

GENDERED RESEARCH AND INNOVATION:

INTEGRATING SEX AND GENDER ANALYSIS
INTO THE RESEARCH PROCESS

LEAGUE OF EUROPEAN RESEARCH UNIVERSITIES

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About LERU

LERU was founded in 2002 as an association of research-intensive universities sharing the values of high-quality teaching in an environment of internationally competitive research. The League is committed to: education through an awareness of the frontiers of human understanding; the creation of new knowledge through basic research, which is the ultimate source of innovation in society; the promotion of research across a broad front, which creates a unique capacity to reconfigure activities in response to new opportunities and problems. The purpose of the League is to advocate these values, to influence policy in Europe and to develop best practice through mutual exchange of experience.

EXECUTIVE SUMMARY

- LERU universities aim to significantly contribute to creating new knowledge and to finding solutions to global challenges, such as climate change, security and public health. LERU universities realise that in order to do so effectively, they need to take into account potential sex and gender differences with respect to the way research is designed, carried out and implemented. Without considering sex and gender analysis in research and innovation (GRI), the scope, impact and utility of research results may not be equally valid for both men and women.
- For example, research shows that women tend to present different heart attack symptoms than men. This knowledge was absent until recently, simply because most research had been carried out on men only and the assumption was made that there were no significant differences between the sexes. Producing research results that apply equally to men and women has the potential to improve lives and to save money.
- It is widely acknowledged that not all research questions and projects, such as certain fields of theoretical mathematics, have a gender dimension. Yet, recognising the wide-ranging importance of gender analysis, the European Commission designated over 130 subfields where data show that gender analysis can benefit research—these range from computer hardware and architecture to nanotechnology, oceanography, geosciences, organic chemistry, aeronautics, space medicine, biodiversity, ecology, biophysics, among others. It is, thus, crucially important to consider GRI factors systematically throughout the research process before they are ruled out as non-significant. Considering GRI encompasses the entire research cycle: from making decisions about priorities for research spending, through deciding on the research focus, methodology and data collection, to analysing and reporting data, and even to disseminating and applying the results. Asking GRI questions, and integrating them in research where appropriate, will contribute not only to individual researchers' and to LERU universities' commitment to excellent research, but also to responsible research and innovation to the benefit of society at large.
- This paper outlines research areas with a clear need for GRI and explains the role of Social Sciences and Humanities research in GRI. It gives concrete examples of research projects that include a GRI dimension (found in boxes in the text with further examples in the appendix) and looks at established or emerging practice at LERU universities and in other organisations.
- LERU universities aspire to lead by example. Besides providing examples of practice at LERU universities, we formulate recommendations for an action-oriented GRI approach, which LERU and other universities can take. For example, the university leadership should raise awareness of the importance of GRI within the institution; provide tools for researchers to understand and apply GRI methods in their research fields; and bring this important topic to the attention of policy makers.
- Next to our recommendations for universities, we suggest that governments should include a GRI dimension in research policies and programmes, help raise awareness and provide information and training on this topic. They should include a GRI dimension in funding calls, where data show sex or gender to be a significant factor. Research funders should also adopt policies to promote GRI.
- The European Commission, in its ERA policy framework and in its Horizon 2020 funding programme, emphasises the importance of integrating gender/sex analysis in research and innovation (R&I) content. The approach taken at the EU level is a model that can serve to inspire national and local approaches; it should be continued and strengthened.
- Journals should set standards for the inclusion of information on GRI, developing clear guidelines for authors on how to include sex and gender analysis in research and research reporting.
- LERU universities should take a lead in national and international discussions with governments, funding agencies, journals and other actors to emphasise the importance of support for GRI and to ensure that sufficient funds are allocated. A comprehensive, strategic and partnership approach is vital to ensure that the momentum is not lost and that awareness of the importance of GRI as a contributor to responsible research and innovation keeps growing.

List of recommendations

To universities:

- 1 Advocate widely for gender/sex to be taken into account in research funding, design, implementation and application of research results, where applicable.
- 2 Create awareness of the importance of GRI throughout the university.
- 3 Provide tools for researchers to understand and apply GRI methods in their research fields, for instance through training, workshops, seminars or showcasing good examples.
- 4 Emphasise that funding or publication opportunities will be missed if GRI methods are not applied.
- 5 Consider allocating internal funds to stimulate GRI and/or provide incentives for researchers to work on GRI proposals and projects, in particular in multidisciplinary collaboration.
- 6 Identify gender experts among the university's ranks of researchers. Encourage them to act as reviewers on the panels and committees that the EU and national funding agencies use to assess research proposals, and acknowledge their work.
- 7 Inform the university's research support services about GRI and make sure they are aware of the requirements in H2020. Training of researchers and of grants offices can be provided by expert internal colleagues, or, if not available, by colleagues from elsewhere.
- 8 Promote integrating the outcomes of GRI into the teaching curriculum, to better prepare the leaders of tomorrow for dealing with societal challenges.
- 9 Inform, as necessary, national (and other) governments as well as business leaders and others about the importance of including GRI in the national research and innovation agenda.

To governments:

- 10 Include a GRI dimension in research policies and programmes.
- 11 Help raise awareness, provide information and training for researchers and others to consider whether sex and/or gender may be important factors and, if so, adopt methodologies and analyses accordingly.
- 12 Be aware of the potential need for a GRI approach when funding national granting agencies, universities and projects of national or local importance, and potentially use a gender-budgeting approach to define research/funding priorities.

To funders:

- 13 Adopt policies to promote GRI.
- 14 Create incentives for researchers to consider GRI methods.
- 15 Model national policies after the approach taken by the EC in the H2020 programme.
- 16 Collect and publicise research that has successfully integrated sex and/or gender perspectives.
- 17 At the European level, continue and strengthen the H2020 gender and, specifically, GRI policies.

To peer-reviewed journals:

- 18 Set standards for the inclusion of information on the gender and/or sex of subjects in humans, animals, cells or cell lines, especially but not exclusively in the Science, Technology, Engineering and Mathematics (STEM) fields.
- 19 Develop clear guidelines for authors on how to include sex and gender analysis in research and research reporting.
- 20 Require, especially in areas where there is reason to suspect that male and female animal or human subjects may differ in their response to a situation or intervention, that a study answers questions for each sex separately.

Introduction

1. Europe's innovative power and vitality depend on its research and innovation. Research and innovation drive economic progress, prosperity and the potential to combat many of the grand societal challenges. LERU universities aim for excellence in research and competitiveness in the global research arena. In order to achieve these goals, we need simultaneously to ensure the right research topics are pursued and to attract the best and brightest minds. On the whole, however, female talent is currently still underutilised, and sex and gender are not systematically considered as potential factors in defining research processes. Both aspects present challenges for LERU and research-intensive universities around the world in their efforts to be at the top of their game, to produce cutting-edge research.
2. The LERU (2012) paper, *Women, research and universities: excellence without gender bias*, examined four well-known, data-driven factors that contribute to gender inequality in European universities, and which present challenges to LERU and research-intensive universities around the world. Firstly, academia in Europe is still losing a considerable amount of its female research capacity. Secondly, women progressing in an academic career may face (un)conscious bias against their qualifications as excellent researchers. Thirdly, there are financial considerations such as gender pay gaps, which manifest themselves in academe as they do in other labour sectors. Fourthly, the paper argued that the lack of an appropriate gender dimension in research design, implementation and organisation can result in serious flaws and potentially harmful effects, thus limiting scientific excellence, creativity and benefits to society. The paper states: "Western science is not as neutral with respect to gender as it often appears to be. Many studies have shown that gender inequalities have influenced the outcomes of research on a large scale, particularly (but not only) in life sciences".
3. The present paper focuses specifically on this fourth point: sex and gender issues with respect to the way research itself is designed, implemented, reported and applied. We refer to this as gendered research and innovation (GRI). 'Sex' is defined as chromosomal, hormonal, genetic and biological and a way to distinguish males from females¹. 'Gender' refers to cultural and social determinants of feminine and masculine traits and behaviours.
4. GRI is about the "processes that integrate sex and gender analysis into all phases of basic and applied research to assure excellence and quality of outcomes" (EC, 2013a). These phases include setting research priorities, making funding decisions, establishing project objectives, developing methodologies, gathering and analysing data, evaluating results, developing patents, transferring ideas to market and drafting policies. When applying sex and gender methods and analysis, researchers ask themselves whether the outcomes of their studies may differ when a distinction is made between male and female subjects, either in terms of gender or in terms of sex, in any phase of the research. A similar case can be made for paying specific attention in research and innovation to race and ethnicity, age, sexual orientation and a number of other factors that define a person as part or not part of a 'norm' group. Without denying the importance of these other factors, and indeed recognising the interplay between them, this paper focuses specifically on sex and gender.
5. A pivotal initiative in bringing out the importance of GRI has been the Stanford University project 'Gendered Innovations' led by Prof. Londa Schiebinger² and supported by the European Commission and the US National Science Foundation (EC, 2013a). Researchers involved in the project have contributed significantly to the GenSET Consensus Report (GenSET, 2010) as well as to the 2011 United Nations resolutions related to gender, science and technology (UN, 2011). According to Schiebinger, "gendered innovations is about stimulating gender-responsible science and technology, thereby enhancing the quality of life for both women and men worldwide". Next to "fixing the number of women" participating in research and "fixing the institutions" to effect structural change for gender equality in research careers, Schiebinger argues that it is equally important to "fix the knowledge", integrating sex and gender analysis into research content and process. Adopting a "gendered innovations" (i.e. GRI) perspective can benefit excellence in research, policy and practice in many fields, from health and medicine, to engineering, the social sciences, and more. It has the proven potential to save lives and money (Roth et al., 2014).
6. This paper is primarily aimed at LERU and other universities, to explain how GRI goes hand-in-hand with their pursuit of excellence in research. It gives examples of the importance of sex and gender ana-

lysis in research, shows how gender analysis applies to the different phases of the research process, explains the importance of humanities and social science approaches and methods to GRI, and discusses two related issues: gender balance in teams and non-evidence-based assumptions. It then turns to the role of research universities, provides examples of research projects and other GRI initiatives at LERU universities and formulates recommendations.

