Women and Chemicals

The impact of hazardous chemicals on women

A thought starter based on an experts' workshop

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Content

Summary

This report aims to summarize existing information and initiatives on the topic of women and chemicals. This report is a thought starter and was informed by and developed subsequent to an expert workshop held at UNEP's offices in Geneva in 2014 and organised by WECF International. The workshop brought together leading global experts on chemicals and health. It was decided to focus on the particular impacts from exposure to hazardous chemicals, taking into account biological and socio-economic aspects of women´s lives. A further complementary scoping study is planned at a later stage to consider the particular role of and impact on men. This report on women and chemicals does not claim to present an exhaustive overview of all available data and information. Instead it aims to give an overview of the topic from different perspectives, on health effects, exposures and policies. It illustrates how the topic of women and chemicals is currently covered in science and in activities of international organizations, governments, and civil society.

During the preparation of the study it became clear how little attention this topic receives, compared to other areas, for example studies on the impacts on women's lives related to climate change or water management, which are much better documented. There are almost no comprehensive studies and summaries currently available on the topic of women and chemicals, although an increasingly large body of evidence points to severe, irreversible and long term health effects of specific hazardous chemicals on women's health, especially the health of pregnant women and the foetus. There is a lack of recognition by policy makers and translation into concrete protection measures, legislation and norms.

Legislation to inform and protect women and men from chemical related health risks is weak in many countries. A specific policy focus on women with their different circumstances and needs in their role of protecting children from hazardous chemicals during their first months and years of development, is mostly non-existent. The few initiatives there are on awareness raising, empowerment and capacity building carry almost no weight in the bigger picture. Information for users and consumers such as product labelling is not widely available. Yet it is very much needed. In parallel with increasing production of hazardous chemicals and pesticides non-communicable diseases such as breast and other cancers, allergies and diabetes, all with links to chemical exposures, are on the rise. Breast cancer in particular is one of the most common causes of death for women worldwide.

So far only a few projects addressing chemical policies and programs specifically target women and they are mainly organized and implemented by NGOs. UNDP developed a six-step approach to integrate gender and chemical issues into national development plans. However, this approach has yet to be imple-

mented by governments. UNEP is developing a toolkit on protecting vulnerable groups from POPs and heavy metals; the publication is still in process.

This report looks at health research, exposure data, and best practice policies to prevent exposure and health impacts. However, protection of women from hazardous chemicals is not enough. Women also have to be empowered as agents of change. With better information on the specific links between their health and hazardous chemicals, women can play a significant role as active supporters of the "2020 goal" of implementing the sound management of chemicals throughout their life cycle. Well-informed individuals need to cooperate on legislative development, enforcement, capacity building, production of safer alternatives, information and awareness raising, to ensure that chemicals are produced and used in ways that minimize significant adverse impacts on human health and the environment worldwide.

There is little comprehensive information available on the risks of hazardous chemicals to women's health; this study intends to make the first step to fill this gap. It shows that numerous scientific studies link exposure to hazardous chemicals with development of certain diseases and disorders including breast cancer, obesity, and infertility, which are most commonly experienced by women. The chapter "Where are women exposed to chemicals?" describes how women are exposed to hazardous chemicals at home, at work, in the environment and during different life stages including during pregnancy. The following chapters give a brief summary about on-going activities of international organisations, NGOs, business and governments on the specific issue of women and chemicals. These are rather limited, as an overview of current literature and websites shows, and are often found as part of studies on other topics such as for example occupational health or specific chemicals. In the current discussions on Endocrine Disrupting Chemicals (EDCs), pesticides and mercury some data is available on the effect that these hazardous chemical substances have particularly on women. However, there is still a great need for more in-depth information and work to be done on the socio-economic impacts of chemicals on women. Hence it is necessary to better understand these implications for the design of projects and programmes that actually help affected women in the long term.

This study is only the first step, as more information needs to be explored and compiled by:

- searching for best practice projects in implementation, capacity building and awareness raising and their indicators for success;
- collecting more gender and sex disaggregated data on issues like exposure scenarios, impacts of hazardous chemicals on women's health, activities to reduce exposures for women;
- developing indicators for better measurement of hazardous chemicals' impacts on women, especially through more research on sources and pathways of exposure.

Yet with the information at hand, immediate concrete action can be taken by:

- issuing a handbook on women and chemicals, with articles from experts presenting the latest in-depth information and research on women and chemicals;
- supporting the issue of women and chemicals as a priority issue under the Strategic Approach to International Chemicals Management (SAICM);
- integrating a gender focus into existing funding schemes;
- allocating and providing funding for projects on women and chemicals.

To support the goal of empowering women and protecting them from hazardous chemicals, the following immediate action points are recommended:

- make the most vulnerable group, in this case children and pregnant women, the norm (and not the exception) for developing threshold limits, where there are safe threshold limits;
- support mandatory labelling of all chemicals in products to ensure the right to know;
- strengthen women's rights, in particular their participatory rights, in all aspects of decision making, chemical production, use and disposal;
- clean up all chemical and heavy metal polluted 'hot spots' to protect the population living nearby and avoid further contamination;
- implement the precautionary principle for chemicals which are harmful or suspected to be harmful to human health and environment, by regulatory measures.

This first scoping overview on "Women and Chemicals" addresses policy makers, national competent authorities, international organisations, science, business and civil society. It will provide initial thoughts on the topic of women and chemicals and it aims to motivate further thought and research to design activities, which aim to empower women and to protect them from hazardous chemicals. Further work will need to be done to complete the gender picture and address the impacts of hazardous chemicals on men and boys.

Why focus on women and chemicals?

Women do not only have different susceptibility to chemicals than men; they also experience different social determinants. In many cases women and men have different gender roles in society and are exposed in different ways to chemicals. Social and biological related determinants define what chemicals women are exposed to, and how they do harm to them and their children.

Women, sustainable development and chemicals

Historically, studies on health effects of chemicals more often have covered specific effects on men, either because they were occupational studies, and there were a majority of men in the workforce, or because reproductive impacts, in particular, such as undescended testes, are immediately visible, in contrast to impacts on women's reproductive health.

Furthermore, the issue of women and chemicals needs to be looked at within the broader concept of gender equality and sustainable development. Principle 20 of the Rio Declaration (1992) is the first to highlight that gender inequality obstructs sustainable development by stating: "Women have a vital role in environmental management and development. Their full participation is therefore essential to achieve sustainable development."[1]

In 2000, state leaders set the agenda of the UN Millennium Development Goals (MDGs). The MDGs are intended to eradicate poverty, and ensure equality and basic standards of living for all people, in turn contributing to development particularly in a way that reaches all parts of society. One of the goals, MDG 3, specifically targets gender equality. This particular goal has a direct relationship to economic development. According to the World Economic Forum's Gender Gap Report, out of the total 135 countries included, gender equality has a direct correlation to gross domestic product (GDP).[2] States with higher degrees of gender equality maintain higher GDPs in comparison to those with lower degrees of gender equality.[3] According to the MDGs Report more than 20 years later than "Our Common Future",[4] gender equality and the empowerment of women are at the heart of the MDGs and are a premise for overcoming poverty, hunger and disease. But progress has been slow on all fronts – from education to access to political decision-making.[5]

This is also a result of the compartmentalised approach of the MDGs to issues, such as gender equality and environmental sustainability, which are by nature cross-cutting issues. It is the complexity of the links between social dimensions, sustainable development and human rights which is a challenge and has so far not been addressed adequately. This is one aim of this study – a need to look into interlinkages between women and chemicals.

The importance of protection from toxins for women's health is demonstrated by the example of non-communicable diseases (NCDs). NCDs, closely linked to harmful chemicals, cause 60 per cent of all deaths worldwide and, according to WHO Global report, 18 million women died from NCDs alone in 2005.[6] NCDs are already the biggest global threat to women's health today – and they are on the rise, as the figures of the most prominent NCDs, breast cancer and diabetes, show. The World Health Organization estimates that around 1.7 million women will be diagnosed with breast cancer in 2020. This is an increase by 26 per cent from current levels.[7] In 2010, 143 million women were diagnosed with diabetes. By 2030 this number is expected to rise to 222 million.[8] There is no question that NCDs need to be addressed also from a women's perspective, to re-

WOMEN CAN BE KEY AGENTS OF CHANGE WORLDWIDE.

verse this trend. Numerous factors contribute to diseases like breast cancer, including inherited breast cancer susceptibility genes. But these genes – which confer a 60-80 per cent lifetime probability of breast cancer – are thought to underlie fewer than 10 per cent of breast cancer cases.[9] Moreover, the susceptibility genes do not cause breast cancer – they increase the vulnerability of women to carcinogens and other factors that promote breast cancer. A study of women with high-risk BRCA1 and BRCA2 genetic variations showed that 24 per cent of women born before 1940 were diagnosed with breast cancer by age 50, compared with 67 per cent of women born later, indicating that non-genetic influences do affect women at high genetic risk.[10] There is substantial evidence linking a number of pesticides and industrial chemicals to breast cancer risk.[11]

Biological determinants

We are all continually exposed to hazardous chemicals in our everyday lives. Once they have made their way into the air we breathe, the water we drink, and the food we eat, it is only a matter of time before they end up in our bodies. That harmful chemicals make their way into the human body has been proven through human biomonitoring, i.e. measuring toxic substances in the body. Many toxins can be identified in samples of blood, the umbilical cord, the placenta, breast milk, urine, hair, sperm and fatty tissue.[12,13] So far 350 pollutants have been proven so far to end up in the human body.[14]

Women and men often have different exposure routes. For example the US Center for Disease Control and Prevention (CDC) reported that adult women have higher levels of urinary metabolites than men for those phthalates that are used in soaps, body washes, shampoos, cosmetics, and similar personal care products, which are linked to e.g. birth defects.[15]

Even more alarming is the fact that the human body burden of chemicals is passed on from one generation to the next, with levels of certain hazardous chemicals increasing from mother to child.[16]

Susceptible windows of development

Women, men and children are all susceptible and exposed to chemicals in different ways. In the case of women, biological factors such as the difference in physical make-up, such as more fatty tissue, are one reason for the different susceptibility to chemicals. Both men and women experience 'windows of susceptibility' during which the impacts of chemical exposures can have critical effects on development and disease burden, most notably during the perinatal period and puberty, but women experience additional windows of susceptibility during pregnancy, lactation and menopause. These are periods when the female body changes and becomes more vulnerable to influences from the environment. In the following chapters some of these windows of susceptibility will be addressed in more detail.

Trans-generational effects

There is emerging evidence that certain diseases triggered by chemicals can manifest in later generations. When women are exposed to a certain substance during their pregnancy, it can be their children and grandchildren that face the disease. There are animal studies showing that exposure to pesticides, phthalates, dioxin, and nicotine can have this trans-generational effect manifesting in low sperm counts, respiratory problems, and obesity in later generations.[17,18,19] One of the most prominent cases proving multigenerational effects is the continued tragedy of diethylstilbestrol (DES).

Studies show that daughters of women who took the drug during their pregnancy, as they were said that it would reduce the risk of pregnancy complications and losses, developed a rare type of vaginal cancer in a very young age, which was not normally observed in women under 50.[20] They also suffered from other reproductive tract abnormalities, decreased fertility, increased breast cancer risk, and early menopause.[21] Even the granddaughters of women who took the drug DES have a higher incidence of menstrual irregularities and potential infertility.[22] The scientists at the Women's Reproductive Health and the Environment Workshop, held in January 2008 at Commonweal, a health and environmental research institute in the US, concluded that DES taught us three important lessons that can guide our investigations of other chemicals. The exposure to hormone disruptors during foetal development can induce reproductive tract defects or other health impacts in the foetus, even if exposure does not affect the mother's health. The risk of health impacts from exposure to hormone disruptors is especially high during prenatal development. And a disease induced during development might only be apparent decades later, and exposure to this one chemical could lead to multiple health risks. Girls who were exposed to DES prenatally appeared to develop normally. Only in adulthood did health impacts like uterine malformations, infertility, vaginal cancer, and breast cancer become apparent.[23]

Gender and other social determinants

When it comes to differences in exposure to chemicals and pollutants, social factors are important. Social, economical and cultural factors strongly influence the chemicals women in different developmental stages are exposed to. Social determinants include, besides the gender aspect, socio economic status, occupational status, ethnicity, education, age, living conditions, geographical location, nutrition and others.

Roles and tasks of women and men

In all societies, women and men have different gender roles, which also impact their exposure to chemicals. There is limited hard data and exact figures on how the different gender roles expose women and men in a different manner to chemicals. More research is required to attain information such as absolute numbers of exposed women, exposure pathways, typical chemicals and their effect on women's health.

