

**United Nations Commission on the Status of Women
Fifty-eighth session
10 – 21 March 2014
New York**

INTERACTIVE EXPERT PANEL

**Access and participation of women and girls in education, training,
science and technology, including for the promotion of women’s
equal access to full employment and decent work**

**Focus: The transition of women from education to full employment
and decent work, with a particular focus on employment in the
areas of science, technology, engineering and mathematics**

Tuesday, March 18, 2014, 3.00 pm– 6.00 pm

**Gendered Innovations: Making Science and Technology Responsive
to Women’s Needs***

by

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*The views expressed in this paper are those of the author and do not necessarily represent those of the United Nations.

United Nations Commission on the Status of Women
Fifty-eighth session
10 – 21 March 2014
New York

Introduction

Governments, non-governmental agencies, and research institutions have taken three strategic approaches to gender equality and women’s empowerment in science and technology (S&T) over the past several decades:

1. “Fix the Numbers of Women” focuses on increasing women's participation.
2. “Fix the Institutions” promotes gender equality in careers through structural change in research organizations.
3. “Fix the Knowledge” or “gendered innovations” stimulates excellence in science and technology by integrating gender-based analysis into research.

Each strategy is important. This paper focuses on the progress made in the third approach over the past three years. The agreed conclusions adopted by the Commission on the Status of Women (now UNWomen) and transmitted to the Economic and Social Council March 2011 called to make science and technology responsive to women’s needs by:

“(rr) Encourag[ing] the integration of a gender perspective in the science and technology curricula throughout all stages of education and continuous learning, and the use of gender-based analysis and gender impact assessments in research and development in science and technology, and promote a user driven approach to technology development in order to increase the relevance and usefulness of advancements in science and technology for both women and men;”ⁱ

“Gender-based analysis ... in science and technology” is central to these efforts. “Fixing the knowledge” or “gendered innovations” creates gender-responsible science and technology, thereby enhancing the lives of both women and men worldwide. This paper offers examples of gender-based analysis that produced sustainable S&T more responsive to women’s needs and sets out three inter-related policy areas that support this work.

Why is gender-based analysis of S&T important?

Gender bias in S&T is expensive in terms of lives and costs, and limits benefits to society. The lack of menstrual hygiene products in rural India, for example, may lead girls to drop out of secondary school.ⁱⁱ In automotive engineering, classing short people (many women, but also many men) as “out-of-position” drivers can lead to greater injury in accidents.ⁱⁱⁱ In medicine, osteoporosis has long been defined as a disease primarily of post-menopausal women—an assumption that has shaped screening, diagnosis, and treatment. Yet, after age 75, men account for a third of osteoporosis-related hip fractures.^{iv} In basic biomedical research, not using female cells, tissues, and animals can lead to greater health risks for women. For example, ten drugs were recently withdrawn from the U.S.A. market because of life-threatening health

United Nations Commission on the Status of Women
Fifty-eighth session
10 – 21 March 2014
New York

effects. Eight of these posed “greater health risks for women than for men.”^v Not only does developing a drug cost billions—but when drugs failed, they caused human suffering and death. We cannot afford to get the research wrong. These are the types of evidence-based problems that gender analysis in S&T seeks to overcome.

Making Science and Technology Responsive to Women’s Needs

To support the 2011 Commission on the Status of Women’s resolutions, a collaborative team of scientists, engineers, and gender experts from the U.S.A., European Union, and Canada developed agreed methods of gender-based analysis for S&T.^{vi} Korea and Taiwan have now joined these efforts (see below). Gender-responsible S&T takes into account the biological and social needs of both women and men and leads to gendered innovations. Examples include:

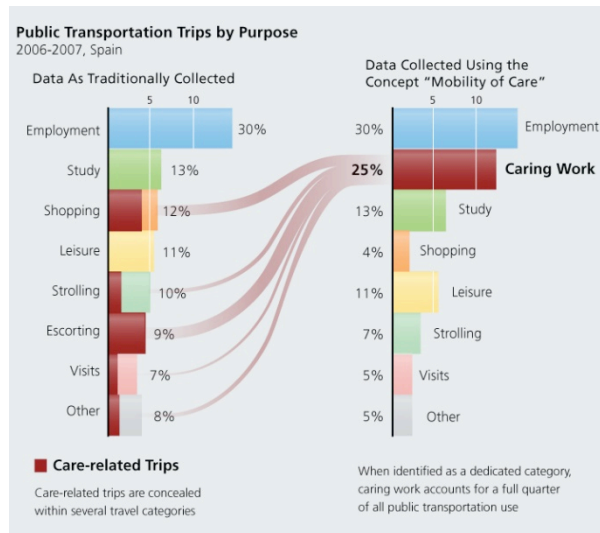
1. Public Transportation: Conceptualizing the “Mobility of Care”^{vii}

A green economy is central to the post-2015 sustainable development goals. Efficient and equitable public transportation supports sustainable development.

How can civil engineers create public transportation systems that best serve all users’ needs? Governments collect data to understand how people use trains, subways, and bus systems. The gender-based analysis in this case study reconceptualizes how data are collected.

Traditionally, governments collect data in eight trip categories: employment, education, shopping, leisure, and the like (see chart, left-hand column). People who travel solely for employment tend to travel directly from home to work and back again. None of these traditional trip categories captures caring work—caring for children, the elderly, or households. People who travel for employment plus caring work have different travel patterns. They tend to travel from home to daycare and on to work. Leaving work, they may stop at a food market, a dry cleaners, and a daycare before returning home.

The chart (right-hand column) shows what happens when “caring work” is conceptualized as a category in data collection. It becomes the second largest, and one that needs to be considered when designing travel routes. Conceptualizing the “mobility of care” as a category of analysis creates more efficient transportation systems, reducing costs and enhancing the quality of life.^{viii}



United Nations Commission on the Status of Women
Fifty-eighth session
10 – 21 March 2014
New York

2. Water Infrastructure: Tapping into Women’s Local Knowledge^{ix}

Nearly one billion people worldwide lack reliable access to water. In sub-Saharan Africa, women and girls spend some 40 billion hours annually carrying water.

Here the gendered innovation is tapping into this local knowledge through participatory research. Because carrying water is women’s work, many women have detailed knowledge of soils and the water they yield. Civil engineers deciding on well placement found that tapping into women’s knowledge provides the best water yields. Such community participation vastly improves water services and reduces women’s time burden.

And it’s a potential win-win: when girls aren’t carrying water, they tend to go to school, and potentially break the cycle of poverty. This supports the target of eradicating extreme poverty. It also addresses global challenges surrounding water and resource efficiency.

3. Gender Medicine: Lowering Health Care Cost by Effectively Preventing and Treating Women’s and Men’s Disease

One important target for sustainable development is improved maternal health. This is crucially important, but efforts now extend also to girl’s and women’s non-reproductive health across the lifespan. The issue is equal access to health care and also, importantly, the quality of care provided. Most diagnostic and therapeutic strategies in clinical medicine, even those developed with public funds, have focused on men.^x The result is that women are often mis- and under-diagnosed.

Gender medicine is a new approach that integrates considerations of both biological sex and sociocultural gender into medical research.^{xi} Researchers now understand, for example, that women have different symptoms and patterns of heart disease.^{xii} National legislation is currently being proposed, in Italy for example, to guarantee gender-appropriate medical care. The goal is to reduce costs to national healthcare systems by improving prevention and medical treatments.^{xiii}

4. BanaPads: Keeping Girls in School, Creating Jobs for Local Women

The 2011 Commission on the Status of Women’s resolutions called for “access and participation of women and girls in education.” Gender-based analysis in S&T is important to achieving that goal. In many parts of the developing world, girls and women lack access to affordable sanitary pads. As a result, girls tend to drop out of school at menarche.^{xiv} In Uganda, BanaPads are manufactured locally from eco-friendly (100% biodegradable) waste from banana plantations. These materials are organic, highly absorbent, and their use in pads recycles otherwise wasted resources. The manufacture of these pads keeps village girls in school and creates jobs for local women.^{xv}

United Nations Commission on the Status of Women
Fifty-eighth session
10 – 21 March 2014
New York