- The paper also recognises the role played by other actors in the research arena. It examines how GRI is addressed in EU level policies and programmes, discusses the role of non-university stakeholders, including governments, funding agencies and scientific journals, and formulates recommendations for each of these. The paper finishes with general conclusions.

GRI in specific research areas

- In this section we describe how a GRI approach is relevant in two fields of research (health and medicine, and transport), where a focus on sex and gender may have important consequences for the validity and applicability of the study results. We describe the potentially negative effects of failing to take sex and gender into account, as well as the positive effects of including them. More examples from these and other fields may be found in the Gendered Innovations report (EC, 2013a) and on the Gendered Innovations website. A selection of examples from LERU universities (and a few from the Gendered Innovations project), illustrating the scope of GRI approaches in different research areas, appear in separate boxes in

Example 1: Gender-specific aggressive behaviour in fruitflies (KU Leuven)

Aggression is a social behaviour present throughout the animal kingdom. It is important in the acquisition of food, mates and territory, defence against predators and for establishing social hierarchy. Aggression is genetically complex and it requires the integration of different types of sensory and physiological information to yield a context-appropriate response. Sex-specific differences in aggression in the fruitfly *Drosophila melanogaster* have been described and depend at least in part on gender-specific differences in neural circuitry. The analysis of the genetic networks that regulate intermale aggression will facilitate the identification of the role of these networks in interfemale aggression and of genes that contribute to gender-specific aggression.

Publication: Zwarts L, Magwire MM, Carbone MA, Versteven M, Herteleer L, Anholt RR, Callaerts P, Mackay TF. 2011. Complex genetic architecture of *Drosophila* aggressive behavior. *Proc. Natl. Acad. Sci. USA* 108, 17070-17075.

Corresponding author: Patrick Callaerts, Laboratory of behavioural and developmental genetics, KU Leuven

the body of the paper; additional ones are collected in an appendix at the end of the paper.

Health and Medicine

- Some of the most striking examples of the effects of the failure to take sex and gender into account can be found in health and medicine. Biological sex differences and behavioural gender differences - and the interaction between the two - can produce very different health outcomes for men and women. Sex differences can be pertinent to both humans and lab animals and can have consequences even at the level of cells and cell lines (cf. example 1 on fruitflies). Gender differences are related to socio-cultural factors, and can include behaviours (e.g. help-seeking behaviours), lifestyle factors (e.g. drinking, smoking and nutritional habits) and socio-economic factors (e.g. poverty and access to health care).
- Interaction often occurs between sex- and gender-related factors and it can be hard to distinguish between the two. For example, gender differences with respect to nutrition or exercise can influence hormonal and physiological processes that in turn can influence the likelihood of disease. Sex differences can influence health care and help-seeking behaviours. It can, for example, be easier for women to seek medical help in other areas after they have experienced receiving care in pregnancy, or women's willingness to engage in preventive behaviours such as stopping smoking can be greater than men's if women are motivated during pregnancy.
- In the last decades, research has shown differences between men and women in health and health out-

comes. Many diseases have been identified that affect women more heavily than men, such as cancer, rheumatoid arthritis and osteoporosis. It is increasingly recognised that women and men may manifest and experience diseases differently, respond differently to treatment, metabolise drugs differently and respond differently to devices (cf. the case study on heart disease on p.8). Some male/female differences can occur as early as during pregnancy and birth. Female infants, for instance, are more likely than males to contract HIV perinatally, regardless of weight and mother's viral load, while male infants are more likely to be infected through breastfeeding. The differences between the sexes can be found at a very fundamental level, namely even in cells, cell lines and cell regulatory practices (Mittelstrass, 2011).

- Remarkably little effort, however, has been made into rigorously investigating and reporting the underlying sex and gender differences. For too long, medical research has not systematically focused on differences in disease prevalence, progression, clinical outcomes and responses to treatment between women and men. Too often it has been, and still may be, assumed that men can be used as the norm group for the entire population. As a result, women (and people who do not fit in the binary male-female scheme) continue to be underrepresented in clinical trials and are frequently subject to medical practices based on data from a predominantly male population (Wizeman, 2012). Treatment guidelines are predominantly based on data on men (Wizeman, 2012). It is crucial that GRI-informed findings are translated into initiatives to bring sex differences in health to the public's attention, as is illustrated by example 2

Example 2: Research on heart failure and cardiovascular disease in women and national support initiatives (Utrecht University)

The University Medical Center Utrecht (UMCU) contributes to large research consortia focused on sex differences in cardiovascular disease. The Queen of Hearts consortium (www.queen-of-hearts.eu), focusses on sex-specific biomarkers for heart failure, and the CREW consortium (Cardiovascular Healthy Ageing for Women) focusses on risk prediction of cardiovascular disease in women. Both are funded by the Dutch Heart Foundation and the main coordinators are appointed in the UMCU. Special topics, such as "Sex matters to the heart," have appeared in *Atherosclerosis*, and other journals. Also, academic expertise and support are provided to Women Inc (www.womeninc.nl), a national initiative which brings sex differences in health to the public's attention.

Publications: den Ruijter HM, Haitjema S, W Asselbergs F, Pasterkamp G. Sex matters to the heart: A special issue dedicated to the impact of sex related differences of cardiovascular diseases. *Atherosclerosis*. 2015 Jul;241(1):205-7. doi:10.1016/j.atherosclerosis.2015.05.003. Epub 2015 May 15. PubMed PMID: 26003338.

den Ruijter H, Pasterkamp G, Rutten FH, Lam CS, Chi C, Tan KH, van Zonneveld AJ, Spaanderman M, de Kleijn DP. Heart failure with preserved ejection fraction in women: the Dutch Queen of Hearts program. *Neth Heart J*. 2015 Feb;23(2):89-93. doi: 10.1007/s12471-014-0613-1. PubMed PMID: 25614387; PubMed Central PMCID:PMC4315788.

Corresponding authors: Gerard Pasterkamp, Hester den Ruijter and Bart Fauser

on heart and cardiovascular disease.

- Women are not just underrepresented in clinical trials. In laboratory studies and preclinical human research, male animals are much more frequently used than females. This is shown, for instance, in pain research: 79% of animal studies published in the journal *Pain* between 2001 and 2011 included males only, with only 8% of studies on females only, and a mere 4% explicitly designed to test for sex differences (the rest did not specify) (Buitendijk et al., 2011). A recent review of 2,347 articles, 618 of which included animals, in basic biomedical science and translational surgery showed pervasive sex bias (Yoon, 2014). 80% of publications included only males, 17% only females and 3% both sexes. Of all animals studied 84% were males and 16% females. 76% of publications on cells did not mention the sex. Only 1% (n=7) of all studies specifically reported sex-based results. 44% of publications on diseases prevalent in women did not report the sex of the subjects or specimens studied. Similar results are known from basic neuroscience, endocrinology and cardiovascular disease. The result of this pervasive bias both in preclinical and clinical science is that medicine and health care as they are practiced today are less evidence-based for women than for men. Eight out of ten drugs that were withdrawn from the market in the US between 1997 and 2000 were found to have worse side-effects in women than in men (US General Accounting Office, 2001). Analysing sex as a variable in preclinical research is not as costly and time-consuming as is often believed and is likely to ultimately save lives and money since it minimises the chances of failure of drugs or therapeutic interventions. Ultimately, it

Case study: heart disease in women

Heart diseases, such as coronary artery disease, myocardial infarction and heart failure, often have different pathophysiologies and different manifestations in men and women. The differences depend on the differential effects of sex hormones and sex chromosomes as well as on gender differences in patients' life-style and health-seeking behaviours and differences in the management of the disease for female and male patients on the doctors' side.

Myocardial infarction (MI) has long been believed to be primarily a disease of men, to a large degree because research was primarily carried out in men. It has a slightly lower prevalence in women than men, but because women on average live longer than men, the numbers of men and women suffering from MI are roughly the same (Anand et al., 2008). A large number of recent studies found that men and women present with different symptoms, which can influence diagnosis and treatment. Men are more likely to exhibit symptoms of chest pain, while women more frequently exhibit nausea, general weakness, sweating and a larger variety of symptoms (Regitz-Zagrosek, 2012). Men and their doctors are more likely to attribute chest pain to heart disease than women and their doctors to attribute their symptoms to heart disease. As a result, the so-called door-to-needle time in women who are admitted and subsequently diagnosed, is significantly longer than that of men (Dey et al., 2009).

An extra complicating factor is that MI is traditionally often diagnosed by angiogramme, showing obstructed arteries. Recent studies have found that women with an MI, even when they exhibit chest pain, more often than men do not have closed-off arteries and do not show abnormalities on the scan. In women, ischaemic heart disease rather than obstructive disease may better describe the underlying issue (Shaw et al., 2009). As a result, many women with MI have been and still are being underdiagnosed, misdiagnosed and under- or mistreated. Research in the last decade has shown that women suffer from MI on average 10 years later than men, are more likely than men to report emotional rather than physical stress as the trigger and more often than men have a single affected artery instead of multiple affected arteries (Regitz-Zagrosek, 2012). Women are less likely to receive thrombolytic therapy, aspirin and beta-blockers when suffering from an acute MI. Even today, mortality after MI is higher for women than for men, especially in younger age (Rosengren et al., 2001, Vaccarino et al., 2002; Vaccarino et al., 1999). The recent significant decrease in mortality due to better recognition and treatment has occurred primarily in men, not women (Lundblad et al., 2008; Vaccarino, 2005).

will improve the quality of research needed to diagnose, treat and cure disease (Klein et al., 2015).