As well as their paid occupations, other core female tasks are childbearing, child rearing and running the household. Apart from the provision of health services and hygienic measures this includes activities such as the purchase of food and other products for daily life, for childcare and for housecleaning. This exposes women to many different kinds of chemicals other than men. On the other hand this role gives them some purchasing power as consumers. If women as consumers would be fully informed about harmful chemicals in the products they buy and if there are safer alternatives, they can play out this power effectively for their and their family's health.

Structural inequalities between women and men also play a role when looking at women and chemicals. Tasks related to providing food for the family, fostering children and sustaining a family depend very much on access to and ownership of land and other assets, such as finances and education. Women all over the world do not have the same level of control as men over these assets, due to their social status and/or traditional gender roles, including cultural and religious components.[24] This is even more the case for the growing number of female-headed households.

Generally, women also have limited decision-making power compared to men. Female representation in political decision-making bodies illustrate this: according to statistics of the Inter-Parliamentary Union only 19 per cent of seats in parliaments worldwide are held by women.[25] Only around 6 per cent of higher government positions, such as head of state or head of government, are assigned to women. These are average figures. However, they reflect a persistent gap in decision-making power between women and men. This is perpetuated in smaller decision-making bodies on regional and local level, and the same pattern is visible for women in science and the private sector.

There are also differences between men and women in relation to employment. Even though progress has been made in advancing gender equality on the employment sector, women continue to be discriminated against in terms of access to jobs, remuneration, benefits, working conditions and access to decision-making bodies.[26] Economic and financial crises had their effects on women and men, in particular on poor and vulnerable groups. But they also pushed even more women into informal employment.[27] Many of these informal employment opportunities are directly or indirectly related to high exposure of harmful chemicals, like to work as a waste picker.

According to the FAO, "women make essential contributions to the rural economy of all developing country regions as farmers, labourers and entrepreneurs".[28] Women have an important role in the production of food. Rural women especially in developing countries often provide the food for their families by subsistence farming and by keeping livestock in close vicinity to their home. As providers of food, these women are highly dependent on natural resources and a sound environment. Therefore they are the first ones to be affected by the impacts of hazardous chemicals in the environment and especially by pesticides.

Links: discrimination, poverty, education, public participation and access to resources

Exposure to chemicals exacerbates existing discrimination patterns. The links between different grounds of discrimination and the issue of chemicals are difficult to unveil and pose a challenge in assessing the level of impact of chemicals on women, however, it is essential to analyse the root causes more closely and to consider the links.

Poverty

Poor women carry multiple burdens of exposure to harmful chemicals. They are more exposed, e.g. due to informal employment or bad living conditions in their homes. They do not have access to information on how to avoid exposure and no means to do so. They are more likely to suffer from chemical related diseases because they are more exposed and in higher vulnerable situations. At the same time they lack access to health insurance and money to pay for treatments. Furthermore, if women cannot contribute to the family income due to disease or illnesses of their children, their economic situation usually gets worse. The poorest people are the ones most dependent on functioning ecosystems.[29] In their traditional roles as care takers and as they often live on sustenance farming, women are the ones most dependent on clean water and non-contaminated soil for small scale farming. This makes them especially vulnerable to the depletion of natural resources. It also makes them and their families more likely to develop diseases, if soil, air or water is polluted.

Education

The issue of "chemicals" is very complex and difficult to understand for non-experts, especially when it comes to factors such as long latency, multigenerational effects or prenatal exposure as well as safer alternatives. All this implies a basic understanding of biology and the human / female body. Many people are unaware of what kind of chemicals they are exposed to and what the health consequences will be. This is exacerbated when labelling and full disclosure of chemicals in products is not applied. However, this kind of knowledge is necessary to avoid exposure, as long as hazardous chemicals are not banned or stockpiles and dumps of obsolete substances are not cleaned up. Therefore many people, especially from developing countries and from a lower socio-economic status, are exposed to them without knowing and have no chance to avoid exposure. Women, especially, feel guilty when their children have birth defects or other diseases and they cannot find a reason for it, as they do not know that their surroundings are polluted by the products they use. As long as the burden of proof lies with the victims, many people will not receive any compensation or justice for their suffering from exposure of hazardous chemicals. There are many cases where the true hazardous nature of chemicals was revealed only step by step. A prominent case is the pesticide endosulfan, a Persistent Organic Pollutant (POP), which is now finally banned under the Stockholm Convention, and listed in Annex III of the Rotterdam Convention. Many women exposed to endosulfan reported illnesses, miscarriage and birth defects. Many of them never received any kind of compensation.

Apart from expert knowledge, women need to be literate and they need access to information, e.g. radio, TV, internet or newspapers.

Environmental health, public health and epidemiology are not, in many countries, obligatory modules in the education of medical doctors, nurses, midwives and other professions. Health and education professionals should be trained in these fields so they can raise awareness and inform the public, especially women, about hazardous chemicals and ways to avoid them. They also need to be able to detect sources of exposure, e.g. in case of an unusual accumulation of certain diseases. They should be able to file reports to state agencies like national cancer registries or simply help families to eliminate the exposure source.

Public participation

The United Nations General Assembly Resolution 66/130 of 2012 (A/RES/66/130) stated with high concern "…that women in every part of the world continue to be largely marginalized from the political sphere, often as a result of discriminatory

laws, practices, attitudes and gender stereotypes, low levels of education, lack of access to health care and the disproportionate effect of poverty on women…".[30]

Women's participation is needed in all decision-making bodies, i.e. in parliament, government and the judiciary at local, regional and national level, and also in the executive boards of big (chemical) companies in order to have a real vote on banning hazardous chemicals or on adopting budgets for research on finding safe alternatives. States have to eliminate discriminatory legislation and prejudices, to remove de facto barriers for women's participation and to raise awareness amongst decision-makers and the population as well as to empower women. Women also need to have more access to information, inter alia by guaranteeing proper access to information and communication technologies for girls and women, even for those who may be marginalised, including indigenous women, women with disabilities or women from rural areas (see above).

Access to resources

Women often do not have access to resources, social protection and finances, they are in a deprived position to deal with problems

linked to exposure to harmful chemicals. Many women around the world have limited access to health care and health treatment. Often they cannot finance medical treatment because of lack of money or health insurance. In many countries there is no health insurance system or a comparable social system for health treatment in place.

To avoid hazardous chemicals women have to use safe substitutes and non-chemical alternatives. In order to do so, they often have to make investments. This may mean for example buying new safe products or removing lead-containing paint in their homes or contaminated soil. Yet 75 per cent of the world's women cannot get bank loans because they have unpaid or insecure jobs and are not entitled to property ownership.[31]

Restricted access to natural resources limit women in the production of traditional, non-chemical containing products. Many natural resources are used in safe alternatives for products like packaging materials, cosmetics or pharmaceuticals. Forests, for example, provide raw materials for products like baskets, fences, drying racks or packaging. In Nigeria women use containers for marketing agricultural products which are almost exclusively made of natural materials.[32] If forests disappear because of climate change, food and soy production, a whole range of non-chemical containing products disappear and women have to use non-natural products like plastic containers.

Scientific limitations

Many legislative decisions are based on scientific research. Besides public opinion changes due to fatal events like accidents and pressure from (influential) stakeholders, the main catalyst for governments to apply stricter laws on chemical management is scientific evidence. To achieve a high protection level for women from hazardous chemicals research should take into account women's specific biological nature. Studies show that currently this is often not the case. In their commentary in the magazine "Nature", US National Institutes of Health director Francis S. Collins and Janine A. Clayton state that using mainly male animals for research can lead to false conclusions in regard to women.[33] For some cases it is known that women do react differently to certain pharmaceuticals and chemicals than men, largely because of their different hormone system. Chemical regulation tends to define a threshold limit that draws the line between safe and harmful exposure. However, these threshold limits often result from norms that are based on the average male height and body weight. Animal research also indicates that males have a five times higher detoxifying capacity than females.[34] Women and children need norms that match their biological conditions, so that threshold limits and doses for pharmaceuticals fit them accordingly. This approach should be promoted among the scientific community and regulators. Existing threshold limits should be reinvestigated accordingly.

Endnotes chapter 2

1 Rio Declaration on Environment and Development, 1992 (United Nations Conference on Environment and Development)

2 Hausmann, R.; Tyson, L.; Zahidi, S. (2011): The Global Gender Gap Report, p. 27

3 Ibid; see also UN Women (2011): Annual Report 2010-2011, p. 3

4 United Nations (1987): Our Common Future, chap. 2

5 United Nations (2010): Millennium Development Goals Report, p. 4

6 WHO (2005): Preventing Chronic Diseases: A Vital Investment: WHO Global Report

7 WHO (2002): The world health report 2002 – Reducing Risks, Promoting Healthy Life

8 NCD Alliance: Non-communicable diseases: A Priority for Women's Health and Development

9 (Davis DL, Axelrod D, Bailey L, Gaynor M, Sasco AJ. 1998. Rethinking breast cancer risk and the environment: the case for the precautionary principle. Environ Health Perspect 106(9):523-9.)

10 King MC, Marks JH, Mandell JB. (2003): Breast and ovarian cancer risk due to inherited mutations in BRCA1 and BRCA2. The New York Breast Cancer Study Group, Science 302(5645):643-6

11 Brody JG, Moyisch KB, Humbet O, Attfield KR, Beehler GP, Rudel RA. (2007): Environmental pollutants and breast cancer. Cancer Supplement 109(12):2667-711

12 See among others: Schuiling, J. and Van der Naald, W. (2005): A present for life: hazardous chemicals in umbilical cord blood. Greenpeace/WWF http://wwf.fi/mediabank/1093.pdf (retrieved February 2014)

13 WWF-UK. (2003): ContamiNation: The results of WWF bio-monitoring survey. http://www.wwf.org.uk/filelibrary/pdf/biomonitoringresults.pdf (retrieved February 2014)

14 Cameron, P. and Smolka, S. (2006): Toxic Inheritance. Friends of the Earth. Europe/BUND, p. 14. www.foeeurope.org/publications/2006/toxic_inheritance.pdf (retrieved February 2014)

15 Centers for Disease Control and Prevention (2015): Fourth Report on Human Exposure to Environmental Chemicals, Updated Tables, February 2015. Atlanta, GA: U.S. Department of Health and Human Services. http://www.cdc.gov/biomonitoring/pdf/FourthReport_UpdatedTables_Feb2015.pdf (Retrieved March 2015)

16 WWF-UK (2004): ContamiNation- the next generation: Results of the family chemical contamination survey. http://www.wwf.org.uk/filelibrary/pdf/family_biomonitoring.pdf (retrieved February 2014)

Liz Szabo(2011): Study finds toxic chemicals in pregnant women's bodies publisched in USA Today. http://usatoday30.usatoday.com/yourlife/parenting-family/pregnancy/2011-01-14-chemicals14_st_N.htm

17 Manikkam, M. et al. (2012): Transgenerational actions of environmental compounds on reproductive disease and identification of epigenetic biomarkers of ancestral exposures. In: PLoS ONE 7(2). http://dx.doi.org/10.1371/journal.pone.0031901 (retrieved February 2014)

18 Rehan, VK. et al. (2012): Perinatal nicotine exposure induces asthma in second generation offspring. In: BMC Med 10:129. http://www.biomedcentral.com/1741-7015/10/129?utm_source=rss&utm_medium=rss&utm_campaign=perinatal-nicotine-exposure-induces-asthma-in-second-generation-offspring (retrieved February 2014)

19 Rehan, VK. (2013): Perinatal nicotine-induced transgenerational asthma. In: American Journal Physiology Lung Cellular and Molecular Physiology, Vol 1. http://dx.doi.org/10.1152/ ajplung.00078.2013 (retrieved February 2014)

20 Herbst A. et al. (1971): Adenocarcinoma of the vagina. Association of maternal stilbestrol therapy with tumor appearance in young women. In: New England Journal of Medicine, Vol 284, p. 878-881

21 Barrett J. et al. (2009): Girl, Disrupted

22 Titus-Ernsthoff, L. et al. (2006): Menstrual and repoductive characteristics of women whose mothers were exposed in utero to diethylstilbestrol (DES). In: International Journal of Epidemiology, Vol. 35

23 Barrett J. et al. (2009): Girl, Disrupted, p. 13

24 FAO (2011): The State of Food and Agriculture 2010-11

25 IPU/DWA (2010): Women in Politics Map. http://www.ipu.org/english/surveys.htm#MAP2010

26 ILO (2011): Equality at Work, p. 11

27 ILO (2011): Equality at Work, p. 9

28 FAO (2011): The State of Food and Agriculture 2010-11, Executive Summary, p. 2

29 TEEB (2010): The Economics of Ecosystems and Biodiversity. Mainstreaiming the Economics of Nature, Synthesis of appraoch, Recommendations and Conclusions of TEEB. http://www.teebweb.org

30 http://www.un.org/en/ga/search/view_doc.asp?symbol= A/RES/66/130

31 http://www.undp.org/content/undp/en/home/ourwork/povertyreduction/focus_areas/focus_gender_and_poverty/ (retrieved March 2014)

32 Falconer, J. and Koppell C. (1990): The Major Significance of „Minor" Forest Products: The Local Use and Value of Forests in the West African Humid Forest Zone. www.fao.org/docrep/t9450e00.htm#Contents (retrieved February 2014)

33 http://www.nature.com/news/policy-nih-to-balance-sex-in-cell-and-animal-studies-1.15195 (retrieved May 2014)

34 WHO Europe (2010): Social and gender inequalities in environment and health, p. 8


TOO MANY
CHEMICALS
ARE NOT YET
TESTED FOR
THEIR IMPACT
ON WOMEN'S
HEALTH.

