased participation of women in the energy sector.
2. Harmonise data sets for increased accuracy of data.

Government

1. Prioritise the sector as a driver of change for gender equity.
2. Enforce gender-inclusive policies.

Community groups

1. Provide advice on local dynamics of communities, increasing the likelihood of success of energy projects.
2. Promote awareness on clean energy initiative.

Media

1. Amplify/lead awareness campaigns on the nexus between women and energy.

Which reports or research papers best capture the underlying gender issues

- Women for Sustainable Energy - Strategies to Foster Women's Talent for Transformational Change - GWNET¹⁴⁹⁾
- The role of appliances in achieving gender equality and energy access for all - ENERGIA¹⁵⁰⁾
- Wind Energy: A Gender Perspective - IRENA, GWEC, GWNET¹⁵¹⁾
- Gender in the transition to energy for all: From evidence to inclusive policies - ENERGIA¹⁵²⁾
- Renewable Energy: A Gender Perspective - IRENA, GWNET¹⁵³⁾
- Women in Clean Energy, Middle East and North Africa Survey 2017 - IRENA CEBC BNEF¹⁵⁴⁾

Relevant references

Ellen Morris, Jennye Greene, Victoria Healey, 2019, "Blueprint Guide for Creating Gender-sensitive Energy Policies", the Clean Energy Solutions Center, Sustainable Energy Solutions

Irene Gonzalez Pijuan, 2018, "Gender inequality and energy poverty", Engineering without borders

Ana Pueyo and Mar Maestre, 2020, "Gender and energy: opportunities for all", Institute of Development Studies, Bulletin.ids.ac.uk

Rabia Ferroukhi, Michael Renner, Divyam Nagpal, and Celia Garcia-Banos, 2019, "Renewable energy: Gender perspective", IRENA, Abu Dhabi

Ana Pueyo, Mar Maestre, 2019, "Linking energy access, gender and poverty: A review of the literature on productive uses of energy", Energy Research & Social Science, vol.53, 170-181

Kalee Whitehouse and Julie Curti, 2018, "Practical Guide to Women in Energy Regulation", USAID Office: Energy Division

Clean Energy Solutions Centre, 2018, "Situation Analysis of Gender and Sustainable Energy in the East African Community"

Morgan G, Bajpai A, Ceppi P, Al-Hinai A, Christensen T, Kumar S, Crosskey S and O'Regan N., 2020, "Infrastructure for gender equality and empowerment of women"¹⁵⁵⁾

149) <https://www.globalwomennet.org/women-for-sustainable-energy/>

150) <https://www.globalwomennet.org/the-role-of-appliances-in-achieving-gender-equality-and-energy-access-for-all/>

151) <https://www.globalwomennet.org/wind-energy-gender-perspective/>

152) <https://www.globalwomennet.org/gender-in-the-transition-to-energy-for-all-from-evidence-to-inclusive-policies/>

153) https://irena.org/-/media/Files/IRENA/Agency/Publication/2019/Jan/IRENA_Gender_perspective_2019.pdf

154) <https://assets.bbhub.io/professional/sites/24/2017/05/2017-05-03-BNEF-CEBC-IRENA-MENA-Women-in-Clean-Energy-Final.pdf>

155) <https://content.unops.org/publications/UNOPS-Infrastructure-for-Gender-Equality-and-the-Empowerment-of-women.pdf?mtime=20200701120805>

What knowledge is still missing?

- **Limited gender-disaggregated data** - Obtaining accurate statistics of women participating in the sustainable energy sector is challenging due to the lack of disaggregated data: both in terms of distinguishing between 'energy sector' data and 'sustainable energy' data as well as data that renders a proportional breakdown of women within an organisation or sector, but does not provide details of the actual positions held in the workforce (i.e. no distinction between a personal assistant, technical consultant or management). Sometimes the sample sizes are limited (to less than 100 participants), are country focused or too narrow in focus, and they depend on the distribution and access to individual respondents. Similarly, the actual boundaries of the sustainable energy sector are very broad - anything that relates to the production and supply of energy, from renewable energy, energy efficiency, smart grids, and transport through to climate policy, multilateral organisations and so forth. (Women for sustainable energy, GWNENET, 2020)
- **Understanding different contexts** - Context matters greatly for understanding both gender barriers and solutions, and this requires more detailed examinations of gender dimensions in different regions and countries, for different types of renewable energy technologies, and for different scales of deployment. For instance, gender equity issues in large-scale grid-connected renewable energy projects (utility-scale solar, wind, geothermal or hydropower, for example) have not yet been researched extensively. Future research should identify guidelines and strategies in this context. (Renewable Energy: a gender perspective, IRENA, 2019)
- **Understanding dynamics of productive use of energy** - A better understanding of the dynamics of productive use of energy is required to design suitable policies for livelihood initiatives in the renewables sector. In particular, the creation of permanent and stable sources of income often remains a challenge for women who have been trained to build, install, repair and sell solar systems, improved cookstoves, or other renewable energy solutions. (Renewable Energy: a gender perspective, IRENA, 2019)
- **Women as entrepreneurs** - While more and more women are becoming entrepreneurs, they still face challenges such as the need to defy social expectations or the struggle to get respect from others, both challenges being driven by the perception of gender roles, the difficulties for women on accessing funding, specially in some areas where there are restricting laws, building a network to connect with experts and peers or the fact that women tend to find it difficult to own their own accomplishments, as self-perception is one of the barriers that women face (Renewable Energy: a gender perspective, IRENA, 2019).

Which keywords can help guide new research for the relevant SDGs?

- gender gap, sexism, energy poverty, unconscious bias, women of colour, intersectional feminism, gender equity, gender equality, gender-based constraints, gender-based violence, gender balance, gender bias, gender analysis, gender blindness, gender-responsive budgeting, gender roles, LGBTQ, sex/gender disaggregated data, empowerment.

What indicators are needed to improve monitoring of progress

- Men and women employment/unemployment rates
- Men and women unemployment related to COVID-19
- Number of days for parental leave
- Percentage of women involved in senior management/legislative/decision making roles
- Availability of affordable childcare
- Gender pay gap/wage inequalities

7. Weather and climate

OVERVIEW

Meteorological data and knowledge have an important enabling role to play in achieving Agenda 2020, and each meteorological organisation around the world supports implementation efforts through a range of activities, such as:¹⁵⁶⁾

- 1) developing alerts and guidance on the occurrence and risk of crop diseases for farmers, local government agents, and central government
- 2) strengthening weather forecasting systems in collaboration with different partners and stakeholders
- 3) creating an evidence base to help make agriculture and food production in developing countries more productive, sustainable and resilient to climate change by developing satellite-based information services to strengthen climate action policy and reduce the impact of natural disasters on food security
- 4) creating the capacity to support development of user-led weather services
- 5) enhance impact-based forecasting to enable effective water resource planning
- 6) supporting policy decision-making, and generating fundamentally new climate science focused on specific geographic and ecological regions
- 7) raising awareness of the gender component, from better participation of women in meteorological science and services to ensuring that the needs of women as beneficiaries of the activities outlined above are well considered.

¹⁵⁶⁾ <https://public.wmo.int/en/our-mandate/what-we-do/wmo-contributing-sustainable-development-goals-sdgs>

Gender Perspective

Jürg Luterbacher, Director Science and Innovation Department, WMO; Assia Alexieva, Head, Monitoring, Evaluation, Risk and Performance Unit, Cabinet Office of the Secretary-General, WMO; Olga Bogdan, Associate Officer, Cabinet Office of the Secretary-General, WMO.

Box 7. Climate change and weather from a gender perspective

Interventions related to climate action, gender-responsive disaster preparedness, and gender-responsive climate information and services delivery also contribute to the elimination of poverty by building resilience of those in most vulnerable situations to climate-related extreme events and environmental shocks and disasters (SDG target 1.5).

In the immediate aftermath of extreme weather and climate-related hazards, women are often exposed to malnutrition and undernourishment, affecting their general health¹⁵⁷⁾

For example, after tropical cyclone Winston hit Fiji in 2016, in Burewaki¹⁵⁸⁾, women mentioned that they were eating only twice per day; because of food insufficiency. Food rations distributed by the Government, such as the Expanded Food voucher Programme for pregnant women in rural areas, are aimed to address this issue.

In Malawi¹⁵⁹⁾, female-headed households were reported to be twice more likely as male-headed households to reduce the number of meals as an adaptation strategy in response to climate shocks. In Niger¹⁶⁰⁾, where drought and flooding are having major impacts on crop yields, female-headed households were also considered more likely to be considered food insecure than male-headed households.

The direct, indirect and long-term impacts of extreme weather events and climate change, among which heatwaves, altered patterns of infectious diseases (including water-borne) and air pollution, on human health are further exacerbated by differentiated vulnerability and adaptive capacity of different groups of women and men, cultural norms, gender relations and roles.

For example, due to social roles, women are more exposed to indoor air pollution (resulting from indoor fossil fuel use), which kills 4.3 million people per year, because of the use of indoor cook stoves.¹⁶¹⁾ Pregnant women who attend to household tasks such as cooking and are exposed to harmful pollutants are at higher risk of having low-birth-weight infants or even still birth.¹⁶²⁾ For example, it was found that due to physiological changes, pregnant women are at higher risk of malaria infection.¹⁶³⁾ Studies have also discovered increased incidence of eclampsia in pregnancy during climatic conditions characterized by low temperature, high humidity or high precipitation. Research on saline contamination of drinking water in Bangladesh indicated that large numbers of pregnant women in coastal areas were diagnosed with eclampsia and hypertension.¹⁶⁴⁾

Women and men also have differentiated vulnerability during heat waves. For example, more women than men died during the 2003 European heat wave and had a higher risk of mortality than men due to heat stress in Mexico City,

although the reverse was true in Santiago and São Paulo. In USA, the death rate from extreme heat was 2,6 times greater for men than for women, while in the Mediterranean cities similarly aged women were more likely to die in heat waves between 1990–2004.¹⁶⁵⁾ Research evidence shows that elderly men are particularly at risk due to social isolation, as evidenced during the Chicago heat wave in 1995.¹⁶⁶⁾

Increased gender analysis when assessing vulnerability and conducting health-impact assessments, ensuring access to both weather and climate information and required health-protection measures for women and men, and encouraging active dialogue between NMHS and ministries of health to ensure gender-sensitive early warnings on weather- and climate-related illness would contribute to addressing these issues.

Attracting girls and young women in STEM at an early age is important for addressing the root causes of their under-representation in science. Outreach activities conducted by NMHSs contribute to this objective, through for example,¹⁶⁷⁾:

- multi-media campaigns showcasing successful women doing weather and climate work in the US;
- school children's visits to MeteoSwiss during National Future Day in Switzerland;
- gender-inclusive education of meteorology and seismology reaching 70% female students at a specialized university in the United Arab Emirates or enhancing the number of female meteorologists as a strategic action in Thailand.

Multiple channels of delivering weather and climate information reach women more effectively. While in many cases women prefer traditional communication tools such as radio and face-to-face interactions, the potential of making digital technology equally accessible to women is undeniable. Mobile-based platforms could enable female farmers to respond to weather information and make inquiries about their specific crops, receiving personalized replies from agricultural extension officers on their phones.

For example, timely weather-based agro-advisories delivered through mobile phones have proven beneficial for gender-inclusive agriculture in India¹⁶⁸⁾, while in Nigeria¹⁶⁹⁾ mobile phones are already distributed by the Government to rural farmers for better access to climate-smart agriculture information from extension workers.

In Bangladesh¹⁷⁰⁾, as part of the initiative GrameenPhone, mobile phones are now being used by women to alert local authorities about disaster risks in infrastructure. At the same time, the methods chosen for disseminating weather and climate information should consider, among others, gender differences in literacy, mobility and access to public venues, labour schedules, and general preferences for the means of information.

Gendered impacts of extreme weather and climate-related hazards, among which differentiated rates of mortality and affected persons, due to socio-economic and cultural factors. For example, 70–80% deaths of the 2004 Indian Ocean Tsunami were women, while more than 90% of deaths resulting from the 1991 cyclone in Bangladesh were women.

Another amplifying factor of vulnerability may be the differentiated level of access to climate information, early

warning and agricultural extension services. For example, research showed that most women in Botswana¹⁷¹⁾ lack access to agricultural extension services, credit and training in new technologies. While the Pacific women¹⁷²⁾ were more aware of the seriousness of climate change and the challenges faced by their countries, a significantly smaller proportion trusted scientific information, preferring media channels. In Bangladesh¹⁷³⁾, focus group discussions with the most heavily affected communities during the 2007 Cyclone Sidr showed that female-headed households and women whose husbands were away did not receive the warnings because they were given in the marketplace which was distant from their homes. At the same time, gender-responsive disaster preparedness, addressing gender needs for climate information and services, and enhancing women's participation in local grassroots initiatives contribute to enhanced climate adaptation and resilience.

For example, women's involvement in disaster preparedness and recovery and the improvement of early warning systems in Bangladesh was cited¹⁷⁴⁾ as contributing to a widespread drop in mortality and a reduced ratio of women to men casualties (from around 140,000 casualties with a ratio of 14 women to 1 man after the Cyclone Gorky hit in 1991, to approximately 3000 victims and a ratio of 5:1 after Cyclone Sidr in 2007).

Women's Weather Watch¹⁷⁵⁾, an inter-operable communication system in Fiji, engages female leaders to deliver simplified weather alerts and early warnings to disadvantaged women and groups from remote areas. Women are not only better prepared to respond to disasters but are also empowered to engage in community-based disaster management.

In Thailand and Lao People's Democratic Republic¹⁷⁶⁾, WMO co-led projects have engaged female community leaders in flood warning dissemination and have color-coded female-headed, disabled and elderly households, prioritizing them for search and rescue teams in the event of a flood.

As sea level continues to rise and coastal villages are relocated to higher ground, women face the extra burden of adapting their livelihoods. For example, after relocation to the Vunidogoloa village in Fiji¹⁷⁷⁾, they were not anymore able to access their coastal resources for fishing, as the new relocated village is too far from the coast, and their household responsibilities restrict them from taking lengthy absences to fish.

At the same time, women's involvement and access to information can contribute to their increased resilience. For example, as part of its Climate Change Gender Action Plan, Liberia¹⁷⁸⁾ conducted gender-sensitive vulnerability studies on coasts to be used for planning for disasters. Local women were trained and mobilized to act as coastal monitors and run local meteorological stations, reporting on coastal conditions. They acted as information focal points for weather information that was transmitted to communities regarding major meteorological events along the coasts.

Programs in coastal flood-prone areas in India, like Gujarat¹⁷⁹⁾, have also facilitated women's involvement in disaster governance at the local level (through Village Disaster Committees), used innovative and dedicated resources to respond to women's priorities and ensured gender-equitable access to information and capacity development. Despite their significant role in agriculture and significant associated impacts, many women lack access to agricultural extension services, credit, training in new technologies.

Through gender-responsive delivery of early warnings and gender-responsive weather-informed agricultural services, NMHS can contribute to reducing risks and increasing adaptive capacity. In the Philippines¹⁸⁰, weather-informed agriculture and fisheries strengthen disaster risk reduction and climate resilience. A program targeted at female farmers helps them improve knowledge about weather and climate patterns through data coming from localised weather stations, climate resiliency field schools train them in ecological agriculture methods (with new organic seed varieties, organic fertilizers and low emission technologies reducing methane emissions). This contributes to climate literacy (SDG4, especially target 4.5), gender equality and preservation of biodiversity (SDG15).

Another study in Senegal showed that female farmers also required a specific type of content of information (rainfall deficit forecasts and early seasonal rainfall cessation), otherwise it could be devastating for them given that they plant their plots a month later than their male counterparts. At the same time, the National Agency of Civil Aviation and Meteorology of Senegal¹⁸¹ in collaboration with the Red Cross addressed such needs, through a project of training targeting women to measure rainfall and relay climatic information to other women, in order to enable them to improve agricultural yields and minimize risks. Similar train-the-trainers' workshops, targeted at female extension workers, were conducted in Nigeria¹⁸² to increase access to and use of climate information in agriculture.

Climate variability and adverse impacts of weather patterns and climate change on agriculture and food security also prompt women and men to seek alternative livelihood activities to adapt. For example, extreme heat, drought and rainfall variability prompt men to migrate to urban areas, wetter areas or to search for new income-generating activities in Burkina Faso¹⁸³, South Africa¹⁸⁴, Botswana¹⁸⁵ and Ethiopia¹⁸⁶.

Despite significant progress over the years, women's participation in climate science and governance remains limited. To address this, WMO has prioritized targeted investment in female leadership. Since 2016 we have organized a series of Women's Leadership Workshops for over 150 female delegates to constituent body sessions and professionals from NMHSs and other national institutions involved in meteorology, hydrology and climatology. Of these, two workshops were held regionally (Africa and the West Pacific) with participants from predominantly Least Developed Countries (LDCs) and Small Island Developing States (SIDS) and three workshops were focused on technical fields, particularly hydrology, marine meteorology and agricultural meteorology. A positive correlation could be observed between meetings coupled with such workshops and the number of female delegates at the meetings. In most cases, we witnessed a 10%-20% increase in female representation, with some of the female experts making it permanently into our governance structures.

157) Capstone Project Research Report "Gendered impacts of weather and climate: evidence from Asia, Pacific and Africa", page 15

158) Capstone Project Research Report "Gendered impacts of weather and climate: evidence from Asia, Pacific and Africa" citing Esler Simone, 'Post-Disaster Needs Assessment of Tropical Cyclone Winston', (Government of Fiji, 2016), page 70

159) Capstone Project Research Report "Gendered impacts of weather and climate: evidence from Asia, Pacific and Africa" citing Global Gender and Climate Alliance, 'Gender and Climate Change: A Closer Look at Existing Evidence', 10 November 2016

160) Global Gender and Climate Alliance, 'Gender and Climate Change: A Closer Look at Existing Evidence', 10 November 2016

161) WMO Greater Horn of Africa Climate Outlook Forum, Session on promoting gender-sensitive weather and climate services, August 2018

162) Mainstreaming gender in health adaptation to climate change programs, WHO, 2012, page 31

163) WMO Greater Horn of Africa Climate Outlook Forum, [Session on promoting gender-sensitive weather and climate services](#), August 2018 and

Gender, climate change and health, WHO, 2014, page 10

164) Idem

165) WMO Greater Horn of Africa Climate Outlook Forum, Session on promoting gender-sensitive weather and climate services, August 2018 and Capstone Project Research Report “Gendered impacts of weather and climate: evidence from Asia, Pacific and Africa”, page 24

166) WMO Greater Horn of Africa Climate Outlook Forum, Session on promoting gender-sensitive weather and climate services, August 2018

167) WMO Good practice on making weather and climate services more gender-sensitive

168) Capstone Project Research Report “Gendered impacts of weather and climate: evidence from Asia, Pacific and Africa”, <https://reliefweb.int/report/world/capstone-project-research-report-gendered-impacts-weather-and-climate-evidence-asia>

169) ibid

170) IUCN, GGCA publication “Roots for the future: the landscape and way forward on gender and climate change”, 2015

171) Capstone Project Research Report “Gendered impacts of weather and climate: evidence from Asia, Pacific and Africa” citing Kulthoum Omari, ‘Gender and Climate Change: Botswana Case Study’, Heinrich Böll Stiftung Southern Africa, 3 February 2014

172) Capstone Project Research Report “Gendered impacts of weather and climate: evidence from Asia, Pacific and Africa” citing Bridie Scott-Parker and et al., ‘Pacific Islanders’ Understanding of Climate Change: Where Do They Source Information and to What Extent Do They Trust It?’, Regional Environmental Change, no. 17 (2017): 1005-15

173) Capstone Project Research Report “Gendered impacts of weather and climate: evidence from Asia, Pacific and Africa” citing International Federation of Red Cross and Red Crescent Societies, ‘A Practical Guide to Gender-Sensitive Approaches for Disaster Management’, 2010, 31

174) Idem

175) Capstone Project Research Report “Gendered impacts of weather and climate: evidence from Asia, Pacific and Africa”, page 16-17 and Annex 3 citing WMO Good practice on making weather and climate services more gender-sensitive

176) <https://www.floodmanagement.info/community-based-approaches-to-flood-management-in-thailand-and-lao-pdr/>

177) Capstone Project Research Report “Gendered impacts of weather and climate: evidence from Asia, Pacific and Africa”, page 14

178) IUCN, GGCA publication “Roots for the future: the landscape and way forward on gender and climate change”, 2015

179) Sara Ahmed and Elizabeth Fajber, ‘Engendering Adaptation to Climate Variability in Gujarat, India’, Gender and Development 17, no. 1 (2009): 45

180) Capstone Project Research Report “Gendered impacts of weather and climate: evidence from Asia, Pacific and Africa” citing Women engage for a common future, Gender-just climate solutions, 2018 edition, page 34

181) WMO Good practice on making weather and climate services more gender-sensitive

182) Idem

183) Capstone Project Research Report “Gendered impacts of weather and climate: evidence from Asia, Pacific and Africa” citing Farhana Sultana, ‘Gender and Water in a Changing Climate: Challenges and Opportunities’, in Water Security across the Gender Divide (Springer International Publishing AG, 2018), 17-34

184) Capstone Project Research Report “Gendered impacts of weather and climate: evidence from Asia, Pacific and Africa” citing Dr. Agnes Babugura, ‘Gender and Climate Change: South Africa Case Study’, Heinrich Böll Stiftung Southern Africa, 2 March 2014

185) Capstone Project Research Report “Gendered impacts of weather and climate: evidence from Asia, Pacific and Africa” citing Kulthoum Omari, ‘Gender and Climate Change: Botswana Case Study’, Heinrich Böll Stiftung Southern Africa, 3 February 2014

186) Global Gender and Climate Alliance, ‘Gender and Climate Change: A Closer Look at Existing Evidence’, 10 November 2016

Which actors and stakeholder to include in partnerships for SDGs implementation

- Government institutions responsible of climate matters and disaster management
- Public gender office
- National Meteorological and Hydrological Services (NMHS)
- Local authorities
- Local groups assisting in disaster preparedness and response, including Red Cross and Red Crescent National Societies
- Media and other dissemination channels of early warnings, weather and climate information
- Civil society organizations
- Local grassroots women's associations and groups
- Climate action activists
- Private sector

Which reports or research papers best capture the underlying gender issues

Bogdan Olga, Chungu McPherlain C., Yoon Seulgi, 'Gendered impacts of weather and climate: evidence from Asia, Pacific and Africa', World Meteorological Organization in collaboration with the Graduate Institute of International and Development Studies, 2019;

Gay-Antaki, Miriam, and Diana Liverman. 'Climate for Women in Climate Science: Women Scientists and the Intergovernmental Panel on Climate Change'. *Proceedings of the National Academy of Sciences of the United States of America* 115, no. 14 (19 March 2018): 2060-65;

Kambon Asha, 'Chapter III: Review of gender-specific issues in early warning systems', Caribbean 2017 Hurricane Season: an evidence-based assessment of the early warning system, World Meteorological Organization, 2018;

Pearse, Rebecca. 'Gender and Climate Change'. *Wiley Interdisciplinary Reviews: Climate Change* 8, no. 2 (March 2017)

Alexieva Assia et al, WMO No. 1148. Conference on the Gender Dimensions of Weather and Climate Services Report", World Meteorological Organization, 2015

Tall et al., 'Who Gets the Information? Gender, Power and Equity Considerations in the Design of Climate Services for Farmers' (Copenhagen, Denmark: CGIAR Research Programme on Climate Change, Agriculture and Food Security (CCAFS), 2014), <https://cgspace.cgiar.org/rest/bitstreams/35642/retrieve>;

Kaijser, Anna, and Annica Kronsell. 'Climate Change through the Lenses of Intersectionality'. *Environmental Politics* 23, no. 3 (4 May 2014): 417-33. <https://doi.org/10.1080/09644016.2013.835203>;

Katrien van Aelst and Nathalie Holvoet, 'Intersections of Gender and Marital Status in Accessing Climate Change Adaptation: Evidence from Rural Tanzania', *World Development* 79 (March 2016): 40-50;

Surabhi Mittal, 'Role of Mobile Phone- Enabled Climate Information Services in Gender- Inclusive Agriculture', *Gender, Technology and Development* 20, no. 2 (2016): 200-217;

Dr. Agnes Babugura, 'Gender and Climate Change: South Africa Case Study', Heinrich Böll Stiftung Southern Africa, 2 March 2014;

Kulthoum Omari, 'Gender and Climate Change: Botswana Case Study', Heinrich Böll Stiftung Southern Africa, 3 February 2014;

Khurshed Alam and Habibur Rahman, 'Women in Natural Disasters: A Case Study from Southern Coastal Region of Bangladesh', *International Journal of Disaster Risk Reduction*, no. 8 (2014): 68-82.

What knowledge is still missing?

- Intersectional analysis of weather and climate impacts to capture the complex experiences of vulnerability, i.e. impacts on different groups of men and impacts on women from disadvantaged communities shaped by economic status, age, disability, etc.
- Field-based case studies highlighting the gender-differentiated needs for climate information and services in terms of content and delivery channels;
- Good practices on grassroots women's involvement in climate action and gender-responsive interventions that contribute to climate resilience, mitigation and adaptation.
- National-level data on women's representation in the meteorology, hydrology and climatology profession, structural barriers and enabling factors.

Which keywords can help guide new research for the relevant SDGs?

Intersectionality; gendered impacts, vulnerability, exposure; gender roles and relations; climate risks; adaptive capacity; gender-differentiated needs; climate science, information and services; early warning; agricultural extension services; access to, perception of and response to climate science, information and services; delivery channels; content of climate information and services; disaster risk reduction and preparedness; post-disaster needs assessment; gender-responsive hazard, vulnerability and capacity mapping; gender-responsive climate and disaster interventions; equal and meaningful participation.

8. Natural environment

OVERVIEW

In their statement to the 6th Global Environment Outlook report, the Co-chairs Joyeeta Gupta and Paul Ekins stressed that the principle that a healthy planet supports healthy people is in line with the integrated approach of the SDGs.¹⁸⁷⁾ “A healthy planet is necessary for human health and well-being - physical, psychological, emotional, social and economic”. The natural environment directly supports the lives and livelihoods of 70 per cent of the proportion of the Earth’s population who live in poverty. It also provides the basis for the production of the goods and services that underpin the global formal economy. Just as women and men have unequal access to rights, resources and opportunities, they relate to and interact with the natural environment in different ways, face differing vulnerabilities and impacts, and have unique adaptive capacity related to climate change, disasters and use of natural resources.

The nexus between gender and environment has been of interest for decades, with the 2030 Agenda for Sustainable Development providing renewed impetus to the discussion.¹⁸⁸⁾ There are vital interconnections between gender, social equity, environment and development. The Stockholm Environmental Institute (SEI) identified five key challenges in integrating gender and social equity in model-based analyses: i) lack of quantitative data, ii) lack of recognition of Gender and Social Equality issues, iii) lack of convincing scientific evidence, iv) lack of analytical tools, and v) low prioritization of these questions¹⁸⁹⁾. Environment statistics, a relatively new field compared with economic, demographic and social statistics, and have been gender-neutral to date.¹⁹⁰⁾ However, the UN Environment and the International Union for Conservation of Nature (IUCN) have recommended a set of 19 indicators to measure the gender-environment nexus.¹⁹¹⁾

Gender perspective

Catherine Power, Elaine Geyer-Allely, Nathalie Simoneau, World Wildlife Fund

The lives of women and men are inextricably attached to the environment and understanding the nexus between gender and the environment is not a new issue. The 2030 Agenda for Sustainable Development provides a renewed impetus to understanding and finding solutions to issues associated with this nexus. With the Agenda’s call for integrated action on sustainable development and the focus of leaving no one behind, it is implicit development cannot progress without analysing and addressing inequality, discrimination and exclusion affecting women and men, including in relation to the environment. Women and men relate to and interact with the natural environment

187) Global Environment Outlook, Technical Summary, 2019, <https://wedocs.unep.org/bitstream/handle/20.500.11822/32024/TS.pdf?sequence=1&isAllowed=y>

188) https://www.unescap.org/sites/default/files/SD_Working_Paper_no.10_Oct2019_gender_in_environment.pdf

189) Marisa Escobar, Laura Forni, Emily Ghosh and Marion Davis, Stockholm Environment Institute - U.S. Center Guidance Materials for Mainstreaming Gender Perspectives into Model-based Policy Analysis, 2017

190) UNDESA: The World’s Women 2015.

191) UN Environment and IUCN (2019): Gender and environment statistics: Unlocking information for action and measuring the SDGs.

in different ways, face differing vulnerabilities and impacts, and have unique adaptive capacity related to climate change, disasters and use of natural resources.

Women are often disproportionately affected compared to men due to their dependence on land, water and other natural resources coupled with their limited mobility, decision-making power, access to information and technology as well as social norms. Because women's livelihoods depend disproportionately on natural resources, more is at stake for them to play a leading role in environmental conservation. Environment statistics, a relatively new field compared with economic, demographic and social statistics, has somewhat been gender-neutral to date. The nexus between gender and environment statistics has typically been presented through qualitative or small-scale quantitative studies only, and mainstreaming gender in environment statistics programmes is yet to be a key part of work programmes of national statistical systems.

Mainstreaming gender in environment statistics is not just about compiling sex-disaggregated data. Though sex-disaggregated data is an essential component, it also requires measuring and monitoring environment-related issues affecting or affected by women or men alone or a preponderance of women compared to men or vice-versa.¹⁹²⁾ This in turn can ensure data captures socially constructed vulnerabilities and the specific needs, challenges and priorities of women, men, girls and boys in relation to the environment.¹⁹³⁾

Gender is relevant across all of the SDGs, as is the health of the natural world, but that intersectionality remains poorly understood and invisible across most sectors and in public policy and structural reforms. Despite the potential for women to vastly contribute to local and global economies - as producers, entrepreneurs, investors, philanthropists, employees and consumers - they continue to face multiple obstacles to greater parity and agency. Some of the same factors that create socio-economic inequality (e.g. equality in work, essential services and enablers of economic opportunity, legal protection and political voice, and physical security and autonomy) also influence women's role (or lack of) in natural resource use and protection. The COVID19 pandemic has underlined and amplified many gender-based vulnerabilities that cut across the SDGs.

The pandemic is a reminder that everything is connected. Our health, our economies, animal health and the natural environment are all interlinked. Tackling problems in siloes is no longer an option. We must create solutions that respect these interconnections, and we need those solutions fast. The Sustainable Development Goals (SDGs) were created with the understanding that everything is connected, and consequently social, environmental, and economic development are indivisible. Individually, the 17 SDGs define key areas of progress for humanity. Delivered together, they will transform the world and create prosperity for all on a healthy planet.

192) UN, Mainstreaming gender in environment statistics for the SDGs and beyond. Identifying priorities in Asia and the Pacific, 2019

193) UN Environment and ICUN (2019) Gender and environment statistics: Unlocking information for action and measuring the SDGs.

<https://genderandenvironment.org/gender-and-environment-statistics-unlocking-information-for-action-and-measuring-the-sdgs/>

Which reports or research papers best capture the underlying gender issues

Examples of analysis and policy recommendations on the intersectionality of gender, natural resources conservation and other SDGs:

Gender and natural resource conservation and sustainable use (all SDGs apart of 8 (cities))

- Nature in all Goals 2020, WWF International ¹⁹⁴⁾
- Nature in all Goals 2019, WWF International ¹⁹⁵⁾

Gender-based violence and environment linkages: The violence of inequality, IUCN, January 2020

This report collates data and case studies from over 1000 sources and documents the extensive direct links between environmental pressures and gender-based violence. Rooted in discriminatory gender norms and laws and shrouded in impunity, gender-based violence (GBV) occurs in all societies as a means of control, subjugation and exploitation that further reinforces gender inequality. This analysis reveals the complex and interlinking nature of GBV across three main contexts: access to and control of natural resources; environmental pressure and threats; and environmental action to defend and conserve ecosystems and resources.

Gender responsive and inclusive conservation, WWF Nepal, 2015¹⁹⁶⁾

The role of women and marginalized communities residing in Nepal's remote high mountains and fringe areas of national parks and buffer zones are very crucial in safeguarding natural resources given that they are the ones living in the frontlines of conservation. These people on the other hand have limited livelihoods options which has made them more vulnerable from any changes in the quality and quantity of natural resources. The mainstreaming of Gender and Social Inclusion (GESI) principles therefore becomes an imperative for any biodiversity conservation program that seeks to promote harmony between people and nature.