Transport

14. Women are less likely than men to own cars, and are more likely to use public transport, walk, ride bikes, and take children to childcare and school in cities and metropolitan areas. They travel shorter distances than men and make more frequent trips. They have different safety concerns and restrict their time of travel because of perceived risks. Women are overrepresented in groups that have specific transport needs that are often not fully met, such as older people, people with disabilities and people with caring and parenting responsibilities. This relative disadvantage has affected women's job opportunities, economic independence and wellbeing (cf. GenderSTE project http://www.genderste.eu/i_transport01.html). Yet, women are underrepresented in decision-making processes regarding infrastructure planning, and a lack of gender analysis has resulted in underreporting of the gender dimension of transport (Sanchez de Madariaga, 2013).
15. Three times more pedestrians than motorists get injured due to slippery/icy roads in winter, with the cost of medical care and loss of work days rising to four times as high as the cost of keeping the roads free from ice and snow. Gender-sensitive transport research can lead to innovative urban transport and planning policies, as demonstrated by a gender-equal snow clearing project in Sweden³. By reversing snow clearing priorities (i.e. starting with pavements and bicycle paths, then roads passing schools, child-

care facilities and employers with female-dominated workforces), more people got to work and school faster and were less likely to have accidents. Karlskoga was the first city to implement this policy, and more cities in Sweden are now adopting it.

The role of Social Sciences and Humanities (SSH) in GRI

16. Analysing sex has led to the development of pregnant crash test dummies and computer simulations (see example 3), which has not only saved the lives of pregnant women and their unborn babies, but has resulted in greater vehicle safety overall.
17. The LERU paper *The future of social sciences and humanities in Europe* (LERU, 2013b) discusses the relevance of SSH for each of the seven grand societal challenges defined in the EU H2020 funding programme. For example, for the societal challenge 'Health, demographic change and wellbeing', research needs to include, among other things, how new social and economic realities impact European populations, such as generational and gender interdependencies in families and other social networks (see example 4 on labour market vulnerability). With respect to meeting the 'Smart, Green and Integrated Transport' challenge, research should include a variety of SSH disciplines to better understand people's everyday habits, beliefs and attitudes towards different modes of transport. With regard to the 'Food security, sustainable agriculture and forestry' challenge, research must analyse women's primary role in food security, such

Example 3: Female and pregnant crash test dummies lead to better vehicle safety standards (Gendered Innovations Project)

Although crash test dummies were developed as early as 1949, female crash test dummies only appeared in the late 1960s and pregnant test dummies did not become a research priority until the 1990s.

Conventional seatbelts do not fit pregnant women properly, and motor vehicle crashes are the leading cause of fetal death related to maternal trauma. Today, state-of-the-art virtual pregnant crash test dummies, including a 36-week fetus (developed by Volvo, for example), allow researchers to model the effects of high-speed impact on the womb, placenta, and fetus.

Analyzing sex has led to the development of pregnant crash dummies and computer simulations. Ultimately, it has given rise to more inclusive standards for crash test dummies and greater vehicle safety overall.

Importantly, it should be remembered that from the start, devices should be engineered for safety in broad populations. Taking both women and men as the norm may expand the quality and creativity of scientific and technological innovation.

To read the full case study and for research references, go to:
<https://genderedinnovations.stanford.edu/case-studies/crash.html#tabs-2>

Example 4: Gendered effects in the labour market (University of Zurich)

Exploring the gender dimension in social science research reveals that core assumptions driving the European welfare state, namely that social security derives primarily from permanent and full-time employment, has gendered effects. Even highly educated women have an over-proportional risk of labour market vulnerability, with potentially severe consequences for their social security.

The European welfare model is built on the premise of permanent full-time employment, and it follows that weak labour market integration carries a high level of individual risk. Women's typically interrupted and/or part-time participation in the labour market – generally explained by the gendered nature of family and care responsibilities in European societies – increases the probability of women being labour market outsiders. The study reveals that highly skilled women have a higher risk of involuntary part-time employment than the general population in all but three of the 13 analysed countries. Moreover, in many countries, highly skilled women also have a higher risk of temporary, as opposed to permanent, employment (ranging between 14% and 31%).

Publication: Hanna Schwander, Silja Häusermann and Thomas Kurer (2014). *High-skilled outsiders? Labour market vulnerability, education and welfare state preferences*. Socio-Economic Review. DOI: 10.1093/ser/mwu026.

as their key role in food production, preparation, consumption and in educating children about their food culture (especially looking at the historical evolution of these issues). Only through a better understanding of women's needs, cultural position, local traditions, and educational level can useful policies be implemented to meet medium and long term goals. In the societal change 'Climate action, environment, resource efficiency and raw materials' it is important to study how, for example, climate risks and impacts are perceived by different segments of society and across regions and cultures. Example 5 makes the point that factors intersecting with gender—including income, age, travel patterns, geographic location, and environmental attitudes—need to be taken into consideration to contribute to a better understanding of climate impacts and responses to mitigation measures.

18. It is clear that a close relationship exists between the reasoning in the LERU paper on the role of SSH in understanding societal challenges and the need for greater attention to GRI outlined in this paper. Researchers from the sciences, engineering or medicine could benefit from working together with researchers in the social sciences and humanities (SSH), where sex and gender analysis is more routinely integrated into research and gender-sensitive methodologies are well developed. SSH insights and perspectives may be most valuable in identifying the right research questions to ask, although a multidisciplinary approach facilitates at all stages of the research process.

Integrating a gender perspective in different phases of the research process

19. As we have seen from the examples above, engaging in GRI includes addressing potential sex and gender differences in each stage of the research cycle: from making decisions about priorities for research spending; through deciding on the research focus, methodology and data collection; to analysing and reporting on data; and even disseminating and applying the results.
20. The potential for gender inequality exists right from the outset of the research cycle. Funds are, by definition, limited and spending in one area will inevitably de-prioritise other areas. Funding priorities depend on many different societal and academic processes and influences: public opinion, unconscious or conscious assumptions, the political need to invest in certain social or medical problems, the influence of powerful vested interests (e.g. industry, pharmaceutical companies and the military), the status of different academic fields, among others. If, for instance, funding is aimed at investigating the potential health effects of particular types of employment and most of the employees in that sector are women, the health effects of men's employment may be relatively under-researched, thus disadvantaging men.
21. In framing the research question, lack of attention to the potential effects of sex or gender differences may limit the scope of the study. If research questions are framed in a way that wrongly assumes no sex differences, or that the research is 'gender-neutral', opportunities for innovation may be missed,

outcomes may advantage one sex over the other, or mistakes that limit the validity of the conclusions made, as, for example, in the case study of heart disease. Example 6 on sex-specific effects of maternal smoking and example 7 on sex differences in bird song also illustrate this. Similarly, if stereotypical beliefs exist about gender roles, innovations may be 'gender-specific' in ways that do not benefit all users. Researchers should be aware of potential gender and sex differences in their specific field, should consult widely, and encourage participation/inclusion of different perspectives in research design. They should determine whether any differential effects will arise in the development phase of their research question.

22. In the analysis phase of a study, sex should be taken into account, where applicable. Sex is an important variable in most biomedical research, fundamental and applied, animal and human, and in product and systems design. Example 8 on machine translation systems shows how a GRI approach is important in computer science (and, importantly, that product design needs to incorporate a gender awareness from the very beginning). Including both sexes in the study and explicitly analysing sex-disaggregated outcomes is a key element. Gender analysis should be used when cultural attitudes, needs and behaviours are important factors that may determine the study outcomes. Sex and gender can sometimes interact, most notably in biomedical research, which can demand complex analyses. Other factors may interact with sex or with gender, or both, such as socio-economic status, age or environment, and may diminish or amplify sex and/or gender differences. Researchers need to consider and measure relevant factors and use them appropriately in the analysis.

23. Lastly, in the reporting phase of the study, the differences in outcomes based on sex and/or gender and the potential interaction between them should be described. Sex-disaggregated data should be published. If there are no such data or no differential outcomes, this also needs to be clearly mentioned. Often, no mention is made of potential sex or gender differences, thus making it unclear whether they do not exist, or have simply not been studied.

Related issues: gender balance of teams and non-evidence-based assumptions

24. No studies have yet been undertaken to determine whether there is a relationship between the gender balance of a research team and that team's engagement in gender-sensitive (GRI) research. However, anecdotal evidence suggests that more female than male researchers are gender experts, and gender training and expertise are mostly provided by female researchers, in research in general and in the STEM (Science, Technology, Engineering, Math) fields in particular. There does appear to be evidence that a gender focus in STEM fields attracts young female students and scientists, just as crossdisciplinary and multidisciplinary approaches in education and research appear to do so, although more evidence is needed. Whether a relationship between GRI and gender balance in teams exists is an area which requires further study⁴.
25. It is important that sex and gender differences are researched and reported thoroughly for two main

Example 5: Climate change: analysing gender as well as other factors intersecting with gender (Gendered Innovations Project)

Analysing gender in relation to climate change and mitigation means comparing women's and men's behaviours and attitudes. But researchers must ask: Which women? Which men? and compare groups of women and men based on social factors that also predict climate footprint, such as income, educational background, and geographic location. Viewing women as an undifferentiated group and opposing this to men as an undifferentiated group (simply disaggregating data by sex) misses important factors that influence gendered behaviours. Rather, studies that analyse gender and control for other social factors avoid stereotypes and false correlations.