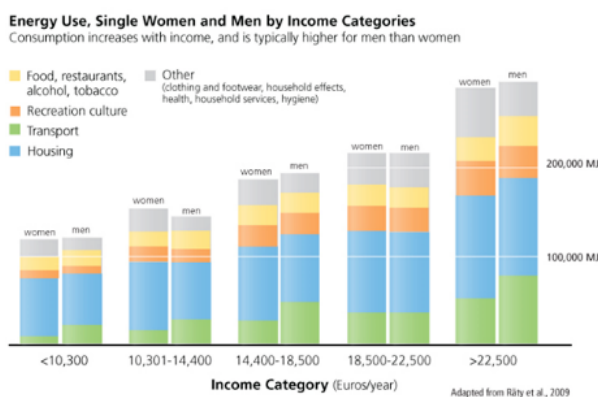
5. Male Birth Control: Sharing the Burdens of Contraception

The lack of a male equivalent to the birth control pill makes men unable to share the burdens of contraceptives. To achieve the 2011 Commission on the Status of Women’s resolutions calling for “equal access to employment and decent work,” men need to share the physical, moral, and economic burdens of birth control. One experimental male contraceptive is Reversible Inhibition of Sperm Under Guidance (RISUG). RISUG injects a polymer into the vas deferens and induces infertility for up to ten years; it also promises to be reversible.^{xvi} Developing male birth control (beyond the condom) would contribute to reducing unwanted pregnancies—a concern as the world’s population nears 6.8 billion—and allow men and women to share more equally the burdens of contraception.

7. Increasing Food Security through Land Ownership

Landesa Rural Development Institute has partnered with the Gates foundation to improve food security and income for 200,000 households in rural India by increasing women’s land ownership. A “gender-transformative project,” Landesa works with state government programs to grant small plots of land to low-caste people and to ensure that the women’s names appear on the land title, either jointly with their husbands or individually. The land supplies food for the household.^{xvii}

8. Gender and Climate Change



Strategies for managing global warming fall into two broad categories: mitigation and adaptation. While much research has focused on supporting the world’s poorest women’s adaptation to global warming, gender-based analysis of mitigation in industrialized countries (the major polluters) is in its infancy. Questions to be investigated include how gender should be considered in strategies to curb greenhouse gas emissions through changes in energy supply, transportation, agriculture, and urban infrastructure, as well as lifestyle.

Gender-based analysis combines gender with other social factors, such as income, educational background, and geographic location. The chart disaggregates energy use by gender and income.

United Nations Commission on the Status of Women
Fifty-eighth session
10 – 21 March 2014
New York

While men use slightly more energy in each income level, wealthy women and men use significantly more energy than poor women and men.

Many new areas relate to gender-based environmental research, such as urban planning and environmental chemicals, but more gender-based analysis is needed to support policy.^{xviii}

Next Steps: Policy Supporting Science and Technology Responsive to Women’s Needs

The 2011 Commission on the Status of Women’s resolutions call for “strengthening national legislation, policies and programmes.” Policy is important to research excellence, gender equality, discovery, and innovation. The next step in the context of the post-2015 sustainable development goals is to implement policies that support S&T responsive to women’s needs. Three inter-related policies support this effort:

1. **Granting agencies** can require applicants to explain how gender analysis is relevant to their proposed research. Several granting agencies have developed innovative policies in this area. More granting agencies need to adopt these policies.

- a. To better meet its grand societal challenges, the European Commission has made considering gender-based analysis in research an important part of Horizon 2020, their new funding framework (2014-2020).^{xix} The Commission identified some fifty fields of science and technology that gender analysis could benefit, including computer hardware and architecture, biodiversity, ecology, biophysics, oceanography, geosciences, organic chemistry, aeronautics, space medicine, and nanotechnology. The Commission also supports gender training as an eligible cost.
- b. Since 2010, all thirteen Canadian Institutes of Health Research have required applicants to consider gender in their research.^{xx}
- c. The Bill & Melinda Gates Foundation has required applicants to consider gender in agricultural research since 2008 and reaffirmed this requirement in 2013.^{xxi} Foundation program officers also offer assistance in incorporating gender analysis into research.
- d. A number of national research councils, such as the Irish Research Council (2013) and the Research Council of Norway (2014) also ask applicants to consider the gender-based analysis and impacts in the research proposal.^{xxii}
- e. The Republic of Korea has founded the Advanced Institute of Women in Science, Engineering and Technology (WISET) supported by the Ministry of Science, Education, and Technology, and since 2013 has a Gendered Innovations research group focused on integrating gender-based analysis into research.^{xxiii}
- f. Taiwan has founded an “Infuse Gender Analysis into Science and Research” group.^{xxiv} The National Science Council of Taiwan also supported the International Conference on Women in Science and Technology in 2013 that networked gender researchers across Asia.^{xxv}