Promoting a gender sensitive approach to addressing corruption in the forestry sector U4, 2019¹⁹⁷⁾

Research shows a link between inadequate corruption control and a high rate of deforestation. Increasing women's active and meaningful participation in community forestry institutions may improve forest governance and the sustainability of resources. This 2019 paper from the U4 Anti-corruption Resource Center presents evidence on corruption in the forestry sector, gender and forestry, and offers suggestions for research, policy and practice. Donors, governments, and civil society are encouraged to support gender-sensitive approaches to forest governance that integrate gender into anti-corruption initiatives and ensure that gender equality initiatives consider corruption as a threat to their goals. A short version of this publication¹⁹⁸⁾ is also available on U4's ¹⁹⁹⁾ website.

194) https://wwfeu.awsassets.panda.org/downloads/nature_in_all_goals_publication__2019_.pdf

195) https://wwfeu.awsassets.panda.org/downloads/nature_in_all_goals_2020.pdf

196) https://wwfasia.awsassets.panda.org/downloads/gender_responsive_and_inclusive_conservation.pdf

197) <https://www.worldwildlife.org/pages/tnrc-partner-resource-u4-promoting-a-gender-sensitive-approach-to-addressing-corruption-in-the-forestry-sector>

Policy Brief: Empowering women in marine communities to mitigate the impacts of climate change, WWF European Policy Office, September 2019²⁰⁰⁾

While 80-90% of the workforce in the global seafood processing industry and 70% of the aquaculture processing workforce is female, these positions exemplify gender disparity as they are mainly low-skilled, low-paid and low-valued jobs. The briefing reviews the crucial role this group of stakeholders will play in the European and global sustainable blue economy and makes policy recommendations to EU decision makers on effective policies to address the diversity of gender roles and the underlying drivers of inequality in the seafood sector to reach key sustainability targets and secure a sustainable blue economy

Fisheries management and gender, WWF UK, 2012²⁰¹⁾

It has become clear that the challenges women face in fishing and fisheries needs to be addressed at various levels. There's a need to challenge unequal gender relations within and outside the household, and within organisations. There's also a need to seek recognition for the paid and unpaid labour of women that goes towards sustaining fisheries and fishing communities, and to ensure that women's roles in the fisheries sector don't remain 'invisible'. Women also need to have an increased right to participate in decision-making processes with respect to fisheries planning and management. Addressing gender inequities by improving women's incomes and educational levels, as well as their access to information and decision-making processes, will enhance women's capabilities and ability to contribute to fishing and fisheries with clear benefits on a number of levels for households, as well as society in general.

Linking the participation of women in forestry and fisheries management groups with better nature resource governance and conservation outcomes²⁰²⁾

For India and Nepal, there is strong and clear evidence of the importance of including women in forest management groups for better resource governance and conservation outcomes. Outside of India and Nepal, there are substantial gaps in the evidence base, but the South Asian evidence presents a compelling case for extending the research to other geographies to see if similar outcomes exist elsewhere and supports a theory of change linking the participation of women in forestry and fisheries management groups with better resource governance and conservation outcomes.

198) <https://www.u4.no/publications/gender-forestry-and-corruption-promoting-a-gender-sensitive-approach-to-addressing-corruption-in-the-forestry-sector/shortversion>

199) <https://www.u4.no/>

200) https://wwwfeu.awsassets.panda.org/downloads/wwf_genderequalityandfisheriespolicybrief.pdf

201) https://d2ouvy59p0dg6k.cloudfront.net/downloads/women_conservation_fisheries_2012.pdf

202) Leisher, C., Tensah, G., Booker, F. *et al.* Does the gender composition of forest and fishery management groups affect resource governance and conservation outcomes? A systematic map. *Environ Evid* 5, 6 (2016). <https://doi.org/10.1186/s13750-016-0057-8>

What knowledge is still missing?

ICUN²⁰³) is leading on important research and exchange of knowledge on gender and natural resource management. Research is needed on the following topics:

- Effective measures to address women's unequal and insecure rights over land and resources and assessing impacts across the SDG targets of more secure rights
- Effective measures to address the underrepresentation of women in natural resource decision making and leadership and assessing impacts across the SDG targets of a more equitable representation
- Effective measures to optimize women's and men's differentiated knowledge for sustainable resource management
- Approaches to addressing gender-based violence and environmental linkages, including best practice in context-based gender and situational analysis and integration of key elements in programme design, implementation and monitoring

Which keywords can help guide new research for the relevant SDGs?

Community-based conservation; environmental sustainability; sustainable livelihoods; climate adaptation; climate resilience; natural resource management; ecosystem services; community forest management; fisheries management; gender mainstreaming; gender equality; social inclusion.

What indicators are needed

The list of indicators below comes from the UN report on Mainstreaming gender in environment statistics for SDGs and beyond: Identifying priorities in Asia and the Pacific²⁰⁴)

Core Indicators

A. Land and biodiversity

GE1. Proportion of total adult population with secure tenure rights to land, (a) with legally recognized documentation, and (b) who perceive their rights to land as secure, by sex and type of tenure (identical to SDG indicator 1.4.2).

GE2. Proportion of agricultural area under productive and sustainable agriculture, by sex of land user/owner (similar to SDG indicator 2.4.1).

GE3. (a) Proportion of total agricultural population with ownership or secure rights over agricultural land, by sex; and (b) share of women among owners or rights-bearers of agricultural land, by type of tenure (identical to SDG indicator 5.a.1).

GE4. Proportion of countries where the legal framework (including customary law) guarantees women's equal

203) <https://www.iucn.org/news/gender/202001/gender-and-environment-what-are-barriers-gender-equality-sustainable-ecosystem-management>

204) UN Environment and ICUN (2019) Gender and environment statistics: Unlocking information for action and measuring the SDGs. <https://genderandenvironment.org/gender-and-environment-statistics-unlocking-information-for-action-and-measuring-the-sdgs/>

rights to land ownership and/or control (identical to SDG indicator 5.a.2).

B. Natural resources including food, energy and water

GE5. Proportion of time spent on unpaid domestic and care work, by sex, age and location (identical to SDG indicator 5.4.1).

GE6. Proportion of population using safely managed drinking water services, by type of household (similar to SDG indicator 6.1.1).

GE7. Proportion of population with access to electricity, by sex of head of household (similar to SDG indicator 7.1.1).

GE8. Proportion of population with primary reliance on clean fuels and technology, by main user (similar to SDG indicator 7.1.2).

GE9. Proportion of the population that are subsistence farmers, fishers, hunters and gatherers, by sex (similar to ISCO).

GE10. Share of food that directly comes from extractive methods (hunting, fishing and collecting) by source of the food, type of household and by urban/rural (non-SDG Indicator).

GE11. Time spent collecting plants, mushrooms, flowers and wild fruits; fishing and hunting for household consumption, by sex (non-SDG Indicator).

GE12. Time spent planting, tending and harvesting a garden patch, and breeding of farmyard animals for household consumption, by sex (non-SDG Indicator).

GE13. Time spent collecting fuel for household consumption, by sex (non-SDG Indicator).

GE14. Time spent collecting water for household consumption, by sex (non-SDG Indicator).

C. Climate change and disasters

GE15. Number of deaths, missing persons and directly affected persons attributed to hydrometeorological disasters per 100,000 population, by sex (similar to SDG indicators 1.5.1; 11.5.1; 13.1.1).

GE16. Number of people whose damaged dwellings were attributed to disasters, by sex (similar to Sendai indicator Sendai B-3).

GE17. Number of people whose livelihoods were disrupted or destroyed, attributed to disasters, by sex (similar to Sendai indicator B-5).

D. Sustainable consumption, production and waste

GE18. Average income of small-scale food producers, by sex and indigenous status (identical to SDG indicator 2.3.2).

GE19. Proportion of jobs in sustainable tourism industries out of total tourism jobs, by sex (similar to SDG indicator 8.9.2).

GE20. Proportion of population that (a) has convenient access to public transport by location (urban/rural), sex, age and persons with disabilities; and (b) use public transport by location (urban/rural), sex, age and persons with disabilities (similar to SDG indicator 11.2.1).

GE21. Proportion of employed population in heavily polluting industries (animal producers), by sex (similar to ISCO-08 (63)).

GE22. Proportion of employed population on waste management (refuse workers), by sex (similar to ISCO-08 (961)).

E. Health, well-being and sanitation

GE23. Mortality and morbidity rates attributed to unsafe water, unsafe sanitation and lack of hygiene, by sex (similar to SDG indicator 3.9.2).

GE24. Mortality and morbidity rates attributed to environmental causes (unintentional poisoning, air & water quality), by age and sex (similar to SDG Indicators 3.9.1, 3.9.2 and 3.9.3).

GE25. Proportion of schools with access to (a) electricity; (b) basic drinking water; (c) single-sex basic sanitation facilities; and (d) basic handwashing facilities (as per the WASH indicator definitions) (similar to SDG indicator 4.a.1).

GE26. Proportion of population using (a) safely managed sanitation services and (b) a hand-washing facility with soap and water, by type of household (similar to SDG indicator 6.2.1).

GE27. Proportion of urban population living in slums, informal settlements or inadequate housing, by sex (similar to SDG indicator 11.1.1).

GE28. Mortality rate attributed to vector- and water-borne diseases, by sex (non-SDG Indicator).

F. Environmental decision-making

GE29. Extent to which (i) global citizenship education and (ii) education for sustainable development, including gender equality and human rights, are mainstreamed at all levels in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment (identical to SDG indicator 4.7.1).

GE30. Extent to which (i) global citizenship education and (ii) education for sustainable development (including climate change education) are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment (identical to SDG indicator 12.8.1).

GE31. Proportions of positions in national and local public environment institutions, including (a) the legislatures; (b) the public service; and (c) the judiciary, compared to national distributions, by sex, age, persons with disabilities and population groups (similar to SDG indicator 16.7.1).

GE32. Consumer spending, by type household: a. Household spending by type of product and type of household b. Decision-making over household spending, by product and sex (intra-household decision-making) (non-SDG Indicator).

GE33. Women in governmental environmental decision-making (a) Heads of environmental ministries, by sex, by sector (non-SDG Indicator)

GE34. Women's participation in environmental decision-making fora (a) Delegates to international environmental COPs, such as for UNFCCC, UNCCD, CBD and BRS Conventions, by sex (b) Heads of delegations to international environmental COPs, such as for UNFCCC, UNCCD, CBD and BRS Conventions, by sex (c) Participants in national level environmental for a, by sex (non-SDG Indicator).

GE35. Women's participation in sector-specific environmental governance bodies (a) Participation in communal land governance bodies, by sex; (b) Participation in forest groups, by sex; (c) Participation in water governance bodies, by sex; (d) Executive managers of national energy utilities, by sex (non-SDG Indicator).

Context-Specific Indicators

CS1. Prevalence of undernourishment, by sex (similar to SDG indicator 2.1.1).

CS2. Prevalence of moderate or severe food insecurity in the population, based on the Food Insecurity Experience Scale (FIES), by sex (similar to SDG indicator 2.1.2).

CS3. Proportion of women and girls aged 15 years and older subjected to sexual violence by persons other than

an intimate partner in the previous 12 months, by age and place of occurrence (identical to SDG indicator 5.2.2).

CS4. Proportion of women aged 20-24 years who were married or in a union before age 15 and before age 18 (identical to SDG indicator 5.3.1).

CS5. Proportion of seats held by women in (a) national parliaments and (b) local governments (identical to SDG indicator 5.5.1).

CS6. Level of water stress: freshwater withdrawal as a proportion of available freshwater resources (identical to SDG indicator 6.4.2).

CS7. Proportion of adults (15 years and older) with an account at a bank or other financial institution or with a mobile-money-service provider, by sex (similar to SDG indicator 8.10.2).

CS8. Proportion of fish stocks within biologically sustainable levels (identical to SDG indicator 14.4.1).

CS9. Forest area as a proportion of total land area (identical to SDG indicator 15.1.1)

CS10. Proportion of traded wildlife that was poached or illicitly trafficked, by sex of perpetrator (similar to SDG indicator 15.7.1).

CS11. Proportion of population that feel safe walking alone around the area they live, by sex (similar to SDG indicator 16.1.4).

9. Marine ecosystems

OVERVIEW

Many gaps exist in ocean-related knowledge, including its interaction with human systems.²⁰⁵⁾

SDG14 was identified by the Independent Group of Scientists as one of the goals on which there is very little discussion and available evidence to make a connection with SDG5. The contribution below from Robert Ellis shows how very rich the topic of gender is, when examined from the biological sex perspectives in relation to Marine Ecosystems. He does not offer advice for SDG5, but these aspects are considered in Le Blanc et al. (2017) who have identified interdependencies between SDG14 and SDG5 when mapping linkages between SDG14 and oceans²⁰⁶⁾

- A focus on training more women to participate in various aspects of the blue economy can help enhance gender equality
- Science, technology and innovation can help improve gender equality in ocean-related activities
- Changes in access to resources and markets for small-scale fishing communities can have positive or negative impacts on gender equality

This topic demonstrates that there is more to 'gender' as an impact factor for Agenda 2030 than was conceived when SDG5 was included and defined. The importance of the biological sex for sustainability applies to all the natural environments, and therefore also to SDGs 2 (food security), 6 (water), 13 (climate), and 15 (life on land).

205) United Nations (2017), Secretary-General's note for the conference on the implementation of Sustainable Development Goal (SDG 14), "Conserve and sustainably use the oceans, seas and marine resources for sustainable development.", New York, January.

206) David Le Blanc, Clovis Freire, Marjo Vierros. Mapping the linkages between oceans and other Sustainable Development Goals: A preliminary exploration, DESA Working Paper No. 149 ST/ESA/2017/DWP/149, 2017

Gender perspective

Robert Ellis, University of Exeter

Box 9. Marine ecosystems from a gender perspective

Sex and gender are vital to all SDGs, in this section the focus is specifically on the implications of the sex of non-human organisms for determining the targets and likely success of specific SDGs, as well as the interactions between SDGs.

With that said, sex and gender of human actors will clearly sit across each SDG, and influence the interaction between the specific SDG's identified, as well as all other SDG's and their interaction.

The sex of human actors could also interact with sex of non-human organisms in intriguing, subtle and underappreciated ways both within, and across SDGs, but this area of research is even less studied than simply accounting for the sex of non-human organisms for impacting SDGs.

Whilst within biomedical literature there is a growing body of research calling for the inclusion of sex as a biological variable, this is not as widely studied in the wider biological sciences.

The literature sources listed below provide an entry point into this world. The highlighted publications and the identified knowledge gaps focus on the latest understanding in biological science research (primarily marine as this is my area of expertise). It therefore provides a representative view of the challenges facing sex and gender analysis in the wider biological sciences - but is not exhaustive.

Which reports or research papers best capture the underlying gender issues

Tannenbaum, C., Ellis, R. P., Eyssel, F., Zou, J., & Schiebinger, L. (2019). Sex and gender analysis improves science and engineering. *Nature*, 575(7781), 137-146.

Ellis, R.P., Davison, W., Queirós, A.M., Kroeker, K.J., Calosi, P., Dupont, S., Spicer, J.I., Wilson, R.W., Widdicombe, S. and Urbina, M.A., 2017. Does sex really matter? Explaining intraspecies variation in ocean acidification responses. *Biology letters*, 13(2), p.20160761.

Benvenuto, C., Coscia, I., Chopelet, J., Sala-Bozano, M. & Mariani, S. (2017) Ecological and evolutionary consequences of alternative sex-change pathways in fish. *Sci. Rep.* 7, 9084.

Benestan, L., Moore, J.S., Sutherland, B.J., Le Luyer, J., Maaroufi, H., Rougeux, C., Normandeau, E., Rycroft, N., Atema, J., Harris, L.N. and Tallman, R.F., (2017). Sex matters in massive parallel sequencing: Evidence for biases in genetic parameter estimation and investigation of sex determination systems. *Molecular Ecology*, 26(24), pp.6767-6783.

Cripps, G., Flynn, K. J., & Lindeque, P. K. (2016). Ocean acidification affects the phyto-zoo plankton trophic transfer efficiency. *PLoS One* 11.

Ospina-Alvarez, N. & Piferrer, F. (2008) Temperature-dependent sex determination in fish revisited: prevalence, a

single sex ratio response pattern, and possible effects of climate change. PLoS One 3, e2837.

Parker, K. (1980) A direct method for estimating northern anchovy, *Engraulis mordax*, spawning biomass. Fish. Bull. 78, 541-544.

Barneche, D. R., Robertson, D. R., White, C. R. & Marshall, D. J. (2018) Fish reproductive-energy output increases disproportionately with body size. Science 360, 642.

Jensen, M. P. et al. Environmental warming and feminization of one of the largest sea turtle populations in the world. Curr. Biol. 28, 154-159 (2018).

Sasaki, M., Hedberg, S., Richardson, K., & Dam, H. G. (2019). Complex interactions between local adaptation, phenotypic plasticity and sex affect vulnerability to warming in a widespread marine copepod. Royal Society Open Science, 6(3).

Parker, L.M., O'Connor, W.A., Byrne, M., Dove, M., Coleman, R.A., Pörtner, H.O., Scanes, E., Virtue, P., Gibbs, M. and Ross, P.M., 2018. Ocean acidification but not warming alters sex determination in the Sydney rock oyster, *Saccostrea glomerata*. Proceedings of the Royal Society B: Biological Sciences, 285(1872), p.20172869.

Kindsvater, H.K., Reynolds, J.D., Sadovy de Mitcheson, Y. and Mangel, M., 2017. Selectivity matters: Rules of thumb for management of plate-sized, sex-changing fish in the live reef food fish trade. Fish and Fisheries, 18(5), pp.821-836.

Le Bris, A., Mills, K.E., Wahle, R.A., Chen, Y., Alexander, M.A., Allyn, A.J., Schuetz, J.G., Scott, J.D. and Pershing, A.J., 2018. Climate vulnerability and resilience in the most valuable North American fishery. Proceedings of the National Academy of Sciences, 115(8), pp.1831-1836.

Cripps, G., Lindeque, P., & Flynn, K. J. (2014). Have we been underestimating the effects of ocean acidification in zooplankton? Global Change Biology 20, 3377-3385.

Ellis, R. P., Spicer, J. I., Byrne, J. J., Sommer, U., Viant, M. R., White, D. A., & Widdicombe, S., 2014. ¹H NMR metabolomics reveals contrasting response by male and female mussels exposed to reduced seawater pH, increased temperature, and a pathogen. Environmental science & technology, 48(12), 7044-7052.

Barneche, D. R., Robertson, D. R., White, C. R. & Marshall, D. J. Fish reproductive-energy output increases disproportionately with body size. Science 360, 642 (2018)

Jarne, P. & Auld, J. R. Animals mix it up too: the distribution of self-fertilization among hermaphroditic animals. Evolution 60, 1816-1824 (2006).

What knowledge is still missing?

Identifying the differential sensitivity of females and males to climate change (SDGs 1, 2, 3, 13, 14, 15)

At present there is a significant lack of research that has investigated the difference in the response of male and female organisms to climate change (Ellis et al 2017; Tannenbaum et al 2019). However, where investigated and results are disaggregated appropriately, sex is shown to be a key factor influencing the sensitivity of different species in many studies.

Sex analysis is thus a key, overarching, knowledge gap with respect to the SDGs in non-human biological systems, directly for SDG 13, 14 and 15, as well as indirectly for SDGs 1,2, and 3 due to the impact of environmental (e.g. climate change) stressors on aquatic species of commercial importance. For example, elevated seawater pCO₂

(dissolved carbon dioxide) is shown to result in differential mortality between the sexes in Crustacea. Both female shrimp (Kurihara et al., 2008) and copepods (Cripps et al., 2014) show greater sensitivity to climate change than their male counterparts.

Conversely, in the copepod *Arcatia tonsa*, females show greater tolerance of elevated temperatures (Sasaki et al., 2019), a similar pattern to that shown in marine mussels, where males were more heavily impacted by warming oceans (Ellis et al 2014). Failing to account for such sex differences in response to climate change risks underestimating population-level impacts (e.g. by overlooking population decline caused by enhanced sensitivity of one sex - such as greater temperature sensitivity of males leading to sperm limitation from greater male temperature sensitivity). Cripps and colleagues (2016) also demonstrate the dangers of omitting sex analysis for determining population responses in investigating the effect of elevated pCO₂ in copepods. Under normal conditions, males have a higher baseline metabolic rate than females. In response to elevated pCO₂, however, females increase and males decrease their metabolic rate (Cripps et al., 2016). Failing to disaggregate physiological responses by sex masks sex-specific responses in physiological performance that are fundamental for determining population responses.

Accurately understanding species, populations and ecosystem level responses are vital for implementing SDGs with respect to mitigating climate change impacts, and an ever growing body of literature shows sex analysis is key to this understanding.

Incorporating sex analysis is key to advancing and improving population management in the face of anthropogenic disturbance (most relevant to SDGs 1, 2, 3, 13, 14, 15)

For ecosystem models, as well as population management strategies, to be accurate and effective, it is vital to account for, and incorporate, all major factors that influence the sensitivity of populations to anthropogenic disturbance. Where successfully achieved, the incorporation of sex-disaggregated data is shown to improve conservation efforts and enable better management of fisheries. Nonetheless, due to a lack of sex-disaggregated data being available, this is often not possible. To successfully deliver on SDGs concerning the direct impact of anthropogenic disturbance (e.g. SDG 6, 13, 14 and 15), as well as indirect implications of impacted environments for subsequent ecosystem services (e.g. seafood provision; SDGs 1, 2, 3), it is vital that sex analysis be incorporated in empirical research, and subsequent modelling and mitigation strategies.

Benestan and colleagues (2017) demonstrate the importance of understanding sex ratios when employing genetics to interpret population structure. These authors demonstrate that when sex ratio information was omitted population structure of American lobster was misinterpreted, which could lead to inappropriate or ineffective population management recommendations. The American lobster is the most valuable catch in North America. Effective population management successfully maximises its sustainable exploitation. Proactive harvester-driven conservation of commercial stocks in the Gulf of Maine resulted in record hauls, despite warming, whereas in the absence of such management, warming led to the collapse of the fishery in southern New England (Le Bris et al., 2018).

Lobster conservation efforts are sex biased, protecting large berried females (females carrying fertilized eggs on

the underside of the abdomen), but not large males. This female-biased protection leads to selective harvesting of large males, which subsequently restricts mate choice and limits sperm, resulting in reduced reproductive success (Tang et al., 2019). In the face of climate change, effective management of this natural resource will become increasingly critical to preserve the reproductive potential of lobster stocks. Robust sex analysis will ensure population structure is understood, and thus managed and protected accurately.

Environmental sex determination in an anthropogenically impacted environments (SDGs 6, 13, 14)

Where sex determination is shown to be influenced by the environment, it is critical to investigate the role of environmental change on the demography and resilience of populations. Environmental sex determination has been demonstrated in a wide range of organisms, with climate change stressors such as hypoxia (e.g. Shang et al., 2006), pH (e.g. Oldfield, 2005), ocean acidification (e.g. Parker et al 2018) and temperature (e.g. Mitchell and Janzen 2010; Jensen et al 2018) impacting the proportion of males and females in a wide range of aquatic organisms. Indeed in fish, warming oceans are proposed to lead to male-skewed populations (3:1 male to female) by the end of the century (Ospina-Alvarez and Piferrer 2008), possibly limiting mate choice or reducing the number of large females in a population—factors critical for reproductive capacity and population viability in many fish communities (Parker 1980; Barneche et al 2018). Similarly, in Green sea turtles rising temperatures projected to occur by 2100 could lead to local extinction of this species from certain sites due to feminisation of these populations (Jensen et al 2018).

In addition to environmental disturbance, anthropogenically derived pollution is shown to have major implications for the sex determination and demographic of aquatic species. Recent research in the UK highlighted that every river in the UK is polluted, with only 1 in 7 deemed to be in good ecological status (WFD report 2020). Moreover, this pollution is having direct impacts on the population demographic of fish species, with a recent study showing a quarter of male roach taken from 51 sites in England to be intersex, a phenomenon induced by the un-natural exposure to estrogenic chemicals (Tyler and Jobling 2008). This direct impact of adverse water quality on organism sex thus highlights the importance of sex as a key metric for determining the successful delivery of SDG 6.

From this growing body of research, it is clear that alterations in sex ratio—in either direction—result in populations less resilient to further disturbance and potentially lead to demographic collapse. A mechanistic understanding of sex-change processes and other ecologically significant sex-based responses are thus vital for accurately modelling impacts of anthropogenic disturbance (e.g. overfishing, climate change or pollution) at a population level. Increasing this body of research to incorporate a wider range of non-model organisms, especially where sex determination mechanisms are not yet understood, is key to enhancing the scientific knowledge base on which to deliver a number of the SDGs, and their interaction. This is particularly the case for SDG 13, 14 and 15 concerning climate change stressors, as well as for the management of commercially important seafood species, which are of significant importance for SDGs 1, 2, and 3.

Methodological development of techniques for non-invasive assessment of organism sex

At present the ability to determine the sex of an organism, non-invasively, is not possible for many species. Development of methods to assist in accurate determination of sex in a wider range of non-model organisms is thus vital. This advance in technical capability is critical to enable the research that will subsequently address any knowledge gap relating to sex of non-human organisms in the context of the SDGs. The continued development and increasing affordability of omics approaches have aided in the establishment of novel sexing techniques for a range of non-model organisms (Tannenbaum et al 2019), facilitating this aim. Nonetheless, a concerted effort to expand this capability to a much wider array of organisms is still crucial for the successful delivery of many of the SDG's, particularly with respect to SDGs 13, 14 and 15.

Investigation of the role of sex change in determining species response to environmental change in hermaphroditic species

One third of all non-human, non-insect animal species display hermaphroditism (Jarne & Auld 2006). However, at present no study has considered the impact of sex in determining the response of hermaphroditic organisms to climate change (i.e. whether the response differs in the male and female form), or the implications of the sex change process for organismal responses (Tannenbaum et al 2019). This is despite the process of changing sex affecting behavioural, physiological and endocrine systems on markedly different timescales (Lamm et al 2015). Due to its prevalence in the animal kingdom, elucidating how hermaphroditism impacts the organisms' response to climate change in a population context, as well as how the sex change process is impacted, is a clear knowledge gap. Due to the ecological and economic importance of a number of key hermaphroditic species (e.g. some species of scallop, oyster and grouper) understanding how sex change impacts these organisms has significant implications for many SDGs (particularly 1,2,3,14 &15).

An enhanced research effort to address this gap in our understanding will enable better modelling of the timing, direction, and duration of sex change, as well as sex determination mechanisms, in relation to anthropogenic stress. This research would also provide a greater understanding of how individual responses to environmental stress manifest where cells/behaviours/physiologies of different sexes co-exist in a single organism simultaneously.

References

Barneche, D. R., Robertson, D. R., White, C. R. & Marshall, D. J. (2018) Fish reproductive-energy output increases disproportionately with body size. *Science* 360, 642.

Benestan, L., Moore, J.S., Sutherland, B.J., Le Luyer, J., Maaroufi, H., Rogeux, C., Normandeau, E., Rycroft, N., Atema, J., Harris, L.N. and Tallman, R.F., (2017). Sex matters in massive parallel sequencing: Evidence for biases in genetic parameter estimation and investigation of sex determination systems. *Molecular Ecology*, 26(24), pp.6767-6783.

Benvenuto, C., Coscia, I., Chopelet, J., Sala-Bozano, M. & Mariani, S. (2017) Ecological and evolutionary consequences of alternative sex-change pathways in fish. *Sci. Rep.* 7, 9084.

Cripps, G., Flynn, K. J., & Lindeque, P. K. (2016). Ocean acidification affects the phyto-zoo plankton trophic transfer efficiency. *PLoS One* 11.

Cripps, G., Lindeque, P., & Flynn, K. J. (2014). Have we been underestimating the effects of ocean acidification in zooplankton? *Global Change Biology* 20, 3377-3385.

Ellis, R.P., Davison, W., Queirós, A.M., Kroeker, K.J., Calosi, P., Dupont, S., Spicer, J.I., Wilson, R.W., Widdicombe, S. and Urbina, M.A., 2017. Does sex really matter? Explaining intraspecies variation in ocean acidification responses. *Biology letters*, 13(2), p.20160761.

Ellis, R. P., Spicer, J. I., Byrne, J. J., Sommer, U., Viant, M. R., White, D. A., & Widdicombe, S., 2014. 1H NMR metabolomics reveals contrasting response by male and female mussels exposed to reduced seawater pH, increased temperature, and a pathogen. *Environmental science & technology*, 48(12), 7044-7052.

Jarne, P. & Auld, J. R. Animals mix it up too: the distribution of self-fertilization among hermaphroditic animals. *Evolution* 60, 1816-1824 (2006).

Jensen, M. P. et al. Environmental warming and feminization of one of the largest sea turtle populations in the world. *Curr. Biol.* 28, 154-159 (2018).

Kindsvater, H.K., Reynolds, J.D., Sadovy de Mitcheson, Y. and Mangel, M., 2017. Selectivity matters: Rules of thumb for management of plate-sized, sex-changing fish in the live reef food fish trade. *Fish and Fisheries*, 18(5), pp.821-836.

Le Bris, A., Mills, K.E., Wahle, R.A., Chen, Y., Alexander, M.A., Allyn, A.J., Schuetz, J.G., Scott, J.D. and Pershing, A.J., 2018. Climate vulnerability and resilience in the most valuable North American fishery. *Proceedings of the National Academy of Sciences*, 115(8), pp.1831-1836.

Ospina-Alvarez, N. & Piferrer, F. (2008) Temperature-dependent sex determination in fish revisited: prevalence, a single sex ratio response pattern, and possible effects of climate change. *PLoS One* 3, e2837.

Parker, K. (1980) A direct method for estimating northern anchovy, *Engraulis mordax*, spawning biomass. *Fish. Bull.* 78, 541-544.

Parker, L.M., O'Connor, W.A., Byrne, M., Dove, M., Coleman, R.A., Pörtner, H.O., Scanes, E., Virtue, P., Gibbs, M. and Ross, P.M., 2018. Ocean acidification but not warming alters sex determination in the Sydney rock oyster, *Saccostrea glomerata*. *Proceedings of the Royal Society B: Biological Sciences*, 285(1872), p.20172869.

Sasaki, M., Hedberg, S., Richardson, K., & Dam, H. G. (2019). Complex interactions between local adaptation, phenotypic plasticity and sex affect vulnerability to warming in a widespread marine copepod. *Royal Society Open*

Science, 6(3).

Tannenbaum, C., Ellis, R. P., Eysse, F., Zou, J., & Schiebinger, L. (2019). Sex and gender analysis improves science and engineering. *Nature*, 575(7781), 137-146.

Which keywords can help guide new research for the relevant SDGs?

Sex, Hermaphrodite, sex-change, climate adaptation, sex analysis, individual variation, sex determination

What indicators are needed to improve monitoring of progress?

- Require experimental assessment of climate change stressors to disaggregate results by sex
- Strongly encourage data incorporated into population/ecosystem models to be disaggregated by sex (where suitable data is available)
- Develop new techniques for measuring an organisms sex non-invasively

10. Food and nutrition security

OVERVIEW

Household food insecurity (HFI) is the result of poverty, poor health of the household member or members, and suboptimal livelihood and household management strategies.²⁰⁷⁾ Food security is closely related to, but not synonymous with, nutrition security and health. Nutrition security is attained by individuals when the body tissues are exposed to optimal amounts of nutrients and other essential substances.

Nutrition security results from the combination of household food security, health care access security, and access to other basic human needs including adequate sanitation. Food security and the other determinants of nutrition security are linked with each other. For example, a household with limited economic access to food may decide to not seek medical care for a child or to not purchase prescribed medications.

For food security to be a reality, households need to have unrestricted access to a healthy and nutritious diet. Access to healthy diets, in turn, depends on having adequate economic resources and for foods to be readily available in the country, region, and communities in which the households are located.²⁰⁸⁾

207) Rafael Pérez-Escamilla, Food Security and the 2015-2030 Sustainable Development Goals: From Human to Planetary Health: Perspectives and Opinions, *Current Developments in Nutrition*, Volume 1, Issue 7, July 2017, e000513, <https://doi.org/10.3945/cdn.117.000513>

208) Rafael Pérez-Escamilla, Food Security and the 2015-2030 Sustainable Development Goals: From Human to Planetary Health: Perspectives and Opinions, *Current Developments in Nutrition*, Volume 1, Issue 7, July 2017, e000513, <https://doi.org/10.3945/cdn.117.000513>

Gender perspective

Hale Ann Tufan, Margaret Mangheni, Brenda Boonabaana, Elizabeth Asimwe, Elisabeth Garner, Devon Jenkins, the GREAT project²⁰⁹⁾

Box 10. Food and nutrition security

The list below maps the connections and interdependencies between SDGs and their targets in the context of agriculture and food security.