Research on the relationship between gender and environmental impact is still in its infancy, but one study (Räty et al., 2009), for example, has shown that in most categories, men use slightly more energy than women, but that the greatest determining factor is income. Efforts to analyse factors that intersect with gender—including income, age, travel patterns, geographic location, and environmental attitudes—contribute to a better understanding of climate impacts and responses to mitigation measures. This understanding may improve mitigation strategies by ensuring buy-in from all energy users. It may also support efficiency and equality by achieving mitigation at the lowest possible social and economic cost and by ensuring that costs are shared in equitable ways.

To read the full case study and for research references, go to:
<http://genderedinnovations.stanford.edu/case-studies/climate.html#tabs-2>

Example 6: Effects of pregnant women's smoking on baby boys and girls (University of Edinburgh)

The liver secretes numerous proteins into the blood stream. It is the main site in the body where chemicals are processed and detoxified. Maternal smoking while the baby is in the womb is known to associate with low birth weight and increased cardiovascular disease risk in children. Importantly, the effects of maternal smoking have been shown to be different in boys and girls.

Specifically, exposure in the womb to cigarette chemicals induces sex-specific disruption of 1-carbon metabolism and DNA methylation in the human fetal liver. Research using human fetal livers from the second trimester has shown that one mechanism may be through effects on methyl donor availability, 1-carbon metabolism and DNA methylation at key target genes. These effects are sex-specific and maternal smoking actually reduces the sex differences at a number of parameters which show sexual dimorphism.

Publication: Drake AJ, O'Shaughnessy PJ, Bhattacharya S, Monteiro A, Kerrigan D, Goetz S, Raab A, Rhind SM, Sinclair KD, Meharg AA, Feldmann J, Fowler PA. *In utero exposure to cigarette chemicals induces sex-specific disruption of one-carbon metabolism and DNA methylation in the human fetal liver.* BMC Med. 2015 Jan 29;13:18. doi: 10.1186/s12916-014-0251-x.

reasons. One is that important differences may remain hidden when the male subject is considered the norm for an entire population (or vice-versa, when the female subject is the norm – see example 9 on eating disorders in young men and example 10 on male sexual exploitation). The second is the risk of exaggerating existing small differences, or of wrongly claiming differences, when research is based on non-evidence-based assumptions. The latter can then result in perpetuating stereotypical views and/or in unjustifiably treating men and women differently. For decades, for instance, according to popular belief girls and women are less gifted in maths than boys and men. Numerous studies have compellingly shown that there is no evidence base for this claim, as shown in a meta-analysis (Hyde & Mertz, 2009). This belief, however, has long influenced the education and career choices of individual girls and women, as well as the attitudes of teachers and employers. Many examples exist of stereotyping in design and engineering aimed at girls and women. For example, manufacturers often assume that ‘shrinking and pinking’ a design makes it more fit for or attractive to girls and women. However, research shows that pink and round shapes in toys do not always appeal to young girls (Sørensen et al., 2011) or that adding fashion to videogames does not necessarily make them more attractive to girls and women (Dickey, 2006). At the very least, products that are designed based on stereotypes instead of solid evidence are likely to reinforce or contribute to gender inequalities (Rommens, 2006).

GRI in EU policies and programmes

26. European research policy has placed increasing emphasis on gender equality and integrating gender into research in recent years, in particular as one of the priorities for action in the development of the European Research Area (ERA), a concept which was first introduced by the European Commission in 2000. LERU is strongly convinced of the value of the ERA and its aim to create “a unified research area open to the world based on the Internal Market, in which researchers, scientific knowledge and technology circulate freely and through which the Union and its Member States strengthen their scientific and technological bases, their competitiveness and their capacity to collectively address grand challenges”, as defined by the European Commission (EC, 2012), and of the value of its inclusion in the Treaty on the Functioning of the European Union (TFEU, Title XIX, Article 179).
27. Since 2012, when the European Commission published a Communication on ERA, the ERA concept has become a more visible policy instrument for the EC with more tangible and concrete actions, centred on five ERA priorities. These include, next to gender equality and mainstreaming in research, an open labour market for researchers, optimal circulation of knowledge, effective national research systems and transnational co-operation. A sixth dimension, internationalisation with a global outlook, has since been added.
28. At the same time the ERA Communication was published in 2012, LERU signed a Memorandum of Un-

derstanding (MoU) with the EC in the spirit of the proposed partnership approach to achieve real progress on a number of priorities⁵. LERU’s MoU identified twelve concrete topics for action within the LERU network, one of which included gender equality⁶. LERU has since reported on the actions undertaken (LERU, 2014b) and has published a briefing paper (LERU 2014a) on the ERA and other priorities for the European Commission and Parliament that were installed following the elections in May 2014. For LERU a smooth functioning ERA is important, and progress on gender-equality issues is an essential element.

29. In a report commissioned by the EC, an ERA expert group called for integrating the gender dimension into research and innovation and into higher education curricula “in order to ensure research quality, long-term sustainability of research and innovation findings, and social robustness of research, as well as in avoiding economic losses” (EC, 2013c, p.48). Yet, progress is slow and difficult to measure. The 2014 ERA Progress Report, for example, notes that the lack of gender analysis in research programmes remains a challenge (EC, 2014a, p.6). An ERA survey reveals that ten EU member states reported having provisions to include gender analysis in research programmes (EC, 2015b, p.33) and only a few countries fund it. Comparatively more research performing organisations (RPO) include a gender dimension in research content, although figures vary significantly, from +70% of RPOs in Austria and Estonia to (almost) none in other countries, such as Malta, Hungary and Greece⁷.
30. The European Commission has introduced significant changes in Horizon 2020, its major research funding programme for 2014-2020. It has developed

three objectives on gender equality:

- Fostering gender balance in Horizon 2020 research teams, in order to address the gaps in the participation of women in the Framework Programme’s projects;
- Ensuring gender balance in decision-making, in order to reach the Commission’s target of 40% of the under-represented sex in panels and groups (50% for advisory groups);
- Integrating gender/sex analysis into research and innovation content, to improve the scientific quality and societal relevance of the produced knowledge, technology and/or innovation.

Guidance to applicants states that “a topic is considered gender relevant when it and/or its findings affect individuals or groups of persons. In these cases, gender issues should be integrated at various stages of the action and when relevant, specific studies can be included. The EC has identified 130 subfields where data showed that a gender analysis can benefit research; these range from computer hardware and architecture to nanotechnology, oceanography, geosciences, organic chemistry, aeronautics, space medicine, biodiversity, ecology, biophysics, among others. These topics are flagged to ease access for applicants⁸. This should not however prevent applicants to a non-flagged topic from including a gender dimension in their proposal if they find it relevant” (EC, 2014b). Applicants are asked in their H2020 proposals to describe how sex or gender analysis is taken into account. Further, in the evaluation process evaluators with gender expertise will check whether this has been done properly, for the flagged topics. The Commission will, as of 2016, monitor what the status is of the inclusion of gender in the content of research proposals that have been submit-

Example 7: Developmental and evolutionary origins of sex differences in avian vocal behaviour (Universiteit Leiden)

Songbirds are the closest animal analogue to human speech acquisition and the foremost animal model for vocal learning in the cognitive neurosciences. Given the often pronounced sex differences in song production, vocal learning and its neural substrate has traditionally been exclusively studied in male songbirds. Yet, factors in the environment during early development (such as family size and quality of nutrition) affects song and song preference learning in males and females. International collaboration helps to build a more inclusive database on the phenology of sex differences (including neglected taxonomic groups and geographic regions). This integrated data set has already yielded surprising novel insights regarding the evolution of sex differences in vocal behaviour: female birdsong is much more common than previously thought and song in male and female birds is the most likely ancestral state.

Publication: Odom KJ, Hall ML, Riebel K, Omland KE & Langmore NE. 2014. *Female song is widespread and ancestral in songbirds*. *Nature Communications* 5, 3379.

Corresponding author: Katharina Riebel – Institute of Biology, University of Leiden

Example 8: Fixing he-she pronoun errors in machine translation (Gendered Innovations Project)

Machine translation (MT) becomes increasingly important in a global world. Machine translation systems massively overuse masculine pronouns (‘he’, ‘him’), even where the text specifically refers to a woman (Minkov et al., 2007). The result is an unacceptable infidelity of the translation and perpetuation of gender bias. When translation programmes default to ‘he’, the occurrence of the masculine pronoun on the web increases (which will reverse the positive trend of equality in language). To fix this, it is crucial to develop algorithms that explicitly determine the gender of each person mentioned in the large text corpora that are used for training machine translation systems like Google Translate or Systran and use this computed gender to inform the translation, thus avoiding the masculine default and increasing the quality of translation overall.

The Gendered Innovations project worked with natural language processing experts from Stanford and from Google to fix the problem (which has not yet been fixed given that the initial platform unconsciously excluded gender issues). Constantly retrofitting for women is not the best road forward. To avoid such problems in the future, it is crucial that computer scientists (and others) design with an awareness of gender from the very beginning. A deeper fix will be to integrate gender studies into the engineering curriculum so that engineers don’t make such errors in the future.

To read the full case study and for research references, go to: <http://genderedinnovations.stanford.edu/case-studies/nlp.html>

ted and granted. Gender training can be included in the eligible costs of an action (EC, 2014b).

31. The Commission has also established a Horizon 2020 Advisory Group on Gender, which includes gender experts and members from other H2020 advisory groups and delivers input into the development process of the H2020 work programmes. In its recent report (EC, 2015a) on the integration of the GRI dimension in the 2016-2017 work programme, the Advisory Group on Gender provides suggestions for research topics to be included in the various thematic calls of the next work programme. An earlier useful EC initiative developed a Gender Toolkit, which includes a checklist of questions on how to integrate GRI in research projects⁹.