Women's health under threat

Typical diseases for women can be linked to chemical exposure. Many studies show associations between single substances and the development of breast cancer, infertility, obesity and many more diseases. Two diseases shall serve as examples to illustrate the kind of role chemicals can play in their outbreak. Breast cancer is a typical women's disease. Infertility of women involves different biological factors than male infertility.

Although many studies are available, much more research is needed. Too many chemicals are not yet tested for their impact on women's health. Additionally, very little comprehensive overview literature is available specifically on women's health and chemicals.

Breast cancer

The first disease one would relate to the issue of chemicals and women is probably breast cancer. The incidence rates of breast cancer have increased dramatically in recent years. These trends cannot be fully explained by the improvement of diagnosis, changes in established risk factors (age at menarche or menopause, genetic susceptibility, age of having babies) or life style causes. Epidemiological studies show evidence that chemicals like PCDD/F, PCBs, organic solvents, DDT/DDE, BPA, PAHs, phenols, alkylphenols, phthalates, parabens, styrene, metals, phytoestrogens, chemicals in first or second-hand smoke, and heavy metals like cadmium are linked to breast cancer.[1]

Most human studies have focused on adult exposure. However, some retrospective studies provide hints that early exposure to hormone disruptors plays a role in adult disease. For example, although some earlier studies showed no link between DDT and breast cancer, narrowing the suspected exposure to girls younger than 14 revealed a fivefold increase in breast cancer risk after age 50.[2]

A broad overview on the incidence of breast cancer is also given by Meriel Watts researching the link between pesticides and breast cancer.[3] The reported incidence rate for breast cancer varies enormously between countries. Reported rates are highest in the USA, Europe, New Zealand, Canada and Australia, and lowest in Asia and Africa. Mortality of breast cancer shadows the incidence.[4] This regional variation in breast cancer incidence could be a result only of the substantial underreporting in many developing countries. Many poor rural women simply cannot afford to go to the doctor or have access to basic health care and hence their breast cancer may never be recorded. Additionally, not all countries have adequate breast cancer registries even for those cases that are seen by a doctor. Hence the breast cancer rate even in these countries may in fact be higher than the currently available statistics reveal.[5]

Conventionally accepted risk factors only account for 30 to 50 per cent of all breast cancers.[6] This leaves 50 to 70 per cent of cases with no known cause. This is where the environment and the exposure to toxic chemicals get in the focus as causes. Andreas Kortenkamp, for example, sees evidence emerging that environmental influences, including chemical exposure, play a vital role.[7] Studies among Scandinavian twins on breast cancer suggest this. They have found that heritability accounted for 27 per cent, environmental factors that were shared by both twins explained 6 per cent, and environmental factors not common to the pair contributed 67 per cent.[9] As it seems that the most important contributors to the development of breast cancer are non-genetic or environmental, much more attention has to be paid to those factors. As chemical exposure is one prominent non-genetic as well as

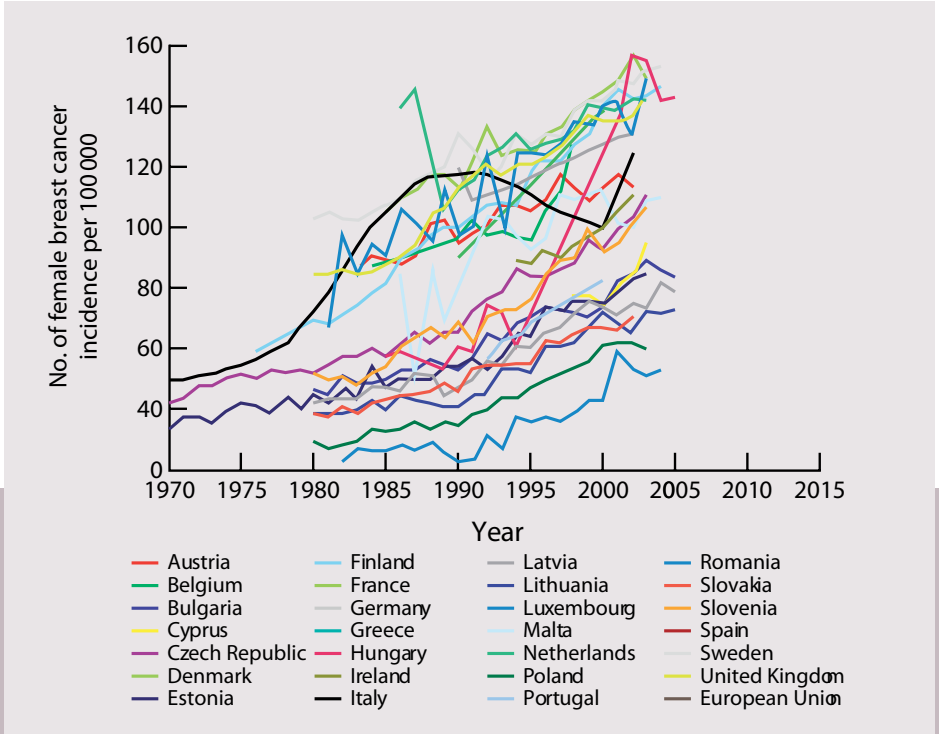
avoidable factor, the prevention of involuntary exposure to chemicals should be a major priority.

Take the influence of exposure of women to specific chemicals on oestrogen. Research shows that the cyclical secretion of oestrogens during a woman's life is a key risk factor for breast cancer. The more oestrogen one receives during life, the higher the overall risk.[10] The length and intensity of exposure is dependent on different parameters like a woman's age at first menstrual period, first pregnancy, and menopause, her number of pregnancies and history of breastfeeding. Lifetime oestrogen exposure may yet be increased by exposure through e.g. oestrogenic hormone disruptors, birth control pills, and hormone replacement therapy. Nowadays, the average exposure of natural oestrogen to women is on the rise, as we see an overall decrease in the age of first menstruation, an overall delay in the onset of menopause and an increase of infertility problems among women. All these issues have been linked to environmental and endocrine disrupting chemicals and substances such as bisphenol A, phthalates and lead.[11, 12] As there is a developing understanding that synthetic oestrogens are an additional risk factor, concerns are growing over other oestrogen-like chemicals present in the environment, in food, cosmetics and personal care products. Exposures during prenatal and pubertal development appear to be especially critical, although the specific details of how each chemical promotes cancer are not yet known.

More than 200 chemicals have been associated with an increased incidence of breast tumors in humans and/or lab animals.[13] Exposures during prenatal and pubertal development appear to be especially critical, although the specific details of how each chemical promotes cancer is not yet known. Breast cancer, like other reproductive disorders, probably results from disruption during more than one stage of breast development.[14]

An overview of current studies and facts regarding breast cancer and environmental pollutants is given by WHO and UNEP in their report, State of the Science of Endocrine disrupting Chemicals from 2012.[15] This report mentions studies that highlight the importance of factors like stress, occupational exposure or shift work but also chemical exposure to endocrine disrupting substances and carcinogens and lifetime exposure to synthetic and natural oestrogens.[16, 17] According to the WHO/ UNEP report[18] studies link chemicals like PCDD/F, PCBs, organic solvents[19], DES[20, 21], BPA[22, 23], PAHs, phenols, alkylphenols, phthalates, parabens, styrene, metals, phytoestrogens, chemicals in first or second-hand smoke[24], to breast cancer. For example, where DDT/DDE exposures during earlier life stages (puberty) could be reconstructed, breast cancer risks became apparent.[25] This echoes insights from the DES epidemiology where the importance of periods of heightened vulnerability during development became obvious.[26] There are also indications that exposure to cadmium, an oestrogen mimic, is associated with breast cancer.[27]

Although it is clear that the causes for breast cancer are manifold, it cannot be dismissed that environmental chemicals play a critical role. Therefore concerns are growing that there is a lack of human studies in this field, and more research of this kind should be undertaken.



The rise in the number of new breast cancer age standardized cases in several countries. All data from World Health Organisation (WHO), 2010, European health for all database (HFA-DB), World Health Organisation Regional Office for Europe.[8]

Some chemicals linked to breast cancer

Chemical Name	Action	Use	Found in (examples)
Phthalates- DEHP, DBP, BBP, DEP	EDC & C	Soften plastics. In cosmetics to denature alcohol (make it undrinkable), and to carry fragrances in cleaning products and cosmetics.	Inks, adhesives, paints, flooring, toys, many plastic consumer products, cosmetics, including perfumed, body sprays, aftershaves.
Parabens, Butyl, Ethyl, Metyl, or Propyl paraben	EDC	Preservative in cosmetics, personal care products and to prevent mould and yeasts in food and drinks.	Cosmetics, such as shower gels, shampoos, moisturizers, and deodorants, Jams, beers, and desserts.
Atrazine, Dichlorvos, Dieldrin, Chlordane, Cyanazine, Captafol, Flucythrinate, Ethylene dioxide, Ethylene dibromide, DDT, Lindane, Tributyltin, Ethylene oxide	EDC & C	Prevent pests in fish farming, and food crops, gardening and as rodent repellent.	Many already banned. Residues found in food, chocolate, drinking water, and some consumer products such as carpets. Antifouling paint on hulls of boats. Persistent in the environment.
Brominated Flame Retardants (BFRs)	EDC	Stop the spread of flames in consumer products.	Computers, furniture, TVs, carpets and paints.
Polycyclic Aromatic Hydrocarbons (PAH's)	C	Point source pollutants produced when carbon containing fuels, such as wood, coal, fat are burnt.	Found in air and industrial pollution.
Vinyl chloride (VCM)	C	Chemical intermediate, and to make PVC.	Building materials, flooring, plastic tubing, wiring, and other plastic consumer products.
Styrene-Vinyl acetate	C	Manufacture of synthetic rubber.	Found in rubber, plastic, insulation, fiberglass, pipes, automobile parts, food containers, and carpet backing.
Bisphenol A	EDC & C	The manufacture of polycarbonate plastic and epoxy resin.	Baby bottles, white dental fillings, nail polish, food packaging, linings of tin cans, contact lenses, water filters, false teeth, adhesives, water pipe linings and flooring.
Methylene chloride	C	Solvent, paint stripper and degreaser as a fumigant in food crops.	Furniture strippers and adhesives.
Nonylphenol & other Alkylphenols	EDC	Additive to prevent plastics from cracking as a surfactant, and in manufacturing of wool and metal.	Cleaning and cosmetic products, detergents and pesticides.
Mercury	EDC	Manufacture of industrial chemicals and electrical and electronic applications.	Thermometers, dentistry, agricultural chemicals, industrial pollution and batteries.
Cadmium	C	Electroplating, semiconductors, dentistry, photography, and as a pesticide.	Found in storage batteries, paints, pigments, glass and glaze.
Benzene	C	Solvent. Used in manufacturing of synthetic rubber and dyes, explosives and pesticides.	Petrol and crude oil. Industrial pollutant.
EDC = Endocrine Disrupting Chemical, C = Carcinogen			

Helen Lynn: Linking breast cancer and environment[28]

Yet this does not mean that nothing needs to happen until research provides confirmatory data from human epidemiological studies, as this kind of output will take decades. Preventative actions to limit exposure have to be taken now – the earlier, the better. They should be based on evidence available from experimental laboratory studies. Knowing the role of oestrogens in breast cancer, it would be a wise step to reduce exposures to chemicals that can mimic oestrogen. Current chemicals policy should pave the way for such chemicals to be banned and replaced with safer alternatives. It is time that environmental factors are officially recognized by health experts and health associations and organisations. Policy measures have to be taken now.