United Nations Commission on the Status of Women
Fifty-eighth session
10 – 21 March 2014
New York

2. **Editorial boards of peer-reviewed journals** can require sophisticated gender-based analysis when selecting papers for publication. A number of journals have implemented this policy. *Clinical Orthopaedic and Related Research* has recommended that studies be sufficiently powered to analyze gender (see box).^{xxvi} In 2012 each of the American Physiological Society's fourteen journals required that authors report and analyze sex.^{xxvii}

The European Association of Science Editors expects to launch a set of standard policies for reporting gender in S&T journals June 2014. Journals, such as *Science* and *Nature*, should take the lead in implementing these policies. More journals need to take adopt these policies.

3. **Educational Institutions** from elementary school to high school and graduate school should integrate the results of gendered innovations into their curricula. Quality primary, secondary, and tertiary education require curricula that incorporate the results of gender-based analysis. RWTH Aachen University, Germany, for example, has implemented (2013) a course on Gender and Diversity in its School of Engineering.^{xxviii}

Clinical Orthopaedic and Related Research recommends that authors:

1. Design studies that are sufficiently powered to answer research questions both for males and females (or men and women) if the health condition being studied occurs in both sexes/genders.
2. Provide sex- and/or gender-specific data where relevant in all clinical, basic science, and epidemiological studies.
3. Analyze the influence (or association) of sex or gender on the results of the study, or indicate in the Patients and Methods section why such analyses were not performed, and consider this topic as a limitation to cover in the Discussion section. Readers need to know whether the results generalize to both sexes/genders.
4. Indicate (if sex or gender analyses were performed post-hoc) that these analyses should be interpreted cautiously because they may be underpowered (leading to a false conclusion of no difference). If there are many such analyses, indicate that they may lead to spurious significance, and an erroneous conclusion of a sex- or gender-related difference.

ⁱ The Commission on the Status of Women, "Agreed Conclusions," adopted 14 March 2011. <http://www.un.org/womenwatch/daw/csw/55sess.htm#agreed>.

ⁱⁱ Kumar, A. & Srivastava, K. (2011). Cultural and Social Practices Regarding Menstruation among Adolescent Girls. *Social Work & Public Health*, 26 (6), 594-604.

ⁱⁱⁱ Augenstein, J., Perdeck, E., Bahouth, G.T., Digges, K.H., Borchers, N., & Baur, P. (2005). Injury Identification. *Proceedings of the 19th International Technical Conference on the Enhanced Safety of Vehicles*. Washington, D.C.

^{iv} Szulc, P., Kaufman, J., & Orwoll, E. (2012). Osteoporosis in Men. *Journal of Osteoporosis*, 1-5.

United Nations Commission on the Status of Women
Fifty-eighth session
10 – 21 March 2014
New York