The role of research universities – innovative practice and recommendations

32. University researchers and leaders can be instrumental in implementing GRI approaches and raising awareness of its importance within their institutions and beyond. In the Hefei Statement that was signed by LERU and like-minded university networks around the world¹⁰, their role is phrased as follows: “Research universities are distinguished by the quality, breadth and depth of their commitment to research. Nations increasingly rely upon research universities to drive national development and wellbeing. Graduates leave universities to work in government, business and the non-profit sector, taking with them the knowledge, skills, and understanding that make it possible for these sectors to work effectively, to respond to changing circumstances and to innovate. In their work and their social interactions, graduates draw on their

university experience and the values that experience has developed to create a richer, more resilient and often more diverse and humane society. Research universities are centres for the development of new ideas and discoveries. They expand our understanding by testing and challenging existing knowledge. They are also centres of creativity that develop new technologies and new ways of doing things. [...] University research drives innovation, helps respond to major national and global problems, and provides the narratives that make it possible to understand a rapidly changing and increasingly volatile world.”

True innovation and robust responses to global problems will not result if half the population is relatively underserved by existing research. Research universities should take responsibility to change that situation.

33. LERU universities want, first and foremost, to take a lead by ensuring that the research performed within the institution incorporates sex and gender analysis at all stages when relevant. We agree with the GenSET (2010) recommendation that leaders need to fully “buy into” the importance of GRI and that the most effective way of doing this is to show how incorporating sex and gender analysis promotes research excellence.
34. Below are a few examples to illustrate how LERU universities are taking action to promote a GRI approach to research:
- The University of Barcelona dedicates a section to GRI in its Horizon 2020 funding opportunities booklet¹¹. It also includes topics such as gender violence in compulsory courses (e.g. on family and community medicine) at the Faculty of Medicine.
 - At the University of Freiburg GRI has been attracting increasing attention, with awareness raising actions steered by the Rectorate. A workshop for

researchers and students of all disciplines is scheduled for 2015 in order to further raise awareness and stimulate new interdisciplinary research projects.

- At the University of Heidelberg, anyone preparing an application for a collaborative research project gets advice from the Equal Opportunities Office on gender in research, on gender-balanced research groups and on funding possibilities for gender-related activities. Funded projects are coached by the Equal Opportunities Office concerning gender activities.
- Leiden University has incorporated in its comprehensive diversity policy the training of its researchers in writing gendered research proposals and carrying out gendered research. Leiden has also organised internal and external symposia on the topic and has started conversations with its Ministry for Education and Science about the importance of GRI.
- At Imperial College London, Prof. Julia Buckingham, then Pro Rector (Education), addressed GRI in her 2010 Athena SWAN lecture, in relation to her own research. Recognising the importance of gender equality for excellent research, Imperial appointed Prof. Dorothy Griffiths as Provost’s Envoy for Gender Equality in March 2014. Under her leadership, the Academic Gender Strategy Committee has discussed GRI. The Medical Faculty is particularly aware and concerned, and gender-sensitive research issues are increasingly recognised and addressed in UK clinical trials.
- The University of Milan has organised several workshops and optional courses on GRI at the Faculty of Medicine. The goal is to make such courses mandatory¹². The University has also had a programme to provide information on the gender dimension in research in H2020. In addition, Milan has organised a programme for graduate

students on how the publication process works with specific attention devoted to sex and gender aspects in research.

- At the University of Barcelona, an analysis has been conducted of teaching staff’s needs and beliefs concerning introducing the gender dimension in teaching practices. In addition, the study seeks to identify the most significant elements that should be included to introduce the gender perspective into teaching programmes. Five faculties (Psychology, Education, Economics and Business, Philosophy and Nursing) have thus far been involved in this project.
35. To be sure, there are many other initiatives at LERU and other universities in Europe and elsewhere that demonstrate good policy and practice on GRI¹³. We put forward the following recommendations to LERU and other universities who wish to pursue a GRI agenda:
- a) Advocate widely for gender/sex to be taken into account in research funding, design, implementation and application of research results, where applicable.
 - b) Create awareness of the importance of GRI throughout the university.
 - c) Provide tools for researchers to understand and apply GRI methods in their research fields, for instance through training, workshops, seminars or showcasing good examples.
 - d) Emphasise that funding or publication opportunities will be missed if GRI methods are not applied.
 - e) Consider allocating internal funds to stimulate GRI and/or provide incentives for researchers to work on GRI proposals and projects, in particular in multidisciplinary collaboration.
 - f) Identify gender experts among the university’s

Example 9: Eating disorders in young men are underdiagnosed and undertreated (Universities of Oxford and Glasgow)

Young men with eating disorders are not getting the help they need because of the perception that eating disorders are a “woman’s illness”. Researchers interviewed 39 young people aged 16 to 25, including 10 men, about their experiences of diagnosis, treatment and support for eating disorders. The study suggests that men are underdiagnosed and undertreated for anorexia and other eating disorders, despite making up about a quarter of cases. Frontline health workers have a key role in identifying eating disorders in young men.

Publication: Räisänen U & Hunt K. 2015. *The role of gendered constructions of eating disorders in delayed help-seeking in men: a qualitative interview study*. BMJ Open. doi:10.1136/bmjopen-2013-004342.

Example 10: The sexual exploitation of boys and young men is underestimated (University College London)

The impact of child sexual exploitation on boys and young men has been underestimated. An analysis of records from 9,042 children and young people affected by child sexual exploitation reveals that 1 in 3 (2,986) were male. This is a much higher figure than previous national studies have found. Crucially, the finding that one in three service users was male highlights the danger in thinking child sexual exploitation only really affects girls. The study should encourage policy-makers, practitioners and the general public to do their utmost to protect vulnerable boys and young men from sexual exploitation. This research is carried out by UCL Security and Crime Science (UCL Engineering) and NatCen, is funded by the Nuffield Foundation and supported by Barnardo’s.

Publication: Cockbain E, Brayley H & Ashby M. 2014. *Not just a girl thing: A large-scale comparison of male and female users of child sexual exploitation services in the UK*. University College London.

Corresponding author: Ella Cockbain, Department of Security and Crime Science, Faculty of Engineering Science, UCL. For relevant publications, see: <https://iris.ucl.ac.uk/iris/browse/profile?upi=EPCOC6o>

ranks of researchers. Encourage them to act as reviewers on the panels and committees that the EU and national funding agencies use to assess research proposals, and acknowledge their work.

- g) Inform the university's research support services about GRI and make sure they are aware of the requirements in H2020 (cf. paragraph 30). Training of researchers and of grants offices can be provided by expert internal colleagues, or, if not available, by colleagues from elsewhere.
- h) Promote integrating the outcomes of GRI into the teaching curriculum, to better prepare the leaders of tomorrow for dealing with societal challenges.
- i) Inform, as necessary, national (and other) governments as well as business leaders and others about the importance of including GRI in the national research and innovation agenda.

The role of other actors - recommendations for governments, funding agencies and journals

National and other governments

- 36. National and other governments can play a crucial role in promoting GRI since they can set research and funding priorities. At present debates are ongoing in many countries about the accountability of research and science with respect to public funding. Democratic governments that make fair decisions about where to spend taxpayers' money should ensure that research outcomes benefit all citizens. As argued in the beginning of this paper, not taking into account men's and women's different biology, needs, habits and behaviours can lead to bad outcomes and expensive mistakes.
- 37. When setting research priorities and making funding decisions, governments (and funding agencies) should determine the possible gendered effects of allocating resources to specific areas or topics and ask themselves whether one sex may benefit more from the prioritisation than another⁴⁴. If this is the case, governments and/or funders should reconsider their priorities or add new ones.
- 38. Governments and funding agencies can ask for proposals that demonstrate that gender and/or sex differences will be taken into account, if applicable, in areas that have been determined as priority fields, as is the case with H2020. By requiring that research-

ers themselves consider questions as to who benefits from the research and who does not, important GRI dimensions will be encouraged.

- 39. A few examples of good practice are⁴⁵:
 - In 2012, the US Food and Drug Administration Safety and Innovation Act included a requirement that the FDA study the availability of data on sex, race, age and ethnicity in clinical trials for new drugs and devices (FDA, 2014).
 - In 2013, the Italian national parliament adopted legislation regulating the introduction of gender medicine into teaching, research and healthcare as part of the national health policy⁴⁶.
 - In 2011, the Spanish Science, Technology and Innovation Act was passed requiring a gender perspective to be included in all aspects of the research process. As a result, both the Spanish Strategy on Science, Technology and Innovation 2013-2020, which contains the general framework, and the State Plan for Scientific and Technical Research and Innovation, which develops the aims and principles of the strategy for 2013-2016, have included integrating a gender perspective into public RDI policies as one of the main principles⁴⁷.
 - The city of Vienna has, for two decades, engaged in gender-sensitive city planning which has resulted in neighbourhoods, transport, roads and streets being planned and designed according to the needs of both men and women (Sanchez de Madariaga and Roberts, 2013).
- 40. Our recommendations to governments are as follows:
 - a) Include a gender dimension in research policies and programmes.
 - b) Help raise awareness, provide information and training for researchers and others to consider whether sex and/or gender may be important factors and, if so, adopt methodologies and analyses accordingly.
 - c) Be aware of the potential need for a GRI approach when funding national granting agencies, universities and projects of national or local importance, and potentially use a gender-budgeting⁴⁸ approach to define research/funding priorities.

Funding agencies

- 41. Funding agencies decide on the research areas to be funded and thus promoted, and could play an important role in integrating sex and gender analysis into funded research. Researchers' behaviour and awareness are more likely to change when research money is at stake.