Infertility

Impaired fertility or infertility includes the difficulty or inability to get pregnant and/or carry a pregnancy to full term. It is difficult to determine exactly how many people experience impaired fertility. Overall there are more studies about male than female infertility due to the difficulty in finding the right endpoints and measurement techniques. The percentage of women in the US who have difficulty in achieving and maintaining pregnancy has increased between 1982 to 2002.[29] The main increase over the last two decades is among women under the age of 25.[30] There are various causes of impaired fertility. "A woman´s fertility depends on several body parts working together to produce and transport a healthy egg and nurture the developing foetus. Conception and foetal health also depend on the quality of the father´s sperm."[31] Disorders, which can impair fertility, include abnormal numbers of chromosomes in the eggs, menstrual irregularities, polycystic ovarian failure, and disorders associated with pregnancy, of which the three most common are miscarriage, preeclampsia, and intrauterine growth restriction. Studies have linked fertility problems to exposure to chemicals like DDT, DES, BPA, cigarette smoke and PCBs, and chlorinated hydrocarbons (includes PCBs, some pesticides, dioxins and furans), disinfection by-products, ethylene oxide, glycol ethers, heavy metals, pesticides, phthalates, solvents, PFOS and PFOA, octylphenol and nonylphenol.[32]

These chemicals are linked to infertility directly or to various diseases which can lead to infertility among women. One example is endometriosis, a chronic disease where tissue, which lines the uterus, grows abnormally in other locations. This can cause infertility, inflammation and pain. Estimates for the incidence of endometriosis vary. Most of them find that between 10 and 15 per cent of reproductive-age women have endometriosis.[46] Animal studies show a clear link between endometriosis and exposure to organochlorine compounds. A few studies link endometriosis in humans with dioxin, phthalates and PCBs.[47]

Male infertility is also influenced by chemical exposure. More information can be found in the WHO and UNEP "State of the Science Report on Endocrine Disrupting Chemicals", and in the ChemTrust report "Male reproductive health disorders and the potential role of exposure to environmental chemicals".[48]

Chemical Exposures During Adulthood and Fertility

Exposure (sources)	Potential female effects (examples)
Bisphenol A (BPA) monomer used to make polycarbonate plastic, resins	e.g. oocyte (egg) chromosome abnormalities[33]
Chlorinated hydrocarbons dioxins/furans, PCBs, some pesticides (organochlorines) and wood preservative (pentachlorophenol)	e.g. endometriosis[34]
Disinfection by-products drinking water treatment	e.g. menstrual irregularities[35]
Ethylene oxide chemical sterilant used in dental and medical practices	fetal loss[36]
Glycol ethers paints, varnishes, thinners, printing inks, electronics	e.g. reduced fertility[37]
Heavy metals lead, mercury, manganese, cadmium	e.g. hormonal changes[38]
Pesticides broad category that includes many classes of insecticides, fungicides, herbicides, rodenticides, and fumigants	e.g. reduced fertility[39]
Phthalates plasticizers added to soften plastics like PVC; also found in cosmetics, toys, pharmaceuticals, and medical devices	e.g. estrous cycle, ovulatory irregularities[40]
Solvents benzene, toluene, xylene, styrene, 1-bromopropane, 2-bromopropane, perchloroethylene, trichloroethylene, and others	e.g. fetal loss[41]
Cigarette smoke includes active and/or passive smoking	e.g. early menopause[42]
Perfluorinated compounds (PFOS, PFOA) used to make fabrics stain-resistant/water-repellant; in coating of cooking pans, floor polish, insecticides	hormonal changes[43]
Octylphenol/nonylphenol surfactants	e.g. altered puberty onset[44]

Chemical Exposures During Adulthood and Fertility/Fecundity Related Impacts[45]

Endnotes chapter 3

1 Brody, J. et al. (2007): Environmental Pollutants and Breast Cancer Epidemiologic Studies. In: CANCER Supplement. Vol 109. No. 12
2 Barrett, J. et al. (2009): Girl, disrupted. Hormone Disruptors and Women's Reproductive Health, p. 23
3 Watts, M. (2012): Breast Cancer, Pesticides and YOU! Pesticide Action Network Asia and Pacific (PAN AP)
4 Watts, M. (2012): Breast Cancer, Pesticides and YOU! Pesticide Action Network Asia and Pacific (PAN AP), p. 11
5 Watts, M. (2012): Breast Cancer, Pesticides and YOU! Pesticide Action Network Asia and Pacific (PAN AP), p. 12
6 Sasco, A. (2001): Epidemiology of breast cancer: an environmental disease? APMIS 109, p. 321-32
7 Kortenkamp, A. (2008): Breast cancer and exposure to hormonally active chemicals, A background briefing paper, Head of the Centre for Toxicology, The School of Pharmacy, University of London, p. 3
8 Bergman, A. et al. (2012): WHO. State of the Science of Endocrine Disrupting Chemicals – 2012. p. 126
9 Lichtenstein, P. et al. (2000). Environmental and heritable factors in the causation of cancer - Analyses of cohorts of twins from Sweden, Denmark, and Finland. In: New England Journal of Medicine, 343, p. 78-85.
10 Travis, RC. & Key, TJ. (2003): Estrogen exposure and breast cancer risk. In: Breast Cancer Research, 5(5) p. 239-247
11 Wang, RY. et al. (2005): Effects of Environmental Agents on the Attainment of Puberty: Considerations When Assessing Exposure to Environmental Chemicals in the National Children's Study. In: Environmental Health Perspectives, Volume 113, No. 8
12 Steingraber, S. (2007): The Falling Age of Puberty in US girls. Published by the Breast Cancer Fund
13 Rudel, RA. et al. (2007): Chemicals causing mammary gland tumors in animals signal new directions for epidemiology, chemicals testing, and risk assessment for breast cancer prevention. In: Cancer 2007; 109: p. 2635-66
14 Diamanti-Kandarakis, E.; Bourguignon, J.-P.; Giudice, L. C.; Hauser, R.; Prins, G. S.; Soto, A. M.; Gore, A. C. (2009): Endocrine-Disrupting Chemicals: An Endocrine Society Scientific Statement. Endocrine Reviews, 30(4), 293-342. doi:10.1210/er.2009-0002.
15 Bergman, A. et al. (2012): WHO. State of the Science of Endocrine Disrupting Chemicals – 2012.
16 Lichtenstein, P. et al. (2000). Environmental and heritable factors in the causation of cancer – Analyses of cohorts of twins from Sweden, Denmark, and Finland. In: New England Journal of Medicine, 343(2), p. 78-85
17 Luke, B. et al. (2005): Gender mix in twins and fetal growth, length of gestation and adult cancer risk. In: Paediatric and Perinatal Epidemiology, 19: p. 41-47
18 Bergman, A. et al. (2012): WHO. State of the Science of Endocrine Disrupting Chemicals – 2012, p.127
19 Brody, JG. et al. (2007). Environmental pollutants and breast cancer – Epidemiologic studies. In: Cancer, 109(12): p. 2667-2711
20 Palmer. JR.et al. (2006): Prenatal diethylstilbestrol exposure and risk of breast cancer. In: Cancer Epidemiology, Biomarkers and Prevention, 15, p. 1509-14
21 Troisi, R. et al. (2007): Cancer risk in women prenatally exposed to diethylstilbestrol. In: International Journal of Cancer; 121: p. 356-60
22 Vandenberg, LN. (2007):. Exposure to environmentally relevant doses of the xenoestrogen Bisphenol A alters development of the fetal mouse mammary gland. In: Endocrinology, 148, p. 116-27
23 Murray, TJ. et al. (2007): Induction of mammary gland ductal hyperplasias and carcinoma in situ following fetal Bisphenol A exposure. In: Reproductive Toxicology, 23, p. 383-90
24 Lee, PN. und Hamling, J.(2006): Environmental tobacco smoke exposure and risk of breast cancer in nonsmoking women: A review with meta analyses. In: Inhalation Toxicology, 18, p. 1053-70
25 Cohn, BA. et al. (2007). DDT and breast cancer in young women: new date on the significance of age at exposure. In: Environmental Health Perspectives, 115(10), p. 1406-1414
26 Palmer, JR.et al. (2006): Prenatal diethylstilbestrol exposure and risk of breast cancer. In: Cancer Epidemiol Biomarkers Preview,15, p. 1509-14
27 Kortenkamp, A. (2011): Are cadmium and other heavy metal compounds acting as endocrine disrupters? In: Life Sciences, 8, 305-317
28 Lynn, H. (2007): Linking breast cancer and the environment, p. 10
29 Swan S. et al. (1999): Reasons for Infecundity. In: Family Planning Perspectives, 31(3), 156-157
30 Barrett, J. et al. (2009): Girl, disrupted. Hormone Disruptors and Women's Reproductive Health. p. 5-7
31 Barrett, J. et al. (2009): Girl, disrupted. Hormone Disruptors and Women's Reproductive Health, p. 18f
32 Barrett, J. et al. (2009): Girl, disrupted. Hormone Disruptors and Women's Reproductive Health. p. 24 and FN32 Jon Luoma: Challenged Conceptions: Environmental Chemicals and Fertility (2005), http://www.rhtp.org/fertility/vallombrosa/documents/challenged_conceptions.pdf (Retrieved December 2014)
33 Hunt, PA. et al. (2003): Bisphenol A exposure causes meiotic aneuploidy in the female mouse. In: Current Biology, 13(7), p. 546-553
34 Sharara, F. et al. (1998): Environmental toxicants and female reproduction. In: Fertility Sterility, 70(4), p. 613-22
35 Windham, G.et al. (2003): Chlorination by-products in drinking water and menstrual cycle function. In: Environmental Health Perspectives, 111(7), p. 935-941
36 Sharara, F. et al. (1998): Environmental toxicants and female reproduction. In: Fertility Sterility, 70(4), p. 613-22
37 Correa, A. et al. (1996): Ethylene glycol ethers and risks of spontaneous abortion and subfertility. In: American Journal of Epidemiology,143(7), p. 707-717
38 Sharara, F. et al. (1998): Environmental toxicants and female reproduction. In: Fertility Sterility, 70(4), p. 613-22
39 Hruska, K.S. et al. (2000): Environmental factors in infertility. In: Clinical Obstetrics Gynecology, 43(4), p. 821-829
40 Sharara, F. et al. (1998): Environmental toxicants and female reproduction. In: Fertility Sterility, 70(4), p. 613-22
41 Sharara, F. et al. (1998): Environmental toxicants and female reproduction. In: Fertility Sterility, 70(4), p. 613-22
42 Younglai, E.V. et al. (2005): Environmental and occupational factors affecting fertility and IVF success. In: Human Reproduction Update, 11(1), p. 43-57
43 Lau, C. et al. (2004): The developmental toxicity of perfluoroalkyl acids and their derivatives. In: Toxicology and Applied Pharmacology, 198(2), p. 231-41
44 Bogh, I.B., et al. (2001): Endocrine disrupting compounds: effect of octylphenol on reproduction over three generations. In: Theriogenology, 55(1), p. 131-50
45 Luoma, J. (2005): Challenged Conceptions: Environmental Chemicals and Fertility, p. 5-6
46 Bergman, A. et al. (2012): WHO. State of the Science of Endocrine Disrupting Chemicals – 2012, p. 43
47 Barrett, J. et al. (2009): Girl, disrupted. Hormone Disruptors and Women's Reproductive Health. p. 22
48 http://www.who.int/ceh/publications/endocrine/en/ (retrieved February 2014)
http://www.env-health.org/resources/publications/article/male-reproductive-health-disorders-829 (retrieved February 2014)

OFTEN WOMEN DO NOT HAVE THE CHOICE OF USING SAFE ALTERNATIVES OR BETTER PRODUCTS.

Where are women exposed to chemicals?