- SDG1:** i) By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions (target 1.2)
ii) connection with other SDGs: 8 SDGs (1, 2, 3, 4, 5, 6, 8, 10)
- SDG2:** i) By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons (target 2.2)
ii) connection to other SDGs: SDGs (1, 2, 4, 5, 8, 10, 13)
- SDG3:** i) By 2030, reduce the global maternal mortality ratio to less than 70 per 100,000 live births (target 3.1)
ii) connections to other SDGs: SDGs (1, 2, 3, 4, 5, 6, 8, 10, 11, 13, 16)
- SDG4:** i) By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes (target 4.1)
ii) connections with other SDGs: (1, 2, 3, 4, 5, 6, 8, 10, 16)
- SDG5:** i) Eliminate all forms of violence against all women and girls in the public and private spheres, including trafficking and sexual and other types of exploitation (target 5.2)
ii) connections with other SDGs: (1, 2, 3, 4, 5, 6, 8, 10, 11, 13, 16)
- SDG6:** i) By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations (target 6.2)
ii) connections to other SDGs - none suggested
- SDG8:** i) By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value (target 8.5)]
ii) connections to other SDGs: (1, 3, 4, 5, 8, 10, 11, 16)

²⁰⁹⁾ <https://www.greatagriculture.org>

- SDG10:** i) By 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status (target 10.2)
 ii) connections to other SDGs: (1, 2, 3, 4, 5, 6, 8, 10, 11, 16)
- SDG11:** i) By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons (target 11.2)
 ii) connections to other SDGs: (1, 2, 3, 4, 5, 6, 8, 10, 11, 13, 16)
- SDG13:** i) Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities (target 13b)
 ii) connections to other SDGs: (1, 2, 4, 5, 6, 8, 10, 11, 13)
- SW16:** i) Proportion of young women and men aged 18-29 years who experienced sexual violence by age 18 (indicator 16.2.3)
 ii) connection to other SDGs - none suggested

Which actors and stakeholder to include in partnerships for SDGs implementation

Government institutions responsible for economic planning monitoring & finance, labour, agricultural development, health, education, gender, water & sanitation; Global and regional development organisations e.g. World Bank, African Development Bank; Regional political and development blocks such as the EU, AU, etc; UN agencies e.g. UNDP, UN Women, FAO, WHO; Academia; Agricultural research organisations (for evidence generation); Community members, groups and institutions; relevant Private sector entities and Civil Society organisations

Which reports or research papers best capture the underlying gender issues

General reviews and background of SDGs and gender:

- *Gender & Development* Sustainable Development Goals special issue
 Notes: Whole issue devoted to SDGs and gender analysis (as reference); not specific to gender, agriculture and environment. Access: <https://www.tandfonline.com/toc/cgde20/24/1>
- Argawal, B. Gender equality, food security and the sustainable development goals
 Gender differences in access to material resources limits the ability of SDG 5 to enhance food security. Access: https://www.sciencedirect.com/science/article/pii/S1877343517302415?casa_token=opFzhQWkMOIAAAA A:vH3PUHxRqOfdWMYg35DKxI9waT5QemWqQLJIIIULUFelRfJ6z4A6bqdi0oRi-2IOHCqlaQLOJg

-
- Doss, C., Meinzen-Dick, R., Quisumbing, A., Theis, S. 2018. “Women in Agriculture: Four Myths”
Notes: In context of SDG 5, these authors analyse four gender myths related to women, agriculture and the environment, which they note can hinder the development of effective food security policies. Access: <https://www.sciencedirect.com/science/article/pii/S2211912417300779?via%3Dihub>
 - Meinzen-Dick et al. 2019. “Women’s Empowerment in Agriculture: Lessons from Qualitative Research.”
Notes: Highlights importance of qualitative research in assessing empowerment. A critique and examination of the WEAI tool and women’s empowerment in agriculture is important given their importance in shaping programs and policies aimed at achieving SDG 5. Access: <http://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/133060/filename/133272.pdf>

Related research articles:

- FAO. 2020. Tracking Progress on agriculture and food-related SDG indicators.
Notes: A recent FAO report on the process towards SDG related to food and agriculture (1,6 14 and 15) reports some studies that focus on gender issues, but the report points out a general lack of data on key gender issues. Access: <http://www.fao.org/sdg-progress-report/en/>

What knowledge is still missing?

- **The integration of gender in agriculture research into programs and policies to achieve SDG goals**

There remains a gap between evolving conceptual frameworks formulated by gender in agriculture researchers, and the research outputs resulting from their application. Analysing how these studies have then been adopted by development practitioners to develop programming or interventions towards SDGs with relevant gender dimensions.

- **The role of the donor (and donor pressure) in prioritising gender issues in agricultural research.**

Considering gender in agricultural research projects and programming is not new but appears to be growing as a widespread donor priority. The primary driver is this donor requirement and push, which has generated demand for gender research skills and training. What we have yet to understand is if agricultural researchers and institutional leadership continue to allocate resources and prioritise gender in their research programs after participating in donor driven programming: i.e. when grants end, do gender issues continue to be prioritised.

- **The impact of gender representation in the research process on women’s empowerment.**

Much of the focus of gender integration into agricultural research focuses justifiably around developing research outputs that may contribute to gender equality among recipients. There is however less research and knowledge around how gender responsive research systems, not outputs, contribute to gender equality. This increased equality could be at the institutional level and in the program impacts: i.e. when women are included in research process, how does this participation contribute towards gender equality goals?

Which keywords can help guide new research for the relevant SDGs?

Standardised usage of gender-related keywords is currently lacking, though some recent attention has been drawn to this issue (see Tyszler, Marcelo and Le Borgne, Ewen. 2019. Findability of gender data sets. Community of Practice on Socio-economic Data report COPSED-2019-002. CGIAR Platform for Big Data in Agriculture. 24 p.). This lack of standardisation can make identifying relevant articles difficult, and variations in common terms makes searching even more inaccurate and tedious.

Standardised keyword vocabularies, such as AGROVOC, “a multilingual controlled vocabulary covering all areas of interest to the Food and Agriculture Organization of the United Nations,” can help, however, many important keywords relating to gender and agricultural research - particularly crop breeding - are missing from AGROVOC. Below is a list of keywords, including whether there is a standard version in AGROVOC or not, and common variations.

Keyword	AGROVOC	Variations
adoption	No	[see <i>technology adoption</i>]
access	Yes	access and benefit sharing; access rights; access to
agency	No	
bargaining power	Yes	
care work	No	care; care labor; [see <i>reproductive labor</i>]
decision making	Yes	decision-making; household decision making
dual-headed household	No	dual headed household; [see <i>female-headed household</i> ; <i>male-headed household</i> ; <i>single-headed household</i>]
ecofeminism	No	feminist environmental philosophy; [see <i>feminism</i>]
empowerment	Yes	[see <i>WEAI</i>]; economic empowerment
end-user	No	end user
equity	Yes	
equality	Yes	gender equality; social equality
family budget	Yes	
farmer knowledge	No	
farmer participation	Yes	
farmer participatory research	No	
farmer preferences	No	
feminization	Yes	[see <i>labour feminization</i>]; feminization of agriculture
farmers' attitudes	Yes	
female-headed household	No	FHH; female headed household; [see <i>dual-headed household</i> ; <i>male-headed household</i> ; <i>single-headed household</i>]
female labour	Yes	
feminism	No	[see <i>ecofeminism</i>]

Keyword	AGROVOC	Variations
gender	Yes	
gender analysis	Yes	
gender and diversity	No	
gender and social equity	No	
gender equality	Yes	[see <i>gender inequality</i> ; <i>gender equity</i>]
gender equity	Yes	[see <i>gender equality</i> ; <i>gender inequality</i>]
gender equity in access to land	Yes	patrilineal inheritance; matrilineal inheritance
gender inequality	No	[see <i>gender equality</i> ; <i>gender equity</i>]
gender gaps	No	[see <i>yield gap</i>]
gender mainstreaming	Yes	
gender norms	No	
gender statistics	Yes	
gender training	Yes	
gendered impact	No	
households	Yes	
household economy	No	[see <i>family budget</i> ; <i>household income</i> ; <i>household expenditures</i>]
household expenditures	Yes	[see <i>family budget</i> ; <i>household economy</i> ; <i>household income</i>]
household income	Yes	[see <i>family budget</i> ; <i>household economy</i> ; <i>household expenditures</i>]
household surveys	Yes	
households	Yes	
inclusion	Yes	
intrahousehold dynamics	No	
interdisciplinary research	Yes	
labour feminization	No	[see <i>feminization</i>]
labour saving technologies for women	Yes	
land allocation	Yes	[see <i>resources allocation</i>]
livelihoods	Yes	
male-headed household	No	MHH; male headed household; [see <i>dual-headed household</i> ; <i>female-headed household</i> ; <i>single-headed household</i>]
male involvement	Yes	[see <i>participation</i> ; <i>women's participation</i>]
men	Yes	man
multidimensional empowerment	No	
participation	Yes	[see <i>male involvement</i> ; <i>women's participation</i>]
participatory approaches	Yes	[see <i>rapid rural appraisal</i> ; <i>participatory rural appraisal</i> ; <i>participatory research</i> ; <i>participation</i>]

Keyword	AGROVOC	Variations
participatory plant breeding	No	participatory plant breeding (PPB); [see <i>preferences</i> ; <i>trait preferences</i> ; <i>participation</i> ; <i>participatory research</i>]
participatory research	Yes	[see <i>rapid rural appraisal</i> ; <i>participatory rural appraisal</i> ; <i>participatory approaches</i> ; <i>participation</i>]
participatory rural appraisal	Yes	[see <i>rapid rural appraisal</i> ; <i>participatory research</i> ; <i>participatory approaches</i> ; <i>participation</i>]
patriarchy	No	
preferences	No	[see <i>participatory plant breeding</i> ; <i>trait preferences</i> ; <i>participation</i>]
rapid rural appraisal	Yes	[see <i>participatory rural appraisal</i> ; <i>participatory research</i> ; <i>participatory approaches</i> ; <i>participation</i>]
reproductive labor	No	[see <i>care work</i>]
resources allocation	Yes	[see <i>land allocation</i>]
role of women	Yes	
rural economics	Yes	rural economy
sex-disaggregated data	Yes	
single-headed household	No	single headed household; [see <i>dual-headed household</i> ; <i>female-headed household</i> ; <i>male-headed household</i>]
social welfare	Yes	
technology adoption	No	[see <i>adoption</i>]
time use	No	
trait preferences	No	[see <i>participatory plant breeding</i> ; <i>preferences</i>]
WEAI	No	Women Empowerment in Agriculture Index; women's empowerment in agriculture index; pro-WEAI; [see <i>empowerment</i>]
women	Yes	woman
women farmers	Yes	
women's empowerment	Yes	women's economic empowerment
women's land rights	No	
women's participation	Yes	[see <i>participation</i>]
yield differences	No	
yield gap	Yes	[see <i>gender gaps</i>]

What indicators are needed to improve monitoring of progress

#	SDG	Suggested/possible gender indicators
1.	No poverty	<ul style="list-style-type: none"> Proportion of men and women with access to at least three basic life services (<i>food, decent shelter and education up to secondary level</i>) Proportion of men and women above the poverty line
2.	Zero hunger	<ul style="list-style-type: none"> Proportion of men and women, girls and boys that can afford eating three meals a day Proportion of men and women resilient to shocks and stresses Proportion of agricultural area under productive and sustainable agriculture owned by men and women Proportion of men and women with access to sustainable agricultural technologies
3.	Good health and well being	<ul style="list-style-type: none"> Gender targets and indicators look good
4.	Quality education	<ul style="list-style-type: none"> Gender targets and indicators look good
5.	Gender equality	<ul style="list-style-type: none"> Number of countries with functional domestic relations legislation Number of gender discriminatory cultural practices outlawed by national legislation
6.	Clean water and sanitation	<ul style="list-style-type: none"> Proportion of population (by sex) accessing clean water points within a distance of less than 1km
7.	Affordable and clean energy	<p>Has no gender specific targets and indicators</p> <ul style="list-style-type: none"> Proportion of population by sex with access to and use of clean and affordable energy sources Time spent collecting fuel by sex and fuel type
8	Decent work and economic growth	<ul style="list-style-type: none"> Proportion of population in paid and decent employment by sex Number of countries with legislation on indiscriminate pay for all ages and sex Number of countries with legislations for a minimum wage for all ages and sex
9.	Industry, innovation and infrastructure	<p>Has no gender specific targets and indicators</p> <ul style="list-style-type: none"> Proportion of population (by sex) that have accessed technical and financial credit for industrial and technological start-ups/innovations of any kind Number of innovators by country and by sex that have registered technological patents Proportion of employees by sex, age, ethnicity/nationality, etc. and industry
10.	Reduced inequality	<ul style="list-style-type: none"> Proportion of income and job growth income by sex, age, ethnicity/nationality, etc. and by industry Income rates by sex, age, ethnicity/nationality, etc. and by industry (indicator for wage gap) (Un)employment rates by sex, age, ethnicity/nationality, etc. and by industry Proportion of land ownership by sex, age, ethnicity/nationality, etc. and by land use, value, and quality Number of laws addressing discrimination and protecting rights
11.	Sustainable cities and communities	<ul style="list-style-type: none"> Proportion of urban population (by sex) with access to decent and affordable housing Countries with legislations against sexual harassment in public spaces including urban transport systems.

#	SDG	Suggested/possible gender indicators
12.	Responsible consumption and production	Has no gender-specific targets and indicators
13.	Climate action	
14.	Life below water	Has no gender-specific targets and indicators <ul style="list-style-type: none"> • Proportion of population (by sex) engaged in sustainable use of marine resources - <i>engaged in sustainable fisheries, aquaculture and tourism</i>
15.	Life on land	Has no gender-specific targets and indicators <ul style="list-style-type: none"> • Proportion of population (by sex) in sustainable management of forestry resources - lower and higher levels of management
16.	Peace and justice, strong institutions	<ul style="list-style-type: none"> • Proportion of women and men represented in peace and justice decision making bodies at different geographical scales
17.	Partnerships to achieve the goal	Has no gender-specific targets and indicators <ul style="list-style-type: none"> • Proportion of male, female, and other leaders of the organizations in partnership • Proportion of those engaged in partnership leadership, by sex, ethnicity/nationality, age, etc. • Proportion of partners that have a stated gender policy

11. Digitalisation and ICTs

OVERVIEW

The discussions of digitalisation and the Sustainable Development Goals show that digital technologies are understood as enabling and transformative in the efforts towards sustainable development.²¹⁰⁾ The underlying assumption is that a decoupling between economic growth and environmental degradation is possible²¹¹⁾, if digitalisation and its technologies contribute to sustainable development by taking place within the safe operating place for humanity, enabling both the SDGs of the societal and economic spheres and also the SDGs of the biosphere.²¹²⁾ Velden (2018)²¹³⁾ defines the notion of digitalisation as the use of digital information and communication technologies, including the interconnectivity and networking of these technologies: big data, artificial intelligence (AI), platform technologies, crypto-currencies, blockchain technology, Internet of Things (IoT), and 3D and 4D printing are some of the technologies associated with digitalisation.

210) <https://www.giz.de/expertise/html/60746.html>

211) E. Sanye-Mengual et al., Assessing the decoupling of economic growth from environmental impacts in the European Union: A consumption-based approach, *Journal of Cleaner Production* 236 (2019) 117535

212) Maja van der Velden and Taylor M.B.: Sustainability Hotspots Analysis of the Mobile Phone Lifecycle, University of Oslo, Oslo, (2017), http://www.mifav.uniroma2.it/inevent/events/idea2010/doc/37_8.pdf

213) Maja van der Velden, Digitalisation and the UN Sustainable development Goals: What role for design, 2018, http://www.mifav.uniroma2.it/inevent/events/idea2010/doc/37_8.pdf

Gender perspective

Londa Schiebinger, Stanford University

Box 11. ICTs and Artificial Intelligence from a gender perspective

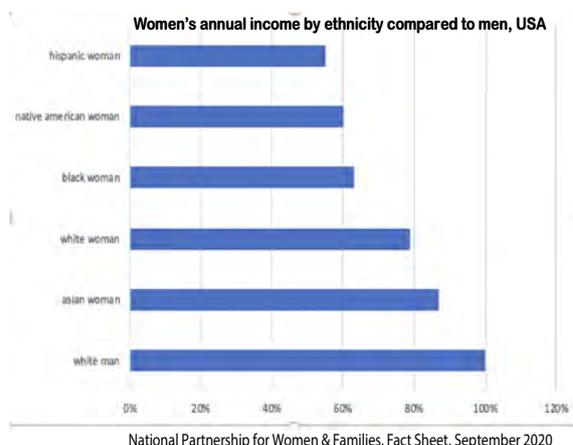
Machine learning, AI, can contribute to the UN Sustainable Development Goals (SDGs): gender equality and reduced inequalities (or enhancing equalities).

Gendered Innovations has been active in this area. The European Commission Horizon 2020 Expert Group, Gendered Innovations/Innovation through Gender published: *Gendered Innovations 2: How Inclusive Analysis Contributes to Research and Innovation* (Luxembourg: Publications Office of the European Union, 2020). The Commission “Missions Areas” support research and policies to aid in achieving the UN SDGs.

Here I delve into intersectional approaches to digitization in science and society.

Doing research wrong costs lives and money. Programs and engineered systems fail—and fail more often for women and people of colour. Here are a few examples.

- In Google search, men are five times more likely than women to be offered ads for high-paying executive jobs.²¹⁴ Why is that? According to OECD data, the differential in men’s median income and women’s median income is about 13.5%.²¹⁵ Women overall, aged 35 years and older, earn 74% to 80% of the earnings of their male counterparts. Black and Hispanic women, however, face larger pay gaps (see chart).²¹⁶ The job of google search is to deliver the correct ad to the correct person. Unless corrected for bias, the algorithm will process the data to deliver the ad for a high-paying job to a man. The study did not include race or ethnic differentials.
- Image recognition amplifies human gender stereotypes. People pictured in kitchens on the internet are more often “women” than “men”—that’s the reality. However, take the example of cooking. In the training set, cooking is over 33% more likely include the picture of a woman than a man, yet the algorithm amplifies the disparity to 68%.²¹⁷
- Soap dispenser do not work for people with dark skin. Why is that? The near-infrared technology that should see the hand, close the circuit, and dispense the soap does not work for darker skin. More seriously, heart-rate monitors, even Apple watches, do not work for darker-skinned people—which may put them at risk for serious conditions like heart disease. And pulse oximeters, used to



measure oxygen levels in the blood, overestimate oxygen levels in the blood in patients with darker skin.²¹⁸⁾ This is particularly worrisome for COVID patients who may not get the supplemental oxygen they need, putting them at risk for organ failure.

- A final example comes from predictive models in genetic medicine. In the US, 80% of participants in genome-wide association studies (GWAS) studies are of European descent. This means that disease risk predictors may fail for non-European populations. Patients of African ancestry, for example, are more often wrongly diagnosed with increased genetic risk of hypertrophic cardiomyopathy—a life-threatening heart condition. Predictors need to be validated on ancestry before they are deployed.²¹⁹⁾

Each of these examples is important. But each focuses on only one social dimension in isolation—either gender (google search and image recognition) or race (the soap dispensers and GWAS). This is why we need to focus on a higher-level problem: Intersectionality.

What do we mean by intersectionality? Intersectionality describes overlapping or intersecting forms of discrimination related to gender, sex, ethnicity, age, socioeconomic status, sexual orientation, abilities, geographic location, etc. The term was coined in 1989 by legal scholar Kimberlé Crenshaw to describe how multiple forms of discrimination intersect.²²⁰⁾

Let me show you how this works in research on facial recognition by Joy Boulamwini—called Gender Shades.²²¹⁾ Gender Shades studies intersectionality—specifically how sex and race intersect—and shows that facial recognition cannot “see” black women’s faces.

Sex analysis shows that the systems performed better on men’s faces than on women’s faces. **Race** analysis shows that the systems performed better on lighter-skin than darker-skin. **Intersectional** analysis shows that the system performed worst for black women. Error rates were 35% for darker-skinned women, 12% for darker-skinned men, 7% for lighter-skinned women, and less than 1% for lighter-skinned men.

But there is more!! We could do an intersectional analysis around **sexuality**. Systems cannot “recognize” transgender faces, especially during transition periods.²²²⁾ We could also add an analysis including **gender**, where we learn that facial cosmetics reduce the accuracy facial recognition methods by up to 76%.²²³⁾

Let me take another example that focuses on the intersectional factor of geographic location. I call it “the bride problem.” These are images of two brides—one North American and One North Indian. A photograph of a traditional US bride dressed in white is correctly labelled in the dataset ‘bride’, ‘dress’, ‘woman’, ‘wedding’, but a photograph of a North Indian bride is incorrectly labelled ‘performance art,’ ‘red,’ ‘costume.’

Why? The issue here, as for most of these examples, has to do with biased data.

More than 45% of ImageNet data, which fuels research in computer vision, comes from the United States, home to only 4% of the world’s population. By contrast, China and India together contribute just 3% of ImageNet data, even though these countries represent 36% of the world’s population. We need datasets with appropriate geodiversity.²²⁴⁾

Gendered Innovations is solution based. We held a Workshop on Gender and Fairness in Machine Learning in 2018. Solutions require interdisciplinary teams of computer scientists, lawyers, political scientists, historians, and gender experts to optimize algorithms that guarantee fairness. We have outlined solutions in our two *Nature* papers (cited above) and also in our case study: Machine Learning: Analyzing Gender.²²⁵⁾

Let me add: Getting the data right and making the technology see everyone is one aspect of computer vision. Larger issues are security. Transgender people, for example, may not want to be tracked by facial recognition systems at all. The potential misuse of facial recognition has led to several actions: Belgium has declared the use of facial recognition illegal. France and Sweden have expressly prohibited it in schools, and San Francisco has banned its use by local agencies, such as the transport authority or law enforcement. Companies, too, are pulling back: IBM has left the facial recognition business entirely, and Amazon has halted police from using its technology in response to worldwide protests against systemic racial injustices in 2020.²²⁶⁾ Seeking long-term solutions, the US Algorithmic Justice League has called for the creation of a federal regulatory office similar to the US FDA.²²⁷⁾

It is clear, then, that intersectional approaches—analysing how gender, race, ethnicity, geographical location, age, etc. intersect—are necessary to support the UN SDGs.

Let me give one more example in this realm: Social robots. And believe me, the robots are coming! As the population ages, we will need new assistive technologies to care for elderly people. We also need social robots to assist autistic children and the like.

Humans—whether as designers or users—tend to anthropomorphize and, consequently, gender machines (because, in human cultures, gender is a primary social category). Social robots are designed in a world alive with gender norms, gender identities, and gender relations.

Ethnicity is another issue. Most social robots are by default white—white plastic to be sure—but nonetheless white. One solution we discovered is Milo. Milo is the only robot we found available in a variety of skin tones. Milo is designed for learners with autism. Because autism affects four times as many boys as girls this robot is, perhaps rightly, designed as a boy. But it would be important to make a teaching robot for the millions of girls suffering from the disorder.²²⁸⁾

There is much work to be done! Researchers need to learn sophisticated methods of gender, race, and intersectional analysis. Universities need to incorporate these methods into their curricula. Editors of peer-reviewed journals need to require sophisticated sex, gender, and intersectional analysis when selecting papers for publication. Corporations need to integrate these insights into product design. Gendered innovations spark creativity and discovery by offering new perspectives, posing new questions, and opening new areas to research. You can take advantage of this to make your work both more creative and social responsible, and in so doing support the UN SDGs.

Reports and publications on this topic

UNESCO, *AI and Gender Equality* (2020): <https://en.unesco.org/AI-and-GE-2020>

UNESCO, *I'd Blush if I could: Closing Gender Divides in Digital Skills through Education* (2019), esp. 86-134: <https://en.unesco.org/ld-blush-if-i-could>

Londa Schiebinger & Ineke Klinge, eds., *Innovations 2: How Inclusive Analysis Contributes to Research and Innovation* (Luxembourg: Publications Office of the European Union, 2020).

Tannenbaum, C., Ellis, R. P., Eyssel, F., Zou, J., & Schiebinger, L. (2019). Sex and gender analysis improve science and engineering. *Nature*, 575(7781), 137-146.

Zou, J., & Schiebinger, L. (2018). AI can be sexist and racist—it's time to make it fair. *Nature*, 559.7714 324-326. <https://data2x.org/>

Digitalisation and ICTs, part 2

Inkyoung SUN, Science and Technology Policy Institute (STEPI), Republic of Korea

Box 11.a. What we need to know for applications of AI

It is critical to examine carefully unintended (possible) consequences of applying new technology into the context

- 214) Datta, Amit, Michael Carl Tschantz, and Anupam Datta. "Automated experiments on ad privacy settings." *Proceedings on Privacy Enhancing Technologies* 2015.1 (2015): 92-112
- 215) World Economic Forum, *Global Gender Gap Report 2020* (Geneva, 2019), 18.
- 216) National Partnership for Women and Families, Fact Sheet, September 2020, <https://www.nationalpartnership.org/our-work/resources/economic-justice/fair-pay/quantifying-americas-gender-wage-gap.pdf>, Accessed 17 December 2020.
- 217) Zhao, J., Wang, T., Yatskar, M., Ordóñez, V., & Chang, K. W. (2017). Men also like shopping: Reducing gender bias amplification using corpus-level constraints. *arXiv preprint arXiv:1707.09457*.
- 218) Feiner, J. R. et al. (2007). Dark skin Decreases the Accuracy of Pulse Oximeters at Low Oxygen Saturation: The Effects of Oximeter Probe Type and Gender. *Anesthesia & Analgesia*, 105(6), S18-S23.
- 219) Popejoy, A. B., & Fullerton, S. M. (2016). Genomics is failing on diversity. *Nature*, 538 (7624), 161.
- 220) Crenshaw, K. (1989). Demarginalizing the Intersection of Race and Sex: A Black Feminist Critique of Antidiscrimination Doctrine, Feminist Theory and Antiracist Politics, *University of Chicago Legal Forum*, 1, 139-167.
- 221) Buolamwini, J., & Gebru, T. (2018). Gender shades: intersectional accuracy disparities in commercial gender classification. *Proceedings of Machine Learning Research*, 81, 77-91.
- 222) Keyes, O. (2018). The misgendering machines: trans/HCI implications of automatic gender recognition. *Proceedings of the ACM on Human-Computer Interaction*, 2 (CSCW).
- 223) Dantcheva, A., Chen, C., & Ross, A. (2012). Can facial cosmetics affect the matching accuracy of face recognition systems? *2012 IEEE Fifth International Conference on Biometrics: Theory, Applications and Systems (BTAS)*, (pp. 391-398). IEEE. See Lorena Fernández Álvarez, Facial recognition: analysing gender and intersectionality in machine learning in Londa Schiebinger & Ineke Klinge, eds., *Innovations 2: How Inclusive Analysis Contributes to Research and Innovation* (Luxembourg: Publications Office of the European Union, 2020).
- 224) Zou, J., & Schiebinger, L. (2018). AI can be sexist and racist—it's time to make it fair. *Nature*, 559.7714 324-326.
- 225) <http://genderedinnovations.stanford.edu/case-studies/machinelearning.html#tabs-2>. Accessed 2 September 2020.
- 226) Surfshark. Retrieved 31 August 2020, from <https://surfshark.com/facial-recognition-map>.
- 227) Learned-Miller, E., Ordóñez, V., Morgenstern, J., & Buolamwini, J. (2020). Facial Recognition Technologies in the Wild. https://global-uploads.webflow.com/5e027ca188c99e3515b404b7/5ed1145952bc185203f3d009_FRTsFederalOfficeMay2020.pdf. Accessed 2 September 2020.
- 228) Gendering Social Robots: Analyzing Gender. <http://genderedinnovations.stanford.edu/case-studies/genderingsocialrobots.html#tabs-2> Accessed 2 September 2020.

of SDGs. For example,

- Investigating potential conflicts in values or increased disparity in benefits of new technology in advance of implementation, may contribute to ‘no one left behind.’
- The representativeness of (big, public, or open) data is significant enough to study further, as data become to be recognized as the primary resources to support evidence-based policymaking.
- Gender-biases in algorithms and machine learning
- Share of female beneficiaries in each SDGs program, project, and investment

12. Urgent gender inequalities: femicide

Contributed by: Shalva Weil²²⁹, Hebrew University of Jerusalem

Box 12. Femicide and gender-based violence

Gender-related killings of women and girls remain a grave problem across regions, in countries rich and poor. While the vast majority of homicide victims are men, killed by strangers, women make up the vast majority of victims killed by an intimate partner, at 82 percent.²³⁰

This thematic report addresses the topic of gender-related killings of women. Rather than a new form of violence, gender-related killings are the extreme manifestation of existing forms of violence against women. Such killings are not isolated incidents that arise suddenly and unexpectedly, they represent the ultimate act of violence which is experienced in a continuum of violence. Women subjected to continuous violence and living under conditions of gender-based discrimination and threat are always on — death row, always in fear of execution. Globally, the prevalence of different manifestations of gender-related killings is reaching alarming proportions. Culturally and socially embedded, these manifestations continue to be accepted, tolerated or justified—with impunity as the norm. The State’s responsibility to act with due diligence in the promotion and protection of women’s rights is largely lacking as regards the killing of women²³¹.

The weaknesses in information systems and the poor quality of data are major barriers in investigating femicides, developing meaningful prevention strategies and advocating for improved policies. The different frameworks, definitions and classifications used in the conceptualization of femicide often complicate the collection of data from different sources and could lead to documentation that may not be comparable across communities or regions.

²²⁹ In 2020, Shalva Weil established the Israel Observatory on Femicide (www.israelfemicide.org)

Studies on the subject have been conducted primarily using data from homicide databases. Information collected by official or State sources is frequently not harmonized or coordinated. Often there are incongruities between the data collated by the different facilities, including inconsistencies in the categories used to document the circumstances surrounding the crime, the victim-perpetrator relationship and the fact of pre-existing violence.

The development of an effective evidence base requires improving the quality and comparability of data. The Global Femicide Watch Platform is a special project of the United Nations Studies Association (UNSA) Global Network. It provides selected, high quality information - the "must-knows" - on the issue of femicide: the gender related killings of women and girls. It addresses and better informs policy and decision makers at all levels, actors from the criminal justice system, practitioners, civil society activists, academics, and individuals concerned with this horrible phenomenon.²³²⁾

Which reports or research papers best capture the underlying gender issues?

- Dimitrijevic, M., Filip, A. and Platzer, M. (eds) *Femicide: Taking Action against Gender-Related Killing of Women and Girls 4*: 118-121. Vienna: ACUNS.
<http://fbf7c7e20b173f4d238f-5912a34ad37e49172ffd347ffbe5002d.r41.cf1.rackcdn.com/FemicideVol-IV.pdf>
- Weil, S., Corradi, C. and Naudi, M. 2018. *Femicide across Europe*. University of Bristol: Policy Press.
- Weil, S. and Keshet, N. 2021 "Female Geronticide: the Case of Israel", *Journal of Gender Studies* 29 (5).
<https://www.tandfonline.com/doi/full/10.1080/09589236.2020.1809361> doi:10.1080/09589236.2020.1809361
- Weil, S. 2020c "Coronavirus (COVID-19) and Femicide". *European Sociologist*, 45. Special Issue: Pandemic (Im)Possibilities, Vol. 1.
<https://www.europeansociologist.org/issue-45-pandemic-impossibilities-vol-1/gendering-coronavirus-covid-19-and-femicide>
- Weil, S. 2020d "Two Global Pandemics: Femicide and Covid-19". *Trauma and Memory* 8 (2)
<http://www.eupsycho.com/index.php/TM/article/viewFile/329>
- Helen Hemblade and Helene Gabriel eds. *Femicide X11: Living Victims of Femicide: Silences to Death*. Vienna: United Nations Studies Association (UNSA).
http://femicide-watch.org/sites/default/files/Femicide%20XII_0.pdf

What knowledge is still missing?

- Disaggregation of crime and violence data for gender;
- Governmental and establishment attitudes in order to gender to ensure secure societies;
- Gender as a human rights issue;
- Femicide as a global pandemic;

230) https://www.unodc.org/documents/data-and-analysis/GSH2018/GSH18_Gender-related_killing_of_women_and_girls.pdf

231) UN General Assembly, 23 May 2012, Rashida Manjoo, Report of the Special Rapporteur on violence against women, its causes and consequences
https://www.ohchr.org/Documents/Issues/Women/A.HRC.20.16_En.pdf

232) http://femicide-watch.org/sites/default/files/Femicide%20XII_0.pdf

-
- Change of male attitudes towards women and education for gender respect

Which keywords can help guide new research for the relevant SDGs?

Femicide, VAW (violence against women), female geronticide (murder of elderly women), domestic abuse

What indicators are needed to improve monitoring of progress?