- 42. The European Commission Directorate-General for Research and Innovation has emphasised the need for sex and gender analysis in its funded projects for years. These policies have been reformulated and strengthened in the current funding framework H2020 (cf. paragraph 30). In the proposal template applicants are asked to describe, when relevant, 'how sex and gender analysis is taken into account in the project's content'. We approve of this approach and recommend that it be strengthened and good practices shared.
- 43. The U.S. National Institutes of Health⁴⁹, the Canadian Institutes of Health Research, the World Health Organisation, the Norwegian Research Council²⁰ and the Irish Research Council have all adopted policies to actively promote gender-sensitive research and innovation. The latter, for example, states: "Excellent research fully considers the potential biological sex and social gender elements of the research content to maximise the impact and societal benefit of research. Not including the sex-gender dimension into the methodology, content and impact assessment of research can lead to poor research and missed opportunities. In order that any assumptions made or issues addressed are based on the best available evidence and information, the sex-gender dimension has to be fully considered". The Swedish Research Council recently published the fourth review of its evaluation process from a gender equality perspective. This review promotes quality in research, identifies tools to achieve gender equality, and shares good examples.
- 44. Our recommendations to funders are:
 - a) Adopt policies to promote GRI.
 - b) Create incentives for researchers to consider GRI methods.
 - c) Model national policies after the approach taken by the EC in the H2020 programme.
 - d) Collect and publicise research that has successfully integrated sex and/or gender perspectives.
 - e) At the European level, continue and strengthen the H2020 gender and, specifically, GRI policies.

Journals

- 45. Peer-reviewed journals can play an important role in promoting GRI by demanding that authors be explicit about the gender dimensions of their research. They can require that the research design and analysis allow for separate observations on men/males and women/females (where applicable), that sex- or

gender-based differences be reported, that authors explain why only men/males or women/females were studied if that is the case and that authors explicitly state when no sex or gender differences were observed. A number of journals, notably in the life sciences, are now requiring sex- or gender-specific reporting of research²¹. For example:

- The Lancet asks prospective authors to routinely include women into clinical trials and to analyse research data by sex and gender.
 - PLOS Biology, Nature and Science ask that authors of animal research provide information on the sex of the animals studied.
 - PLOS Medicine asks that authors make explicit their methods of categorising human subjects by sex and gender.
 - The Journal of the International AIDS Society strongly encourages authors to include data disaggregated by sex and to provide a comprehensive analysis of potential gender differences.
46. Our recommendations to peer-reviewed journals are:
- a) Set standards for the inclusion of information on the gender and/or sex of subjects in humans, animals, cells or cell lines, especially but not exclusively in the STEM fields.
 - b) Develop clear guidelines for authors on how to include sex and gender analysis in research and research reporting.
 - c) Require, especially in areas where there is reason to suspect that male and female animal or human subjects may differ in their response to a situation or intervention, that a study answers questions for each sex separately.

Conclusions

47. Addressing GRI, i.e. sex and gender analysis in research and innovation content and process, is an important issue. Next to “fixing the numbers” and “fixing the institutions”, GRI represents a third gender-equality dimension, which can be described as “fixing the knowledge”. GRI should be seen as a separate but related issue, which needs to be given due attention if we are going to achieve gender equality and mainstreaming. From our discussions with a wide range of people within LERU universities and beyond, it is apparent that the GRI approach is not as widely understood or practiced as it should be.
48. More awareness-raising and training are necessary across the board to make research more sensitive to gender and sex differences. While GRI is rapidly becoming better known in certain fields, especially health and biomedical research, in other research areas it is still unknown. Our argument is not that all research questions and projects must necessarily have a gender perspective; it is merely that such questions should be posed at the outset and systematically throughout the research process to assess whether important sex or gender differences need to be addressed.
49. It is important that GRI be linked to and integrated with other gender equality initiatives at all levels: through inclusion in government policies and strategies, funders’ granting programmes, universities’ research activities and researchers’ projects. We have therefore formulated a set of recommendations in this paper for various stakeholders to act upon. We have listed them at the beginning of this paper in the hope that they will be acted upon by those responsible.
50. LERU universities, individually and as a network, must take the lead in discussions with governments, funding agencies, journals and other actors to highlight the importance of GRI and to ensure that sufficient funds are being allocated to it. A comprehensive, strategic and partnership approach is vital to ensure that the current momentum is not lost and that awareness of the importance of GRI continues to grow. LERU universities can play a pivotal role in making research results equally applicable to men and women, which will save money and lives, and will contribute to LERU universities’ commitment to responsible research and innovation to the benefit of society at large.

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Endnotes

- 1 The terms 'male' and 'female' and 'men' and women' are used throughout this paper. However, we recognise that not everyone identifies with the binary notions of 'male' and 'female', and that it is equally important to address non-binary definitions of sex and gender in research.
- 2 See the Gendered Innovations project and website at <http://genderedinnovations.stanford.edu/>
- 3 See <https://vimeo.com/77692813> for a video about the initiative. More information is also available at the Swedish Standards Institute website <http://www.sis.se/en/Nyheter-och-press/Nyheter/Jamstall-d-snoroining/>.
- 4 The relationship between gender diversity in teams and research performance is studied, for example in a Horizon 2020-funded project "Gender Diversity Impact - Improving Research and Innovation through Gender Diversity (Gedii)". It aims to produce new insights into how gender diversity in teams affects research performance. Using innovative methods for analysing the diversity-performance relationship, the project will develop in the first place a reliable gender diversity measure, the Gender-Diversity-Index (GDI), which is sensitive to power, status and information sharing differentials within research teams and across public and private organisations.
For more details, see: http://in3.uoc.edu/encms_portalin3/encms/en/activitats/destaquem/2015/noticia_008
- 5 See http://ec.europa.eu/research/era/partnership_en.htm and <http://www.leru.org/index.php/public/activities/other-activities/era-partnership/>
- 6 See http://www.leru.org/files/publications/ERA_Final_MoU_LERU.pdf
- 7 The ERA survey was completed by a limited number of organisations. The EC notes the RPO (performers) and RFO (funders) responses cover respectively about 515,000 researchers (about 20% of total EU researchers) and about 34% of total GBOARD.
- 8 There are two ways of accessing topics with an explicit gender dimension in the H2020 participant portal: 1/ by clicking on a "quick finder" link, the list of all the gender-flagged topics appears: <http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/flags/gender.html#c.topics=flags/s/Gender/1/1&callDeadline/desc2/> through a keyword search at the following link: http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/search/search_topics.html
- 9 See <http://www.yellowwindow.be/genderinresearch/>
- 10 These are the American Association of Universities (AAU), the Russell Group in the UK, the Australian Group of Eight (Go8), the Chinese network C9, the AEARU (Association of East Asian Research Universities), the RU11 in Japan, the U15 Canada and the U15 Germany.
See <http://www.leru.org/index.php/public/global-network/> for the Hefei statement and more information.
- 11 See pp.9-10 of the document, accessible via https://acesconvocatories.ub.edu/media/documents/OPIR_Informacio_i_texts_H2020.pdf
- 12 Work performed in the context of the EU-funded FP7 project STAGES - www.stages.unimi.it
- 13 Tromsø and Stanford are examples of universities where a strategic approach to GRI has been taken.
- 14 Gender budgeting as a general approach for gender equality and for improved government accountability is advocated for example by the UN, see <http://gender-financing.unwomen.org/en>
- 15 The EU-funded project GENDER_NET is studying this (<http://www.gender-net.eu/spip.php?article33&lang=en>). One of the project's work programmes has the following objectives: "Exchange best practices on the integration of the gender dimension in research and innovation contents and programmes, building on the mutual opening, through networking activities, of national and European initiatives on the use of sex and gender analysis in disciplines beyond social science and humanities. It collects information on policies and programmes integrating gender analysis in research at national and regional levels; develops a comprehensive description of existing programmes; produces a comparative analytical report; designs supporting tools for adapting the common best practices to transnational contexts; and develops a strategic framework for implementing transnational activities."
- 16 See <http://genderedinnovations.stanford.edu/policy/ItalianNationalGenderMedicineBill2013.pdf>
- 17 The Act involves the inclusion of a gender perspective in the content of scientific, technical and innovation research in order to enrich the creative process. It also seeks to correct the loss of human capital associated with the uneven distribution of women and their professional development in the areas of scientific and technical research, both in the public and business sectors. The Spanish Foundation CIREM has developed a practical guide with a set of methodological tools and case studies in the areas of information and communication technologies, architecture, and biotechnology and medicine (CIREM, 2012 – in Spanish).
- 18 Gender budgeting, according to http://www.wikigender.org/index.php/Gender_Budgeting, "refers to the process of conceiving, planning, approving, executing, monitoring, analyzing and auditing budgets in a gender-sensitive way; involves analysis of actual expenditure and revenue (usually of governments) on women and girls as compared to expenditures on men and boys; helps Governments to decide how policies need to be made, adjusted and reprioritized".
- 19 The NIH guidelines for considering sex as a variable in medical research are an integral part of NIH's *Enhancing Reproducibility through Rigor and Transparency*. The guidelines, which were issued in June 2015, are available at: <http://grants.nih.gov/grants/guide/notice-files/NOT-OD-15-102.html>.
- 20 The gender equality policy of the Research Council of Norway (in English) is available at: <http://www.forskningradet.no/servelet/Satellite?blobcol=urldata&blobheader=application%2Fpdf&blobheadername=ContentDisposition%3A&blobheadervalue1=+attachment%3B+filename%3D%22GenderPolicyfinal.pdf%22&blobkey=id&blobtable=MungoBlobs&blobwhere=1274460419346&ssbinary=true>
- 21 The Gendered Innovations project maintains a list of peer-reviewed journals that have editorial policies requiring sex- or gender- specific reporting of scientific research (<http://genderedinnovations.stanford.edu/sex-and-gender-analysis-policies-peer-reviewed-journals.html>).