Women as consumers

According to UNEP, "consumption patterns in developed and developing countries differ significantly, but there is an overlap in terms of the elite minority in developing countries and the growing numbers of the poor in industrialized countries. Globalization is also fuelling an explosion of consumption throughout the world. Yet 20 per cent of the highest-income countries account for 86 per cent of the total private consumption, while the poorest 20 per cent account only for 1.3 per cent. On the one hand, overconsumption places increasing pressures on the environment; on the other hand, 1 billion people living in poverty have no survival options. Women and men usually consume differently. In general, women first address the needs of their families, particularly their children, whereas men are more likely to spend resources for personal consumption. Women are the largest group of consumers or shoppers worldwide, making day-by-day purchasing choices. But since women are poorer than men in most societies, they often suffer heavily from a lack of basic necessities."[1]

The International Finance Corporation of the World Bank claims that „the financial power of women as consumers controls about $20 trillion globally by 2009 and is projected to reach beyond $28 trillion in the next five years.[2] Much of this is concentrated in the developing world, including poor women consumers whose collective household spending adds to hundreds of billions of dollars. In many countries, women can have as much, or more, influence over household and family spending than men."[3] Thus, women would have a tremendous market power, if they received substantial information on the safety of the purchased products and if there was an actual choice between different products.

Women do not only shop for their own needs. They are also the main care takers of their families. They plant food for their families, cook meals, buy everyday products, wash clothes and clean the house. During all these activities they or their family are exposed to the chemicals in the products they bought.

At the moment consumers only have very limited information about chemicals in purchased products. In many countries there is no labelling or declaration in place at all. In others legislation enforces or advises some level of information. In the EU ingredients have to be disclosed and labelled for cosmetics and food. India has a voluntary standard and labelling for lead. Yet even regulation beyond labelling often does not suffice to protect consumers, as many companies are able to bypass them. Despite the clearly deficient regulatory norms in the European toys directive, customs authorities report that 30 per cent of all products inspected and rejected at the border are toys. Most probably there is a much higher rate of non-compliance products that pass customs and are sold in European toys stores. Since regulation and laws differ from country to country, unsafe products can easily be sold in countries with less strict or no regulation. Many of the toys rejected by EU customs are sold in other countries.

Often women do not have a choice to use safer alternatives and better products, as they are either not available or not affordable. Often they do not have any influence on their exposure to chemicals as consumers e.g. in public transportation, hotels or shops that are often perfumed with air fresheners or even special designed odours. Those fragrances can cause non-curable allergies.

Chemical regulation and research often takes the average male as a reference norm for thresholds or daily allowance tolerances. They do not take into account the different susceptibility of women and their different needs. Current limits and regulations might not be enough to protect women's health, as latest research in the fields of endocrine disruptors, nanomaterials, multiple exposures, chronic exposure to very small doses, earliest exposure and multi-generational effects indicates.

Chemicals in products

Synthetic chemicals are present in everyday consumer items from personal care and cleaning products to clothes, toys, furniture and kitchen utensils; we are directly exposed to them in our everyday lives. Hazardous chemicals have been detected in a wide range of different consumer products. Almost all of them are not disclosed directly on products or their labels. Only in cosmetics in some regions of the world there is comprehensive disclosure.

Exposure to hazardous substances from products can be direct or indirect, i.e. via the environment. Chemicals are released into the environment in the life cycle of many products – in the exploitation or production of their raw materials, in their manufacture, their usage and their disposal. Some of these chemicals are persistent organic pollutants (POPs). They are globally dispersed, accumulating in wildlife like seals and polar bears – and in our bodies. Others reach the human body through direct contact (e.g. cosmetics or textiles), others via indoor air (e.g. furniture, flooring, toys or paint). Research into levels of industrial chemicals in the human body, from newborn babies to adults, shows that we are continuously exposed to a multitude of chemical pollutants that accumulate in our bodies and the environment. Studies on chemicals in the blood of umbilical cords have found more than 280 individual chemicals from 15 groups of well-known hazardous chemicals in each new born baby. „Of the 287 chemicals detected in umbilical cord blood, 180 are known to cause cancer in humans or animals, 217 are toxic to the brain and nervous system, and 208 cause birth defects or abnormal development in animal tests. The dangers of pre- or post-natal exposure to this complex mixture of carcinogens, developmental toxins and neurotoxins have never been studied." [4]

In the following sub-chapters we present product groups that are highly associated with women and give more in depth information about chemicals present in those products and potential health effects for women.

Chemicals in textiles

Textiles usually contain a large number of complex chemical ingredients. Many more are used in the production process, including some that are potentially hazardous. Estimations of the number of chemicals used go up to 1900. Only around 200 of them are tested for their health and environmental effects. They

Chemicals in textile production process[5]

Process step	Chemicals or chemical groups used	Function / product specifics
Fibre production	**Pesticides**, soda, detergents	Remove wool impurities
	Pesticides, fertilizers (and irrigation water)	Cotton
	Heavy metals, sulphides	Viscose
	Heavy metals, acetaldehyde, 1,4-dioxane	Polyester
	nitrile, acrylate, acetate, amide, sulphate, chloride, pyridine	Acrylic
Yarn manufacturing	**mineral** / vegetable oil; emulsifiers, **antimould agents**	Spinning oil
Knitting	**mineral oils (including poly-aromatic hydrocarbons-PAHs)**, waxes	lubricating/emulsifying
Washing	synthetic tensides; **organic solvents, nonylphenols/nonylphenol ethoxylates (NPE/NPEOs)**	detergents in washing
Desizing	Enzymes, alcohol, carboxy methyl cellulose, **DDT, Pentachlorophenol (PCP)**	remove starch sizes
Dyeing or Printing	**azo dyes (which can cleave into carcinogenic aromatic amines)** and other organic compounds	
	acids, bases, salts (iron, copper, aluminium, tin), **heavy metals (e.g. mercury**, **cadmium**, **chromium VI**, **lead & arsenic)**, carriers (also organic) – eg. **organochlorines (chlorinated solvents, chlorinated benzenes)**	e.g., attach dyes to fibre
Fire-proofing	**heavy metals**, **halogen salts**, **formaldehyde**	
	Brominated Fire Retardants (BFRs) eg. Poly-brominated diphenyl ethers (PBDEs), hexabromocyclododecane (HBCD), Other fire retardants – TCEP	
	Asbestos	

Important chemicals or chemical classes used in different stages of textile and clothing manufacturing and their function; Chemicals with particular toxicity are shown in bold.

may be present in the final products, whether intentionally or not. It is difficult to fully assess the mixture of chemicals used in textiles, since there is no mandatory full disclosure of ingredients and treatments, like methods for dying or weaving. The complex fabrication is not comprehensible for consumers.

Commonly used synthetic fibres are polyester, microfibers, rayon, and lyocell. Rayon and lyocell consist of natural raw material (wood cellulose and bamboo), which is synthetically modified during the treatment. Polyester is based on polyethylene terephthalate (PET). Micro fibres and polar fleece is also made of PET or polyamide. To make them waterproof, some textiles are treated with perfluorinated compounds that are harmful to humans and the environment.

Inevitably, our clothing is in close and continuous contact with our skin. There are justifiable concerns about what kind of chemicals can be found within these most intimate of products.

Many countries regulate the contamination of textiles with hazardous chemicals. However, this regulation does not cover all hazardous substances by far. In most cases consumers do not know if the clothes or textiles they buy are contaminated with hazardous chemicals. Not only do the public lack this information, but also the regulators are not aware of most chemical ingredients in textiles, as there is no obligation for labelling or full disclosure of used chemicals by manufacturers. The UNEP multi-stakeholder project "Chemicals in Products" under SAICM tries to find solutions to that problem.[6] However, it is a voluntary approach and depends to some extent on the good will of companies. Some companies already aim for more transparency and have adopted a code of conduct for their production process and their products. H&M provides a list of chemicals that they banned in their products.[7] The Adidas Group recently announced that they plan to be 90 per cent PFC free as of 31 December 2017.[8]

Hazardous chemicals in clothes are not only harmful for people wearing them, but also for people working in the production process. Most of them are women. And harmful chemicals used in the production process are also harmful to the environment, as water and soil become polluted. People living close to polluted sites or polluted rivers and water systems are yet again exposed to those hazardous chemicals.

Chemicals in cosmetics

Women all over the world apply cosmetics to look better, make their skin smoother, straighten or curl their hair, and for daily body care. Surveys show that women are significantly greater users than men of personal care products, including soaps, cosmetics, lotions and the like. For example, a study by the Campaign for Safe Cosmetics indicates that women use an average of

Typical chemicals in textiles

Harmful chemicals	Use	Possible health effects
Nonylphenol, nonylphenolethoxilate	Surfactants	Persistent, bioaccumulative, PBT, disrupts the hormone system
Azo dyes and heavy metals	Part of ink, prints, dyes, in buttons and zippers	Some are carcinogenic and trigger allergies
Phthalates (DBP, DINP, DIDP, DNOP etc)	Inks and coated prints	Hormone disrupting, toxic for reproduction
Formaldehyde	Anti-wrinkle treatment	Carcinogenic, mutagenic and toxic for reproduction
Triclosan, Triclocarban	Anti-bacterial treatment	Very toxic to aquatic life, disrupts the hormone system
Silver nanoparticles	Anti-bacterial treatment	Toxic for cells, persistent in environment and organisms

Typical chemicals in cosmetics

Shampoos & bath additives

Daily showers or long foam baths can dry out and irritate sensitive skin. This effect is mostly caused by surfactants like sodium lauryl sulfate. Also certain preserving agents and fragrances are potentially allergenic, hormonally active or carcinogenic.

Toothpaste & mouthwash

Toothpaste contains mechanical abrasives and surfactants, fragrances, flavors, sweeteners, and preserving agents, as well as fluoride which supposedly prevents cavities. Preservatives are used to prevent dental plaque. The potentially harmful substances are triclosan or chlorhexidine. Also mouthwash can contain preservatives and alcohol.

Sunscreen

Sunscreen provides protection from UV radiation that can cause skin cancer. In sun lotions, chemical filters and mineral pigments are responsible for that protection. Some chemical filters like benzophenone-3 (oxybenzone) disrupt the endocrine system and accumulate in the body. Mineral UV protection can contain nano titanium dioxide or nano zinc oxide.

Lotions, creams & oils

Skincare products often contain synthetic mineral oils that can accumulate in the body and be damaging to one's health. Allergenic fragrances are problematic as well. Preservatives like parabens can disrupt the hormone system. Many vanishing creams are supposed to protect the skin from UV damage. Some of those UV filters can accumulate in the body and also disrupt the hormone system.

Deodorants & perfumes

Deodorants act against the bacteria responsible for odour development using preservatives like formaldehyde or formaldehyde releasers and alcohol. Alcohol can irritate and dry out sensitive skin and some odour covering fragrances are allergenic. Musk compounds are persistent, so they can accumulate in the environment and in the body. Deodorants and perfumes can contain endocrine disrupting phthalates which are used as denaturants.

Skin lightening creams

Mercury is still found in a number of consumer products, including bleaching skin creams. In India, 61 per cent of the dermatological market consists of skin lightening products. The main adverse effect of the inorganic mercury contained in skin lightening soaps and creams is kidney damage. Mercury in skin lightening products may also cause rash, discolouration and scarring, as well as a reduction in the skin's resistance to bacterial and fungal infection.

NGO example: Skin lightening products in China

In 2011 Green Beagle and IPEN published a study, together with Chinese NGOs in 10 provinces, to determine whether skinlightening products containing high levels of mercury are available on the market in China.

In China, skinlightening and freckle-removing products are popular products among women. According to the World Health Organization, the inorganic mercury contained in some skinlightening products can cause kidney damage, skin rashes, skin discoloration, scarring, anxiety, depression, psychosis, peripheral neuropathy, and reduction of resistance to infections.[1]

In China, mercury is limited to 1ppm in skin lightening and freckle-removing products due to concerns over exposure and harm to health. Products were purchased online and in stores and markets located in Beijing (Beijing Municipality), Chongqing (Sichuan Province), Dongguan (Guangdong Province), Harbin (Heilongjiang Province), Hefei (Anhui Province), Nanjing (Jiangsu Province), Lanzhou (Gansu Province), Panjin (Liaoning Province), Shanghai (Shanghai Municipality), and Tianjin (Tianjin Municipality). Mercury was measured using a portable X-ray fluorescence analyzer (XRF) which was calibrated using laboratory measurements of products.

The NGOs found 112 products (23 %) that violated the Chinese regulatory limit for mercury of 1 ppm. Mercury concentrations in products ranged from 18 ppm to nearly 44,000 ppm. The top five products contained mercury at concentrations ranging from 17,918 ppm to 43,988 ppm. These products should not be for sale on the Chinese market.