16.1.1. Violence in general-MENTION FEMICIDE SEPARATELY;

16.1.2 Violence against children-MENTION GIRL/FEMALE CHILDREN SEPARATELY

16.1.3 Sexual physical harassment-MENTION WOMEN AND GIRLS, RAPE & TRAFFICKING

16.2.3. Sexual violence against children -MENTION FAMILY MEMBERS AND RELATION OF PERPETRATORS TO FEMALE (AND MALE) CHILDREN

5.2.1 Violence against women-ADD GIRLS UNDER the AGE OF 15

5.3 Harmful practices-ADD WITCHCRAFT AND DOWRY MARRIAGES

5.3.1 Harmful practices-ADD GIRLS UNDER 15

13. Peace and security

Rebecca Blum, Nordic Centre for Gender in Military Operations (NCGM)

Box 13. Security and human rights from a gender perspective

The intersection of the SDGs 5 and 16 has been recognized by the international community as being an area of particular importance. This intersection is formulated in the Women, Peace and Security (WPS) agenda which was initiated when the UN Security Council unanimously adopted the first resolution on the topic in October 2000 under the Namibian presidency. While the reference of the WPS agenda is not high-lighted in the SDGs. The resolution; UNSCR 1325 is built on well-established international policies and frameworks including the UN Charter and the Convention on the Elimination of all forms of Discrimination against Women (CEDAW) and the Beijing Declaration and Platform for Action (1995). In 2020, ten resolutions on Women, Peace and Security have been adopted and constitute a comprehensive framework building on the landmark UNSCR 1325. This solid foundation could support the implementation of the WPS agenda more explicitly into the SDG work.

The resolutions in the agenda aim to work with both ensuring women's, and men's equal right to participation, and influence on issues on peace, security and armed conflict, but also highlights the obligations to ensure their equal rights to be protected during and following the end of an armed conflict.

The WPS agenda is not an agenda for the few, it is an agenda for the many. It is worth noting, that Since 2000, 86 nations have adopted national action plans or similar for the implementation of the agenda²³³. The research in the

area of the Women, Peace and Security agenda is substantial and several scholarly articles are regularly produced²³⁴).

Identifying gaps in knowledge

Despite the focus on the WPS Agenda, and the broad will of nations to implement the agenda there are significant gaps when it comes to its implementation. One suggested area that would be of interest to further research would be the intersection of the SDG goal 5 and 16 as connected to the WPS agenda. The agenda clearly identifies areas with regards to the thematic in goal 5 and 16 and could serve as an additional platform for their further implementation. Not only would such an approach further guide the development of useful indicators in the when it comes to Peaceful and Just societies (goal 16) it would secure that those indicators would bear relevance from goal 5 highlighting how women and girls are affected differently in non-peaceful settings and secure that the work would foster gender equality.

Another gap which is significant in achieving the SDGs is that of the role of the military actors. The role and significance of the security sector actors are well recognized in goal 16, but the role of the military is by and large missing. As the military will be one of the main actors when it comes to some of the indicators in goal 16. For instance, indicator 16.1.2 highlights conflict-related deaths per 100,000 population, by sex, age and cause. What we know from recent data is that women are disproportionately affected by war and armed conflict and in a recent report from Afghanistan²³⁵) we see that there has been an overall decrease in civilian casualties but an overall increase in women casualties. These gaps could be further researched to achieve a better outcome on the gender related effects of conflict-related civilian casualties in which the military actors have a significant role to play when it comes to both planning military operations and securing that its operations do not affect women disproportionately, and when it comes to the protection of civilian women, men, girls and boys.

Identifying gender keywords

Women and men in battle-related deaths,
Women, Peace and Security Agenda related to SDGs
Military role in the implementation of SDGs

Identifying new gender indicators

For SDG 5 - a national action plan or similar to implement the WPS Agenda.
Such an indicator would show the willingness of a nation to secure equal participation of women and men in both conflict, conflict resolution and conflict prevention.

For SDG16 - national data on equal participation (sex-disaggregated data) in the national armed forces, sex-disaggregated data on deployed peacekeepers in all types of missions.

233) <https://www.peacewomen.org/member-states> - Oct. 2020

14. Green technology and industry

Changmo Sung, Chaewoon Oh, and Kye Young Lee, Green Technology Centre, South Korea

Box 14. Green technology from a gender perspective

Technology transfer has been a key element of the United Nations Framework Convention on Climate Change (UNFCCC). The Clean Development Mechanism (CDM) was developed as the central instrument for transferring green technologies from developed to developing countries.

The UN made efforts to bolster technology development and transfer in order to expedite actions for implementing SDGs.²³⁶⁾ One exemplary effort is the establishment and operation of the Technology Facilitation Mechanism (TFM). As the main forum for the TFM to discuss topics of common interests of Member States and STI stakeholders, the UN also established the Interagency Task Team on Science, Technology and Innovation for the SDGs (IATT).²³⁷⁾ It is supported by the 10-Member Group which consists of representatives from civil society, private sectors and the scientific community and open to the participation of all UN agencies, funds and programmes and the functional commissions of the Economic and Social Council.²³⁸⁾ The IATT has been unfolding global pilot programme on science-technology-innovation (STI) for SDGs roadmaps. It has been working on the development of STI Roadmaps for SDGs, and, along this line, guidelines on the STI roadmap for SDG guidelines was prepared for countries to utilize in their preparation of national roadmaps on STI for SDGs.²³⁹⁾

In parallel with these efforts under the UN, the Technology Mechanism under the UNFCCC made efforts to mainstream gendered perspectives in its policies, programmes and activities for climate technology support to developing countries. Climate technologies are technologies that address climate change, such as renewable energies (i.e. wind energy, solar power and hydropower, etc.) that reduce greenhouse gas emissions and technologies designed to adapt to the adverse effects of climate change (i.e. drought-resistant crops, early warning systems, sea walls, etc.).²⁴⁰⁾ There are also 'soft' climate technologies such as energy-efficient practices or training for using equipment.²⁴¹⁾ These technologies closely relate with all the SDGs.

The Climate Technology Center & Network (CTCN), which is the implementing entity of the Technology Mechanism, provides technology assistance in climate adaptation and mitigation sectors while prioritizing sustainable development and the empowerment of vulnerable groups, including women, as their project goals.²⁴²⁾ In other words, gender equality and technology development & transfer are interrelated commonly as cross-cutting themes that apply to all the other SDGs.

Energy access is a critical factor affecting efforts to reduce poverty and is fundamental to achieving SDGs. The 2.7 billion women, men and children around the world who currently lack some form of access to energy are missing the opportunity to improve their lives - to cook food and heat their homes in a smoke-free environment, to earn a living, and to benefit from good health and education services. Sustainable, affordable and reliable modern energy

234) See for instance The Oxford Handbook on Women, Peace and Security, Ed. Sara E. Davies, Jacqui True, Oxford University Press, 2018

235) <https://www.ohchr.org/Documents/Countries/AF/ProtectionCiviliansAnnualReport2019.pdf>

access is a first step that gives communities the power to challenge their economic circumstances.

The area of our expertise covers climate technology cooperation and the relevant policies developed under the UNFCCC (The title of the session 4 we organized for the 19th Gender Summit was “Global Climate Technology Cooperation and Gender-mainstreaming Efforts”).

Gaps in knowledge

First of all, research on the gender mainstreaming efforts with regard to climate technology cooperation should move from ‘general cooperative process’ to ‘specific technology sectors’. Previous gender mainstreaming efforts are reflected into guidelines for technical support. However, gender elements can be varied by technology types and sectors. Accordingly, technology-specific guidelines need to be considered and developed. These guideline should include methodologies for collecting sex-disaggregated data, conducting gender analysis and developing capacity-building activities for specific climate technologies (or by sector or by type). For doing so, extensive research on best practice case studies on gender-applied climate technology projects should be conducted first in order to provide a source of literature review or a basis for research development.

Second, research should be conducted for mainstreaming gendered activities at the domestic level on the basis of international gender mainstreaming efforts (UNFCCC) and applying them to the national plans. A few number of countries such as Moldova²⁴³, Suriname²⁴⁴ and the Marshall Islands²⁴⁵ have recently renewed their National Determined Contributions (NDCs) with gender elements but there are still many Party countries that have not. The national plans may include the National Adaptation Plan (NAP), National Communication (NC) and the Nationally Appropriate Mitigation Action (NAMA), etc.

Third, studies should be conducted on gender mainstreaming national roadmaps or policies for STI for SDGs. In December 2019, the UN IATT published “A Guidebook for the Preparation of STI for SDGs Roadmaps” to be used as a source of reference for interested national and local governments that wish to develop national SDGs plans or roadmaps for achieving SDGs.²⁴⁶ Research demand on integrating gender perspectives with national plans on STI for SDGs should be on the rise as countries prepare relevant policy development.

236) <https://developmentfinance.un.org/technology-transfer>

237) Sustainable Development Goals Knowledge Platform (2020). [Accessed on September 11, 2020] <https://sustainabledevelopment.un.org/TFM>
238) Ibid.

239) UN IATT (2019). A Guidebook for the Preparation of STI for SDGs Roadmaps. Retrieved from https://sustainabledevelopment.un.org/content/documents/22724Guidebook_STI_for_SDG_Roadmaps_Draft_for_STI_Forum.pdf.

240) UNFCCC (2016). Technology and the UNFCCC: Building the foundation for sustainable development. Retrieved from https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/NAD_EBG/54b3b39e25b84f96aeada52180215ade/b8ce50e79b574690886602169f4f479b.pdf.

241) Ibid.

242) CTCN (2015). CTCN Operating Manual for National Designated Entities (NDEs); Retrieved from https://www.ctc-n.org/sites/default/files/documents/NDE%20Manual%20Version%201.2_April%202015.pdf. Annex 3.

243) Government of the Republic of Moldova (2020). Updated Nationally Determined Contribution of the Republic of Moldova. Retrieved from https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Republic%20of%20Moldova%20First/MD_Updated_NDC_final_version_EN.pdf

244) The Republic of Suriname (2020). National Determined Contributions. Retrieved from <https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Suriname%20Second/Suriname%20Second%20NDC.pdf>

Which reports or research papers best capture the underlying gender issues

Ellen Morris, Jennye Greene, Victoria Healey, 2019, “Blueprint Guide for Creating Gender-sensitive Energy Policies”, the Clean Energy Solutions Center, Sustainable Energy Solutions

Irene Gonzalez Pijuan, 2018, “Gender inequality and energy poverty”, Engineering without borders

Ana Pueyo and Mar Maestre, 2020, “Gender and energy: opportunities for all”, Institute of Development Studies, Bulletin.ids.ac.uk

Rabia Ferroukhi, Michael Renner, Divyam Nagpal, and Celia Garcia-Banos, 2019, “Renewable energy: Gender perspective”, IRENA, Abu Dhabi

Ana Pueyo, Mar Maestre, 2019, “Linking energy access, gender and poverty: A review of the literature on productive uses of energy”, Energy Research & Social Science, vol.53, 170-181

Kalee Whitehouse and Julie Curti, 2018, “Practical Guide to Women in Energy Regulation”, USAID Office: Energy Division

Clean Energy Solutions Centre, 2018, “Situation Analysis of Gender and Sustainable Energy in the East African Community”

Morgan G, Bajpai A, Ceppi P, Al-Hinai A, Christensen T, Kumar S, Crosskey S and O’Regan N., 2020, “Infrastructure for gender equality and the empowerment of women”, UNOPS, Copenhagen, Denmark.

What knowledge is still missing?

- Gender sensitive energy policy
- Empowering Women in the Energy Value Chain
- Gender Implications of Energy Use and Energy Access
- Women entrepreneurs and sustainable energy
- Women in Energy Regulation

Which keywords can help guide new research for the relevant SDGs?

- Gender Equality and Empowerment of women in Energy
- Gender impacts of energy access

245) The Republic of the Marshall Islands (2018). Nationally Determined Contribution. Retrieved from <https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Marshall%20Islands%20First/20181122%20Marshall%20Islands%20NDC%20to%20UNFCCC%2022%20November%202018%20FINAL.pdf>

246) UN IATT (2019). A Guidebook for the Preparation of STI for SDGs Roadmaps. Retrieved from https://sustainabledevelopment.un.org/content/documents/22724Guidebook_STI_for_SDG_Roadmaps_Draft_for_STI_Forum.pdf

-
- Gender in the transition to energy

What indicators are needed to improve monitoring of progress?

- Proportion of gender population with main dependence on clean fuels and technology
- Measure the skill differences in gender roles and access to renewable energy
- Enhance international cooperation to support gender for the financing sustainable energy

Which reports or research papers best capture the underlying gender issues?

Asian Development Bank (2017). From Goals to Action : Implementing the Sustainable Development Goals. Seminar Background Note. [Accessed on September 5, 2020]

<https://www.adb.org/sites/default/files/publication/301696/goals-action-sdgs.pdf>

Burns, B. & Lee, A. (2015). Gender mainstreaming practices in the context of climate responses. Women's Environment and Development Organization (WEDO). [Accessed on September 5, 2020]

<https://wedo.org/wp-content/uploads/2016/08/Gender-mainstreaming-practices-in-the-context-of-climate-responses.pdf>

International Council for Science (ICSU). (2017). A guide to SDG interactions: from science to implementation [Griggs, D.J., Nilsson M., Stevance, A., McCollum, D (eds)] International Council for Science, Paris.

Jost, C., Kristjanson, P., & Ferdous, N. (2015). Lessons in Theory of Change: Gender and Inclusion (CCSL Brief No. 14). Copenhagen: CGIAR Research Program on Climate Change, Agriculture and Food Security (CAAFS). [Accessed on September 5, 2020]

<https://cgspace.cgiar.org/bitstream/handle/10568/61900/Learning%20Brief%202014.pdf>

Resurrección, B.P., Bee, B.A., Dankelman, I., Park, C.M.Y, Halder, M., & McMullen, C.P. (2019). "Gender-transformative climate change adaptation: advancing social equity" Background paper to the 2019 report of the Global Commission on Adaptation. Rotterdam and Washington, DC. [Accessed on September 5, 2020]

<https://www.sei.org/wp-content/uploads/2019/11/gender-transformative-climate-change-adaptation.pdf>

Asian Development Bank. (2016). Mainstreaming gender into climate mitigation activities - Guidelines for policy makers and proposal developers. [Accessed on September 5, 2020]

<https://www.adb.org/sites/default/files/publication/217771/gender-climate-mitigation.pdf>

Dazé, A. & Dekens, J. (2018). Towards Gender-Responsive National Adaptation Plan (NAP) Processes: Progress and Recommendations for the Way Forward. International Institute for Sustainable Development. Winnipeg, Canada. [Accessed on September 5, 2020].

<http://www.napglobalnetwork.org/wp-content/uploads/2018/04/napgn-en-2018-towards-gender-responsive-nap-processes-synthesis-report.pdf>.

de Waal, M. (2006). Evaluating gender mainstreaming in development projects. *Development in Practice*, 16 (2): 209-214. [Accessed on September 5, 2020]
<https://academic.udayton.edu/RichardGhere/NGO%20Man/de%20Waal.pdf>

Johnson, N.L, Kovarik, C, Meinzen-dick, R, Njuki, J, & Quisumbing, A. (2016). Gender, Assets, and Agricultural Development: Lessons from Eight Projects. *World Development*. Vol. 83: 295-311. [Accessed on September 5, 2020]
<https://reader.elsevier.com/reader/sd/pii/S0305750X16000073?token=168EF5EB9B1B5775E01E3D3B93159BA35A3759041698AB6AE506B95367C78D0BABD60441606AF326218007A049645E92>

Which keywords can help guide new research for the relevant SDGs?

Gender-responsive technology, gender-sensitive technology, climate technology, technology support, SDGs, sustainable development, climate adaptation, climate mitigation, climate finance, Climate Technology Centre & Network (CTCN), Green Climate Fund (GCF)

Part 5: Additional perspectives

Gender gaps in the UN Global Compact/KPMG industry perspectives on SDGs

The table below contains information on gender targets extracted from The SDG Industry Matrix, conceived and led jointly by the United Nations Global Compact and KPMG International Cooperative ('KPMG').²⁴⁷ Their aim was to convert potential interests of industry in contributing to Sustainable Development Goals through industry activities, e.g. sparking new innovative approaches, prompting companies to replicate successful activities in new markets, catalysing new collaborations and increasing participation in existing collaborations.

They conclude that there are several trends offering compelling opportunities:

- **Demographics:** The population in developing regions is projected to increase from 5.9 billion in 2013 to 8.2 billion in 2050 whilst the population of developed regions will remain around 1.3 billion people
- **Income growth:** Between 2010 and 2020, the world's bottom 40% will nearly double their spending power from US\$3 trillion to US\$5.8 trillion
- **Technology:** Rapid innovation is catalysing improved market analysis, knowledge sharing, product and service design, renewable energy sources, distribution models and operational efficiencies. Technology is also lowering market entry costs for non-traditional actors and start-ups with innovative 'disruptive' business models
- **Collaborations:** Governments, businesses, international financial institutions, the United Nations, civil society and academia are developing new ways of working with each other in pursuit of compatible objectives.²⁴⁸

The areas covered in the Industry Matrix are financial services; food, beverages & consumer goods; climate extracts; healthcare & life sciences; industrial manufacturing; transportation; energy, natural resources, chemicals. It is clear from the presented ideas and examples of industry interventions that gender equality is not valued very much and is only narrowly recognised as an opportunity to influence SDGs implementation, which is surprising since gender equality, diversity and inclusion have been increasingly recognised in many industry sectors as critically important to company and market performance.

SDG1

Women's empowerment in the global financial system context

Support displaced and resettled communities to develop improved **alternative livelihoods**, and in conjunction with governments ensure they have access to basic services, particularly considering the needs of women, people with a disability, and other vulnerable groups.

247) UN Global Compact, SDG Industry Matrix,

https://sustainabledevelopment.un.org/content/documents/9786CRT046599%20SDG_Food_Bev_24Feb_WEB_FINAL.pdf

248) <https://www.unglobalcompact.org/library/3111>

SDG2	Collaborate with Governments and development finance institutions to increase financing for sustainable agriculture , including people that are often financially excluded including women, persons with disabilities, indigenous persons, and racial and ethnic minorities.
SDG4	<p>Increase collaboration across the industry and explore best practices for advancing financial literacy at scale both in schools and for men and women, including marginalized groups (such as persons with disabilities, indigenous persons, and racial and ethnic minorities). Explore collaboration with other stakeholders including ministries of education and civil society.</p> <p>Promote and invest in STEM education (i.e. Science, Technology, Engineering and Mathematics) for girls, boys, women and men to secure access to employees with skillsets which meet future business needs in countries of operation (e.g. engineers, technology experts and data analysts).</p> <p>Collaborate with other companies and educational institutions to provide vocational training in order to develop a diverse talent pipeline including women, men and vulnerable persons (such as persons with disabilities, indigenous persons, and racial and ethnic minorities).</p>
SDG5	<p>View the women's market as a distinct value proposition supported by the Board and Executive Management, informed by market research and delivered with a tailored brand strategy driving progress towards clear, gender disaggregated key performance indicators.</p> <p>Design new savings, credit and insurance products and distribution models which enable women in high-growth markets to establish and grow businesses in both urban and rural environments.</p> <p>Adapt credit processes and lending methods to expand lending to women-led SMEs, for example offering collateral free loans or accepting household goods or jewelry as collateral (when legislation or custom preclude women from owning land or property title).</p> <p>Expand insurance for maternal health, where applicable including costs incurred in accessing public health services.</p> <p>Increase the share of women on company Boards and in senior roles, and invest in policies and programs which support women in the workforce and encourage organizations in the value chain to do the same.</p> <p>Integrate the Women's Empowerment Principles into core business operations and value chain to ensure a comprehensive approach to achieving gender equality, and encourage peers to do likewise.</p> <p>Design safe passenger transport solutions and practices that reduce women's vulnerability to sexual violence and abuse whilst they are travelling.</p> <p>Engage in policy initiatives and partnership efforts that help to prevent and identify human trafficking and sexual exploitation which disproportionately affect women.</p> <p>Integrate the needs of women and girls into transportation and infrastructure policy making and decision-making, both at company level and also informing government level policies and investments.</p> <p>Develop evidence-based strategies to attract and retain a higher proportion of female workers in the sector, considering organizational culture, health and safety and other issues.</p> <p>Increase the share of women on company Boards and in senior roles and invest in policies and programs which support the development of women in the workforce and encourage organizations in the value chain to do the same.</p>

	Integrate the Women’s Empowerment Principles into core business operations and value chain to ensure a comprehensive approach to achieving gender equality and encourage peers to do likewise.
SDG8	Integrate diversity and inclusiveness into supply chain management practices to provide opportunities to women and minority-owned businesses. Implement hiring and training programs that focus on local employees including women, youth and marginalized persons (including indigenous peoples).

Focus on the Mining Industry

OVERVIEW

Mining is a global industry and is often located in remote, ecologically sensitive and less-developed areas that include many indigenous lands and territories. Opportunities for mining companies to positively contribute to SDGs are found across all of the goals²⁴⁹⁾ but individual companies need to do their own analysis to understand how their business can make an impact.²⁵⁰⁾

Specific actions and opportunities will depend on the local social, political and economic context; the mineral resource; the phase of mining activities (exploration, development, extraction or closure); and the input received from local communities and other stakeholders.²⁵¹⁾ Every site, community and context are unique, but every facet of the mining sector differently impacts and benefits women and men. These gender differences can be found at all levels, from production sites; in mining-affected communities; in local and national economies; upwards across mineral supply chains; and in all institutions involved - from government offices and company boardrooms to mine sites and households. This is true in artisanal and small-scale mining as well as in the formal large-scale mining sector as shown in Figure 19, below.²⁵²⁾

249) Christian Parra, Brandon Lewis, Saleem H. Ali, Mining, Materials, and the Sustainable Development Goals (SDGs). 2030 and Beyond, ISBN 9780367358501, Published October 15, 2020 by CRC Press

250) Mapping Mining to the Sustainable Development Goals: An Atlas
<https://www.undp.org/content/undp/en/home/librarypage/poverty-reduction/mapping-mining-to-the-sdgs--an-atlas.html>

251) Mapping Mining to the Sustainable Empowered lives. Resilient nations. Development Goals: An Atlas
https://www.undp.org/content/dam/undp/library/Sustainable%20Development/Extractives/Mapping_Mining_SDGs_An_Atlas_Executive_Summary_FINAL.pdf

252) Katrine Danielsen & Jennifer Hinton (2020) A social relations of gender analysis of artisanal and small-scale mining in Africa’s Great Lakes Region, Canadian Journal of African Studies / Revue canadienne des études africaines, 54:1, 17-36, DOI: 10.1080/00083968.2019.1676807, <https://www.kit.nl/project/gender-equality-and-womens-rights-in-mining/>

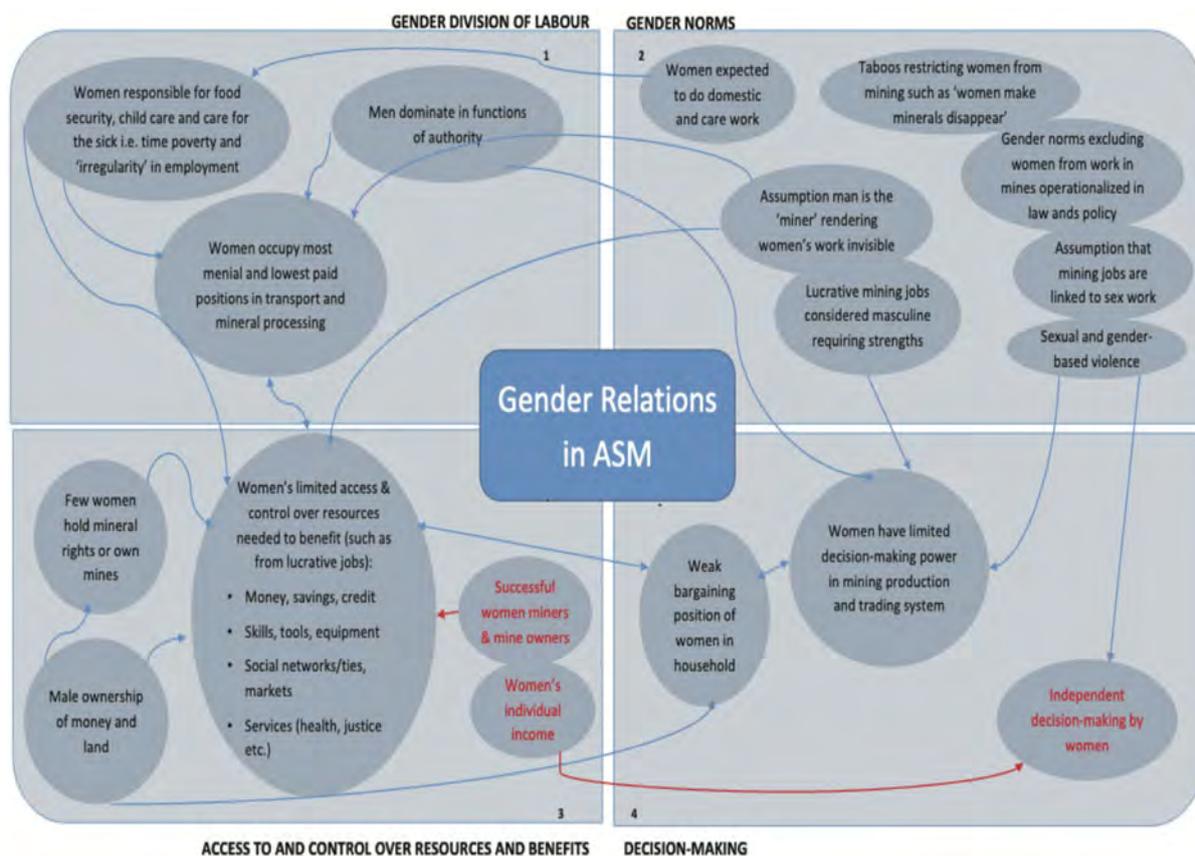


Figure 19. Gender and artisanal and small-scale mining reproduced with permission from Danielsen and Hinton

Danielsen and Hinton (2020)²⁵³ identify obstacles to gender equality in artisanal and small scale mining (ASM) and show their dynamics in Figure 19 along four interrelated dimensions of gender relations: division of labour; access to and control over resources and benefits; decision-making; and gender norms. Unequal gender relations in ASM are mainly legitimized by gender norms that produce and are reinforced by the varying abilities of women and men to make decisions and control resources. The diversity and instability of gender relations, and gender inequalities, can be and are being challenged by women miners.

Which actors and stakeholder to include in partnerships for SDGs implementation

- OECD Forum on Responsible Mineral Supply Chains
- Government Ministries
- NGOs and Civil Society organisations
- Research communities
- Industry

253) Katrine Danielsen & Jennifer Hinton (2020) A social relations of gender analysis of artisanal and small-scale mining in Africa's Great Lakes Region, *Canadian Journal of African Studies / Revue canadienne des études africaines*, 54:1, 17-36, DOI: 10.1080/00083968.2019.1676807

Which reports or research papers best capture the underlying gender issues

Encyclopedia of Gender and Mining²⁵⁴⁾

https://www.kit.nl/wp-content/uploads/2019/10/womens-rights-and-mining_10dos_oct_2019_english.pdf

<https://www.kit.nl/wp-content/uploads/2019/02/The-Gender-Dimensions-of-3Ts-in-the-GLR-1.pdf>

<https://www.kit.nl/wp-content/uploads/2019/02/Advancing-Gender-Equality-in-the-Scaling-Up-Minerals-Traceability-Project.pdf>

<https://www.kit.nl/publication/sexual-gender-based-violence-in-mining-in-africa/>

²⁵⁴⁾ <https://womenandmining.org/wp-content/uploads/2019/04/Encyclopedia-.pdf>

Part 6: Reading list recommended by the experts

1. Agarwaal B (2018) Gender equality, food security and the sustainable development goals. *Current Opinion in Environmental Sustainability* 34:26-32. Available at:
<https://www.sciencedirect.com/science/article/abs/pii/S1877343517302415>. Accessed 03 Dec 2020
2. Agnew, K, Francescon D, Schemm Y, et al (2020) *The Power of Data to Advance the SDGs*. Elsevier . Available at:
https://www.elsevier.com/___data/assets/pdf_file/0004/1058179/Elsevier-SDG-Report-2020.pdf . Accessed 03 Dec 2020
3. Ahmed S, and Fajber, E, (2009) Engendering adaptation to climate variability in Gujarat, India. *Gender and Development* 17(1). Available here:
<https://www.tandfonline.com/doi/abs/10.1080/13552070802696896>. Accessed 06 Dec 2020
4. Alam M, Cropper M, Herrera Dappe M, et al (2019) *Closing the gap: Gender, transport and employment in Mumbai*. University of Maryland Department of Economics. Available at:
<https://www.econ.umd.edu/publication/closing-gap-gender-transport-and-employment-mumbai>. Accessed 09 Dec 2020
5. Alam K, Rahman H (2018) Women in natural disasters: A case study from southern coastal region of Bangladesh. *International Journal of Disaster Risk Reduction* 8:68-82.
<https://www.sciencedirect.com/science/article/abs/pii/S2212420914000041> . Accessed 11 Dec 2020
6. Asian Development Bank (ADB) and UN Women (2018) *Gender equality and the Sustainable Development Goals in Asia and the Pacific: Baseline and pathways for transformative change by 2030*
<https://www.adb.org/publications/gender-equality-sdgs-asia-pacific>. Accessed 13 Dec 2020
7. Asian Development Bank (ADB) (2017) *From goals to action : Implementing the Sustainable Development Goals*. Seminar Background Note. Available at:
<https://www.adb.org/sites/default/files/publication/301696/goals- action-sdgs.pdf> . Accessed 11 Dec 2020
8. Asian Development Bank (ADB) (2016) *Mainstreaming gender into climate mitigation activities - Guidelines for policy makers and proposal developers*. Available at:
<https://www.adb.org/publications/mainstreaming-gender-climate-mitigation-activities>. Accessed 11 Dec 2020
9. Asian Development Bank (ADB) (2013) *Gender equality and food security: Women’s empowerment as a tool against hunger*. Available at:
<https://www.adb.org/sites/default/files/publication/30315/gender-equality-and-food-security.pdf>. Accessed 11 Dec 2020
10. Babinard J, Roberts P (2006) *Maternal and child mortality development goals: What can the transport sector do?*

The World Bank Group Transport Papers. Available at:

https://assets.publishing.service.gov.uk/media/57a08c3b40f0b652dd0011cc/C21-tp12_maternal_health.pdf.
Accessed 09 Dec 2020

11. Babinard J, Scott K (2011) What do existing household surveys tell us about gender and transportation in developing countries? Transportation Research Board - Women's Issues in Transportation Volume 2. Available at: <https://openknowledge.worldbank.org/handle/10986/16949> . Accessed 09 Dec 2020
12. Babugura A (2010, April 27) Gender and climate change: South Africa case study. Heinrich Böll Stiftung. Available at: <https://www.boell.de/en/navigation/climate-energy-South-Africa-9074.html> . Accessed 11 Dec 2020
13. Baggio G, Corsini A, Floreani A, et al (2013) Gender medicine: a task for the third millennium. *Clinical Chemistry and Laboratory Medicine* 51(4):713-27. Available here:
<https://pubmed.ncbi.nlm.nih.gov/23515103/>. Accessed 05 Dec 2020
14. Banerjee R, Sachdeva A (2015) Pathways to preventive health, evidence from India's Rural Road Program. SSRN. Available at:
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2636999 . Accessed 09 Dec 2020
15. Barneche DR, Robertson DR, White CR, et al (2018) Fish reproductive-energy output increases disproportionately with body size. *Science* 360:642-645. Available at:
<https://science.sciencemag.org/content/360/6389/642> . Accessed 11 Dec 2020
16. Beaman L, Duflo E, pande R, et al (2012) Female leadership raises aspirations and educational attainment for girls: A policy experiment in India. *Science* (335):582-586. Available at:
<https://science.sciencemag.org/content/335/6068/582>. Accessed 11 Dec 2020
17. Bennich T, Weitz N, Carlsen H (2020) Deciphering the scientific literature on SDG interactions: A review and reading guide. *Science of the Total Environment* 728:138-405. Available at:
<https://www.sciencedirect.com/science/article/pii/S0048969720319185> . Accessed 03 Dec 2020
18. Benestan L, Moore J-S, Sutherland BJJ, et al (2017) Sex matters in massive parallel sequencing: Evidence for biases in genetic parameter estimation and investigation of sex determination systems. *Molecular Ecology* 26(24):6767-6783. Available at:
<https://onlinelibrary.wiley.com/doi/abs/10.1111/mec.14217> . Accessed 11 Dec 2020
19. Benvenuto C, Coscia I, Chopelet J, et al (2017) Ecological and evolutionary consequences of alternative sex-change pathways in fish. *Scientific Reports* (7). Available at:
<https://pubmed.ncbi.nlm.nih.gov/28831108/> . Accessed 11 Dec 2020
20. Bloomberg New Energy Finance (BNEF) (2017) Women in clean energy, Middle East and North Africa Survey 2017. Available at:

<https://assets.bbhub.io/professional/sites/24/2017/05/2017-05-03-BNEF-CEBC-IRENA-MENA-Women-in-Clean-Energy-Final.pdf> . Accessed 10 Dec 2020

21. Bolte G, David M, Dębiak M, et al (2018) Integration von Geschlecht in die Forschung zu umweltbezogener Gesundheit. Ergebnisse des interdisziplinären Forschungsnetzwerks Geschlecht - Umwelt - Gesundheit (GeUmGe-NET). Bundesgesundheitsblatt-Gesundheitsforschung-Gesundheitsschutz 61:737-746. Available at: <https://link.springer.com/article/10.1007/s00103-018-2745-8> . Accessed 10 Dec 2020
22. Bolte G, Kraus U, Jacke K, et al (2019) New approaches for integrating sex/gender into environmental health research: the interdisciplinary research project INGER. Environmental Epidemiology 3:33. Available at: https://journals.lww.com/environepidem/Fulltext/2019/10001/New_approaches_for_integrating_sex_gender_into.100.aspx . Accessed 10 Dec 2020
23. Bonnet F, Vanek J, Chen M (2019) Women and men in the informal economy: A statistical brief. Women in Informal Employment: Globalizing and Organizing (WIEGO). Available at: https://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---travail/documents/publication/wcms_711798.pdf. Accessed 11 Dec 2020
24. Borker G (2018, January 15) Safety first: Perceived risk of street harassment and educational choices of women. Data2x. Available at: https://data2x.org/wp-content/uploads/2019/11/PerceivedRiskStreetHarassmentandEdChoicesofWomen_Borker.pdf. Accessed 09 Dec 2020
25. BRACED (2017, March 1) How to conduct an effective interview. Available at: <http://www.braced.org/resources/i/?id=23492c8d-f480-46ac-98ee-5c967eb8bac8> . Accessed 09 Dec 2020
26. BRIDE (June 2008) Gender and climate change: mapping the linkages - a scoping study on knowledge and gaps. Institute of Development Studies, University of Sussex. Available here: http://www.bridge.ids.ac.uk/sites/bridge.ids.ac.uk/files/reports/Climate_Change_DFID.pdf. Accessed 5 Dec 2020.
27. Buolamwini J, Gebru T (2018) Gender shades: intersectional accuracy disparities in commercial gender classification. Proceedings of Machine Learning Research 81:77-91. Available at: <http://proceedings.mlr.press/v81/buolamwini18a/buolamwini18a.pdf> . Accessed 08 Dec 2020
28. Burns B, Lee A (2015) Gender mainstreaming practices in the context of climate responses. Women's Environment & Development Organization (WEDO). Available at: <https://wedo.org/wp-content/uploads/2016/08/Gender-mainstreaming-practices-in-the-context-of-climate-responses.pdf> . Accessed 11 Dec 2020
29. Business Insider (2020, August 26) The gender wage gap varies wildly depending on the state. Available here: <https://www.businessinsider.com/gender-wage-pay-gap-charts-2017-3#the-gender-wage-gap-varies-widel>

y-depending-on-the-state-1 . Accessed 7 Dec 2020

30. Caribbean 2017 hurricane season: An evidence-based assessment of the early warning system. Available at: https://library.wmo.int/doc_num.php?explnum_id=5459 . Accessed 10 Dec 2020
31. Climate Technology Centre & Network (2015) CTCN operating manual for National Designated Entities (NDEs). Available at: https://www.ctc-n.org/sites/default/files/documents/NDE%20Manual%20Version%201.2_April%202015.pdf . Accessed 09 Dec 2020
32. Collste D, Pedercini M, Cornell SE (2017) Policy coherence to achieve the SDGs: using integrated simulation models to assess effective policies. *Sustain Sci* 12:921-931. Available at: https://www.researchgate.net/publication/318715666_Policy_coherence_to_achieve_the_SDGs_using_integrated_simulation_models_to_assess_effective_policies . Accessed 03 Dec 2020
33. Council on Foreign Relations (2017, June 16) Girls' STEM education can drive economic growth. Available at: <https://www.cfr.org/blog/girls-stem-education-can-drive-economic-growth> . Accessed 09 Dec 2020
34. Crenshaw K (1989) Demarginalizing the intersection of race and sex: A black feminist critique of antidiscrimination doctrine, feminist theory and antiracist politics. *University of Chicago Legal Forum* 1:139-167. Available here: <https://chicagounbound.uchicago.edu/cgi/viewcontent.cgi?article=1052&context=uclf>. Accessed 07 Dec 2020.
35. Criado-Perez C (2019) *Invisible women: Exposing data bias in a world designed for men*. Vintage Publishing
36. Cripps G, Flynn KJ, Lindeque PK (2016). Ocean acidification affects the phyto-zoo plankton trophic transfer efficiency. *PLoS One* 11(4). Available at: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0151739> . Accessed 11 Dec 2020
37. Cripps G, Lindeque P, Flynn KJ (2014) Have we been underestimating the effects of ocean acidification in zooplankton? *Global Change Biology* 20(11). Available at: <https://onlinelibrary.wiley.com/doi/full/10.1111/gcb.12582> . Accessed 11 Dec 2020
38. Danielsen K, Hinton J (2020, March 5) A social relations of gender analysis of artisanal and small-scale mining in Africa's Great Lakes Region. *Canadian Journal of African Studies / Revue Canadienne des études Africaines*, 54(2):1-20. Available at: <https://www.tandfonline.com/doi/abs/10.1080/00083968.2019.1676807?journalCode=rcas20> . Accessed 09 Dec 2020
39. Dantcheva A, Chen C, Ross A (2012) Can facial cosmetics affect the matching accuracy of face recognition systems? *Proceedings of 5th IEEE Fifth International Conference on Biometrics: Theory, Applications and Systems (BTAS)*. Available at:

https://www.cse.msu.edu/~rossarun/pubs/DantchevaChenRossFaceCosmetics_BTAS2012.pdf . Accessed 08 Dec 2020

40. Datta A, Tschantz MC, Datta, A (2015) Automated experiments on ad privacy settings. *Proceedings on Privacy Enhancing Technologies* 2015(1):92-112. Available at:
<https://www.andrew.cmu.edu/user/danupam/dtd-pets15.pdf> . Accessed 07 Dec 2020
41. Davies S, True J (eds) (2019) *The Oxford Handbook of Women, Peace and Security*. Oxford University Press. Available at:
<https://www.oxfordhandbooks.com/view/10.1093/oxfordhb/9780190638276.001.0001/oxfordhb-9780190638276> . Accessed 09 Dec 2020
42. Dawes JHP (2019) Are the Sustainable Development Goals self-consistent and mutually achievable? *Sustainable Development* 28(1):1-26. Available at:
<https://onlinelibrary.wiley.com/doi/full/10.1002/sd.1975> . Accessed 09 Dec 2020
43. Dazé A, Dekens J (2018). Towards gender-responsive NAP processes: Progress and recommendations for the way forward. International Institute for Sustainable Development. Available at:
<https://www.iisd.org/publications/towards-gender-responsive-nap-processes-progress-and-recommendations-way-forward>. Accessed 11 Dec 2020
44. Dębiak M, Groth K, Kolossa-Gehring M, et al (2019) Sex and gender approaches in environmental health research: two exemplary case studies of the German environment agency. *Interdisciplinary Science Reviews* 44(2):114-130. Available at:
<https://www.tandfonline.com/doi/abs/10.1080/03080188.2019.1603860>. Accessed 10 Dec 2020
45. Demetriades J, Esplen E (2009). The gender dimensions of poverty and climate change adaptation. *IDS Bulletin* 39(4) <https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1759-5436.2008.tb00473.x>. Accessed 13 Dec 2020
46. de Waal M (2006) Evaluating gender mainstreaming in development projects. *Development in Practice* 16(2):209-214. Available at:
<https://www.jstor.org/stable/4029881?seq=1>. Accessed 11 Dec 2020
47. Dimitrijevic M, Filip A, Platzer M (eds) (2015) *Femicide: A global issue that demands action - Taking action against gender-related killing of Women and Girls Vol 4*. Academic Council on the United Nations System (ACUNS) Vienna Liaison Office. Available at:
http://www.femicideinCanada.ca/sites/default/files/2017-12/ACUNS%20%282015%29%20FEMICIDE%2C%20GLOBAL%20ISSUE%20THAT%20DEMANDS%20ACTION_VOLUME%204.pdf. Accessed 09 Dec 2020
48. Doss C, Meinzen-Dick R, Quisumbing A, et al (2018) Women in agriculture: Four myths. *Global Food Security* 16:69-74. Available at:
<https://www.sciencedirect.com/science/article/pii/S2211912417300779>

-
49. Duflo E (2012) Women empowerment and economic development. *Journal of Economic Literature* 50(4):1051-1079. Available at <http://dx.doi.org/10.1257/jel.50.4.1051> . Accessed 03 Dec 2020.
 50. East African Centre of Excellence for Renewable Energy & Efficiency (EACREE) (2018) Situation analysis of gender and sustainable energy in the East African community. Available at: <https://www.eacreee.org/sites/default/files/documents/files/Situation%20Analysis%20of%20Gender%20and%20Sustainable%20Energy%20in%20the%20East%20African%20Community.pdf> . Accessed 10 Dec 2020
 51. Eastin J (2018) Climate change and gender equality in developing states. *World Development* 107: 289-305 <https://www.sciencedirect.com/science/article/abs/pii/S0305750X18300664>. Accessed 13 Dec 2020
 52. Ellis RP, Davison W, Queirós AM, et al (2017) Does sex really matter? Explaining intraspecies variation in ocean acidification responses. *Biology Letters* 13(2):2016-0761. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5326506/> . Accessed 04 Dec 2020
 53. Ellis RP, Spicer JI, Byrne JJ, et al (2014) ¹H NMR metabolomics reveals contrasting response by male and female mussels exposed to reduced seawater pH, increased temperature, and a pathogen. *Environmental Science & Technology*, 48(12):7044-7052. Available at: <https://pubs.acs.org/doi/10.1021/es501601w> . Accessed 11 Dec 2020
 54. Escobar M, Forni L, Ghosh E, et al (2017) Guidance materials for mainstreaming gender perspectives into model-based policy analysis. Guidance document prepared for the SEI Gender and Social Equity Programme. Stockholm Environment Institute, Stockholm. Available at: <https://www.sei.org/publications/guidance-materials-for-mainstreaming-gender-perspectives-into-model-based-policy-analysis/>. Accessed 05 Dec 2020
 55. European Commission (2020, November 25) Joint communication to the European Parliament and the Council - EU Gender Action Plan (GAP) III - An ambitious agenda for gender equality and women's empowerment in EU external action. Available at: https://ec.europa.eu/international-partnerships/system/files/join_2020_17_en_final.pdf . Accessed 04 Dec 2020
 56. Feiner, JR, Severinghaus JW, Bickler PE (2007) Dark skin decreases the accuracy of pulse oximeters at low oxygen saturation: The effects of oximeter probe type and gender. *Anesthesia & Analgesia* 105(6):18-23. Available here: https://www.researchgate.net/publication/5798914_Dark_Skin_Decreases_the_Accuracy_of_Pulse_Oximeters_at_Low_Oxygen_Saturation_The_Effects_of_Oximeter_Probe_Type_and_Gender . Accessed 07 Dec 2020
 57. Ferguson L, and Harman S (September 2015) Gender and infrastructure in the World Bank. *Development Policy Review* 33(5):653-671. Available at:

<https://ssrn.com/abstract=2639420>. Accessed 05 Dec 2020

58. Fernández Álvarez L (2020) Facial recognition: analysing gender and intersectionality in machine learning. In: Schiebinger L, Klinge I (eds) *Innovations 2: How Inclusive Analysis Contributes to Research and Innovation*. Available at:
https://ec.europa.eu/info/sites/info/files/research_and_innovation/strategy_on_research_and_innovation/documents/ki0320108enn_final.pdf . Accessed 08 Dec 2020
59. Fletcher A, Schonewille, R (2015) Overview of resources on gender-sensitive data related to water. *Gender and Water Series*. WWAP. Paris, UNESCO
http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/SC/pdf/Overview_of_resources_on_gender_sensitive_data_related_t_01.pdf. Accessed 13 Dec 2020
60. Food and Agriculture Organization of the United Nations (FAO) Tracking progress on food and agriculture - related SDG indicators 2020. Available at:
<http://www.fao.org/sdg-progress-report/en/> . Accessed 11 Dec 2020
61. Ganzleben C, Antignac J-P, Barouki R, et al (2017) Human biomonitoring as a tool to support chemicals regulation in the European Union. *International Journal of Hygiene and Environmental Health* 220 (2 Pt A): 94-97. Available at: <https://pubmed.ncbi.nlm.nih.gov/28284775/> . Accessed 10 Dec 2020
62. Gay-Antaki M, Liverman D (2018) Climate for women in climate science: Women scientists and the Intergovernmental Panel on Climate Change. *Proceedings of the National Academy of Sciences of the United States of America* 115(9):2060-2065. Available at:
<https://www.pnas.org/content/115/9/2060> . Accessed 10 Dec 2020
63. Gender & Chemicals. #Expert-blog series: How to create a gender-just healthy planet. Available at:
<http://gender-chemicals.org/category/blog-series-how-to-create-a-gender-just-healthy-planet> . Accessed 10 Dec 2020
64. Gender & Development - Sustainable Development Goals special issue (2016). Available at:
<https://www.tandfonline.com/toc/cgde20/24/1> . Accessed 11 Dec 2020
65. Gender Resource Facility (2016, August 2) The gender dimensions of tin, tantalum and tungsten mining in the Great Lakes region. Available at:
<https://www.kit.nl/wp-content/uploads/2019/02/The-Gender-Dimensions-of-3Ts-in-the-GLR-1.pdf>. Accessed 11 Dec 2020
66. Gender Resource Facility (2016, August 1) Advancing gender equality in the scaling up minerals traceability project. Available at:
<https://www.kit.nl/wp-content/uploads/2019/02/Advancing-Gender-Equality-in-the-Scaling-Up-Minerals-Traceability-Project.pdf>. Accessed 11 Dec 2020

-
67. Gender Summit (2015, April 28-29) Professor Peter Piot video address. Available at:
<https://gender-summit.com/gs5-speakers/944-piot> . Accessed 04 Dec 2020
 68. Gender Summit (2017) GS10 Tokyo recommendation: BRIDGE - Better Research and Innovation through
Diversification and Gender Equality. Available at:
<https://gender-summit.com/tokyo-recommendation-bridge>. Accessed 04 Dec 2020
 69. Gendered Innovations. Machine learning: Analyzing gender. Available at:
<http://genderedinnovations.stanford.edu/case-studies/machinelearning.html#tabs-2> . Accessed 08 Dec 2020
 70. Gendered Innovations. Gendering social robots: Analyzing gender. Available at:
<http://genderedinnovations.stanford.edu/case-studies/genderingsocialrobots.html#tabs-2> . Accessed 09 Dec
2020.
 71. Gendered Innovations. Sex and gender are different terms. Available at:
<http://genderedinnovations.stanford.edu/terms/distinct.html> . Accessed 10 Dec 2020
 72. Geraldine T (2009) No climate justice without gender justice: An overview of the issues. *Gender & Development*
17:5-18
<https://www.tandfonline.com/doi/abs/10.1080/13552070802696839>. Accessed 13 Dec 2020
 73. German Cooperation. Encyclopedia of Gender and Mining. Available at:
<https://womenandmining.org/wp-content/uploads/2019/04/Encyclopedia-.pdf> . Accessed 09 Dec 2020
 74. Global Environment Facility (November 2015) IFI Joint approach to GHG assessment in the transport sector.
Available here:
https://assembly.thegef.org/sites/default/files/file_attach/Joint-IFI-Transport-GHG-Accounting.pdf. Accessed
05 Dec 2020
 75. Global Health 50/50 (October 2020) The covid-19 sex-disaggregated data tracker - October update report.
Available at:
<https://globalhealth5050.org/wp-content/uploads/October-2020-The-COVID-19-Sex-Disaggregated-Data-Tracker-Update.pdf> . Accessed 04 Dec 2020
 76. Global Health 5050. Available at:
<https://globalhealth5050.org>. Accessed 05 Dec 2020
 77. Global Women's Network for the Energy Transition (GWNET) (March 2019) Gender in the transition to sustainable
energy for all: from evidence to inclusive policies. Available here:
<https://www.globalwomensnet.org/gender-in-the-transition-to-energy-for-all-from-evidence-to-inclusive-policies/> . Accessed 05 Dec 2020

-
78. Global Women's Network for the Energy Transition (GWNET) (April 2020) The role of appliances in achieving gender and equality and energy access for all. Available here:
<https://www.globalwomennet.org/the-role-of-appliances-in-achieving-gender-equality-and-energy-access-for-all/>. Accessed 05 Dec 2020
79. Global Women's Network for the Energy Transition (GWNET) (January 2020) Wind energy: A gender perspective. Available here:
<https://www.globalwomennet.org/wind-energy-gender-perspective/>. Accessed 05 Dec 2020
80. Global Women's Network for the Energy Transition (GWNET) (2020) Women for sustainable energy - Strategies to foster women's talent for transformational change. Available at:
<https://www.globalwomennet.org/wp-content/uploads/2020/02/Gwnet-study.pdf> . Accessed 10 Dec 2020
81. Goli I, Najafabadi MO, Lashgarara F (2020) Where are we standing and where should we be going? Gender and climate change adaptation behavior. *Journal of Agricultural and Environmental Ethics* 33: 187-218
<https://link.springer.com/article/10.1007/s10806-020-09822-3>. Accessed 13 Dec 2020
82. Gonzalez Pijuan I (2018) Gender inequality and energy poverty - A forgotten risk factor. *Engineering Without Borders*. Available at:
<https://esf-cat.org/wp-content/uploads/2018/02/ESFeres17-PobresaEnergeticaiDesigualtatdeGenere-ENG.pdf> . Accessed 10 Dec 2020
83. Government of the Republic of Moldova (2020) Updated nationally determined contribution of the Republic of Moldova. Available at:
https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Republic%20of%20Moldova%20First/MD_Updated_NDC_final_version_EN.pdf . Accessed 09 Dec 2020
84. Griggs DJ, Nilsson M, Stevance A, et al (2017) A guide to SDG interactions: From science to implementation. Paris, France: International Council for Science (ICSU). Available at:
<https://cgspace.cgiar.org/handle/10568/80993> . Accessed 03 Dec 2020.
85. GSMA (2018) Connected women - The mobile gender gap report. Available at:
https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2018/04/GSMA_The_Mobile_Gender_Gap_Report_2018_32pp_WEBv7.pdf . Accessed 09 Dec 2020
86. Habtezion S (2013) Overview of linkages between gender and climate change - Policy brief (Asia and the Pacific) United Nations Development Programme (UNDP)
<https://www.undp.org/content/dam/undp/library/gender/Gender%20and%20Environment/PB1-AP-Overview-Gender-and-climate-change.pdf>nited Nations Development Programme
<https://www.undp.org/content/dam/undp/library/gender/Gender%20and%20Environment/PB1-AP-Overview-Gender-and-climate-change.pdf>. Accessed 13 Dec 2020

-
87. Hardee K (2009) Population, gender and climate change. *British Medical Journal* 2009;339:b4703. Available at: <https://www.bmj.com/content/339/bmj.b4703.full>. Accessed 11 Dec 2020
 88. Hemmati M, Bach A (2017) Gender and chemicals - Questions, issues and possible entry points. MSP Institute. Available at: http://gender-chemicals.org/wp-content/uploads/2017/12/2017-12-04-Gender_and_Chemicals_IssuePaper_MSP_Institute.pdf . Accessed 09 Dec 2020
 89. Herbert R, Falk-Krzesinski HJ, Plume A (2020) Sustainability through a gender lenses: The extent to which research on UN Sustainable Development Goals (SDGs) includes sex and gender consideration. SSRN. Available at: <https://ssrn.com/abstract=3689205> . Accessed 03 Dec 2020
 90. High-Level Political Forum on Sustainable Development (2020, July 7) Launching the decade of action at a time of crisis: Keeping the focus on the SDGs while combating COVID-19. Available at: https://sustainabledevelopment.un.org/content/documents/26298HLPF_2020_impact_COVID19.pdf. Accessed 04 Dec 2020
 91. HBM4EU. Coordinating and advancing human biomonitoring in Europe to provide evidence for chemical policy making. Available at: <https://www.hbm4eu.eu/> . Accessed 10 Dec 2020
 92. International Council for Science (ISC). A guide to SDG interactions: From science to implementation. Available at: <https://council.science/wp-content/uploads/2017/05/SDGs-Guide-to-Interactions.pdf>. Accessed 04 Dec 2020
 93. International Finance Corporation (2018) Driving toward equality: Women, ride-hailing, and the sharing economy. Available at: https://www.ifc.org/wps/wcm/connect/62a2871b-271b-4256-b426-65b2012d00f7/00418+IFC+DTE+Report_Complete_Layout+Final2-pxp.pdf?MOD=AJPERES&CVID=m9ksr4q . Accessed 09 Dec 2020
 94. International Institute for Sustainable Development (IISD) (May 2020) Un Secretary-General Releases 2020 SDG Progress Report. Available at: <https://sdg.iisd.org/news/un-secretary-general-releases-2020-sdg-progress-report/>. Accessed 04 Dec 2020
 95. International Institute for Sustainable Development (IISD) (2018, April 2) UNEP, IUCN Propose 18 Gender-Environment Indicators. Available : <https://sdg.iisd.org/news/unep-iucn-propose-18-gender-environment-indicators/#:~:text=The%20proposed%20gender%2Denvironment%20indicators,decision%20making%20at%20all%20levels>. Accessed 13 Dec 2020
 96. International Network on Gender & Sustainable Energy (ENERGIA) (2020) The role of appliances in achieving gender equality and energy access for all. Available at: https://storage.googleapis.com/e4a-website-assets/Role-of-Appliances_Policy-Brief_FINAL.pdf. Accessed 10 Dec 2020

-
97. International Network on Gender & Sustainable Energy (ENERGIA) (2019) Gender in the transition to energy for all: From evidence to inclusive policies. Available at:
https://www.globalwomensnet.org/wp-content/uploads/2019/03/Gender-in-the-transition-to-sustainable-energy-for-all_From-evidence-to-inclusive-policies_FINAL.pdf . Accessed 10 Dec 2020
 98. International Renewable Energy Agency (IRENA) (2019) Renewable energy: A gender perspective. Available here:
https://irena.org/-/media/Files/IRENA/Agency/Publication/2019/Jan/IRENA_Gender_perspective_2019.pdf. Accessed 05 Dec 2020
 99. International Renewable Energy Agency (IRENA) (2020) Renewable energy and jobs - annual review 2020. Available at:
<https://www.irena.org/publications/2020/Sep/Renewable-Energy-and-Jobs-Annual-Review-2020> . Accessed 10 Dec 2020
 100. International Renewable Energy Agency (IRENA) (2020) Global renewables outlook: Energy transformation 2050. Available at:
<https://www.irena.org/publications/2020/Apr/Global-Renewables-Outlook-2020> . Accessed 10 Dec 2020
 101. International Renewable Energy Agency (IRENA) (2020) Post-COVID Recovery: An agenda for resilience, development and equality. Available at:
<https://www.irena.org/publications/2020/Jun/Post-COVID-Recovery> . Accessed 10 Dec 2020
 102. International Renewable Energy Agency (IRENA) (2020) Wind energy: A gender perspective. Available at:
<https://www.irena.org/publications/2020/Jan/Wind-energy-A-gender-perspective> . Accessed 10 Dec 2020
 103. International Renewable Energy Agency (IRENA) (2019) Renewable energy: A gender perspective. Available at:
<https://www.irena.org/publications/2019/Jan/Renewable-Energy-A-Gender-Perspective> . Accessed 10 Dec 2020
 104. International Renewable Energy Agency (IRENA) (2018, April 22) Indonesia's 'Superheroines' Empowered with Renewables. Available at:
<https://irena.org/newsroom/articles/2018/Apr/Indonesias-Superheroines-Empowered-with-Renewables>. Accessed 10 Dec 2020
 105. International Renewable Energy Agency (IRENA) (2016) Renewable energy benefits: Decentralised solutions in the agri-food chain. Available at:
<https://www.irena.org/publications/2016/Sep/Renewable-Energy-Benefits-Decentralised-solutions-in-agri-food-chain> . Accessed 10 Dec 2020
 106. International Union for Conservation of Nature (IUCN) (January 2020) Gender and the environment: What are the barriers to gender equality in sustainable ecosystem management? Available at:

-
- <https://www.iucn.org/news/gender/202001/gender-and-environment-what-are-barriers-gender-equality-sustainable-ecosystem-management> . Accessed 07 Dec 2020
107. Jaramillo F, Desormeaux A, Hedlund J, et al (2019) Priorities and interactions of Sustainable Development Goals (SDGs) with focus on wetlands. *Water* 11. Available at:
<https://www.mdpi.com/2073-4441/11/3/619> . Accessed 04 Dec 2020
108. Jarne P, Auld JR (2007) Animals mix it up too: The distribution of self-fertilization among hermaphroditic animals. *Evolution* 60(9). Available at:
<https://onlinelibrary.wiley.com/doi/10.1111/j.0014-3820.2006.tb00525.x> . Accessed 11 Dec 2020
109. Jensen MP, Allen CD, Eguchi T, et al (2018) Environmental warming and feminization of one of the largest sea turtle populations in the world. *Current Biology* 28(1):154-159. Available at:
<https://www.sciencedirect.com/science/article/pii/S0960982217315397> . Accessed 11 Dec 2020
110. Jimenez-Aceitono A, Peterson GB, Norström AV et al (2020) Local lenses for SDG implementation: lessons from bottom up approaches in Africa. *Sustainability Science* 15:729-743. Available at:
<https://link.springer.com/article/10.1007/s11625-019-00746-0#citeas> . Accessed 03 Dec 2020
111. Johnson, OW, Han JYC, Knight AL, et al (2020) Intersectionality and energy transitions: A review of gender, social equity and low-carbon energy. *Energy Research & Social Science* 70. Available here:
<https://www.sei.org/publications/intersectionality-and-energy-transitions-gender-social-equity-and-low-carbon-energy/>. Accessed 05 Dec 2020
112. Johnson NL, Kovarik C, Meinzen-Dick, R, et al (2016) Gender, assets, and agricultural development: Lessons from eight projects. *World Development* 83:295-311. Available at:
<https://www.sciencedirect.com/science/article/pii/S0305750X16000073>. Accessed 11 Dec 2020
113. Jost CC, Kristjanson P, Ferdous N (2015). *Lessons in theory of change: Gender and inclusion*. CGIAR
114. Jütting M (2020) Exploring mission-oriented innovation ecosystems for sustainability: Towards a literature-based typology. *Sustainability* 12(16). Available at:
<https://www.mdpi.com/2071-1050/12/16/6677>. Accessed 05 Dec 2020
115. Kaijser A, Kronsell A (2013) Climate change through the lenses of intersectionality. *Environmental Politics* 23(3): 417-33. Available at:
<https://www.tandfonline.com/doi/full/10.1080/09644016.2013.835203> . Accessed 10 Dec 2020
116. Kambon A (2017) Chapter III: Review of gender-specific issues in early warning systems. In: Chapter III: Review of gender specific issues in EWS. In: World Meteorological Organization (WMO).
117. Keyes O (2018) *The misgendering machines: trans/HCI implications of automatic gender recognition*.

-
- Proceedings of the ACM on human-computer interaction 2:1-22. Available at:
<https://dl.acm.org/doi/10.1145/3274357> . Accessed 08 Dec 2020
118. Kimmel J (2006) Child care, female employment, and economic growth. *Community Development* 37(2):71-85. Available at:
<https://www.tandfonline.com/doi/abs/10.1080/15575330609490208> . Accessed 09 Dec 2020
119. Kindsvater HK, Reynolds JD, Sadovy Y, et al (2017) Selectivity matters: Rules of thumb for management of plate-sized, sex-changing fish in the live reef food fish trade. *Fish and Fisheries*:1-16. Available at:
https://www.researchgate.net/publication/313964444_Selectivity_matters_Rules_of_thumb_for_management_of_plate-sized_sex-changing_fish_in_the_live_reef_food_fish_trade . Accessed 11 Dec 2020
120. Kit Royal Tropical Institute. Gender equality and women's rights in mining. Available at:
<https://www.kit.nl/project/gender-equality-and-womens-rights-in-mining/> . Accessed 09 Dec 2020
121. KIT Royal Tropical Institute (2020) Sexual & gender-based violence in mining in Africa. Available at:
<https://www.kit.nl/publication/sexual-gender-based-violence-in-mining-in-africa/>. Accessed 11 Dec 2020
122. Kolossa-Gehring M, Becker K, Conrad A, et al (2012) Environmental surveys, specimen bank and health related environmental monitoring in Germany. *International Journal of Hygiene and Environmental Health* 215 (2): 120-126. Available at:
<https://www.sciencedirect.com/science/article/abs/pii/S1438463911002161> . Accessed 10 Dec 2020
123. Krause J, Krause W, Branfors P (2018) Women's participation in peace negotiations and the durability of peace. *International Interactions* 44(6):985-1016. Available at:
<https://www.tandfonline.com/doi/full/10.1080/03050629.2018.1492386> . Accessed 09 Dec 2020
124. Learned-Miller E, Ordóñez V, Morgenstern J, et al (2020, May 29). Facial Recognition Technologies in the Wild. Algorithmic Justice League. Available at:
https://global-uploads.webflow.com/5e027ca188c99e3515b404b7/5ed1145952bc185203f3d009_FRTsFederalOfficeMay2020.pdf . Accessed 8 Dec 2020
125. Le Blanc D, Freire C, Vierros M (February 2017) Mapping the linkages between oceans and other Sustainable Development Goals: A preliminary exploration. Department of Economic & Social Affairs Working Paper No. 149. Available at:
https://sustainabledevelopment.un.org/content/documents/12468DESA_WP149_E.pdf. Accessed 07 Dec 2020
126. Le Bris A, Mills KE, Wahle RA, et al (2018) Climate vulnerability and resilience in the most valuable North American fishery. *Proceedings of the National Academy of Sciences* 115(8):1831-1836. Available at:
<https://www.pnas.org/content/115/8/1831> . Accessed 11 Dec 2020

-
127. Leisher C, Temsah G, Booker F, et al (2016) Does the gender composition of forest and fishery management groups affect resource governance and conservation outcomes? A systematic map. *Environmental Evidence* 5(6):1-10 (2016). Available at:
<https://environmentalevidencejournal.biomedcentral.com/articles/10.1186/s13750-016-0057-8> . Accessed 07 Dec 2020
128. Levy H (2004) Rural roads and poverty alleviation in Morocco. World Bank. Available at:
<http://documents1.worldbank.org/curated/en/420301468756995092/pdf/308170MOR0Rural0Roads01see0also0307591.pdf> . Accessed 09 Dec 2020
129. Lungu K, Kafosa VM, Hussein J, et al (2001) Are bicycles ambulances and community transport plans effective? *Malawi Medical Journal* 13(2). Available at:
https://www.researchgate.net/publication/279644237_Are_bicycles_ambulances_and_community_transport_plans_effective . Accessed 09 Dec 2020
130. MacGregor S (2009) A stranger silence still: The need for feminist social research on climate change. *The Sociological Review* 57:124-140
<https://journals.sagepub.com/doi/abs/10.1111/j.1467-954X.2010.01889.x>. Accessed 13 Dec 2020
131. Majid H (2013) Increased rural connectivity and its effects on health outcomes. *The Lahore Journal of Economics* 18:271-282. Available at:
<http://lahoreschoolofeconomics.edu.pk/EconomicsJournal/Journals/Volume%2018/Issue%20SP/12%20Hadia%20Majid.pdf> . Accessed 09 Dec 2020
132. Majid H, Malik A, Vyborny K (2018) Infrastructure investments and public transport use: Evidence from Lahore, Pakistan. International Growth Centre. Available at:
<https://www.theigc.org/wp-content/uploads/2018/06/Majid-et-al-2018-Working-paper.pdf> . Accessed 09 Dec 2020
133. Martinez D, Mitnik OA, Salgado E, et al (2019) Connecting to economic opportunity: The role of public transport in promoting women's employment in Lima. *Journal of Economics, Race, and Policy* 2:1-23. Available at:
<https://link.springer.com/article/10.1007/s41996-019-00039-9> . Accessed 09 Dec 2020
134. Matas A, Raymond J, Roig JL (2010) Job accessibility and female employment probability: The cases of Barcelona and Madrid. *Urban Studies* 47(4):769-787. Available at:
https://www.researchgate.net/publication/227575413_Job_Accessibility_and_Female_Employment_Probability_The_Cases_of_Barcelona_and_Madrid . Accessed 09 Dec 2020
135. McCollum, DL, Busch S, Pacahauri S, et al (2018) Connecting the sustainable development goals by their energy inter-linkages. *Environmental Research Letters* 13(3). Available here:
<https://iopscience.iop.org/article/10.1088/1748-9326/aaafe3/pdf> . Accessed 05 Dec 2020