Appendix: Examples of gendered research and innovation at LERU universities

Empowering young people in preventing gender-based violence through peer education (Universitat de Barcelona)

The aim of this research is to contribute to preventing and combating gender-based violence among adolescents. In addition to producing new insights into young people's attitudes towards gender-based violence and the links between gender stereotypes and gender-based violence, the research provides educators with information and tools for working with young people in the prevention of gender-based violence, to promote the role of schools and other formal and non-formal education centres, and to contribute to policy development on the prevention of gender-based violence in educational contexts on a national and EU level.

The 24-month project [YOUTH4YOUTH](#) was funded by the Daphne III programme of the European Commission, coordinated by the Mediterranean Institute of Gender Studies (Cyprus), with the University of Barcelona and others as partners. See for example the teachers' manual produced: http://www.medinstgenderstudies.org/wp-content/uploads/Y4Y-Manual_digital_v12.pdf

Contact at the University of Barcelona: Marta Soler Gallart, Head of the Centre of Research in Theories and Practices that Overcome Inequalities, crea@ub.edu, <http://creaub.info>

Estrogens protect male mice from obesity complications (University of Edinburgh)

In comparison to men, women appear to be protected from the metabolic consequences of obesity, at least until the menopause. There is growing evidence that estrogen has an important effect on body fat and metabolism in males. Research using a mouse model of dietary-induced obesity (DIO) has shown that male and female mice responded differently to stress hormones. Specifically, DIO-induced sex-specific changes in glucose-insulin homeostasis were ameliorated in males treated with estrogen, highlighting the importance of sex steroids in metabolism. The research also provided evidence that the sexually dimorphic expression and activity of glucocorticoid metabolising enzymes may play a role in the differential metabolic responses to obesity in males and females.

Publication: Dakin RS, Walker BR, Seckl JR, Hadoke, PWF, Drake AJ. 2015 (in press). *Estrogens protect male mice from obesity complications and influence glucocorticoid metabolism*. International Journal of Obesity.

The diagnosis of myocardial infarction in women (University of Edinburgh)

Women presenting with suspected acute coronary syndrome can get a better diagnosis (and hence treatment) thanks to a recent high-profile study. Research conducted at the University of Edinburgh has demonstrated the value of highly sensitive troponin τ in increasing the diagnosis of myocardial infarction in women. Highly sensitive troponin τ increased the number of appropriate diagnoses by 100% in women, compared with only 10% in men, suggesting that novel test could be beneficial to women.

Publication: Shah AS et al. 2015. High sensitivity cardiac troponin and the under-diagnosis of myocardial infarction in women: prospective cohort study. *BMJ*. 350:g7873. doi: 10.1136/bmj.g7873

Empowering vulnerable people through rights education (University of Geneva)

The Law Clinic organises gender-sensitive courses on the rights of vulnerable people. The programme uses a “Know Your Rights” approach, which is aimed at empowering vulnerable people through rights education. Every year a group of 15 Master’s students conduct extensive legal research on specific questions for a specific vulnerable group living in Geneva. Specialists on gender issues are invited to raise awareness among the students.

During the first year, the Law Clinic worked on the rights of the Roma People living in precarious conditions in Geneva. During the second and the third year, the Law Clinic focused on the rights of illegal immigrant women in Geneva. This topic addresses specific questions concerning illegal migrant women, for instance working conditions in specific areas where women are mainly employed, such as domestic work or sex work. In all of the clinical work (research papers, brochures, etc.), gender-inclusive language is used and gender stereotypes are analysed critically.

A multidisciplinary doctoral programme based on Gender Studies (University of Helsinki)

The doctoral programme ‘Gender, Culture and Society’ (Sukupuoli, kulttuuri ja yhteiskunta, SKY) is a multidisciplinary programme based on Gender Studies at the Department of Philosophy, History, Culture and Art Studies at the University of Helsinki. The programme on the central Helsinki campus welcomes applications from students interested in gender, sexuality and feminist scholarship.

More information: <http://www.helsinki.fi/doctoral-programme/gender-culture-society/index.html>

Thinking public spaces through the spatiality of women (KU Leuven and VUB)

In the conservative Arab culture of the city of Nablus, Palestine, public and private spaces are strictly separated, with different rules and habits. As a result, men and women do not use the different spaces in the same manner. For example, women employ indoor rather than outdoor spaces for social and recreational activities. By introducing semi-public spaces, e.g. the school play yard, as an intermediate for public and private spaces, cultural barriers can be overcome and urban planning problems can find new solutions. These ‘semi-public spaces’ are of vital importance. They respect the cultural values and help the society in organising the activities in a familiar space where everyone has the right to use.

Corresponding author: Mokarram Abbas, doctoral dissertation ‘Thinking public spaces through the spatiality of women’ (KU Leuven and VUB). More information at: <https://eng.kuleuven.be/geniaal/geniaaljg7nr27.pdf> (pages 10-11).

Understanding and changing gender assumptions in physics (Lund University)

To find a gender perspective in physics is an important and challenging task. Despite the fact that the objects of physics seem non-gendered (elementary particles do not have a sex after all), physicists use metaphors and pictures to explain and illustrate their concepts. It is clear that these can introduce bias. Recently a commonly used textbook of physics (Benson’s “University Physics”) was analysed in Lund, after it was reported as sexist by one student. A picture illustrating the effect of parallel mirrors and an infinite number of images showed a scantily dressed actress. A further analysis of the pictures in this textbook found that the pictures of men and women were very different, both in content and in numbers. It is clear that visual representation can be very powerful – and very biased.

The physics textbook analysis was performed in the context of the university-wide “Gender Certification” project at Lund. In an assessment of the project after five years, it was found that the physics department not only had been able to attract more women students and hire a woman professor, it had also worked systematically with methods very similar to the ones outlined in the Stanford “Gendered Innovations” project. Through several workshops, for example, physicists analysed gender assumptions in their teaching and research. As a result, academic staff rethought their teaching, including concepts and language, and changed their research questions and priorities.

Contact: Thomas Brage, Department of Physics, Lund University

More information at: <http://genderedinnovations.stanford.edu/case-studies/textbooks.html#tabs-2>

Women suffer more from mental illness (University of Oxford)

Mental health professionals, psychologists, and psychiatrists give surprisingly little attention to the question of gender differences. Research looking at international epidemiological data shows that in any given year total rates of psychological disorder are 20-40% higher in women than men. As to why women suffer from mental illness disproportionately, there are some indications that biological and genetic influences may be involved. But, for now at least, the bulk of the evidence points toward the contribution of life events and social roles. Indeed the conditions to which women seem especially vulnerable (such as anxiety and depression) are those for which genetic factors are known to be much less significant than environmental influences. Conditions with relatively high heritability – such as schizophrenia and bipolar disorder – tend to occur equally in men and women. More research into the causes of mental illness and specifically the role that gender may play in mental illness are needed.

Publication: Freeman D. & Freeman J. 2013. *The Stressed Sex: Uncovering the Truth about Men, Women, and Mental Health*. Oxford University Press.

Gender-sensitive sports education (Université Paris-Sud)

It is essential that the findings of gendered research are taken up in the educational curricula at universities and beyond. In order to raise awareness and to educate future sport professionals about gender, diversity and equality issues in sport, a 27-hour teaching module entitled “Activités physiques et sportives et différences des sexes” for all second-year students of STAPS (Sciences and Techniques of Physical and Sports Activities) at the Université Paris-Sud has been developed, which is informed by gendered sports research carried out at the university and elsewhere. For third-year students, 30 hours of tutorial classes are dedicated to gender and diversity in sports education, taking into consideration socio-historical, psychological and pedagogical approaches. Another teaching module entitled “industry knowledge” includes ten hours of education about gender equality to deconstruct gender stereotypes. Developed with the ESPE (*Ecole Supérieure du Professorat et de l’Éducation*), it is open to all Paris-Sud training courses (mathematics, physics, chemistry, biology, sports).

The family structure and childcare: constrained arbitrations and socialisation effects (University of Strasbourg)

Childcare is a crucial issue for gender analysis. This research analyses two dimensions of family structure: the logic governing the choice of childcare, shaped both by objective constraints (socio-professional conditions and local context); and the subjective representations of parents, shaped by the distribution of the care between father, mother and other guardians form a context of secondary socialisation, capable of transforming the practices and representations of both spouses. The 18-month survey is based on a hundred detailed interviews conducted with fifty couples, selected to represent a diversity of socio-professional and residential situations in which both spouses are met separately. It aims to highlight the changes of relations between sexes during the learning process of parental roles and to clarify the specific role of different types of childcare in this process.

Corresponding author: Anaïs Collet, Sylvie Monchatre, UMR 7363 - SAGE Laboratory – University of Strasbourg

Gender equality and economic growth in the cliometric long run (University of Strasbourg)

Despite the recent recognition of gender equality and female empowerment as a key goal for economic development, gender differences persist and continue to be a major challenge for both developed and developing countries. Inequalities between men and women seem to be rooted in the cultural, social and political systems of many countries. This research project is stimulated by the conviction that the understanding and the explaining of comparative economic development requires a global view of the entire process of development. It addresses the relation between economic growth and gender equality over the whole period of human history. To do so, insights from sociologists, demographers, historians and anthropologists are needed, even if the approach remains that of economists specialised in cliometrics. A cliometric projection of the social sciences in the past is produced, structured by economic theory and mathematical modeling using statistical and econometric methods. The ambition of the project is twofold: building a bridge between theoretical growth models and economic history; and encouraging economists to examine more systematically these theories grounded upon history while nevertheless aiming at finding general laws. This middle road between pure empiricism and abstract theory aims at opening the door to better economic theory, enabling the scientific community and the society in general to interpret current economic issues in the light of the past and to understand more deeply the historical working of socio-economic processes.