Skin-lightening products were also found that exceeded Chinese regulatory limits for arsenic (10 ppm) and lead (40 ppm). Forty-six products contained arsenic, lead, or both metals. Forty-four of the 46 products violated the Chinese regulatory limit for arsenic. Twenty products in this group exceeded the Chinese regulatory limit for lead (40 ppm) and 28 exceeded the ASEAN limit for lead (20 ppm). Twenty-three products contained all three metals; mercury, arsenic, and lead. The presence of more than one toxic metal in a product applied directly to the body increases the possibility of harm.

All of the products in the study that violate the regulatory limit for mercury were readily available on the market in stores located in 10 cities in 10 different provinces. In addition, products containing high levels of mercury were available for purchase throughout the country. None of the products tested were labelled to indicate mercury, arsenic, or lead content.

This was the largest publicly available investigation of mercury in skin-lightening and freckle-removing products in China. For more information please see http://ipen.org/news/china-skin-products-study

nine personal care products each day, exposing themselves to a mixture of over 100 individual chemicals. 25 per cent of women (but only one in a hundred men, or 1 per cent) report using an average of 15 products daily.[9]

Many products used contain harmful chemicals. Some ingredients have irritating or allergenic effects. Others are suspected of being endocrine disruptors or have been linked to cancer. Chemicals like endocrine disruptors can even affect developing babies during use in pregnancy. Widespread use of disinfectants like triclosan and nano-silver can lead to bacterial resistance. Many of these harmful substances are being found in human blood, urine, and breast milk. Triclosan was detected in the urine of three-quarters of the US population.[10] Even if most cosmetic ingredients are listed on the packaging with their technical terms in many countries, safe products cannot be recognized on first sight. The labels are often hard to read and can be confusing for non-experts.

Despite the fact that some of the ingredients are proven to be harmful, we know even less about how those chemicals react when combined with each other. Chemical mixtures are rarely scientifically assessed.[11] Yet recent studies show that chemical cocktails can lead to different and more potent negative health effects.

Hazardous chemicals in cosmetics and body care products should be phased out or safely substituted. Many organic certified products on the market show that this can be easily achieved.

Chemicals in cosmetics and linked health effects

Drug class/ hazardous chemicals (INCI*)	Possible health effects
Preservatives: Parabens (e.g. Propylparaben, Butylparaben)	Estrogenic effects, disrupt the endocrine system, sensitizing agent
Preservatives: Phenoxyethanol	Irritating after prolonged exposure, neurotoxic, allergenic
Preservatives: Chlorhexidine, Digluconate or Cetylpyridinium Chloride	Irritating, can cause allergies and lead to tooth discoloration
Preservatives: Formaldehyde and formaldehyde releasers (e.g. Benzylhemiformal, 2-Bromo-2-nitropropane-1,3-diol, 5-Bromo-5-nitro-1,3-dioxane, Diazolidinylurea, Imidazolidinyl urea, Quaternium-15, DMDM Hydantoin)	Carcinogenic, mutagenic, impairs fertility, irritates mucous membranes and skin, allergenic
Preservatives: Triclosan	Allergenic, creates bacterial resistance, disrupts the endocrine system
Surfactants: Sodium Lauryl Sulfate (SLS), Cocamidopropylamine Oxide	Irritates and dries out the skin
UV-filters: Benzophenone-3 (oxybenzone), 4-Methylbenzylidene camphor (4-MBC), 3-Benzylidene camphor (3 BC), Octyl methoxycinnamate (OMC), Octyl-Dimethylpara- Amino-Benzoic-Acid PABA (OD-PABA)	Disrupts the endocrine system, accumulates in living organisms (e.g. breast milk) and in the environment, can cause photoallergic reactions
Nanomaterials e.g. Nano Titanium Dioxide, Nano Zinc Oxide)	Indications for toxic effects in cells, accumulation in the body - health risks are currently unknown
Solvents and denaturant agents: Phthalates (e.g. used to denature perfumes)	Disrupt the endocrine system, potentially sensitising
Fragrances, Musk Compounds, Parfum, (Perfume, Scent)	Allergy risk, irritate the skin, accumulate in the environment, the body and the breast milk, some can disrupt the endocrine system
Mineral oils (Paraffinum liquidum, Wax)	Accumulates in lungs, liver and lymph nodes
Chelating agents: EDTA (Disodium EDTA)	Accumulate in the body and in the environment

Hazardous Chemicals and their possible health effects

Women at home

Because of their roles in societies, women spend more time at home than men, because many of them are housewives, caring for their children and household, or work from home. At home they are exposed to toxic chemicals in various ways. Household chemicals and substances which off-gas from products like furniture, mosquito nets, fly-sprays and other pest control substances including treatments of pets, flooring, construction materials, are major indoor exposure sources. Indoor cooking with firewood or other fuels is very common in some countries. It can lead to damage of the respiratory system and causes various diseases. Homes can be in bad condition due to mould or bad airing systems.

Toxic building materials

A 1984 World Health Organisation report suggests that up to 30 per cent of new and remodeled buildings worldwide may be subject to complaints related to poor indoor air quality. Toxic building materials include asbestos, lead in paint and pipes, PVC flooring and windows, wood preservatives like formaldehyde or PCB, or insulation material containing brominated flame retardants. According to the International Agency for Research on Cancer (IARC), asbestos is one of the main occupational carcinogens. It can cause asbestosis, mesothelioma, and other diseases like ovarian cancer. In many buildings asbestos was and still is used exposing the people living and working there. In the Ukraine 95 per cent of all roofing is made of asbestos containing material. In many developing countries asbestos is a cheap building material and widely used in roofing, insulation or cement. Workers in the building industry are particularly exposed, but people in their homes, teachers (mainly women) and pupils in asbestos contaminated school buildings are also exposed. In Australia governmental agencies recognize a new wave of asbestos victims, which are women and men renovating their houses built in times where asbestos was commonly used.[12] There are known cases where women became asbestos victims because they regularly washed their husband's clothes containing asbestos fibres from work.[13]

A very common insulation material is polystyrene, which contains hexabromocyclododecane (HBCD). HBCD affects the ability of children to learn and grow, because it harms thyroid function and neurodevelopment, with some of the effects being transgenerational. It is found in mother's breast milk and thus passed on to children. Some breast milk studies show that levels of HBCD are increasing. The Conference of the Parties of the Stockholm Convention recently decided to phase out HBCD globally, with a five year exemption for insulation materials.

Many people do not know what toxic building materials their homes were made of, especially if their houses are older. Furthermore, replacing toxic building materials is very costly and cannot be afforded by poor people. Construction companies should be more aware of the materials they use, protecting their workers and the future inhabitants.

Example:
Lead in Paint-Initiative

The International POPs Elimination Network (IPEN) and their member-NGOs are engaged in activities to eliminate lead in paints and to raise the awareness on the adverse health effects of lead in paints. The Global Alliance to Eliminate Lead Paint organized an „International Lead Poisoning Awareness Week" in October 2013 where IPEN released together with UNEP a report about lead in paint in nine countries. In their „Asian Lead Paint Elimination Project" IPEN cooperates in seven Asian countries with the industrial and governmental sector to eliminate lead in paint. The global partnership GAELP, under the auspices of World Health Organization (WHO) and the United Nations Environment Programme (UNEP), is promoting a phase-out of the manufacture and sale of paints containing lead.

Indoor air pollution

According to WHO, 4.3 million people a year die from the exposure to household air pollution.[14] WHO identifies as main indoor air pollutants benzene, carbon monoxide, formaldehyde, naphthalene, nitrogen dioxide, polycyclic aromatic hydrocarbons, radon, trichloroethylene, and tetrachloroethylene. WHO provides guidelines for several indoor air pollutants.[15] However, only a small amount of gender aspects on that topic could be found. There is a need to find out more on exposure and health effects for women due to indoor air pollution.

One main source of indoor air pollution, which affects mainly women, is cooking fuels. In developing countries many households use wood-fuel stoves that do not have chimneys for letting the smoke out. Small particles, which contain many chemicals, are concentrated in the in-house air and endanger the health of the women and children present during cooking. Mainly poor households are affected as they have no means to build chimneys or hoods. Poor households use small-scale inexpensive wood burning stoves which do not fully burn wood-fuel to carbon dioxide but half-burn fuel into small particles which contain many hazardous chemicals. These chemicals cause pneumonia in children and chronic

bronchitis, heart diseases and emphysema in adult women. Use of biomass fuel (woodfuel and charcoal) may also lead to diseases like cataracts and low birth weight in babies of exposed expectant mothers. As poor women and children are the main victims of this kind of indoor pollution, a compelling alternative needs yet to be established.

Another common source for diseases in homes is mould. It grows naturally in humid areas of the house. Often colonies can be found underneath the wallpaper or behind cupboards. Mould fungi, even when dead, can trigger asthma, irritation of the skin and mucous membranes or flu-like symptoms. Recent studies show that exposure to mould affects women in a different way than men. One study has shown that dampness and indoor mould growth common in dwellings is a risk factor for lung function decline, especially in women.[16] Badly functioning ventilation systems or highly insulated houses, where air cannot circulate properly, are high risk factors for developing mould.

Other sources for indoor air pollution are harmful chemicals off-gassing from products like furniture, clothes, carpets, toys, etc. To reduce exposure, rooms need to be aired frequently and products containing harmful chemicals have to be avoided. Since strict laws banning hazardous chemicals in products are rarely in place and often good information on chemical content is not available, this is very difficult to implement for the individual consumer.

Typical exposure source at home – cleaning detergents

Cleaning the house is still mainly the task of women around the world. "The more, the better" is common thinking in terms of cleaning detergents, which leads to overdosing, although modern cleaners work effectively even in small doses. Many chemicals contained in household cleaning and care products are the same as those used in industrial cleaning agents. They can contain strong irritants, sensitizing and allergenic substances and fragrances, phosphates, carcinogenic and neurotoxic solvents. Some of the most observed effects are skin irritations, allergies and respiratory problems. The effect of household cleaning agents on women is not well known. However, there are occupational health studies showing effects on women. The ILO states "Some large population-based epidemiological studies have found high cancer rates among cleaners".[17] Among women, invasive cervical cancer is almost five times more common among cleaners than other women. These results are attributed to chemical exposures, particularly solvents."[18]

Typical chemicals in detergents

All-purpose cleaners
There is a wide range of all-purpose cleaners. They may contain strong irritants like ammonia, which can also cause kidney and liver damage; chlorine, also known as bleach, and carcinogens like formaldehyde. Very often they contain preservatives, perfumes and colourants including hormon disrupting chemicals and chemicals, which can provoke skin sensitization and respiratory distress.

Laundry
They may contain bleaches, synthetic whiteners, and sensitizing fragrances and surfactants. Detergent residues on clothes and bed linens can be a source of skin irritation, and lingering scents from scented products can cause respiratory reactions.

Dishes
A dishwasher usually gives better results with significantly lower water consumption and time. Machine dishwasher detergents often contain environmentally harmful phosphates and sensitizing substances. Detergents for doing the dishes by hand are in general less harmful for the skin.

Bath and toilet
Many toilet bowl cleaners, toilet blocks and deodorants are often highly caustic and form toxic gases when mixed with water. They can contain 1,4-dichlorobenzene, a carcinogenic chemical which can cause liver and kidney damage, hydrochloric acid, whose vapors can cause coughing and breathing difficulties, and chemicals which are severe eye, skin and respiratory irritant, and can form carcinogenic chlorine gas.

Floor, carpet, furniture
Floor, carpet and furniture cleaning agents may contain carcinogenic and neurotoxic solvents and preservatives and hormone disrupting phthalates as well as sensitizing fragrances.

Air Freshener
A lavender potpourri in the bathroom, a scented candle in the living room, a "sea breeze" spray or an odor remover for cigarette smoke and cooking smells: instead of a positive impact on our well-being, air fresheners may contain chemicals that are carcinogenic and cause allergies and respiratory reactions.

Women at the workplace

Women work in very different surroundings, in agriculture, in industry, in services, or in the informal sector. ILO estimates that occupational exposure to hazardous substances cause an estimated 651,000 deaths per annum, mostly in the developing world. These numbers may be greatly underestimated due to the inadequate reporting and notification systems in many countries.[19] Women represent over 40 per cent of the global workforce, or 1.2 billion out of the global total of 3 billion workers.[20]

Labour markets are often segregated by sex. The ILO Global Environment Trends for Women 2012 finds "for a sample of both advanced and developing countries, men were over-represented in crafts, trades, plant and machine operations, and managerial and legislative occupations. In contrast women were overrepresented in mid-skill occupations, like clerks, service workers, and shop and sales workers."[21] It also shows that male workers are more present in industry and mining, as women are the majority in services and agriculture. Many women work in the informal sector, underpaid or even non-paid, with low security measures and less access to trainings and information. Due to the fact that women often have a double burden of work, the unpaid household and child care work and the paid work, women work more hours per week than men.[22] Therefore they are in contact with different and probably more exposure sources than men.