-
136. McCright AM (2010) The effects of gender on climate change knowledge and concern in the American public. *Population and Environment* 32:66-87
<https://link.springer.com/article/10.1007/s11111-010-0113-1>. Accessed 13 Dec 2020
 137. McKinsey (15 July 2020) COVID-19 and gender equality: countering the regressive effects. Available at: [mckinsey.com/featured-insights/future-of-work/covid-19-and-gender-equality-countering-the-regressive-effects](https://www.mckinsey.com/featured-insights/future-of-work/covid-19-and-gender-equality-countering-the-regressive-effects) . Accessed 05 Dec
 138. Meinzen-Dick RS, Rubin D, Elias M, et al (2019) Women's empowerment in agriculture: Lessons from qualitative research. IFPRI Discussion Paper. Available at: <https://www.ifpri.org/publication/womens-empowerment-agriculture-lessons-qualitative-research>. Accessed 11 Dec 2020
 139. Mittal S (2016) Role of mobile phone-enabled climate information services in gender-inclusive agriculture. *Gender, Technology and Development* 20(2):200-217. Available at: <https://journals.sagepub.com/doi/full/10.1177/0971852416639772> . Accessed 11 Dec 2020
 140. Morris E, Greene J, Healey VM (2019) Blueprint guide for creating gender-sensitive energy policies - Developed for The Clean Energy Solutions Center. Available at: <https://www.nrel.gov/docs/fy19osti/73927.pdf> . Accessed 10 Dec 2020
 141. MSP Institute (2019) Gender & SAICM Beyond 2020 - How to create a gender-just healthy planet. Available here: https://saicmknowledge.org/sites/default/files/publications/MSPInstitute_Broschu%CC%88re_Howtcreate.pdf . Accessed 05 Dec 2020
 142. Muralidharan K, Prakash N (2017) Cycling to school: Increasing secondary school enrollment for girls in India. *American Economic Journal: Applied Economics*, 9(3):321-350. Available at: <https://www.aeaweb.org/articles?id=10.1257/app.20160004> . Accessed 09 Dec 2020
 143. National Association of Regulatory Utility Commissioners (NARUC). The Practical Guide to Women in Energy Regulation. Available at: <https://www.naruc.org/international/news/the-practical-guide-to-women-in-energy-regulation/> . Accessed 10 Dec 2020
 144. Nilsson M, Griggs D, Visbeck M (June 2016) Map the interactions between sustainable development goals. *Nature* 534:320-322. Available here: <https://www.nature.com/news/policy-map-the-interactions-between-sustainable-development-goals-1.20075>. Accessed 05 Dec 2020
 145. Nilsson M., et al., (2017) A guide to SDGs interactions: from science to implementation, International Council of Science (ICS), Paris

-
146. Nakamura S, Nuru M, Bundervoet T (2019) Rural roads, poverty, and resilience: Evidence from Ethiopia. World Bank Group Poverty & Equity. Available at:
<http://documents1.worldbank.org/curated/en/889411554201199190/pdf/Rural-Roads-Poverty-and-Resilience-Evidence-from-Ethiopia.pdf> . Accessed 09 Dec 2020
 147. Omari K (201, April 27) Gender and climate change: Botswana case study. Heinrich Böll Stiftung. Available at:
<https://www.boell.de/en/navigation/climate-energy-Botswana-9075.html> . Accessed 11 Dec 2020
 148. Ondimu KN (2001) Determinants of perinatal health problems in Kisumu district, Kenya. International Journal of Health Care Quality Assurance 14(5):200-211. Available at:
https://www.researchgate.net/publication/241703256_Determinants_of_perinatal_health_problems_in_Kisumu_district_Kenya . Accessed 09 Dec 2020
 149. Ospina-Alvarez, N. & Piferrer, F. (2008) Temperature-dependent sex determination in fish revisited: prevalence, a single sex ratio response pattern, and possible effects of climate change. PLoS ONE 3(7). Available at:
<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0002837> . Accessed 11 Dec 2020
 150. Organisation for Economic Co-operation and Development (OECD) (2008) Gender and sustainable development: Maximising the economic, social and environmental role of women. Available at:
<https://www.oecd.org/social/40881538.pdf>. Accessed 11 Dec 2020
 151. Organisation for Economic Co-operation and Development (OECD) (2020, September 23) The Social Institutions and Gender Index (SIGI) 2019 - A revised framework for better advocacy. Available at:
<https://www.oecd.org/publications/the-social-institutions-and-gender-index-sigi-2019-022d5e7b-en.htm> . Accessed 04 Dec 2020
 152. Organisation for Economic Co-operation and Development (OECD) (2020) Applying a gender lenses on the SDGs: How are women & girls doing? Available at:
<http://www.oecd.org/sdd/applying-a-gender-lenses-on-SDGs-OECD.pdf>. Accessed 11 Dec 2020
 153. Organisation for Economic Co-operation and Development (OECD) (2008) Gender and sustainable development: Maximising the economic, social and environmental role of women. OECD Publishing, Paris
<https://www.oecd.org/social/40881538.pdf>. Accessed 13 Dec 2020
 154. Parker LM, O'Connor WA, Byrne M, et al (2018) Ocean acidification but not warming alters sex determination in the Sydney rock oyster, *Saccostrea glomerata*. Proceedings of the Royal Society B: Biological Sciences. Available at:
<https://royalsocietypublishing.org/doi/full/10.1098/rspb.2017.2869> . Accessed 11 Dec 2020
 155. Parra C, Lewis B, Ali SH (eds) (2020) Mining, Materials, and the Sustainable Development Goals (SDGs) - 2030 and Beyond. CRC Press

-
156. Peace Women - Women's International League for Peace and Freedom (2020) National level implementation. Available at :
<https://www.peacewomen.org/member-states> . Accessed 09 Dec 2020
157. Pearse R (2016) Gender and climate change. WIREs Climate Change 8(2). Available at:
<https://onlinelibrary.wiley.com/doi/abs/10.1002/wcc.451> . Accessed 10 Dec 2020
158. Pedercini M, Arquitt S, Collste D, et al, (2019) Harvesting synergy from sustainable development goal interactions. PNAS 116(46) Available at:
<https://www.pnas.org/content/116/46/23021> . Accessed 03 Dec 2020
159. Perch L (2011) Mitigation of what and by what? Adaptation by whom and for whom? Dilemmas in delivering for the poor and vulnerable in international climate policy (2011) International Policy Centre for Inclusive Growth (IPC-IG) Working Paper number 79
https://www.researchgate.net/publication/254424579_Mitigation_of_What_and_by_What_Adaptation_by_Whom_and_for_Whom_Dilemmas_in_Delivering_for_the_Poor_and_the_Vulnerable_in_International_Climate_Policy. Accessed 13 Dec 2020
160. Pérez-Escamilla R (July 2017) Food security and the 2015-2030 Sustainable Development Goals: From human to planetary health: Perspectives and opinions, current developments in nutrition. Current Developments in Nutrition 1(7). Available here:
<https://academic.oup.com/cdn/article/1/7/e000513/4259862> . Accessed 07 Dec 2020
161. Pham-Truffert M, Rueff H, Messerli P (2019, August 29) Knowledge for Sustainable Development: Interactive repository of SDG interactions. CDEdata blog. Available at:
<https://datablog.cde.unibe.ch/index.php/2019/08/29/sdg-interactions/> . Accessed 09 Dec 2020
162. Pham-Truffert M, Metz F, Fischer M, et al (2020, June 4) Interactions among Sustainable Development Goals: Knowledge for identifying multipliers and virtuous cycles. Sustainable Development 28(5). Available at:
<https://onlinelibrary.wiley.com/doi/abs/10.1002/sd.2073?af=R> . Accessed 09 Dec 2020
163. Pollitzer E (Fall 2018/Winter 2019) Creating a better future. Journal of International Affairs 72:75-90. Available here: <https://www.jstor.org/stable/e26588334> . Accessed 05 Dec 2020
164. Popejoy AB, Fullerton SM (2016) Genomics is failing on diversity. Nature 538 (7624):161-164. Available here:
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5089703/> . Accessed 07 Dec 2020
165. Portia and Wiset (2016) The role of gender-based innovations for the UN Sustainable Development Goals - Towards 2030: Better science and technology for all. Available at:
https://gender-summit.com/images/GS6Docs/SDG_Report_FINAL.Jan13.pdf . Accessed 04 Dec 2020
166. Pueyo A, Maestre M (2020) Gender and energy: Opportunities for all. IDS Bulletin 51(1). Available at:

-
- <https://www.ids.ac.uk/publications/gender-and-energy-opportunities-for-all/> . Accessed 10 Dec 2020
167. Pueyo A, Maestre M (2019) Linking energy access, gender and poverty: A review of the literature on productive uses of energy. *Energy Research & Social Science* 53:170-181. Available at:
<https://www.sciencedirect.com/science/article/pii/S2214629618306145> . Accessed 10 Dec 2020
 168. Ramsar Convention on Wetlands (2018) Scaling up wetland conservation, wise use and restoration to achieve the Sustainable Development Goals. Available at:
https://www.ramsar.org/sites/default/files/documents/library/wetlands_sdgs_e.pdf . Accessed 04 Dec 2020
 169. Ramsar Convention on Wetlands (July 2020) Call for case studies. Available at:
<https://www.ramsar.org/news/call-for-case-studies> . Accessed 04 Dec 2020
 170. Ramsar (21-29 October 2018) Wetlands for a sustainable urban future - Resolution XIII.18 gender and wetlands. Available at:
https://www.ramsar.org/sites/default/files/documents/library/xiii.18_gender_e.pdf. Accessed 04 Dec 2020
 171. Research Program on Climate Change, Agriculture and Food Security - CCSL Learning Brief No. 14. Available at:
https://www.pacificclimatechange.net/sites/default/files/documents/CGIAR_Theory%20of%20change_GenderInclusion.pdf . Accessed 11 Dec 2020
 172. Resurrección BP, Bee BA, Dankelman I, et al (2019) Gender-transformative climate change adaptation: Advancing social equity. Background paper to the 2019 report of the Global Commission on Adaptation. Rotterdam and Washington. Available at:
<https://www.sei.org/publications/gender-transformative-climate-change-adaptation-advancing-social-equity/> . Accessed 11 Dec 2020
 173. Richardson SS (2013) *Sex itself: The search for male and female in the human genome*. University of Chicago Press.
 174. Rosenberg M, Armanios DE, Aklin M, et al (2020) Evidence of gender inequality in energy use from a mixed-methods study in India. *Nature Sustainability* 3:110-118. Available at:
<https://www.nature.com/articles/s41893-019-0447-3> . Accessed 04 Dec 2020
 175. Social Institutions and Gender Index. Available at:
<https://www.genderindex.org/> . Accessed 04 Dec 2020
 176. Sanches de Madariaga I, Neumann M (eds) (2020) *Engendering cities: designing sustainable urban spaces for all*. Routledge
 177. Sasaki M, Hedberg S, Richardson K, et al (2019). Complex interactions between local adaptation, phenotypic plasticity and sex affect vulnerability to warming in a widespread marine copepod. *Royal Society Open Science*.

-
- Available at:
<https://royalsocietypublishing.org/doi/10.1098/rsos.182115> . Accessed 11 Dec 2020
178. Sauer A, Arning J, Conrad A, et al (2019, February 19) Toxic gender? The role of sex and gender in chemicals management. *Gender & Chemicals*. Available at:
<http://gender-chemicals.org/toxic-gender-the-role-of-sex-and-gender-in-chemicals-management>. Accessed 10 Dec 2020
179. Scarselli A, Corfiati M, Di Marzio D, et al (2018) Gender differences in occupational exposure to carcinogens among Italian workers. *BMC Public Health* 18:413-413. Available here:
<https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-018-5332-x>. Accessed 05 Dec 2020
180. Schalatek, L (2009) Gender and climate finance: Double mainstreaming for sustainable development. Heinrich Böll Stiftung - The Green Political Foundation. Available at:
https://cz.boell.org/sites/default/files/gender_and_climate_finance.pdf. Accessed 11 Dec 2020
181. Schiebinger L, Klinge I (eds) *Gendered Innovations 2: How Inclusive Analysis Contributes to Research and Innovation*. Available at:
https://ec.europa.eu/info/sites/info/files/research_and_innovation/strategy_on_research_and_innovation/documents/ki0320108enn_final.pdf . Accessed 11 Dec 2020
182. SLOCAT Partnership (2019) Sustainable transport: A critical driver to achieve the Sustainable Development Goals - An analysis of 2016 - 2019 voluntary national reviews. Available at:
www.slocat.net/vnr. Accessed 05 Dec
183. Smyth I (2009) Gender in climate change and disaster risk reduction. *Development in Practice* 19(6):799-802,
<https://www.jstor.org/stable/27752121?seq=1>. Accessed 13 Dec 2020
184. Squazzoni F, Bravo G, Grimaldo F, et al (October 2020) No Tickets for Women in the COVID-19 Race? A Study on Manuscript Submissions and Reviews in 2347 Elsevier Journals during the Pandemic . Available at SSRN:
<https://ssrn.com/abstract=3712813>. Accessed 05 Dec 2020
185. Stanford University. *Gendered Innovations in Science, Health & Medicine, Engineering, and Environment*. Available at:
<http://genderedinnovations.stanford.edu/> . Accessed 04 Dec 2020
186. Stekelenburg J, Kyanamina S, Mukelabai M, et al (2004) Waiting too long: low use of maternal health services in Kalabo, Zambia. *Tropical Medicine and International Health* 9(3):390-398. Available at:
<https://pubmed.ncbi.nlm.nih.gov/14996369/> . Accessed 09 Dec 2020
187. Stockholm Environment Institute. SEI initiative on gender equality, social equity and poverty. Available at:
<https://www.sei.org/projects-and-tools/projects/sei-initiative-on-gender-equality-social-equity-and-povert>

y/ . Accessed 09 Dec 2020

188. Stockholm Environment Institute (2018) Integrating gender and social equality into sustainable development research. Available at:
<https://www.sei.org/wp-content/uploads/2018/11/190118a-gill-segnerstam-gender-guidance-1808h-photo-credit-change.pdf> . Accessed 09 Dec 2020
189. Strategic Approach to International Chemicals Management (SAICM) Secretariat (September 2018), Gender and the sound management of chemicals and waste - Policy brief. Available here:
http://www.saicm.org/Portals/12/Documents/SDGs/SAICM_Gender_Policy_Brief.pdf . Accessed 05 Dec 2020
190. Strategic Approach to International Chemicals Management (SAICM) (Dec 2017) Gender and the sound management of chemicals and waste, Second meeting of the intersessional process considering the Strategic Approach and the sound management of chemicals and waste beyond 2020. Available here:
http://www.saicm.org/Portals/12/documents/meetings/IP2/IP_2_6_gender_document.pdf. Date Accessed 05 Dec 2020
191. Surfshark. The Facial Recognition World Map. Available at:
<https://surfshark.com/facial-recognition-map> . Accessed 08 Dec 2020
192. Sustainable Development Solutions Network (SDSN) (2017, May 11) Webinar: Practical approaches to mapping university contributions to the Sustainable Development Goals (SDGs). Available at:
<https://ap-unsdsn.org/webinar-mapping-university-contributions-to-the-sdgs/> . Accessed 04 Dec 2020
193. Swedish Secretariat for Gender Research (2016) Guidelines for gender mainstreaming academia. Available at:
<https://www.jamstallhdhetsmyndigheten.se/wp-content/uploads/2017/12/Guidelines-for-Gender-Mainstreaming-in-Academia.pdf> . Accessed 04 Dec 2020
194. Swedish Gender Equality Agency. Government agencies in the GMCA programme. Available at:
<https://www.jamstallhdhetsmyndigheten.se/en/gender-mainstreaming/government-agencies-higher-education-institutions/government-agencies-in-the-gmga-programme-2> . Accessed 04 Dec 2020
195. Tall A, Kristjanson P, Chaudhury M, et al (2014) Who gets the information? Gender, power and equity considerations in the design of climate services for farmers. CCAFS Working Paper No. 89. Copenhagen, Denmark: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Available at:
<https://ccafs.cgiar.org/resources/publications/who-gets-information-gender-power-and-equity-considerations-design> . Accessed 10 Dec 2020
196. Tannenbaum C, Ellis RP, Eyssel F, et al (2019) Sex and gender analysis improves science and engineering. *Nature* 575:137-146. Available at:
<https://www.nature.com/articles/s41586-019-1657-6> . Accessed 10 Dec 2020

-
197. The Inter-Organization Programme for the Sound Management of Chemicals (IOMC) (February 2018) Chemicals and waste management: Essential to achieving the Sustainable Development Goals (SDGs). Available here: https://www.who.int/iomc/ChemicalsandSDGs_interactive_Feb2018_new.pdf?ua=1. Accessed 05 Dec 2020
 198. The Republic of Suriname (2020) Nationally determined contribution. Available at: <https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Suriname%20Second/Suriname%20Second%20NDC.pdf> . Accessed 09 Dec 2020
 199. The Republic of the Marshall Islands (2018). Nationally determined contribution. Available at: <https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Marshall%20Islands%20First/20181122%20Marshall%20Islands%20NDC%20to%20UNFCCC%2022%20November%202018%20FINAL.pdf> . Accessed 09 Dec 2020
 200. Tripathi, R (2018) Community-based approaches to flood management in Thailand and Lao People's Democratic Republic. World Meteorological Organization Bulletin 67(1). Available at: <https://public.wmo.int/en/resources/bulletin/community-based-approaches-flood-management-thailand-and-lao-peoples-democratic> . Accessed 13 Dec 2020
 201. U4 Anti-corruption Resource Centre (2019) Promoting a gender-sensitive approach to addressing corruption in the forestry sector. U4 Issue 2019(14). Available here: <https://www.worldwildlife.org/pages/tnrc-partner-resource-u4-promoting-a-gender-sensitive-approach-to-addressing-corruption-in-the-forestry-sector> . Accessed 06 Dec 2020
 202. Umwelt Bundesamt (UBA) (2017) Geschlechterverhältnisse und Nachhaltigkeit. Available at: <https://www.umweltbundesamt.de/publikationen/geschlechterverhaeltnisse-nachhaltigkeit> . Accessed 10 Dec 2020
 203. Umwelt Bundesamt (UBA). Available at: <https://www.umweltbundesamt.de/en> . Accessed 10 Dec 2020
 204. Umwelt Bundesamt (2017, November 5) German Environmental Survey, GerES. Available at: <https://www.umweltbundesamt.de/en/topics/health/assessing-environmentally-related-health-risks/german-environmental-survey-geres> . Accessed 10 Dec 2020
 205. UN News (2019, September 24) Sustainable Development Summit: 'We must step up our efforts - now', Guterres declares. Available at: <https://news.un.org/en/story/2019/09/1047302> . Accessed 03 Dec 2020
 206. United Nations Secretary-General (2019, September 24) Secretary-General's remarks to High-Level Political Forum on Sustainable Development. Available at: <https://www.un.org/sg/en/content/sg/statement/2019-09-24/secretary-generals-remarks-high-level-political-forum-sustainable-development-bilingual-version-delivered-scroll-down-for-all-english>. Accessed 03

Dec 2020

207. United Nations (2019) The future is now - Science for achieving sustainable development. Available at: https://sustainabledevelopment.un.org/content/documents/24797GSDR_report_2019.pdf . Accessed 03 Dec 2020
208. United Nations (1997) Mainstreaming the gender perspective into all policies and programmes in the United Nations system. Available at: <https://www.un.org/womenwatch/daw/followup/main.htm> /. Accessed 04 Dec 2020
209. United Nations Statistical Commission (UNSD) (2020) Second report of the interlinkages workstream - Items for discussion and decision: Data and indicators for the 2030 Agenda for Sustainable Development. Available at: <https://unstats.un.org/unsd/statcom/51st-session/documents/BG-Item3a-Interlinkages-Workstream-E.pdf>. Accessed 04 Dec 2020
210. United Nations Office for Project Services (UNOPS) (2020) Infrastructure for gender equality and the empowerment of women. Available at: <https://content.unops.org/publications/UNOPS-Infrastructure-for-Gender-Equality-and-the-Empowerment-of-women.pdf?mtime=20200701120805> . Accessed 04 Dec 2020
211. United Nations Statistics Division (UNSD) (2018, March 14) Gender-relevant SDG indicators (80 indicators) Available at: https://unstats.un.org/unsd/demographic-social/gender/documents/14Mar2018_Gender_relevant_SDG_indicators_MB-HSS.pdf . Accessed 04 Dec 2020
212. United Nations Office for Disaster Risk Reduction (UNDRR) (2016) Report of the open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction. Available at: <https://www.undrr.org/publication/report-open-ended-intergovernmental-expert-working-group-indicators-and-terminology> . Accessed 04 Dec 2020
213. United Nations (2020) The Sustainable Development Goals Report. Available at: <https://unstats.un.org/sdgs/report/2020/The-Sustainable-Development-Goals-Report-2020.pdf> . Accessed 04 Dec 2020
214. United Nations Economic and Social Council (ECOSOC) (April 2020) Progress towards Sustainable Development Goals - Report of the Secretary-General. Available at: <https://unstats.un.org/sdgs/files/report/2020/secretary-general-sdg-report-2020--EN.pdf>. Accessed 04 Dec 2020
215. United Nations Department of Economic and Social Affairs Statistics Division (UN DESA) (November 2020) SDG Indicators. Available at: <https://unstats.un.org/sdgs/indicators/database> . Accessed 04 Dec 2020

-
216. United Nations Economic and Social Council (ECOSOC) (2019, April 5) Mainstreaming a gender perspective into all policies and programmes in the United Nations system - Report of the Secretary-General. Available at: <https://undocs.org/E/2019/54> . Accessed 04 Dec 2020
217. United Nations Development Programme (UNDP) (2018) Institutional and Context Analysis for the Sustainable Development Goals. Available at: <https://www.undp.org/content/undp/en/home/librarypage/sustainable-development-goals/institutional-and-context-analysis-for-the--sustainable-developm.html> . Accessed 03 Dec 2020
218. United Nations (1999) Mainstreaming gender in water resources management - Why and how. Available at: <https://www.pacificwater.org/userfiles/file/IWRM/Toolboxes/gender/MAINSTREAMING%20GENDER%20IN%20WATER%20RESOURCES.pdf> . Accessed 03 Dec 2020
219. United Nations (2019) The Sustainable Development Goals report. Available at: https://un.am/up/library/SDG_Report_2019.pdf . Accessed 04 Dec 2020
220. United Nations Statistical Commission (UNSD) (2020, March 3-6) Items for discussion and decision: Data and indicators for the 2030 Agenda for Sustainable Development Second Report of the Interlinkages Workstream. Available at: <https://unstats.un.org/unsd/statcom/51st-session/documents/BG-Item3a-Interlinkages-Workstream-E.pdf>. Accessed 04 Dec 2020
221. United Nations Global Compact (2015) SDG Industry Matrix. Available at: <https://www.unglobalcompact.org/library/3111>. Accessed 05 Dec
222. United Nations (2019) The Sustainable Development Goals report. Available at: http://un.am/up/library/SDG_Report_2019.pdf. Accessed 05 Dec 2020.
223. United Nations (March 2018) Gender-relevant SDG indicators (80 indicators). Available at: https://unstats.un.org/unsd/demographic-social/gender/documents/14Mar2018_Gender_relevant_SDG_indicators_MB-HSS.pdf. Accessed 05 Dec 2020
224. United Nations (September 2015) Analysis of the transport relevance of each of the 17 SDGs. Available here: <https://sustainabledevelopment.un.org/content/documents/8656Analysis%20of%20transport%20relevance%20of%20SDGs.pdf> . Accessed 05 Dec 2020
225. United Nations Conference on Trade and Development (UNCTAD) (2019) Making trade policies gender-responsive: Data requirements, methodological developments and challenges https://unctad.org/system/files/official-document/ditc2019d1_en.pdf. Accessed 13 Dec 2020
226. UN Women. End violence against women and girls. Available here: <https://interactive.unwomen.org/multimedia/infographic/violenceagainstwomen/en/index.html>. Accessed 05

Dec 2020

227. United Nations Environment Programme (UNEP) (May 2017) Global gender and environmental outlook (GGEO). Available here:
<https://www.unep.org/resources/report/global-gender-and-environment-outlook-ggeo>. Accessed 05 Dec 2020
228. United Nations Environment Programme (UNEP) (November 2018) Mainstreaming gender into UNDP-GEF projects on chemicals and waste. Available here:
https://www.undp.org/content/undp/en/home/librarypage/environment-energy/chemicals_management/GuidanceGender&Chemicals.html . Accessed 05 Dec 2020
229. United Nation Environment Programme (UNEP) (March 2019) Global chemicals outlook II. From legacies to innovative solutions: Implementing the 2030 Agenda for Sustainable Development. Available here:
<https://www.unenvironment.org/resources/report/global-chemicals-outlook-ii-legacies-innovative-solutions> . Accessed 05 Dec 2020
230. United Nations Development Programme (UNDP) Environment & Energy Group (2011) Chemicals and gender. Available here:
https://www.undp.org/content/undp/en/home/librarypage/environment-energy/chemicals_management/chemicals-and-gender.html . Accessed 05 Dec 2020
231. United Nations. Water and Gender. Available here:
<https://www.unwater.org/water-facts/gender/>. Accessed 05 Dec 2020
232. United Nations Environment Programme (UNEP) (2019) Gender and waste nexus. Experiences from Bhutan, Mongolia and Nepal. Available here:
<https://www.unenvironment.org/resources/report/gender-and-waste-nexus-experiences-bhutan-mongolia-and-nepal>. Accessed 05 Dec 2020
233. United Nations Environment Programme (UNEP) (2016) Global Gender and Environment Outlook. Available here:
<https://www.unenvironment.org/resources/report/global-gender-and-environment-outlook-ggeo>. Accessed 05 Dec 2020
234. United Nations Environment Programme (UNEP) (March 2019) Global environment outlook - technical summary. Available here:
<https://www.unenvironment.org/resources/global-environment-outlook-6> . Accessed 06 Dec 2020
235. United Nations (2015, October 20) The World's Women 2015: Trends and Statistics. Available at:
<https://www.un.org/development/desa/publications/the-worlds-women-2015.html> . Accessed 13 Dec 2020
236. United Nations Environment Programme (UNEP) and International Union for Conservation of Nature (IUCN) (2019) Gender and environment statistics: Unlocking information for action and measuring the SDGs. Available

here:

<https://www.unenvironment.org/resources/report/gender-and-environment-statistics-unlocking-information-action-and-measuring-sdgs> . Accessed 06 Dec 2020

237. United Nations (2019) Mainstreaming gender in environment statistics for the SDGs and beyond - Identifying priorities in Asia and the Pacific. Available here:
https://www.unescap.org/sites/default/files/SD_Working_Paper_no.10_Oct2019_gender_in_environment.pdf . Accessed 06 Dec 2020
238. United Nations (2017) Secretary-General's note for the conference on the implementation of Sustainable Development Goal (SDG 14), New York: Conserve and sustainably use the oceans, seas and marine resources for sustainable development. Available at:
<https://sustainabledevelopment.un.org/index.php?menu=3280> . Accessed 07 Dec 2020.
239. United Nations Educational, Scientific and Cultural Organization (UNESCO) (2020, August 31) Artificial Intelligence and Gender Equality. Available at:
<https://en.unesco.org/AI-and-GE-2020> . Accessed 11 Dec 2020
240. United Nations Office on Drugs and Crime (UNODC) (2018) Global study on homicide - Gender-related killing of women and girls. Available at:
https://www.unodc.org/documents/data-and-analysis/GSH2018/GSH18_Gender-related_killing_of_women_and_girls.pdf . Accessed 09 Dec 2020
241. United Nations Educational, Scientific and Cultural Organization (UNESCO) (2019) I'd Blush if I could: Closing gender divides in digital skills through education. Available at:
<https://unesdoc.unesco.org/ark:/48223/pf0000367416.page=1> . Accessed 11 Dec 2020
242. United Nations General Assembly - Human Rights Council (2012, May 23) Report of the Special Rapporteur on violence against women, its causes and consequences, Rashida Manjoo. Available at:
https://www.ohchr.org/Documents/Issues/Women/A.HRC.20.16_En.pdf . Accessed 09 Dec 2020
243. United Nations Studies Association (UNSA) Vienna (2019) Femicide Volume XII - Living victims of femicide. Available at:
http://femicide-watch.org/sites/default/files/Femicide%20XII_0.pdf . Accessed 09 Dec 2020
244. United Nations Global Compact (2015). SDG industry matrix - New Sustainable Development Goals. Available at:
<https://www.unglobalcompact.org/library/3111> . Accessed 09 Dec 2020
245. United Nations Development Programme (2016, November 8) Mapping mining to the SDGs: An atlas. Available at: <https://www.undp.org/content/undp/en/home/librarypage/poverty-reduction/mapping-mining-to-the-sdgs--an-atlas.html> . Accessed 09 Dec 2020

-
246. United Nations Assistance Mission in Afghanistan (2019) Afghanistan – Protection of civilians in armed conflict. Available at:
<https://www.ohchr.org/Documents/Countries/AF/ProtectionCiviliansAnnualReport2019.pdf> . Accessed 09 Dec 2020
247. United Nations Department of Economic and Social Affairs (UN DESA). Technology facilitation mechanisms. Available at:
<https://sustainabledevelopment.un.org/TFM> . Accessed 09 Dec 2020
248. United Nations Inter-Agency Task Team on Science, Technology and Innovation for the SDGs (IATT) (2019) A Guidebook for the Preparation of STI for SDGs Roadmaps. Available at:
https://sustainabledevelopment.un.org/content/documents/22724Guidebook_STI_for_SDG_Roadmaps_Draft_for_STI_Forum.pdf . Accessed 09 Dec 2020
249. United Nations Framework Convention on Climate Change (2016) Technology and the UNFCCC: Building the foundation for sustainable development. Available at:
https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/NAD_EBG/54b3b39e25b84f96aeada52180215ade/b8ce50e79b574690886602169f4f479b.pdf . Accessed 09 Dec 2020
250. United Nations Development Programme (UNDP) (2011) Chemicals and gender. Available at:
https://www.undp.org/content/undp/en/home/librarypage/environment-energy/chemicals_management/chemicals-and-gender.html . Accessed 09 Dec 2020
251. United Nations Environment Programme (UNEP) (2016) Global gender and environment outlook. Available at:
https://wedocs.unep.org/bitstream/handle/20.500.11822/14764/Gender_and_environment_outlook_HIGH_res.pdf?sequence=1&isAllowed=y . Accessed 09 Dec 2020
252. United Nations Environment Programme (UNEP) (2019) Gender and waste nexus – Experiences from Bhutan, Mongolia and Nepal. Available at:
<https://www.unenvironment.org/resources/report/gender-and-waste-nexus-experiences-bhutan-mongolia-and-nepal> . Accessed 09 Dec 2020
253. United Nations Environment Programme (UNEP) (2019) Global chemicals outlook II: From legacies to innovative solutions: Implementing the 2030 Agenda for Sustainable Development. Available at:
<https://www.unenvironment.org/resources/report/global-chemicals-outlook-ii-legacies-innovative-solutions> . Accessed 09 Dec 2020
254. United Nations Office for Project Services (UNOPS) (2020) Infrastructure for gender equality and empowerment of women. Available at:
<https://content.unops.org/publications/UNOPS-Infrastructure-for-Gender-Equality-and-the-Empowerment-of-women.pdf?mtime=20200701120805> . Accessed 10 Dec 2020