Publication: Diebolt C & Perrin F. 2013. *From Stagnation to Sustained Growth: the Role of Female Empowerment*. American Economic Review, 103 (3), pp. 545-549.
http://www.cliometrie.org/images/wp/AFC_WP_04-2013.pdf

Girls and boys are not looked at in the same way (Universities of Strasbourg, Lorraine and Ca' Foscari)

Body, gender and age are at the centre of current concerns over the transition from childhood to adolescence. Discussions, for example, about the hypersexualisation of girls or risky behaviour, have given expression to a form of moral panic which, in focusing on the developing body, has called into question the place of the child in contemporary society and the process of doing gender in life transition. The CorAge programme focuses on studying both the way children think of and experience these changes in everyday life, and how the adults around them perceive them and give support during this stage in life. This anthropological and comparative research has deconstructed risk rhetoric that propagates concerns bearing little relation to the child's experience of growing up. The way puberty is constructed in educational and medical discourse, popularised, simplified and given media coverage has reinforced such issues as, for example, the early development of young girls, and sexist representations of the "Lolita" type. The wide range of children's and adults' experience questions the idea of the child's development which places growth in a continuum of universal, objective phases. Rather, growing up means coming to terms with a multitude of norms, models and recommendations. Girls and boys are not looked at in the same way; other than in the children's press, the male process of growing up is given little visibility: the experience of boys should be given more consideration. On the other hand, in epidemiology, clinical discourse, media and educational programs, girls' puberty and sexuality are over-emphasised, even if these representations don't match children's actual experiences.

Publications: Diasio N. (Ed.). 2015. *Grandir. Pouvoirs et périls*. Ethnologie française. Presses Universitaires de France (PUF), 2015/4 octobre.
 Diasio N. & Vinel V. (Eds.). 2014. *La préadolescence existe-telle?* Revue des Sciences Sociales, 2014, 51.

Corresponding authors: Nicoletta Diasio, UMR 7367 Dynamiques européennes, University of Strasbourg ; Virginie Vinel, Laboratoire Lorrain des Sciences Sociales, University of Lorraine; Donatella Cozzi, Ca' Foscari University, Venice.

Sex-based differences in the neuroendocrine regulation of human, social-emotional behaviour (Utrecht University)

Steroids and peptides mediate a diverse array of animal social behaviours. Human research is restricted by technical-ethical limitations, and models of the neuroendocrine regulation of social-emotional behaviour are therefore mainly limited to non-human species, often under the assumption that human social-emotional behaviour is emancipated from hormonal control. Development of acute hormone administration procedures in human research, together with the advent of novel non-invasive neuroimaging techniques, have opened up opportunities to systematically study the neuroendocrinology of human social-emotional behaviour. Researchers at Utrecht University reviewed all placebo-controlled single hormone administration studies addressing human social-emotional behaviour, involving the steroids testosterone and estradiol, and the peptides oxytocin and vasopressin. These studies demonstrate substantial hormonal control over human social-emotional behaviour and give insights into the underlying neural mechanisms. They have also proposed a theoretical model that synthesises detailed knowledge of the neuroendocrinology of social-emotional behaviour in animals with the recently gained data from humans described in the review.

Importantly, this review study systematically addresses sex-based differences. For example, it points out that research on social recognition is limited because most data on a single hormone is obtained from a single sex. Oxytocin data is collected mostly from males, whereas testosterone data is collected mostly from women. The choice to limit the subject group to males is mostly to avoid interactions with cyclic hormonal fluctuations in female participants. A recent imaging study (discussed in the review study), which investigated the effect of the hormone oxytocin on face processing specifically in females, found different activation patterns compared to data obtained from male subjects. Interestingly, females showed more reactivity in the amygdala in response to fearful faces after oxytocin as compared to placebo. Also, in females activation was enhanced by oxytocin in the inferior frontal gyrus (IFG) and the superior temporal gyrus (STG), both of which are involved in the evaluation and interpretation of complex stimuli such as emotional expressions, mind-reading, and imitation. This finding indicates that the current knowledge on the effects of oxytocin on the brain is biased by not taking into account the striking sexual dimorphism of the brain (i.e. the physical differences between male and female individuals that arise as a consequence of sexual maturation). The next challenge is to elucidate the effects of oxytocin on face processing in both sexes, and investigate the mechanism by which oxytocin affects the different neural regions involved in social processing.

In sum, it is crucial that sex-based differences are systematically investigated and reported in the development of models of the neuroendocrine regulation of human, social-emotional behaviour.

Publication: Bos PA, Panksepp J, Bluthé R & Van Honk J. 2012. *Acute effects of steroid hormones and neuropeptides on human social-emotional behavior: A review of single administration studies*. Frontiers in Neuroendocrinology, 33 (2012) 17-35.

Corresponding author: P.A. (Peter) Bos, Utrecht University

Flirting in the field: the effect of sex and gender factors on research data collection (University of Zurich)

There is a now a sophisticated body of literature discussing how situated identities such as gender, race and age as well as interlocked power relations shape what is said and done – or not said and not done – in research encounters, i.e. in situations where researchers and human subjects interact (in interviews, observations, test taking, etc.). This work gives evidence about the complex engagements and disengagements with sexuality in fieldwork and how this affects research data collection. The analysis of episodes of flirting in research encounters provides evidence not only of the contingency of data collection, but of the fluidity of subject positions. Furthermore, sexuality enacted in fieldwork can be experienced as both threatening and pleasant; it can facilitate data collection or impede it; it can balance power relations or enforce or reverse the asymmetry; and more likely than not, this will all take place within the very same encounter. As these relations are part of the data itself, they need to be taken into account in analysis. Based on feminist methodology, the paper gives evidence that doing so clearly enriches data analysis and hence research outcomes.

Publication: Heidi Kaspar and Sara Landolt. 2014. *Flirting in the field: shifting positionalities and power relations in innocuous sexualisations of research encounters*. *Gender, Place & Culture: A Journal of Feminist Geography*. DOI: 10.1080/0966369X.2014.991704

Why are male care workers and female electricians still rare? (University of Zurich)

Compared to other countries, gender segregation of educational and vocational pathways in Switzerland is high and persistent. Young adults who persevere in gender-atypical pathways have higher than average scholastic abilities and more beneficial family backgrounds. This indicates that - for both women and men - successfully establishing a gender-atypical employment field for oneself is still more difficult than a gender-typical one. Anticipating these difficulties, young adults are deterred from entering gender-atypical educational pathways and the respective employment fields lose a considerable number of potentially talented young people. Gender-sensitive analyses of occupational pathways identify these deterrents and develop measures to ensure more equal access to all occupations irrespective of gender.

Publication: Schwiter K, Hupka-Brunner S, Wehner N, Huber E, Kanji S, Maihofer A & Bergman M. 2014. *Pourquoi les aides-soignants et les électriciennes sont-ils toujours aussi rares? La ségrégation sexuée des parcours éducatifs et professionnels des jeunes adultes en Suisse*. *Swiss Journal of Sociology*, 40 (3), 401–428.

Strategies for gendered research in sustainable development at the Swiss National Center of Competence in Research North-South (University of Zurich)

Mainstreaming gender has become a core concern in larger research projects. Within the Swiss National Center of Competence in Research North-South (NCCR N-S, Research Partnerships for Mitigating Syndromes of Global Change), for example, a dual strategy for gender mainstreaming was pursued - on the organisational level and in project design. Measures include policy statements and guidelines for the advancement of women in the team and the analysis and consolidation of concepts and methodologies for gender-sensitive research related to sustainable development. By elaborating a rationale and ways to enhance research projects focusing on or considering gender/sex as an important category and by individual coaching of young researchers, gender-relevant knowledge has become enhanced and applied in many research projects.

Publication: Bieri S, Ott C, Freytes Frey A, Cross C, Partenio F, Fernández Álvarez MI. 2011. *A tool for thought and transformation: Gender-considerate global change research in practice*. In: Wiesmann U, Hurni H, editors; with an international group of co-editors. *Research for Sustainable Development: Foundations, Experiences, and Perspectives*. Perspectives of the Swiss National Centre of Competence in Research (NCCR) North-South, University of Bern, Vol. 6. Bern, Switzerland: Geographica Bernensia, 640 pp. [ISBN: 978-3-905835-31-1], available at: <http://www.north-south.unibe.ch/content.php/publication/id/2663>

See also: <http://www.north-south.unibe.ch/content.php/publication/id/1719>, <http://www.zora.uzh.ch/61657/>, http://www.north-south.ch/publications/Infosystem/On-line%20Dokumente/Upload/Lanz_Bieri_Fankhauser-NCCR_Dialogue_40.pdf

Corresponding author: Ulrike Müller-Böker, University of Zurich

Gendered memories (University of Zurich)

Over the last three decades, the role played by phenomena linked to the (re-)making of collective memories in situations of societal and political change has gained attention in humanities and social sciences research, and only in recent years has this subject been researched with respect to colonial and postcolonial settings. Importantly, up until now gender has largely been neglected on the conceptual level. The research indicates that the making of collective memory is often linked to highly gendered and sexualised models of national, religious, or ethnic identity. At the same time, situations of societal and political change open up spaces for questioning and (re-)negotiating existing gender norms and gender relations.

Publication: Dennerlein B, Hegasy S (Guest Editors). 2012. *Gendered Memories in the Middle East and North Africa*. *Journal of Middle East Women's Studies*, 8, 1. Bloomington: Indiana University Press.

Corresponding author: Bettina Dennerlein, University of Zurich

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LERU Office

Minderbroedersstraat 8
B-3000 Leuven
Belgium

tel +32 16 32 99 71
info@leru.org
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