- ^v United States General Accounting Office. (2001). *Drug Safety: Most Drugs withdrawn in Recent Years had Greater Health Risks for Women*. Washington, DC: Government Publishing Office.
- ^{vi} <http://genderedinnovations.stanford.edu/methods-sex-and-gender-analysis.html>.
- ^{vii} <http://genderedinnovations.stanford.edu/case-studies/transportation.html#tabs-2>.
- ^{viii} Sánchez de Madariaga, I., & Roberts, M. (Eds.) (2013). *Fair Share Cities: The Impact of Gender Planning in Europe*. London: Ashgate.
- ^{ix} <http://genderedinnovations.stanford.edu/case-studies/water.html#tabs-2>.
- ^x Beery, A., & Zucker, I. (2011). Sex Bias in Neuroscience and Biomedical Research. *Neuroscience and Biobehavioral Reviews*, 35 (3), 565-572; Taylor, K., Vallejo-Giraldo, C., Schaible, N., Zakeri, R., & Miller, V. (2011). Reporting of Sex as a Variable in Cardiovascular Studies using Cultured Cells. *Biology of Sex Differences*, 2 (11), 1-7.
- ^{xi} Oertelt-Prigione, S. & Regitz-Zagrosek, V. (Eds.) (2012). *Gender Aspects in Clinical Medicine*. London: Springer Verlag; Regitz-Zagrosek, V. (Ed.) (2012). *Gender Differences in Pharmacology*. London: SpringerVerlag; and Schenck-Gustafsson, K., DeCola, P., Pfaff, D., & Pisetsky, P. (Eds.) (2012). *Handbook of Clinical Gender Medicine*. Basel: Karger.
- ^{xii} <http://genderedinnovations.stanford.edu/case-studies/heart.html#tabs-2>.
- ^{xiii} Chamber of Deputies of the Italian Parliament, Bill Proposing a Law on Gender Medicine, August 5, 2013.
- ^{xiv} Dasgupta, A. & Sarkar, M. (2008). Menstrual Hygiene: How Hygienic is the Adolescent Girl? *Indian Journal of Community Medicine*, 33(2), 77-80.
- ^{xv} <http://se-forum.se/2013/02/26/banapads-keeps-village-girls-in-school-and-to-create-jobs-for-local-women/>.
- ^{xvi} Cheng, C. & Mruk, D. (2010). New Frontiers in Non-Hormonal Male Contraception. *Contraception*, 82 (5), 476–482.
- ^{xvii} <http://www.gatesfoundation.org/What-We-Do/Global-Development/Agricultural-Development/Creating-Gender-Responsive-Agricultural-Development-Programs>.
- ^{xviii} <http://genderedinnovations.stanford.edu/case-studies/climate.html#tabs-2>; <http://genderedinnovations.stanford.edu/case-studies/urban.html>; <http://genderedinnovations.stanford.edu/case-studies/environment.html>.
- ^{xix} European Commission. (2013). Fact Sheet: Gender Equality in Horizon 2020. Brussels, Dec. 9. https://ec.europa.eu/programmes/horizon2020/sites/horizon2020/files/FactSheet_Gender_2.pdf.
- ^{xx} Canadian Institutes of Health Research. (2012). Gender, Sex and Health Research Guide: A Tool for CIHR Applicants. Enacted December 2010. <http://www.cihr-irsc.gc.ca/e/32019.html>.
- ^{xxi} Gates Foundation. (2013). Agricultural Development: Creating Gender-Responsive Agricultural Development Programs. <http://www.gatesfoundation.org/What-We-Do/Global-Development/Agricultural-Development/Creating-Gender-Responsive-Agricultural-Development-Programs>.
- ^{xxii} Irish Research Council. (2013). Research Project Grants Schemes, Terms and Conditions. http://genderedinnovations.stanford.edu/IRC_RPG_2013_TermsConditions_FINAL_2.pdf. Research Council of Norway. Gender Balance and Gender Perspectives in Research and Innovation. February 2014. For other policies, see <http://genderedinnovations.stanford.edu/sex-and-gender-analysis-policies-major-granting-agencies.html>.
- ^{xxiii} <http://www.wiset.re.kr/eng/>.
- ^{xxiv} <http://www2.tku.edu.tw/~gmist/>.
- ^{xxv} <http://www.2013iconwist.com.tw/>.
- ^{xxvi} Leopold, S. Beadling, L, Dobbs, M., Gebhardt, M., Lotke, P., Manner, P., Rimnac, C., & Wongworawat, M. (2014). Fairness to All: Gender and Sex in Scientific Reporting. *Clinical Orthopaedics and Related Research*, 472, 391–392.
- ^{xxvii} Miller, V. (2010). In Pursuit of Scientific Excellence: Sex Matters. *American Journal of Physiology - Heart and Circulatory Physiology*, 302, H1171-H1172.

United Nations Commission on the Status of Women
Fifty-eighth session
10 – 21 March 2014
New York

^{xxviii} <http://www.gdi.rwth-aachen.de/engl/>.