-
255. UN Women (2019) Progress on the Sustainable Development Goals: The gender snapshot 2019
<https://www.unwomen.org/en/digital-library/publications/2019/09/progress-on-the-sustainable-development-goals-the-gender-snapshot-2019>. Accessed 13 Dec 2020
256. UN Women (2018) Turning promises into action: Gender equality in the 2030 Agenda for Sustainable Development,
<https://www.unwomen.org/en/digital-library/publications/2018/2/gender-equality-in-the-2030-agenda-for-sustainable-development-2018>. Accessed 13 Dec 2020
257. UN Women. Making women and Girls Visible: Gender Data Gaps and Why They Matter. Available here:
<https://www.unwomen.org/en/digital-library/publications/2018/12/issue-brief-making-women-and-girls-visible>. Accessed 10 Dec 2020
258. UN WOMEN. Gender Equality and Big Data Making Gender Data Visible. Available here:
<https://www.unwomen.org/en/digital-library/publications/2018/1/gender-equality-and-big-data>. Accessed 10 Dec 2020
259. Van Aelst K, Holvoet N (2016) Intersections of gender and marital status in accessing climate change adaptation: Evidence from rural Tanzania. *World Development* 79:40-50. Available at:
<https://www.sciencedirect.com/science/article/abs/pii/S0305750X15002776> . Accessed 10 Dec 2020
260. Van der Velden, M (2018) Digitalisation and the UN Sustainable development Goals: What role for design. *Interaction Design and Architecture(s) Journal* 37:160-174. Available at
http://www.mifav.uniroma2.it/inevent/events/idea2010/doc/37_8.pdf . Accessed 07 Dec 2020
261. Van Soest HL, Van Vuuren DP, Hilaire J, et al (2019) Analysing interactions among Sustainable Development Goals with Integrated Assessment Models. *Global Transitions* 1:210-225. Available at:
<https://www.sciencedirect.com/science/article/pii/S2589791819300179> . Accessed 04 Dec 2020
262. Vinuesa R., et al (2020) The role of artificial intelligence in achieving the Sustainable Development Goals. *Nature Communications* 11, Article number: 233. Available at
<https://www.nature.com/articles/s41467-019-14108-y> Accessed on 15 Dec 2020
263. Weil, S, Corradi C, Naudi M (eds) (2018) *Femicide across Europe*. Bristol University Press. Available at:
<https://www.jstor.org/stable/j.ctv8xfq2> . Accessed 11 Dec 2020
264. Weil, S. and Keshet, N. 2021 "Female Geronticide: the Case of Israel", *Journal of Gender Studies* 29 (5).
<https://www.tandfonline.com/doi/full/10.1080/09589236.2020.1809361>doi: 10.1080/09589236.2020.1809361
265. Weil, S. 2020c "Coronavirus (COVID-19) and Femicide". *European Sociologist*, 45. Special Issue: Pandemic (Im)Possibilities, Vol. 1.
<https://www.europeansociologist.org/issue-45-pandemic-impossibilities-vol-1/gendering-coronavirus-covid>

-19-and-femicide

266. Weil, S. 2020d "Two Global Pandemics: Femicide and Covid-19". *Trauma and Memory* 8 (2)
<http://www.eupsycho.com/index.php/TM/article/viewFile/329>
267. Weitz N, Carlsen H, Nilsson M, et al (2018) Towards systemic and contextual priority setting for implementing the 2030 Agenda. *Sustainability Science* 13:531-548. Available at:
<https://link.springer.com/article/10.1007/s11625-017-0470-0> . Accessed 04 Dec 2020
268. Women and Mining. A guide for governments, companies and practitioners to support women's rights and mitigate gender risks during OECD due diligence implementation. Available at:
https://www.kit.nl/wp-content/uploads/2019/10/womens-rights-and-mining_10dos_oct_2019_english.pdf.
Accessed 11 Dec 2020
269. Women Engage for a Common Future (2017) Gender dimensions of hazardous chemicals and waste policies under the Basel, Rotterdam and Stockholm Conventions. Available at:
<https://www.wecf.org/gender-dimensions-of-hazardous-chemicals/> . Accessed 09 Dec 2020
270. Women Engage for a Common Future (2016) Women and chemicals: The impact of hazardous chemicals on women - A thought starter based on an experts' workshop. Available at:
<https://www.wecf.org/77912/> . Accessed 09 Dec 2020
271. World Bank Group (2010) Mainstreaming gender in road transport: Operational guidance for World Bank staff. Available at:
<http://documents1.worldbank.org/curated/en/669831468330934298/pdf/569540NWP0Tran10Box353751B01PUBLIC1.pdf> . Accessed 09 Dec 2020
272. World Bank Group (2019) Guinea - The economic benefits of a gender inclusive society. Available at:
<https://openknowledge.worldbank.org/bitstream/handle/10986/32507/Guinea-The-Economic-Benefits-of-a-Gender-Inclusive-Society.pdf?sequence=1&isAllowed=y> . Accessed 09 Dec 2020
273. World Bank Group (2012) World Development Report 2012: Gender Equality and Development
<https://openknowledge.worldbank.org/handle/10986/4391>. Accessed 13 Dec 2020
274. World Economic Forum (2019) Global Gender Gap Report 2020. Available here:
http://www3.weforum.org/docs/WEF_GGGR_2020.pdf . Accessed 07 Dec 2020
275. World Economic Forum (Various years) Global Gender Gap Report. Available at:
<https://www.weforum.org/reports/> . Accessed 09 Dec 2020
276. World Health Organisation (WHO) (2015) Human biomonitoring: facts and figures. Available at:
<https://apps.who.int/iris/handle/10665/164588> . Accessed 10 Dec 2020

-
277. World Inequality Lab (2018) World Inequality Report 2018. Available at:
<https://wir2018.wid.world/>. Accessed 11 Dec 2020
278. World Meteorological Organization (WMO) (2019) Gendered impacts of weather and climate: Evidence from Asia, Pacific and Africa. Available at:
https://library.wmo.int/doc_num.php?explnum_id=10106 . Accessed 10 Dec 2020
279. World Meteorological Organization (WMO) (2015) Conference report - Conference on the gender dimensions of weather and climate services. Available at:
https://library.wmo.int/doc_num.php?explnum_id=7893 . Accessed 10 Dec 2020
280. World Wildlife Fund (WWF) (2019) Nature in all goals: How nature-based solutions can help us achieve all the Sustainable Development Goals. Available here:
https://wwfeu.awsassets.panda.org/downloads/nature_in_all_goals_publication__2019_.pdf . Accessed 06 Dec 2020
281. World Wildlife Fund (WWF) (2019) Empowering women in marine communities to mitigate the impacts of climate change. EU Policy Brief. Available at:
https://wwfeu.awsassets.panda.org/downloads/wwf_genderequalityandfisheriespolicybrief.pdf. Accessed 07 Dec 2020
282. World Wildlife Fund (WWF) (2012) Fisheries management and gender. UK Briefing. Available at:
https://d2ouvy59p0dg6k.cloudfront.net/downloads/women_conservation_fisheries_2012.pdf . Accessed 07 Dec 2020.
283. Zhao J, Wang T, Yatskar M, et al (2017) Men also like shopping: Reducing gender bias amplification using corpus-level constraints. Proceedings of the 2017 Conference on Empirical Methods in Natural Language Processing. Available here:
https://www.researchgate.net/publication/322587393_Men_Also_Like_Shopping_Reducing_Gender_Bias_Amplification_using_Corpus-level_Constraints. Accessed 07 Dec 2020
284. Zou J, Schiebinger L (2018, July 18). AI can be sexist and racist—it's time to make it fair. *Nature*:324-326. Available at:
<https://www.nature.com/articles/d41586-018-05707-8>. Accessed 08 Dec 2020

Part 7: Common gender phrases used in SDG-related research

Age-gender divide
Early childhood girls/boys
Equity in maternal health
Family planning
Female economy
Female entrepreneurship
Female experience of violence
Female headed household
Female labour force participation
Female power
Female representation
Feminisation of ...
Feminist research/theory
Gender action plan
Gender analysis
Gender and development
Gender and farmer preferences
Gender and innovation
Gender and migration
Gender and resilience
Gender and risk attitudes
Gender and sexuality
Gender and urbanicity
Gender assessment
Gender assessment
Gender budgeting
Gender capital
Gender classification
Gender data
Gender development
Gender differences
Gender differential effects
Gender differentiated
Gender digital divide
Gender dimension
Gender diversity
Gender divides
Gender dynamics
Gender equal (e.g. labour market)

Gender equality
Gender equitable
Gender equity
Gender factor
Gender framing
Gender gap
Gender gap in productivity
Gender in innovation
Gender in science
Gender in water governance
Gender inclusive (e.g. in governance)
Gender inclusiveness
Gender Index
Gender inequality
Gender inequality
Gender norms
Gender integration
Gender justice
Gender lenses
Gender mainstreaming
Gender parity
Gender pay gap
Gender perception
Gender perspective
Gender quotas
Gender responsive (e.g. budgeting)
Gender role stereotype
Gender roles
Gender scoping
Gender segmented markets
Gender sensitive research
Gender specific (e.g. analysis, causes, indicators)
Gender transformative programme/interventions
Gender vulnerability
Gender wage gap
Gender-based violence
Gender-related concerns
Gendered impacts
Gender health inequalities
Glass ceiling
Human rights of women/girls
Intimate partner violence

Mainstreaming women's rights
Maternity care
Partner violence
Pregnant women
Regional gender agenda
Reproductive health
Reproductive rights
Rural women/men
Sex-age specific mortality
Sex disaggregated data
Sexual and reproductive health
Sexual behaviour
Sexual dimorphism
Sexual exploitation
Sexual reproduction
Sexual violence
Social differences
Social safety nets
Sustainable gender equality framework
Underrepresentation of women
Women's access (e.g. to education, resources)
Women and poverty
Women entrepreneurship
Women in development
Women of colour
Women-oriented approach
Women's access to land/resources
Women's achievement
Women's assets
Women's decision-making autonomy
Women's empowerment
Women's feminist engagement
Women's health
Women's land rights
Women's leadership/leaders
Women's mobility
Women's movement
Women's representation
Women's sanitation practices/needs
Young women

Part 8: Mainstreaming gender into projects

SEI guidance on including women's needs in energy projects: asking the right questions²⁵⁵⁾

The questions below were adapted by SEI from BRACED 2016²⁵⁶⁾ and are examples that can be used to explore social equality concerns in cases where a researcher is face-to-face with an interviewee, focus group participant, or survey respondent²⁵⁷⁾. Each question should be revised for applicability in the given context and project. Note that they are kept open in order to be able to capture all possible relevant social identities.

- What activities are mainly performed by women within the geographic area being studied?
- What are the main gender differences related to access to energy resources?
- Who are the users of energy in each sector?
- How much energy do they consume, and what type of energy do they use (biomass, electricity, natural gas, etc.)?
- How are women represented in the geographic area being studied?
- What are the gender data needs in this particular setting of the sphere of influence of the project?
- When assessing data gaps and proxies, does some of the data exist, and it is just a matter of integration?
- If not, how can we generate the data ourselves (for example, through surveys, mobile apps, sharing photos, entering data on specific locations)?
- What would be the key aspects of data needed and what method could be used to collect the data?
 - Hours spent by month to fetch biomass;
 - Distance travelled to fetch biomass;
 - Compensating for gender-disaggregated large-data gathering with the use of mobile devices or data input boxes:
 - Gender disaggregated quantities of various forms of energy used for estimation of energy demand and pollutant concentrations;
 - Women in charge of household can report on days of the week or number of hours in a month with energy shortages in the house (representing issues of energy supply intermittence);
 - Type of kitchen appliances (including type of cookstove) and chimney design;
 - Labour force participation to estimate the number of women that are in charge of the household and in control of energy use (related to access issues and conservation campaigns).

255) <https://www.sei.org/projects-and-tools/projects/sei-initiative-on-gender-equality-social-equity-and-poverty/>

256) <http://www.braced.org/resources/i/?id=23492c8d-f480-46ac-98ee-5c967eb8bac8>

257) <https://www.sei.org/wp-content/uploads/2018/11/190118a-gill-segnerstam-gender-guidance-1808h-photo-credit-change.pdf>

SEI guidance on including women's needs in projects for access to resources: asking the right questions

With some revision, these questions could be used in a comparison between countries of the distribution of support for climate mitigation. In such cases, the questions would mainly be used in the data analysis (e.g. in the analysis of the underlying assumptions behind the distribution of support) and perhaps not as much in the collection of data. The questions should be revised to include more detail and supplement responses of surveys.²⁵⁸⁾

- Who does what?
- If there are differences in tasks, why do you think these differences exist?
- Who has access to what resources?
- Who makes the decisions on how to use the resources? What types of resources are decided on by some and not by others?
- If there are differences in access and decision-making, why do you think these differences exist?
- What are the implications of these differences?
- Are there any negative outcomes for those who cannot make decisions about resources?
- Are there any negative implications for those who have to make all the decisions about resources?
- Who participates in decision-making processes? What types of processes are not equally accessible?
- If there are differences in participation, why do you think these differences exist?
- Can these differences have an impact on the capacity of individuals, families, and communities to prepare for and recover from environmental, technological or economic changes and shocks?
- Do these differences have an impact on participation in decision-making?
- How would your life be different if decision-making power was shared equally among family members?

258) SEI, Integrating gender and social equality into sustainable development research. A guidance note, <https://www.sei.org/wp-content/uploads/2018/11/181105a-gill-segnestam-gender-guidance-1808h.pdf>

Part 9: APPENDIX

Details of contributing experts

1. Jonathan Dawes, University of Bath, UK

Jonathan Dawes is Professor of Applied Mathematics at the University of Bath, UK. His research spans a wide range of mathematical modelling projects involving dynamical systems, fluid and solid mechanics, and network science. His academic projects involve many research partners, from British Telecom to UNICEF. From 2015 - 2020 he was Director of Bath's Institute for Mathematical Innovation (IMI), which cultivates novel collaborations between mathematicians and natural and social scientists. He currently Chairs the UK Engineering and Physical Sciences Research Council's Strategic Advisory Team for the Mathematical Sciences, and is a member of the Advisory Board for the Royal Academy of Engineering's Safer Complex Systems Programme.

2. David Griggs, Monash University, Australia

David Griggs is an adjunct Professor of Sustainable Development at Monash University in Australia and an Honorary Professor at Warwick University in the UK. From 2016 to 2018, David established and was Director of the Warwick Institute for Global Sustainable Development. From 2007 to 2015 David was Director of the Monash Sustainability Institute (MSI) which aims to deliver solutions to key sustainability challenges. In November 2008 he established and became CEO of the newly created Climate Works Australia (CWA), an independent research-based non-profit organisation committed to catalysing greenhouse gas emissions reductions. Previous positions he held included UK Met Office Deputy Chief Scientist, Director of the Hadley Centre for Climate Change, and Head of the Intergovernmental Panel on Climate Change (IPCC) scientific assessment unit. He is a past vice-chair of the World Climate Research Programme. David was involved in the development of the UN Sustainable Development Goals (SDGs), representing the Science and Technology Major Group in the SDG negotiations at the UN and publishing two papers in Nature on the SDGs, one of which has received over 1500 citations. David was awarded the Vilho Vaisala award (World Meteorological Organization) in 1992 and a 2014 WME Leaders List Award which honours individuals who have provided extraordinary environment leadership.

3. Eun Mee KIM, EWHA Women's University, South Korea

Eun Mee Kim is Professor in the Graduate School of International Studies and Director of the Global Health Institute for Girls at EWHA Women's University in Seoul, South Korea. Her research focus has been on economic and social development of developing countries, starting from her own country of South Korea since the 1960s from extreme poverty to now a donor of development cooperation. Her research has shifted to how South Korea as a relatively new donor has responded to developing countries with a unique blend of the ownership needs of the developing countries and South Korea's own experience as a recipient of foreign aid during the post-colonial and post-war periods. Her research has now expanded to global public health with a particular focus on women and children, with girls as the most vulnerable yet with the greatest empowerment potential. This research has been supported by the Bill & Melinda Gates Foundation since 2013. She was appointed by the UN Secretary General as one of 15 scientists in the world to work

on the Global Sustainable Development Report 2019, which was presented at the UN General Assembly in September 2019 with the title, The Future is Now: Science for Achieving Sustainable Development.

4. Muneeza Mehmood Alam, World Bank

Muneeza Mehmood Alam is an Economist in the Transport Global Practice of the World Bank. During her time at the Bank she has worked on a myriad of topics relating to infrastructure and economic policy. These include economic corridors and regional connectivity, urban transport, logistics, gender, and electric mobility. Muneeza has a keen interest in understanding the mechanisms through which the economic and social benefits of transport investments can be maximized and more equitably distributed. Muneeza holds a PhD in Economics from Yale University and prior to joining the World Bank she has worked in economic consulting.

5. Karla Gonzalez Carvajal, World Bank

Karla Gonzalez Carvajal is a specialist in the subject of negotiation and alternative dispute resolution. She obtained her MBA with an emphasis on Marketing at the University of San Diego in California and holds a degree in Law from the University of Costa Rica. Her work over the last decade has provided her with extensive experience in the area of public service. She has specialized in Alternative Conflict Resolution Methods and is currently a member of the Centro Internacional de Arbitraje y Conciliación Comercial (International Center for Arbitration and Commercial Conciliation). She was a member of Road Safety Committee, which is led by the Fundación Internacional de Automovilismo (International Automobile Foundation). As Minister of Public Works and Transportation in Costa Rica she achieved a fourfold increase in the investment of public works, the resumption of construction at the national airport, which was stalled due to conflicts, the transformation of the driver's license system, the promotion of a new traffic law and the inclusion of road safety components in the design of road infrastructure. She is currently the World Bank's Practice Manager for Transport in Europe. Karla is also leading the Gender Task Force for the World Bank's Transport Global Practice, working to operationalize the gender agenda in the transport sector

6. Karla Dominguez Gonzales, World Bank

Karla Dominguez Gonzalez is a gender specialist at the World Bank with experience mainstreaming gender into transport projects. She has focused on the analysis of the barriers and enabler's for women's mobility and accessibility, strategies to address sexual harassment in public transport within urban settings, and gender analysis for rural road projects in Latin America and Africa. She designed the first intervention to prevent and respond to sexual harassment in Mexico City's buses that has been evaluated on its potential for behavioural change. She holds a MSc Development Management from the London School of Economics and Political Science and a Certificate on Public Administration from the Maxwell School at Syracuse University. She has collaborated with international civil society organizations (ODI, Practical Action, Oxfam) and worked for different agencies of the Mexican government, including the Ministry of Social Development, where, in collaboration with the Mexican Ministry of Women, she was in charge of coordinating the design and implementation of its gender mainstreaming strategy.

7. **Minu Hemmati**, MSP (Multi-Stakeholder Participation) Institute, Germany

Minu Hemmati is a co-founder and a member of the MSP Institute, and working on individual projects as an associate of the organization. Minu is a clinical psychologist with a doctorate in Organisational and Environmental Psychology. 1992-1998, she served as assistant professor at the University of the Saarland, Germany, focusing on social and environmental psychology and gender studies. Since 1998, she has been working as an independent advisor with NGOs; governments; international agencies; women's networks; corporations; and research institutions. Minu is focusing on transformation processes towards sustainable development, gender equity, and good governance. Her work includes designing, facilitating and coaching change processes that use dialogue and multi-stakeholder partnerships; leadership development; training and teaching; and research and advocacy on participation and on gender issues. She has wide experience with multi-stakeholder processes at all levels; facilitating a diversity of meeting formats for small and large groups; international policy-making on sustainable development and related issues; local and national level implementation; as well as evaluation in the field.

8. **Anna Holthaus**, MSP Institute, Germany

Anna Holthaus is the project coordinator of "Gender and Chemicals Beyond 2020". Anna holds a Master's degree in Governing Sustainability from the City University of Applied Sciences in Bremen, Germany, and a Bachelor in Environmental Sciences from Leuphana University, Lüneburg. In her master thesis she analyzed the relevance and integration of gender issues in the German degrowth movement. She was a Board Member of Young Friends of the Earth Germany from 2012-2014, the youth representative on the scientific advisory board of Friends of the Earth Germany from 2014-2016 and co-founder of "GeNaWerk" - a young network for gender and sustainability - in 2016

9. **Małgorzata Dębiak**, German Environment Agency

Małgorzata Dębiak holds Diploma in Biology, a Master's degree in Business and Administration and a PhD in Biology from the Johannes Gutenberg University of Mainz. She committed her research career to molecular and regulatory toxicology. For several years she studied molecular mechanisms of genotoxicity, DNA repair and cancerogenesis. She joined the German Environment Agency in 2013 as a toxicologist where she was involved in projects concerning risk assessment for indoor air pollutants. Since 2020 she is responsible for the planning and coordination of the German Environmental Survey (GerES).

10. **Sophie Fichter**, German Environment Agency

Sophie Fichter is a researcher at the German Environment Agency. She holds a degree in environmental sciences and currently works in the INGER project where she contributes her knowledge of statistics to integrating new concepts of Sex and Gender into environmental health research.

11. **Katrin Groth**, German Environment Agency

Katrin Groth joined the German Environment Agency as a scientist for the BMBF-funded project INGER (INtegrating Gender into Environmental health Research) in November 2017. She concentrates her research on human

biomonitoring and gender and has theoretical and practical knowledge in data handling and data analysis. In the past she collected experiences in data processing and communication in the public health sector and worked in the longitudinal data field with the focus on inequalities and capabilities. She holds a Diploma in Economics and a Master of Science in Statistics.

12. Marike Kolossa-Gehring, German Environment Agency

Marike Kolossa-Gehring, received her state exam in Biology and a Ph.D. based on a toxicological thesis from the Christian-Albrechts- University of Kiel. She joined the German Environment Agency in 1992 where she worked as a scientist in different sections on the environmental impacts on human health and the environment. In 2002 she became head of the section responsible for environmental risk assessment and regulation of pharmaceuticals, washing- and cleansing agents. Since 2004 she is heading the section “toxicology, health related environmental monitoring” where she is responsible for the Human Biomonitoring in the German Environmental Survey (GerES) and the German Environmental Specimen Bank (ESB). She acted as work package leader in the finalized EU-projects ESBIO (Expert team to Support BIOmonitoring), a consortium preparing a concept for biomonitoring in Europe and COPHES, the human biomonitoring pilot study DEMOCOPHES and is currently co-ordinator of the European Joint Program HBM4EU.

13. Arn Sauer, German Environmental Agency

Arn Sauer is Research Officer for Gender Mainstreaming at the German Federal Environment Agency since 2013. He recently completed his PhD in Transdisciplinary Gender Studies at Humboldt University Berlin on the subject of Equality Governance through Gender Impact Assessment and Gender-based Analysis. He holds a MA degree in history and political science from Humboldt University Berlin and a certificate in “Interdisciplinary Women and Gender Research” from the Technical University Berlin. Previous positions include Research Associate at the Simone de Beauvoir Institute of Concordia University in Montreal, Teaching Assistant in the master programme “Gender and Diversity Competence” at the Free University Berlin and Researcher for the Gender Competency Centre at Humboldt University Berlin. His research interests and work focus are gender mainstreaming and gender equality, equality governance, diversity, human rights and impact assessment.

14. Rabia Ferroukhi, International Renewable Energy Agency

Rabia Ferroukhi joined IRENA in 2011. She is currently the Director of the Knowledge, Policy and Finance Centre where she oversees the Agency's work on knowledge, policy and finance, including: efforts to produce up-to-date and authoritative renewable energy data and information; analysis to identify best practice in renewable energy policies and finance; and advice and support to countries, tailoring policy and investment analysis to renewables deployment in the field. Dr. Ferroukhi brought to this position over 25 years of experience in the fields of energy, development and environment. She worked in both public and private sectors, including with energy companies and governments globally, international institutions, and research centres. Dr. Ferroukhi holds a Master's in Applied Economics and a Ph.D. in Economics from the American University in Washington DC.

15. **Celia Garica-Banos**, International Renewable Energy Agency

Celia García-Baños is an Associate Programme Officer in IRENA's Knowledge Policy and Finance Centre in Abu Dhabi. Within the Policy Unit, she works on a diverse range of subjects, including policy and socio-economic benefits of renewable energy. Prior to joining IRENA, she worked with the Sustainable Bioenergy Research Consortium at the Masdar Institute researching molecular and biochemical screening of mangrove sediments in Abu Dhabi for biomass-degrading enzymes. Celia is a chemical engineer from the Industrial Engineering School of the Technical University of Madrid.

16. **Christine Lins**, Global Women's Network for the Energy Transition

Christine Lins works as Executive Director of GWNET, the Global Women's Network for the Energy Transition, which aims at empowering women in the sustainable energy sector. Furthermore, she runs her own consultancy and is Member of the Board of Directors of ISES, the International Solar Energy Society. From July 2011 until March 2018, Christine Lins acted as Executive Secretary of REN21, the Renewable Energy Policy Network of the 21st Century, headquartered at UNEP, the United Nations Environment Programme in Paris/France. Between 2001 and 2011, Ms. Lins served as Secretary General of the European Renewable Energy Council. Previously, she worked in a regional energy agency in Austria promoting energy efficiency and renewable energy sources. Ms. Lins holds a Master's degree in international economics and applied languages. She has more than 23 years of working experience in the field of renewable energy sources and energy efficiency.

17. **Davina Ngei**, Global Women's Network for the Energy Transition

Davina Ngei is Communications Manager at GWNET where she works closely with the management to support advocacy, networking, and mentorship projects. Prior to joining GWNET, Davina worked as the Communications Specialist at the Partnership on Women's Entrepreneurship in Renewables (wPOWER Hub), where she led the development of several key publications focused on the nexus of gender and renewable energy. She is also an experienced content creator, consulting with businesses across several sectors.

18. **Jürg Luterbacher**, World Meteorological Organisation

Jürg Luterbacher has been the Director of Science and Innovation since January 2020 and the WMO Chief Scientist since May 2020. He studied physical Geography, botany, chemistry and geology at the University of Bern, Switzerland. He was awarded a PhD in Climate Science from the Faculty of Science, University of Bern. Before joining the WMO, Prof. Luterbacher has been the Chair of Climatology, Climate Dynamics and Climate Change and member of the Centre for international Development and Environmental Research at the Justus-Liebig-University Giessen, Germany. Professor Luterbacher brings leadership skills for the development of efficient collaboration between operational communities and research, cross-cutting and interdisciplinary science, in fostering teamwork between institutions in developing and developed countries. He worked in paleoclimate science and studied present climate change and extremes. He has over 200 peer-reviewed publications. He has demonstrated effectiveness in cooperating with policy-makers and stakeholders. He was a lead author of the IPCC Assessment Report (AR5) chapter 5 "Information from Paleoclimate Archives". Professor Luterbacher is a recipient of the Senior Visiting Scientist Award of the Chinese Academy of

Science, the Scientific Research Expert of the Academy of Athens and he is a member of the Academy of Sciences & Literature / Mainz, Germany.

19. **Assia Alexieva**, World Meteorological Organisation

Assia Alexieva is the Head of the Monitoring, Evaluation, Risk and Performance Unit of the World Meteorological Organization (WMO). In this role, she has been leading the development of a data-driven monitoring and decision support system as well as the modernization of tools and reporting formats. She also coordinates the strategic and operational planning processes. As WMO Gender Focal Point from 2013 to 2019, Dr Alexieva was one of the main organizers of the Conference on the Gender Dimensions of Weather and Climate Services. She coordinated all gender-related activities at WMO, including policy formulation and implementation, monitoring, UN inter-agency cooperation, and capacity development in the areas of unconscious bias, inclusive leadership and women's leadership. Dr Alexieva has previously worked at the UN Office of the High Commissioner for Human Rights (OHCHR) and at the International Union for Conservation of Nature (IUCN). She started her career at the U.S. Agency for International Development (USAID). Dr Alexieva holds a doctorate in Political Science from the Graduate Institute of International and Development Studies, Geneva. She is author of publications on foreign policy decision-making, counter terrorism, and the climate negotiations.

20. **Olga Bogdan**, World Meteorological Organisation

Olga Bogdan is Associate Officer, Cabinet Office of the Secretary-General, World Meteorological Organization. She is international relations professional with expertise in mission's mandate on human rights issues, including gender equality and women's rights, the question of the death penalty, prevention of torture and ill-treatment, children's rights, fighting trafficking in human beings, as well as health, and humanitarian affairs. She developed, collaboratively implemented and coordinated the first international Model United Nations program in Moldova (MDIMUN)" with the general theme: Human rights and conflict resolution", simulating the UN General Assembly, Human Rights Council, Security Council, Economic and Social Council.

21. **Catherine Power**, World Wildlife Fund

Director of Strategy and Partnerships, WWF International

22. **Elaine Geyer-Allely**, World Wildlife Fund

Deputy Leader, Governance Practice, WWF International

23. **Nathalie Simoneau**, World Wildlife Fund

Nathalie Simoneau is Lead Specialist, Gender and Social Inclusion, Integration and Performance, at WWF US. She is a health and nutrition specialist who holds a master's degree from McGill University's Centre for Indigenous Peoples' Nutrition and Environment. She focuses on mainstreaming gender and social issues into major WWF programs globally.

24. **Robert Ellis**, University of Exeter, UK

Robert Ellis is an Industrial Innovation Research Fellow in the Biosciences department at the University of Exeter, having obtained a PhD in Marine Biology from the University of Plymouth. His research focuses on adaptation and acclimation in aquatic animals exposed to environmental change. Specifically, how a mechanistic understanding of animal physiology can be used to improve the productivity and sustainability of aquaculture as well as be used to help secure future marine ecosystems in the face of climate change impacts. In 2014 he published the first study to show males and females responded differently to climate change and followed this up in 2017 highlighting sex as a wholly overlooked factor affecting species responses in climate change studies more generally.

25. **Hale Ann Tufan**, The GREAT Project

Hale Ann Tufan is associate director for the Feed the Future Innovation Lab for Crop Improvement, co-director of the Gender Responsive Researchers Equipped for Agricultural Transformation (GREAT) project. She is a research professor in the Department of Global Development and an adjunct faculty member of Plant Breeding and Genetics section at Cornell University. She has a multidisciplinary background spanning Ph.D.-level research in molecular plant pathogen interactions, plant breeding with CIMMYT, international agricultural research for development program management, and gender research and capacity development across sub-Saharan Africa. Her work focuses on building gender responsive agricultural research systems, through curriculum development and training delivery for GREAT, and leading research on priority setting, market research, gender research and on-farm testing for the Nextgen Cassava and ILCI projects. Hale is the 2019 recipient of the Norman Borlaug Field Award. She completed her PhD in molecular biology from the John Innes Centre, UK.

26. **Margaret Mangheni**, The GREAT Project

Margaret is an Associate Professor of Agricultural Extension Education at Makerere University. She has over 10 years of practical experience supporting integration of gender into higher education, having successfully spearheaded the integration of gender into the agriculture curriculum at the university. This process involved resource mobilization, advocacy and lobbying for management buy in, gender capacity development, and curriculum review. She teaches an undergraduate and postgraduate course on gender and agricultural development and supervises postgraduate students' research on a range of topics including gender, agricultural extension and rural development. She has won gender-focused research grants and published in the area of gender and agriculture. Her research and short-term consultancy projects to African national and regional organizations, including the Rwanda Agricultural Board, Uganda's National Agricultural Research Organization, ASARECA and RUFORUM, among others, focuses on review and advice on gender responsiveness of project proposals, gender training, evaluations, project design, and institutional analysis. She is a member of the international advisory committee of a USAID-funded project on Integrating gender and nutrition into agricultural extension and advisory services and a Co-Project Leader for GREAT.

27. **Brenda Boonabaana**, The GREAT Project

Brenda is a Lecturer at Makerere University, Uganda, Gender and Development Researcher and trainer, and has a PhD in Tourism, Development and Gender attained from the University of Otago, Dunedin, New Zealand (2012). She is a

Fellow of the African Women in Agricultural Research and Development (AWARD) and the International Food Policy Research Institute (IFPRI) under the GAAP2 project. Over the last 5 years, she has provided Gender expertise to several international and national development agencies. She will co-train on the following GREAT sessions: Self-awareness; Gender-Responsive Agricultural Research for Development; Data collection methods (Qualitative); Interview and Focus Group practice; Debrief of field visit and self-awareness and approaches to gender analysis using field visit data.

28. Elizabeth Asiimwe, The GREAT Project

Elizabeth is an agricultural extension professional awaiting graduation with an MSc in Agricultural Extension Education. Currently, she works at Makerere University's College of Agriculture and Environmental Sciences as a project administrative and financial support officer on the Gender-responsive Researchers Equipped for Agricultural Transformation (GREAT)-a BMGF funded project that trains agricultural research on gender responsive methods of research. She is also a part-time tutor in the College of Education and External studies where she teaches in-service secondary school teachers of agriculture. Elizabeth's work experience ranges from promotion of agricultural inputs in the private sector to research and research / communication work in academic and CGIAR institutions, respectively. Her research interests include gender, agriculture, human nutrition and adult learning.

29. Elisabeth Garner, The GREAT Project

Elisabeth Garner has expertise in gender and rural development with a focus on the differentiated needs, roles, and responsibilities in food and agriculture systems. As the lead for cross-cutting issues in the Innovation Lab for Crop Improvement, Elisabeth coordinates activities focused on gender, youth, resilience, diversity and nutrition. Before joining Cornell's Department of Global Development as a Gender and Agriculture Postdoctoral Associate, she worked with organizations such as the Food and Agriculture Organization, the World Food Programme, and the World Bank. She also worked as a planner in the Houston region and with Habitat for Humanity in the Boston area. Her dual-title PhD studies were in Rural Sociology and Women's Studies at Penn State University. As a Borlaug Food Security Fellow with the International Food Policy Research Institute (IFPRI), her research focused on the gender and social dynamics of regional food systems in Northern Ghana. She also has a Masters in Regional Planning from Cornell University and a B.A. in International Relations from SUNY Geneseo.