Although women's occupational health aspects are more and more in the focus of national authorities and other organisations, the occupational health and safety risks for women are often underestimated because tests and standards are traditionally based on male populations. The US National Institute for Occupational Safety and Health has conducted a Firefighter Cancer Study since 2010. In 2012 the Institute began incorporating female subjects, but only less than 1 per cent of total subjects.[23] In General Safety Data Sheets, which inform workers about hazardous substances, do not differentiate between health hazards for men and women, which would be necessary to implement better gender sensitive protection measures at the workplace. More information and sex disaggregated data is needed to protect women and especially pregnant women at their workplaces. For many sectors we do not have enough information about the substances women are exposed to at the workplace and about the possible consequences to their health, especially their reproductive health.

In some countries pregnant workers are under special protection by law. In the EU there is the Directive for pregnant women at the workplace, which obliges employers to protect pregnant women from substances like mercury. Although this is a step in the right direction, the directive fails to e.g. include endocrine disrupting chemicals that are known to be especially harmful to the foetus. Pregnant women in some countries are protected in the last period before giving birth and right after by having the right to go on maternity leave. However, the developing child is highly vulnerable to chemicals during all stages of pregnancy. Female workers in the informal sectors, where also little data is available, lack any protection at all.

Although there is evidence that occupational exposure to harmful substances can lead to severe health problems for women, there is a lack of protecting regulation and law. In case there is protective regulation, in many cases policy implementation and surveillance from governments and the industry is weak worldwide.

Women in agriculture

Chemical pollution from agro-chemical residues expose agricultural workforce, neighbours and other people living close to water, soil and air polluted by pesticides as well as consumers eating this contaminated fruits, vegetables, and livestock. While this pollution may be seen as gender-neutral, the fact is that women are affected disproportionately.

Women in agriculture have a higher level of informal and vulnerable employment[24] and therefore less access to benefits and social protection, low representation and more occupational hazards.

Women outnumber men in agricultural workplaces like intensive agricultural production, market gardening, floriculture and agro processing industries, where the use of toxic chemicals, and especially pesticides, is most common. The brochure "Breast cancer, pesticides and you" by Meriel Watts[25] gives an overview of women's exposure to pesticides: "In some countries women make up 85 per cent or more of the pesticide applicators on commercial farms and plantations, often working whilst pregnant or breastfeeding. There are an estimated

30,000 women pesticide sprayers in Malaysia alone that spray pesticides, and frequently highly toxic ones like paraquat, on an average of 262 days per year. Eighty per cent of the spraying is carried out with leaky hand-held equipment. An incentive of extra 50 cents per day is enough to encourage these impoverished women to spray. Even if they do not directly apply the pesticides, women work and raise their children in a toxic environment. They mix pesticides, weed while pesticides are being applied, wash out pesticide containers, or harvest pesticide-doused crops. They wash pesticide-soaked clothing and store pesticides in their homes."[26]

Female farmers and workers in agriculture very often do not know what kind of pesticides and chemicals they deal with and how dangerous they are for their own and their children's health. Often they are less educated and less informed than men, so they have greater difficulties in understanding warning instructions and labels. Since many of the health problems occur later in life many women are unlikely to connect them to their chemical exposure. As a result, many diseases caused by exposure to hazardous chemicals stay undetected. Rural women's access to information is very much needed, as well as stricter laws protecting rural workers from hazardous chemicals.

Example: African Horticulture[34]

Since two decades, the industry of horticulture and floriculture is becoming a huge working field for East Africans due to the demand of the European market. While food safety is observed very strictly, the working conditions of the field workers is not the interest of European companies. The workers, a lot of them women, suffer from various working conditions, e.g. extremely low pay rates, absence of contracts, forced overtime, sexual harassments and poor health and safety conditions.

In Uganda for example, 227 pesticides are used in horticulture, some of them are even banned and highly toxic. In most of the farms, the workers do not get any training or awareness raising on pesticide hazards and appropriate behavior to avoid the direct exposure to these toxic chemicals. Some of the workers even were unaware of their toxic workplace and the long-term effects pesticides could cause on their health.

A lot of farms do not provide their workers provision of appropriate personal protective equipment, which is an absolute prerequisite for anyone handling pesticides. The lack of boots and gloves is a high risk for workers in making them vulnerable to chemical penetration through the skin.

From exposure of pesticides, chemical poisoning is not an exception in the daily life of the workers. Common disorders are miscarriages and irregular menstrual flow, skin irritation and burns, as well as upper respiratory tract problems.

Example: Women working in greenhouse/flower production

Female workers in greenhouses are exposed to a lot of pesticides, including pesticides, which are influencing the hormone system. Bretveld[35] compared in her study 8000 workers to a control group with 8000 non-exposed workers and could show that fulltime female workers who were exposed to pesticides needed longer to get pregnant. Their fertility was rated by the "TTP-factor", the "time to pregnancy-factor" which states the time period from the point when the woman wants to get pregnant until she gets pregnant. The possibility of getting pregnant was 10 per cent lower for the female workers and 30 per cent lower for the partners of men working in greenhouses. Also the risk of getting a miscarriage is double.[36]

A survey of female rice farmers in Thailand found that women lack basic training in handling pesticides. Their husbands, who were skilled using pesticides had left the country in search for work, and their wives had to take over in the fields. Despite the negative consequences for their health, they were not willing to participate in training courses because of conflicting caring and housework commitments.[27] A USAID training programme in Papua New Guinea failed for the same reasons. They did not consider women's family responsibilities, because the programmes were arranged as three full-day trainings away from the villages. Women found it difficult to travel and find arrangements for child care.[28]

Surveys have shown that highly hazardous pesticides are in widespread use, in unsafe conditions exposing and poisoning the environment and the people. As stated in UNEP's Global Chemicals Outlook, the estimated costs of poisonings from pesticides in sub-Saharan Africa now exceed the total annual overseas development aid given to the region for basic health services, excluding HIV/AIDS. Between 2005 and 2020, the accumulated cost of illness and injury linked to pesticides in small-scale farming in sub-Saharan Africa could reach USD $90 billion.

The International Code on Pesticide Management states that "pesticides whose handling and application require the use of personal protective equipment that is uncomfortable, expensive or not readily available should be avoided, especially in the case of small-scale users and farm workers in hot climates."[29] In such countries, the responsible regulatory approach should be to prohibit the import and use of HHPs and to help farmers identify effective, less hazardous alternatives. However, countries are often unaware of safer alternatives. There is even a lack of initiative on which HHPs should be prioritized for prohibition and substitution.

Acute exposure to pesticides can lead to death or serious illness.[30] Long-term exposure to pesticides can increase the risk of developmental and reproductive disorders, immune system disruption, endocrine disruption, impaired nervous system function, and development of certain cancers. Women are more susceptible to pesticides than men. They absorb pesticides through their skin more easily than men. For example, dermal absorption of the organochlorine lindane is three times greater for women than for men.[31] Pesticides also reside longer in female bodies than in males.[32] Women are more vulnerable to endocrine disrupting ac-

tive pesticides, especially in critical windows such as during pregnancy, lactation or puberty. Many pesticides are associated with breast cancer: hexachlorocyclohexane, endosulfan, chlorpyriphos, malathion, aldicarb, and more. Meriel Watts presents a comprehensive list of pesticides associated with breast cancer in her book "Pesticides & Breast Cancer: A Wake Up Call".[33]

Women in industry

In their Global Employment Trends publication, ILO estimates that around 16 per cent of employed women worldwide work in the industry sector in 2012. In East Asia women's employment in industry rose to a quarter, as in most of the developing countries women moved out of the agricultural sector directly into services.[37] Less information is available about certain branches and the related chemical exposure of women. One typical industry branch with a high female employment is the textile industry, where some information is available.

Textile industry: impacts on female worker's health

The textile industry is often criticized for its high chemical use, low wages and environmental pollution. The majority of workers at various stages of the textile chain, from manufacturing to packing and retailing of the final products, are women. They are significantly exposed to the variety of chemicals present in clothing products.

Zhang[38] summarizes the impacts on workers in dyeing/printing and finishing processes: inevitably workers will be in daily and routine contact with a large number of chemical substances, many of which are known to be hazardous to human health. For example, advice from the UK Health and Safety Executive (HSE) indicates that some reactive dyes are respiratory sensitizers, which can cause occupational asthma by inhalation. Some of the dyestuffs can cause skin allergies and furthermore, a number of dyes, based on their chemical characteristics, are potentially carcinogenic. HSE also points out that health problems are most commonly caused by the use of textile chemicals which act as irritants; for example formaldehyde-based resins, ammonia, acetic acid and soda ash can cause skin irritation, stuffy noses, sneezing and sore eyes.

The concentration of chemicals in clothing can be reduced by washing it; for example, levels of formaldehyde were shown to fall distinctively after one stage of washing at a low temperature. This indicates that the greatest exposure to this carcinogen is likely to be to industry employees including retail staff.[39] In general, although levels of formaldehyde in textile processing facilities have been reduced significantly since the 1980s,[40] high levels can still be found in some garments. Formaldehyde is still the most commonly found substance in laboratories among tested substances.

Studies show ill health effects linked to textiles processing. A study by the US National Institute for Occupational Safety and Health (NIOSH) found a link between length of exposure to formaldehyde and leukaemia deaths for textile workers.[41] Women who work in textile factories and are exposed to synthetic fibres and petroleum products at work before their mid-30s, seem to be most at risk of developing breast cancer later in life. For example, women working with acrylic and nylon fibres have increased risk of developing breast cancer compared to the normal population.[42] A study of textile workers in Shanghai found an elevated risk of a spontaneously aborted first pregnancy associated with exposure to synthetic fibres and mixed synthetic and natural fibres.[43]

Women working in the plastics industry

In the plastics industry, women are highly exposed to a large variety of toxic chemicals, including styrene, crylonitrile, vinyl chloride, phthalates, bisphenol A (BPA), brominated flame retardants, heavy metals, a host of solvents, and complex chemical mixtures.

These substances are used for the whole plastic production process and are linked to various diseases. Some of the substances are known to have a mutagenic effect and can lead to cancer. Some are suspected of being mutagenic. Others have endocrine disrupting effects that can promote cancer and other illnesses linked to the endocrine system like reproductive health impacts. A study shows that the exposure in the plastic industry poses women at disproportionate risk. It also shows the need for regulatory action.[44] Women in the plastics industry have a significantly higher body burden than unexposed workers and the general population. A Canadian study shows that women working in automotive plastics and food canning industries have fivefold increase in pre-menopausal breast cancer.[45] The study also claims that "Despite concern about the harmful effects of substances contained in various plastic consumer products, little attention has focused on the more heavily exposed women working in the plastics industry."[46]

Women in services

Besides agriculture, services are one of the main working sectors for women. The ILO estimates that 47 per cent of employed women worldwide work in services[47] such as health care, retail and education. Women in typical female professions, like hairdressers, nurses and cleaners, are among the most exposed in this sector. The material they use such as medical devices, shampoo, etc. are mainly chosen and purchased by the companies they work for. Often the employers and the employees have little to no knowledge about the substances in the products they use, since they are rarely labelled, ingredients are not disclosed or specific trainings are not in place.