30. Devon Jenkins, The GREAT Project

Devon Jenkins is an agricultural development / communications specialist based at Cornell University. His background covers over 13 years of international and community development experience, with a focus on sustainable agriculture and holistic community development, and includes extensive work in West Africa. Devon is the GREAT project manager for the Cornell part of the team, and a trainer for communications and communications for institutional behaviour change. He has a master's degree in International Agriculture and Rural Development from Cornell.

31. Londa Schiebinger, Stanford University

Londa Schiebinger is the John L. Hinds Professor of History of Science at Stanford University, and Director of EU/US Gendered Innovations in Science, Health & Medicine, Engineering, and Environment. She is a leading international

expert on gender in science and technology and has addressed the United Nations on the topic of “Gender, Science, and Technology.” She is an elected member of the American Academy of Arts and Sciences and the recipient of numerous prizes and awards, including the prestigious Alexander von Humboldt Research Prize and Guggenheim Fellowship. Her global project, Gendered Innovations, harnesses the creative power of sex, gender, and intersectional analysis to enhance excellence and reproducibility in science and technology.

32. **Martina Schraudner**, Fraunhofer Centre for Responsible Innovation

Martina Schraudner heads the Center for Responsible Research and Innovation of the Fraunhofer IAO and has been on the board of acatech- Deutsche Akademie der Technikwissenschaften e.V. since January 2018. After studying biology and biotechnology and obtaining her doctorate at the Technical University of Munich, she held various positions at the gsf München, the ETH Zurich and the Forschungszentrum Jülich (FZJ) since 1993. Starting in 2001, she was initially involved in the research planning of the Fraunhofer headquarter. Since 2008, she has developed and established the Center for Responsible Research in Innovation. Prof. Dr. Martina Schraudner heads the department "Gender and Diversity in Technology and Product Development" at the Technical University of Berlin. She is active in national and international selection committees for application-oriented research and innovation projects, among others for the expert group "Structural Change" of the EU and the Advisory Board for Gender and Inclusion of Elsevier. Furthermore, she is a member of several University Councils (Paderborn, Landshut) and of the Board of the Competence Centre for Technik-Diversity-Chancengleichheit e.V.

33. **Shalva Weil**, Hebrew University

Shalva Weil is a graduate of the L.S.E. and Sussex University, UK. She is Senior Researcher at the School of Education at the Hebrew University of Jerusalem, Israel. In 2018 she was GIAN Distinguished Professor at JNU, New Delhi. She has published over 100 articles in scientific journals, edited books (Routledge, OUP, Marg, Magnes, Palgrave-Macmillan and more) and runs a women’s empowerment project for migrants from FSU in Israel’s slums. From 2013-2017, Prof. Weil served as Chair of the Cost Action IS1206 on Femicide Across Europe, heading a Management Committee from 30 countries. During 2015-6, she addressed the Parliaments of Portugal, Spain and Italy, and was invited to three UN meetings on femicide in Bangkok, New York and Vienna. In 2018, she co-edited the book Femicide across Europe (Bristol University Press, Policy). Her publications include Special Issue on femicide in Current Sociology, 2016; “Failed Femicides among Migrant Survivors” Qualitative Sociology Review (QSR), 2016; “Femicide of Girls in Contemporary India” Ex Aequo, 2016; Special Issue on Researching Femicide from a Qualitative Perspective in QSR, 2017; articles on femicide of elderly women, and orphans of femicide in Israel, in United Nations Studies Association, 2019; “Coronavirus and Femicide” in European Sociologist, 2020.

34. **Rebecca Blum**, Nordic Centre for Gender in Military Operations (NCGM)

Rebecca Blum is the senior analyst at Nordic Centre for Gender in Military Operations. She leads the analysis in current security and defence policy, and the global security environment, and its relation to the international Agenda on Women, Peace and Security and Gender Perspective in Military Operations. Rebecca leads the work with NCGM’s task as NATO Department Head for Gender in Military Operations and as such oversees developments in the discipline. She has a degree in Peace and Conflict Studies and anthropology. Rebecca has served with the UN and has been working in the

field on Security Sector Reform primarily in sub-Saharan Africa. Rebecca has also worked for the European Parliament with security and political analysis. In addition, Rebecca holds a degree in mediation and conflict resolution.

35. **Changmo SUNG**, Green Technology Center, Republic of Korea

Changmo Sung is President of GTCK (Green Technology Center Korea). He was formerly a President of Hyosung Corporation, responsible for its R&D Business Institute from 2006-2011. Prior to that, he was President of Inje University in Korea's Gyeongnam Province from 2004-2006. He has also served on Korea's Presidential Committee on Balanced National Development, the Presidential Commission on Policy Planning, and National Special Committee of Innovation Science Technology. Dr Sung was involved in planning and execution of Korean high technology clusters and commercialization for advanced regional economic development. He was also a tenured professor at University of Massachusetts, Lowell from 1993-2004, where he worked in the NSF Nanomanufacturing Center and Renewable Energy Research. He has published more than 100 technical papers and presentations on materials and nanoengineering. He received his Ph.D. from Lehigh University, USA, and MS degrees from Ohio State University and Seoul National University in the materials engineering field. GTCK is a government research institution to coordinate and advise green growth policies to related ministries and agencies, in particular for Korea's interdepartmental green technologies R&D. GTCK aims to be Korea's main gateway for global green technology cooperation and has recently been working with the Global Green Growth Institute (GGGI), the Green Climate Fund (GCF), the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), the United Nations Development Programme (UNDP), CityNet, and the Asian Development Bank (ADB).

36. **Chaewoon OH**, Green Technology Center, Republic of Korea

Chaewoon Oh is a Principal Researcher at the Division of Policy Research of the Green Technology Center (GTC), a government-funded research institute under the Ministry of Science and ICT (MSIT) in Korea. At GTC, she has been leading numerous research projects on technology-related international institutions that govern global climate technology cooperation under the UNFCCC. She received a B.A. from Korea University, a B.E. from Korea National Open University, and a M.A. in international relations and a Ph.D. in international studies from Waseda University. Her research focuses on international relations and international institutions & organizations in the field of global environmental politics, particularly in the issue area of climate change and international technology transfer.

37. **Kye Young LEE**, Green Technology Center, Republic of Korea

Kye Young Lee is a researcher in the Division of Policy Research of the Green Technology Center, currently pursuing research in the gender mainstreaming strategies of the UNFCCC and its constituted bodies and policy development processes in the Technology Mechanism. Prior to joining Green Technology Center, she was Energy Advisor at the Embassy of the Republic of Korea in Canada and a professional staff at the Consulate General of the Republic of Korea in Montreal and Permanent Mission to the International Civil Aviation Organization. She holds a BA from the University of British Columbia and MAs in International Relations from Waseda University and New York University.

38. **Inkyoung SUN**, Korea Advanced Institute of Science and Technology

Inkyoung Sun is the Head of the Office of Development Cooperation Research at the Science and Technology Policy Institute (STEPI) in Korea. Her research areas are science, technology, and innovation (STI), public policy, international relations, and energy innovation. In the Office of Development Cooperation Research at STEPI, she has led the “K-Innovation Partnership Program,” which has provided overseas STI policy consultations, and conducted several research projects on science diplomacy, R&D globalization, and STI-Official Development Assistance (ODA). As a principal investigator, she has recently presented a new conceptual framework of STI for SDGs that identifies major roles of STI achieving SDGs and analyzed emerging signals of non-traditional STI development cooperation in the era of SDGs. Dr. Sun also works as a delegation of Korea to the Global Science Forum (GSF) in OECD, contributing to the development of policy recommendations and guidelines for various issues in international STI collaborations such as “mobilizing sciences in times of crisis” and “research integrity within the global science ecosystem.” Her other expertise is in energy innovation and low-carbon energy transition. As a principal investigator in research projects including “Challenges and Opportunities in the Low Carbon Energy Transitions,” “A Voyage of Scientists and Engineers in the Energy Transition,” and “Energy R&D towards Sustainability,” she conducted comparative studies on national energy policy and energy innovation competitiveness using both qualitative case studies and quantitative analysis.

39. **Miyoko Watanabe**, Japan Science and Technology Agency

Miyoko O. Watanabe serves at Japan Science and Technology Agency (JST) as Executive Director and Director of Office for Diversity and Inclusiveness. She has a long experience of research in semiconductor physics at Toshiba R&D Center in Japan, and she conducted her physics research as a Postdoctoral Fellow at Dalhousie University, Canada, from 1986 to 1988 and as a Visiting Researcher at Nanoscale Physics Research Laboratory at the University of Birmingham, U.K., in 1997. Returning to Toshiba, she served there at different positions, including that of Executive Quality Leader at Innovation Division in the headquarters. She has also been Council Member of Science Council of Japan (SCJ) since 2011, and Vice-president of SCJ in charge of science and society since October 2017. She worked as Chair of Committee on Comprehensive and Synthetic Engineering in SCJ from 2014 to 2017. Dr. Watanabe has been a member of Specialist Committee on Priority Policy in Council for Gender Equality of Cabinet Office of Japan since 2014. She was the chair of both Science Agora in 2015 and 2016 and Gender Summit 10 in Tokyo in 2017. She was also appointed STEM girls ambassador by Cabinet office in June, 2018, and has been active to promote STEM girls activity.

40. **Heisook Lee**, Center for Gendered Innovations in Science and Technology Research (GISTeR)

Heisook Lee served as the founding president of the Center for WISET (Women in Science, Engineering and Technology) until March 2016, Professor Heisook Lee moved to GISTeR to focus on Gendered Innovations research in STEM fields. Professor Lee was a co-organizer of the Gender Summit Asia Pacific in 2015. She received her B.S. M.Sc. and Ph.D. degrees in Mathematics from Ewha Womans University, Korea, the University of British Columbia and Queen's University, Canada, in 1971, 1974 and 1978 respectively. She worked at Universitat Regensburg, Germany, as a postdoctoral fellow, and was later appointed Professor of Mathematics at Ewha Womans University in Seoul Korea. Professor Lee was Dean of the College of Natural Sciences, and Dean of Research affairs at Ewha between 1997 and 2001. She served as Dean of the Graduate School from 2006 to 2008. Professor Lee served as the founding Editor of Communications of the Korean Mathematical Society from 1986 to 1988 and as Chief Editor of the Journal of the Korean

Mathematical Society from 1994 to 1996.

She also served as the founding director of the WISE Center in Korea between 2001 and 2010. HRD in STEM fields has been her main research interest. She also served as president of the Korea Federation of Women Scientists associations from 2006 to 2007. She was a member of Presidential Advisory Council on Science & Technology and National Science & Technology Commission.

41. **Hee Young Paik**, Center for Gendered Innovations in Science and Technology Research (GISTeR)

Hee-Young Paik currently serves as the Director of the Center for Gendered Innovations in Science and Technology Research (GISTeR), Korea Federation of Women's Science and Technology Associations (KOFWST) in Korea and Professor Emeritus of Seoul National University. Dr Paik received Doctor of Science in Nutrition from Harvard School of Public Health in Boston, Massachusetts, USA. After receiving doctoral degree, she worked as a faculty member at Sookmyung Women's University and then at Seoul National University in Korea until February 2016. She worked in various professional organizations serving various roles including Presidents of the Korean Home Economics Association in 2013, the Korean Nutrition Society in 2015, and the Korea Federation of Women's Science and Technology Associations in 2014-2016. She was the Chair of the Korean DRIs Committee during 2002-2005, when the Dietary Reference Intakes for Koreans were newly developed in Korea. She was a member of the IUNS Council in 2005-2009, and received several honours including Excellent Research Awards in Science (2005), National Honour for High Achievements in Science (2008), and Asia-Pacific Clinical Nutrition Award (2009) and Blue Ribbon National Medal for Public Service (2012). Dr Paik served as the Minister of Gender Equality and Family, Republic of Korea, 2009-2011.

42. **Elizabeth Pollitzer**, Portia

Elizabeth Pollitzer, is the founder and director of Portia, which set up the Gender Summit in 2011 and has co-convened each summit since then. She is expert evaluator and expert adviser to the European Commission, and is involved in several EU projects. Portia's mission as an organization is to improve gender equality in STEM and promote the inclusion of the gender dimension in STEM. Dr Pollitzer has 20 years of experience in teaching and researching, at the Departments of Computing and the Management School at Imperial College, University of London. Her original training was in Biophysics. She now applies this scientific background to her work as director of Portia. Portia was the coordinator of the EU genSET project, that has led to the creation of the Gender Summit.

43. **Holly-Falk Krzesinski**, International Centre for Science Research, Elsevier

Holly J. Falk-Krzesinski is the Vice President, Research Intelligence on the Global Strategic Networks team at Elsevier. Her key role is building and maintaining long term relationships with research institutions and funders, giving voice to research leaders at those organizations within Elsevier to help the business deliver the most impactful solutions to support research globally. Dr. Falk-Krzesinski focuses on how insights from data and analytics guide strategic planning for research institutions, funders, and science policy organizations and her engagement activities include building partnerships around gender diversity and equity issues. Actively involved in promoting women leaders in STEM, Dr. Falk-Krzesinski is co-chair of the Gender Working Group at Elsevier and co-author on Elsevier's two global gender reports. She also previously served as the editor-in-chief of the AWIS Magazine. Prior to joining Elsevier, Holly was a faculty member and administrator at Northwestern University. Notably, there she launched the Chicago Collaboration

for Women in STEM and the Navigating the Professoriate and Beyond Tenure programs in support of career advancement for women faculty members in STEM fields.

44. **Rachel Herbert**, International Centre for Science Research, Elsevier

Rachel Herbert is a Senior Research Evaluation Manager at Elsevier. She has worked in scholarly publishing for over 10 years and has an active interest in the evaluation of research, particularly through the lens of gender. Her work focuses on developing analytical approaches to derive insights about the world of research using bibliometric and scientometric tools.

45. **Andrew Plume**, International Centre for Science Research, Elsevier

Andrew Plume is President of the International Center for the Study of Research (ICSR) and Senior Director of Research Evaluation at Elsevier. Dr Plume specializes in applying scientometric techniques (the scientific qualification and analysis of science) to market and competitive intelligence in scholarly publishing. From the lowest levels of aggregation, such as individual authors and articles, through to entire countries and subject domains, Andrew studies the growth and development of the scholarly literature by analyzing patterns of publications, citations and related indicators. Andrew frequently presents these topics to journal editors, learned and scholarly societies, and the publishing community.

46. **Ylann Schemm**, Elsevier Foundation

Ylann Schemm is the Elsevier Foundation's Director, and in this role she drives technology-enabled partnerships to advance diversity in science, build research capacity and support global health around the world. She has been an integral part of the Foundation's growth since joining as a Program Officer in 2008. In July 2020, Ylann was appointed the Chair for the Executive Council of Research4Life, a UN-publisher partnership to bridge access gaps for researchers, policymakers and healthcare practitioners in developing countries. In addition, Ylann currently serves as Elsevier's Director of External Partnerships, building on 15 years in corporate relations and responsibility roles and focusing on key technology, gender and sustainability collaborations. Prior to joining Elsevier in 2005, Ylann held various roles in publishing and the non-profit sector, representing the European Platform for Dutch Education at the European Commission. She started her career as a writer and researcher for Time Life Books and holds an MA in Film & Television Studies from the University of Amsterdam and a BA, magna cum laude in English from Amherst College in Massachusetts. Ylann is both American and Dutch and based in Amsterdam.

Details of this report's production partners

Center for Gendered Innovations in Science and Technology Research, ROK (GISTeR)

The Center for Gendered Innovations in Science and Technology Research (GISTeR) was established in February 2016 affiliated to the Korea Federation of Women's Science and Technology Associations (KOFWST). GISTeR aims to develop systems and policies to support researchers integrate sex and gender analysis into research and development. With the research fund from Ministry of Science and ICT (MSIT) of the Republic of Korea, GISTeR has conducted projects to develop and disseminate policies as well as building research teams in four major areas basic science, health/medicine, engineering/technology, and city planning/environment and developed case studies. It has developed DB which can be used globally by researches to better integrate sex and gender into research. GISTeR has played an active role in global networks of gendered innovations by knowledge sharing and empowering the capacity of researchers to create new values.

Portia Ltd

Portia is a not-for-profit organisation founded in London and established in 2001 by a group of women scientists at Imperial College London to advance understanding of gender issues in science, in participation, in organisational practices, and in science knowledge. In 2018 we established a wholly owned independent subsidiary in Germany, Portia gGmbH, which is also not-for-profit. Portia works through collaborative partnerships with research funding and research performing organisations, policy makers, Civil Society, private enterprise, and any stakeholder in science endeavours who is committed to gender equality and excellence in science.

Programme of 19th Gender Summit

Day 1, 19 August 2020 (KST; UTC+9)	
10:00-10:10	<p>Welcoming Comments</p> <ul style="list-style-type: none"> • Hee Young Paik, Director, Gendered Innovation Science and Technology Research Centre, Republic of Korea • Elizabeth Pollitzer, Director, Portia, UK • Byung-ki Cheong, President, GTC, Republic of Korea • Hwang-Hee Cho, President, STEPI, Republic of Korea
10:10-11:20	<p>Theme 1: Uniting Funders, Doers, and Custodians of Research to Strategically and Comprehensively Advance Quality Gender Research for SDGs</p> <p><i>This session draws on the concept of the triple helix as an expression of co-dependency between the purposes and capacities of research funders, research performing organisations, and publishers/ facilitators of research communication to advance scientific understanding and expertise needed to incorporate gender perspectives into planning of interventions for SDG targets.</i></p> <p>Moderator introducing Theme 1: 1-0 Changmo Sung, Extraordinary Professor of Graduate School of Energy and Environment, Korea University, United Nations Framework Convention on Climate Change (UNFCCC). Technology Executive Committee(TEC) Expert Member (2016-2017), Republic of Korea</p> <ul style="list-style-type: none"> • 1-1 Youngsuk Chi, Chairman, Elsevier, USA <i>Enabling inclusive sharing of knowledge for SDGs. Innovations introduced at Elsevier at the nexus of gender, sustainability, and development research communication</i> • 1-2 Eun Mee Kim, Professor of the Graduate School of International Studies at Ewha Womans University, Republic of Korea <i>UN SDGs and the Voluntary National Reviews (VNRs) on Gender: What Countries are Reporting and What is Missing in VNRs</i> • 1-3 Ana Maria F. Almeida, Co-lead of the Global Research Council's Working Group on Gender, Brazil <i>Mobilising, enhancing and harmonising the capacity of research funders to advance women and gender perspectives in research programmes for better quality of impact</i> • 1-4 Claudia Sarrico, Policy Analyst, OECD, Paris France <i>Solving societal problems by fostering gender equality in the educational, research, and innovation functions of HEIs</i>
11:20-12:45	<p>Theme 2: Improving Data Collection, and Reliability of Statistics and Indicators on Gender with Intersectionality Dimensions</p> <p><i>This session tackles the historical lack of reliable data on gendered social behaviours, cultures, and processes, which impact in different ways on quality of interventions and of change for women and men. It also examines important interconnections between biological (sex) and social diversities (gender) with other human conditions such as age, ethnicity, education, and social status.</i></p> <p>Moderator introducing Theme 2: 2-0 Insill Yi, Professor, Graduate School of Economics at Sogang</p>

	<p>University, 12th Commissioner of Statistics Korea, Republic of Korea</p> <ul style="list-style-type: none"> • 2-1 Papa Seck, Chief Statistician, UN Women, USA <i>Counted and visible: Measurements of gender and intersecting inequalities across UN agencies</i> • 2-2 Albert Motivans, Head of Data and Insights, Equal Measures 2030, USA <i>Exploring the policy space and gender data, using data across the SDGs and unpacking disparities</i> • 2-3 Cheryl Doss, Senior Lecturer and Associate Professor, U Oxford, UK <i>Lessons from the Gender Asset Gap Project</i> • 2-4 Jonathan Dawes, Professor, Deputy Director, Centre for Networks and Collective Behaviour, University of Bath, UK <i>Prioritisation within the SDG network: which SDG linkages matter most?</i> • 2-5 Jacqueline McGlade, Frank Jackson Foundation Professor of the Environment at Gresham College, Professor of Resilience and Sustainable Development at University College London and Professor at the Maasai Mara University in Kenya <i>Can gender equality help solve Climate Change</i>
<p>12:45- 14:10</p>	<p>Theme 3: Strengthening Science and Technology for Better Response to Societal Inequalities, Disruptions, and Emergencies This session is organised by Elsevier <i>The purpose of this session is to focus on the various aspects of risk-control, response and recovery in the face of a disaster, with particular focus on gendered aspects. Currently, COVID-19 is bringing about extraordinary circumstances across the globe, with heightened demand for immediate and precise action from medical and health related experts. Pandemics, natural disasters and other emergencies affect everyone, highlighting the importance of an intersectional approach that leaves no one behind.</i></p> <p>Moderator introducing Theme 3: 3-0 Anders Karlsson, Vice President of Global Strategic Networks, Elsevier, Japan</p> <ul style="list-style-type: none"> • 3-1 Jemilah Mahmood, Special Advisor to the Prime Minister of Malaysia on Public Health, Malaysia <i>Gender aspects of COVID-19 and the need for better data</i> • 3-2 Rajib Shaw, Professor, Graduate School of Media and Governance in Keio University, past Executive Director of the Integrated Research on Disaster Risk (IRDR), Japan <i>Biological Hazards and Disaster Risk Reduction: Gender Implications</i> • 3-3 Takako Izumi, International Research Institute of Disaster Science, Japan <i>Impact of COVID-19 on higher education institutions, and gender perspective in disaster response in Japan</i> • 3-4 Jocalyn Clark, Executive editor at The Lancet. Adjunct Professor at University of Toronto, Canada <i>Supporting the Global SDGs: Gender Equity Initiatives at The Lancet</i> • 3-5 Rosemary Morgan, Assistant Scientist, Johns Hopkins Bloomberg School of Public Health, USA <i>COVID-19 & the need for gender responsive pandemic preparedness and response plans</i>
<p>14:10- 15:30</p>	<p>Theme 4: Global Climate Technology Cooperation Projects and Gender-Mainstreaming Efforts (Session organised by Green Technology Centre, Rep.Korea) <i>This session examines the gender-mainstreaming efforts made by the international organizations of the CTCN and the GCF in their support to developing countries under the UNFCCC. Also, it features the research results</i></p>

and implications for Korea on implementing its future gender-mainstreaming strategies for climate technology cooperation with developing countries on the basis of the gender-mainstreaming efforts of the CTCN and the GCF.

Moderator introducing Theme 4: 4-0 Kye Young Lee, Researcher, GTC, Republic of Korea

- 4-1 Hyung-ju Kim, Director General, GTC, Republic of Korea
Global climate technology cooperation efforts under the UNFCCC as a government funded research institute and the meaning of gender-mainstreaming
- 4-2 Karina Larsen, Knowledge Communications Manager (Gender Focal Point), CTCN, Denmark
Gender responsive technology development and transfer
- 4-3 Seblewongel Negussie, Gender and Social Specialist, Republic of Korea
GCF's Gender Policy and Implementation
- 4-4 Michelle Winthrop, Policy Director, Irish Aid, Department of Foreign Affairs and Trade, Ireland
Ireland's role in championing gender-responsive climate action, in policy and development programmes
- 4-5 Oh Chaewoon, Principal Researcher, GTC, Republic of Korea
Implications for Korea on implementing its future gender-mainstreaming strategies for climate technology cooperation with developing countries on the basis of the gender-mainstreaming efforts of the CTCN and the GCF.

Distinguished Plenary Session

MC: Jennifer Hyunjong Shin, Professor, KAIST, Republic of Korea

Congratulatory and Policy Statements from Ministers and Senior Leaders

- 15:30-
16:40
- Kim Sang-hee, Deputy Speaker of the 21st National Assembly, Republic of Korea
 - Choi Ki-young, Minister of Science and ICT, Republic of Korea
 - Byun Jae-il, Member of National Assembly, Republic of Korea
 - Jo Myung-hee, Member of National Assembly, Republic of Korea
 - Patrick Child, Deputy Director General in DG Research and Innovation at the European Commission and Acting Director for the Clean Planet, Belgium

Guest of Honour & Plenary Speech:

- Mr. Ban Ki-moon, Former Secretary-General of the UN
Women empowerment and SDGs

Theme 5: Science for Peace and for Safe and Secure Societies

This session examines scientific evidence and analyses of the widespread and destructive consequences of violence against women and girls across a range of contexts, to recommend how gender violence can be prevented and societies made safe and more secure in times of discord and conflict.

16:40-
17:50

Moderator introducing Theme 5: 5-0 Eun Ha Chang, Director, Center for International Development and Cooperation, Korean Women's Development Institute, Republic of Korea

- 5-1 Rebecca Blum, Strategic Analyst - Security and Defence Policy and International Affairs and Development, Nordic Centre for Gender in Military Operations (NCGM), Sweden
Integrating gender perspectives into the planning, execution and evaluation phases of military operations and exercises
- 5-2 Fredrik Bondestam, Director, The Swedish Secretariat for Gender Research, University of

	<p>Gothenburg, Sweden</p> <p><i>Gender-based violence in global higher education: Prevalence, prevention and ways to move forward</i></p> <ul style="list-style-type: none"> • 5-3 Shalva Weil, Senior Researcher, School of Education, Hebrew University of Jerusalem, Israel <i>Ensuring safe societies by femicide prevention. A global perspective.</i> • 5-4 Gunhui Chung, Assistant Professor, Department of Civil Engineering, Hoseo University, and member of research team at GISTeR, Republic of Korea <i>Gender empowerment of the society improves resilience in disaster management.</i>
17:50-19:00	Special Performance(Korean Creative Dance: N.O.T-No One There)
Day 2, 20 August 2020 (KST; UTC+9)	
10:00-11:40	<p>Theme 6: Developing and Applying Methods of Sex/Gender Analysis in Research for SDGs</p> <p><i>This session presents latest advances in research methods to understand when, why and how biological (sex) and socio-cultural (gender) characteristics of studied populations, and in their ecological contexts, impact on research results and differentiate quality of research outcomes for women/females and men/males.</i></p> <p>Moderator Introducing Theme 6: 6-0 Martina Schraudner, Board Member at acatech, Professor at Fraunhofer and at Technical University Berlin, Germany</p> <ul style="list-style-type: none"> • 6-1 Holly J. Falk-Krzesinski, Vice President, Research Intelligence, Global Strategic Networks, Elsevier, USA <i>New analysis of the literature on SDGs to identify across which SDGs (beyond SDG5) gender research is being incorporated and where gaps may still exist</i> • 6-2 Jenny Graves, VC's Fellow & Distinguished Professor, Ecology, Environment & Evolution, La Trobe U, Australia <i>Genetic studies on the differences between the sexes and what they mean for gender research and gender equity</i> • 6-3 Londa Schiebinger, Professor, History of Science, Stanford U, and Director of the EU/US Gendered Innovations in Science, Health & Medicine, Engineering, and Environment, USA <i>Intersectional perspectives in digitalisation of science and society</i> • 6-4 Katrin Groth on behalf of the INGER study group, Scientist, German Environment Agency (UBA), Germany <i>Integrating sex/gender methods into human biomonitoring studies</i> • 6-5 Shirin Heidari, Senior Fellow in Residence at the Global Health Centre at the Graduate Institute of International and Development Studies, and Chair and President of GENDRO, Switzerland <i>Advancing best practice for incorporation of gender analysis in health research</i> • 6-6 Sun-Young Rieh, Professor, University of Seoul, Republic of Korea <i>Gender Issues in Community Design for Ageing in Place</i>
11:40-13:20	<p>Theme 7: Adding Value by Exploiting Cross Cutting and Spill-over Benefits of Gendered Innovations</p> <p><i>This session will focus on improving the quality of impact of SDG interventions to achieve equal change benefiting in the circumstances women and men through multi-stakeholder actions involving researchers, policy makers and gender experts.</i></p> <p>Moderator: Introducing Theme 7: 7-0 Oakla Cho, Emeritus Professor, Sogang University, Republic of Korea</p>

- 7-1 Dominique Charron, Vice-President, Programs and Partnerships, International Development Research Centre, Canada
Promoting Gender Transformative Approaches to Research and Capacity Building for the SDGs
- 7-2 Muneeza Mehmood Alam, World Bank, USA
Sustainable Mobility for All from a gender perspective
- 7-3 Jürg Luterbacher, Director Science and Innovation at the World Meteorological Organization (WMO), Switzerland.
Gender dimensions of weather and climate services
- 7-4 Rabia Ferroukhi, Director Knowledge, Policy, Finance, International Renewable Energy Agency (IRENA), UAE, and Christine Lins, Executive Director, Global Women's Network for Energy Transition (GWNET), Austria
Women in and for sustainable energy
- 7-5 Marco Lambertini, Director General, WWF International, Switzerland, and Alice Ruhweza, Regional Director for Africa, WWF International, Switzerland
Nature Conservation through the Gender Lenses
- 7-6 Nayoung Kim, professor, School of Medicine, Seoul National University, Republic of Korea
Developing gender-sensitive alcohol policy: Harmonizing scientific evidences and societal perception of alcohol in Korea

Theme 8: Advancing Science and Inclusive Career Pathways in Sustainability-related Emerging Research and Innovation Fields (*Session organised by Science and Technology Policy Institute, Rep.Korea*)

This session examines conditions and opportunities for developing careers in sustainability-related fields, many of which are necessarily interdisciplinary and emerging and therefore are not burdened by traditional male dominated research cultures and traditions, and more welcoming to women, as well as integration of gender perspectives into science practice.

Moderator: Introducing Theme 8: 8-0 Eun Mee Kim, Professor of the Graduate School of International Studies at EWHA Womans University, Republic of Korea

- 8-1 Sarah Huggett, Head of Analytical Services APAC, Elsevier, Singapore
The Researcher Journey Through a Gender Lenses: An examination of research participation, career progression, and perceptions across the globe
- 8-2 Curt Rice, Rector, Oslo Metropolitan U, Norway
Engaging men in women's advancement and empowerment in science endeavours
- 8-3 Carlotta M. Arthur, Director, Clare Boothe Luce Programme for Women in STEM, Henry Luce Foundation, USA
Crossing disciplinary boundaries in researcher training to address large-scale, real-world problems
- 8-4 Laura Camfield, Professor, Development Research and Evaluation, University of Anglia, UK
Integrating gender analysis into postgraduate training on international development
- 8-5 Myongsook S. Oh, Chair, Board of Women in Science, Engineering & Technology (WISSET) Centre, President of Korea Society for Engineering Education, Professor of Hongik University, Chair, The 4th National Basic Plan for Human Resources in Science & Technology (2020-2025), Republic of Korea
Expanding career choices of female chemical engineering students through chemical processes

13:20-
15:15

contributing to SDGs

- 8-6 Dorothea Strueber, Manager, SDSN, Spain

Mobilising the research community of the Sustainable Development Solutions Network to adopt gender perspectives in their research for SDGs

- 8-7 So Young Kim, Professor, KAIST, Seoul, Republic of Korea

A Sticky Pipeline: Why So Few Women of Science at the Top?

Theme 9: Shaping the Next 10 Years of Research and Interventions for SDGs

This session looks at the next 10 years of the UN Sustainable Development agenda to identify: what gender research can be done in the near, medium and long term; where there is a need to prioritise specific research to fill in important gaps in knowledge, and how to increase participation of women scientists in sustainability agenda.

Moderator Introducing Theme 9: 9-0 Elizabeth Pollitzer, Director, Portia, UK

- 9-1 Miyoko Watanabe, Deputy Executive Director, Japan Science and Technology Agency ; Director, Office for Diversity and Inclusion, JST, Japan

Advancing BRIDGE (better research, innovation and development for gender equality) through cooperation between universities, industry and society

- 9-2 Ylann Schemm, Director, Elsevier Foundation, Netherlands

Initiatives and programmes for engaging women scientists in developing world in research for SDGs

- 9-3 Heisook Lee, Director for policy, Center for Gendered Innovations for Science & Technology Research (GISTeR) Center, Professor Emeritus, Ewha Womans University, Republic of Korea

Gendered Innovations in accountable data management research for sustainable development

- 9-4 David Griggs, Professor, Monash Sustainable Development Institute, Australia

An integrated approach - gender and SDG interlinkages

- 9-5 Lydie Hakizimana, Interim CEO, African Institute for Mathematical Sciences, Rwanda

Building science in Africa with full participation of women as researchers, educators and leaders

- 9-6 Dorothy Nyambi, President & CEO, Mennonite Economic Development Associates (MEDA), Canada

Catalyzing the earning potential of disadvantaged women, men and youth by integrating them into viable economic systems

15:15-
16:55