Women in the health sector

Nurses are exposed constantly to toxins in disinfectants and stylizing agents, additionally they can be in contact with hazardous chemicals in medical devices, chemotherapy, pesticides, and other tools and materials. This exposure can lead to serious health problems. Common chemicals to which women in the health sector are exposed to are: BPA, PVC, triclosan, PBDE, phthalates, perfluorinated compounds and mercury. All of those chemicals can be found in blood, urine and hair samples of female nurses and doctors.[48] Nurses report that the four common exposures are hand and skin disinfectants, medications, housekeeping chemicals and latex.[49] Studies show that among nursing professionals, workplace exposures to cleaning products and disinfectants increase the risk of new-onset asthma.[50] A two-fold increased risk of late spontaneous abortion (12-20 weeks) among nurses was associated with exposure to sterilizing agents.[51] In the US, nurses teamed up to demand better chemicals regulation protecting them from harmful chemicals.[52] Several projects and activities from civil society and trade unions try to achieve the same goal. The NGO Health Care Without Harm (HCWH) runs several campaigns and projects to make health care greener and healthier for professionals and patients.[53]

Women as hairdressers

Hairdressers are exposed to harmful substances in a number of products like hair dyes, bleaching agents, permanent waves solutions, hair shampoos and conditioners, hair spray and perfumes. Common substances found in those products are: ammonia and ammonia derivatives, formaldehyde releasers, allergens, acrylate copolymers in aerosol-form products, and EDCs such as parabens and UV-filters. Hair dyes typically contain the

Call of female waste pickers in South America

March 8th: Women in the struggle for inclusive recycling

"For women waste pickers, March 8 is a day of struggle – a struggle for inclusive recycling and for the end of inequality in recycling. Inclusive recycling is recycling by the waste pickers, in their associations and cooperatives. It understands the entire production process: public service provision, segregation of waste, industrialization of recyclables. Inclusive recycling is already a practice in many places around the country, but many waste pickers continue to suffer exploration and lack of payment for the service they provide. When things get difficult, we women bend over backwards to make sure nothing is missing at home. That's why we are fighting for 100 per cent recycling with 100 per cent social inclusion. We are fighting for contracts based on a new model of integrated solid waste management – a system that promotes waste management with public participation and social inclusion. We say no to incineration, no to privatization. We say no to the "containerization" of waste, because we don't believe "makeovers" will solve our problems. We demand a national program for investment in inclusive recycling (PRONAREP) that would finance and prioritize waste pickers' organizations. This would support the small waste pickers' associations working on landfills to those that are already engaging in commercialization through networks, among other social and financial supports. We waste pickers of Rio Grande do Sul fight every day against oppression. In the Uruguaiana landfill, we have fought incineration and in the metropolitan region, we fight against the privatization of waste. On March 8, we call all women to the struggle. Like all working women, we demand the right to childcare, housing, and public health. For food sovereignty, inclusive recycling, the well-being of women and our earth!"[64]

highest number of harmful substances. Studies show that respiratory and dermatological diseases are particularly common for hairdressers.[54] A UK study investigated 60 hairdressing salons and noted that over a third of the respondents had hand dermatitis.[55] Exposure to chemicals in indoor air is increased because usually more than one hairdresser operates in the same room, and sufficient ventilation systems are rarely in place. Therefore hairdressers have a higher risk of chronic bronchitis, asthma-like symptoms, rhinitis combined with irritative eye symptoms than control groups.[56] A study of pregnant women in France found that on-the-job exposure to chemical solvents during pregnancy increased the risk of certain types of birth defects. Mothers with more exposure were 4 to 12 times more likely to have babies with oral clefts than mothers with less exposure. Metabolites of two large classes of organic solvents, glycol ethers and chlorinated solvents, were linked to occupational use of cleaners and cosmetics in jobs such as hairdressing, pharmacy and nursing.[57] To decrease the exposure of hairdressers, urgent action is required such as procurement of non-harmful products, sufficient labelling of products, training of employees, better ventilation systems, and stricter laws.

Women in the informal sector

According to WIEGO (Women in Informal Employment: Globalizing and Organizing) "60 per cent or more of female non-agricultural workers in the developing world are informally employed. Among non-agricultural workers, in sub-Saharan Africa, 84 per cent of women workers are informally employed compared to 63 per cent of men workers; in Latin America, 58 per cent of women workers compared to 48 per cent of men; and in Asia, 73 per cent of women workers compared to 70 per cent of men workers."[58] These numbers include a wide range of occupations: inside and outside informal enterprises, self-employed, waste pickers, cleaners, domestic workers, street vendors etc. The chemical exposure to the different groups, which are summed up under this definition, varies accordingly. Highly exposed are women working in industry and mining related facilities as well as waste pickers and recyclers.

Waste pickers

There are millions of waste pickers in the world. Very little is known about their exact numbers, as statistical data is difficult to collect. An Indian study estimated local waste pickers at 1.5 million, primarily women and those from socially marginalized groups.[59]

A study[60] about solid waste management in Nigeria found that women and children play a very dominant role in collection and sale of recyclable materials to itinerant waste collectors. The results show that 55 per cent of recyclable materials are being sold by women and 40 per cent by children while only 5 per cent were men. A distinct gender division of labour was observed as women are almost conspicuously absent at the higher levels of solid waste recycling processes. This is largely due to cultural constructs, poor coordination and lack of capital. Waste pickers are at health risk due to their proximity to pre-separated discards, which often include infectious and toxic materials and due to the hazardous conditions under which valuable recyclables and their components are physically retrieved.

A three country study in India, Cambodia and the Philippines showed that the health costs of waste picking are very high. The waste pickers are exposed to a cocktail of toxic fumes and other chemicals in the dump and from open burning. "Waste pickers burn PVC coated wires in order to extract copper, which sells at a high price. They find that cutting it can result in sharp cuts on their fingers and hands. However, burning copper wires results in the production of dioxins, which are known to have some negative effects on reproduction, the immune system and may cause birth defects as well as cancers."[61] The National Solid Waste Management Commission on the Philippines noted that "risks come from direct contact with waste such as broken glass, human/faecal matters, materials with toxic substances, containers with residues from chemicals, pesticides, needles and bandages from hospitals/clinics and smoke and toxic fumes from open burning of waste".[62]

Typical chemicals that waste pickers are exposed to are dioxins, carbon monoxide, hydrogen sulphide, nitrogen oxide from waste burning, and chemicals contained in waste like PVCs, brominated flame retardants, lead and other endocrine disrupting chemicals. This may lead to asphyxiation, respiratory diseases including asthma, chronic liver and kidney diseases, brain injuries, cardiovascular and cancer related diseases. The health problems of waste pickers are severe and often lead to premature death. Waste pickers are among the poorest population. They have no money for health care and medical treatment. They also suffer from poor general health, since a high proportion work and live on the dumpsite all their lives. Therefore even easily treatable diseases can have severe effects.

Female waste pickers are often the sole earners in the family, so they are dependent on their work. To avoid exposure of waste pickers, a holistic approach is needed: implementation of cradle to cradle and zero-waste policies, mandatory labelling and phase out of toxic substances, development of a social protection floor for women and other measures including better employment options for those that currently make their living this way. Organisations like GAIA, WIEGO and Global Alliance of Waste Pickers[63] developed policy recommendations like e.g. the inclusion of waste pickers in participatory planning of solid waste management, and organize implementation projects, also in collaboration with UN agencies and national governments.

Artisanal Small Scale Gold Mining (ASGM)

The lessons from the Minamata tragedy and the Minamata disease show the negative impact of mercury exposure to people and the environment. Especially for women and children, they

are irreversible and last for generations. UNEP has identified ASGM sector as the single largest source of mercury emissions from intentional use, which has no global target reduction (emissions and use) under the treaty. The target for mercury elimination will depend on a country's policy and implementation plans. Women in Africa represent approximately 40-50 per cent of the ASGM workforce and children under the age of 18 may constitute up to 30-50 per cent of the entire ASGM workforce.[65] While women represent lower fractions of the workforce in Latin America (10-20 per cent) and Asia (about 10 per cent), it is clear that mercury exposure from ASGM has a profound global impact on women. In many ASGM areas, women perform the most toxic jobs since they do not require strength. These jobs include pouring the mercury into the ball-mills or mixing the mercury in panning, and burning the amalgam – usually while their children or babies are nearby. In some countries, women also carry the rocks from the mining sites to the processing plants.[66]

Biomonitoring results from many ASGM countries show alarming concentrations of mercury in hair, urine and blood of children, women and men. There is a rapidly growing body of knowledge in this area, which has also revealed some symptoms similar to Minamata disease and its adverse effects. Damage to the developing brain is of particular concern. ASGM is most often considered a result of local socio-economic and development problems but over the years it has become a global challenge. The global demand for gold continues to be a driving force for more investment into ASGM, typically in isolated regions and impoverished communities. Mercury used in ASGM translates into increases in mercury exposure to women and children. In addition, global emissions of mercury will increase as more mercury is used in the ASGM sector, impacting the environment and food chain. The immediate economic investment in ASGM should take into account the health and environmental impacts in ASGM communities.

Women as mothers

One of the most significant roles of women is the one of being a mother. Women are the first environment for their children, and therefore they have a risk of exposing their uborns, who are highly susceptible to chemicals. Therefore their exposure is very critical and should be avoided. Women also often change their behaviour and values with becoming a mother, which translates into a higher consumer awareness and openness to environmental topics, such as chemicals in products.

Pregnant women

Research shows that the placenta does not provide a defense against harmful chemicals, as previously thought.[67] Persistent and bio-accumulative chemicals remain in the human body long after exposure and can be passed from mother to baby, in utero and via breast milk. It can also cross the blood brain barrier to affect a child's central nervous system and its development. Children exposed to chemicals like EDCs, even at very low levels are more likely to develop health problems later in life such as cancer, infertility, or diabetes, particularly with exposure during certain windows of prenatal development.[68] EDCs can also cause multigenerational harm. A prominent example for this is diethylstilbestrol (DES), a drug given to pregnant women from the 1940s to 1970s. Studies show that many DES-victim daughters (grandchildren of the DES users) experience infertility and cancer in their reproductive organs and breasts. Animal studies show that the granddaughters of women who took DES are also at risk for ovarian and uterine cancers. Infact, prenatal development is one of the most susceptible stages to health risks caused by chemical exposure.[69]

The Endocrine Disruption Exchange (TEDX) gives a very good overview on studies showing the negative effects of certain chemicals during critical windows of development during pregnancy.[70]

In 2010 a study by the University of California at San Francisco confirmed that pregnant women carry multiple chemicals in their bodies that can be passed onto their foetus. Data collected by the U.S. Center for Disease Control and Prevention (CDC) in 2003-2004 showed that 43 banned as well as currently used chemicals in the US, including PCB, which is banned in the US for over 30 years, organochlorine pesticides, PFCs, phenols, PBDE flame retardants, phthalates, BPA, were detected in 99-100 per cent of over 250 pregnant women.[71] Many of the 163 chemicals studied are known to be transferred to the foetus and have been linked to poor health outcomes. It places the foetus at risk for birth defects or chronic illnesses later in life. Furthermore, because the women in the study were tested for exposure to only a fraction of chemicals on the market, it also suggests that pregnant women are likely carrying and passing onto their foetus many more chemicals than have been reported in the study.[72]

Even though there is enough convincing evidence that many chemicals can harm the foetus, not many governments and companies take precautionary measures or even inform pregnant women about simple measures to avoid hazardous chemicals in their lives. The following measure are to be taken to protect pregnant women and the developing child: awareness raising campaigns, information materials for pregnant women, and labeling of products.

Breast milk contamination

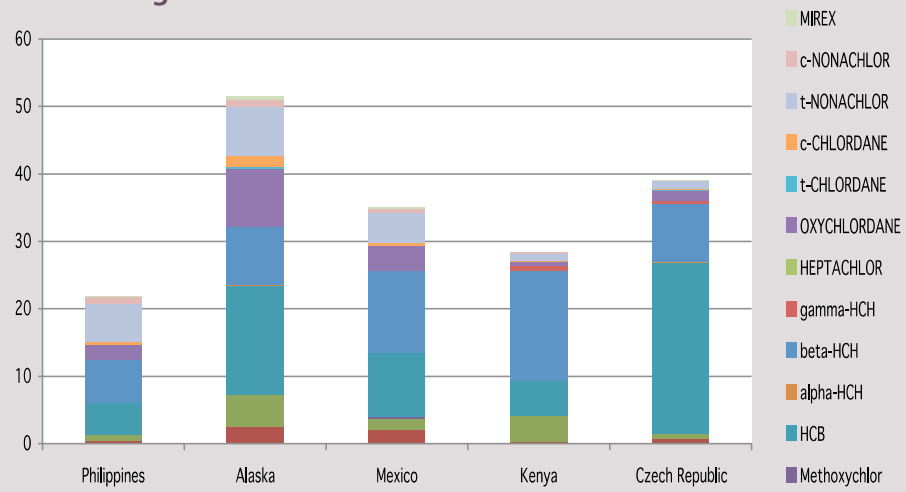
Harmful chemicals can be transmitted to the baby not only during pregnancy, but also via breastfeeding after birth. Contamination can occur due to exposure to e.g. pesticides or toxic chemicals in food and indoor air as many human biomonitoring programmes and projects have found out by testing breast milk on various substances.

As POPs are the most hazardous ingredients of polluted breast milk, breast milk has been tested by WHO for POPs within the process of the Stockholm Convention for several years. The last testing round spanned the period from 2010 to 2012.[73] The results from the third, fourth and fifth rounds of the survey spanning the period from 2000 to 2012, are presented in a report based on the findings by Malisch et al.[74]

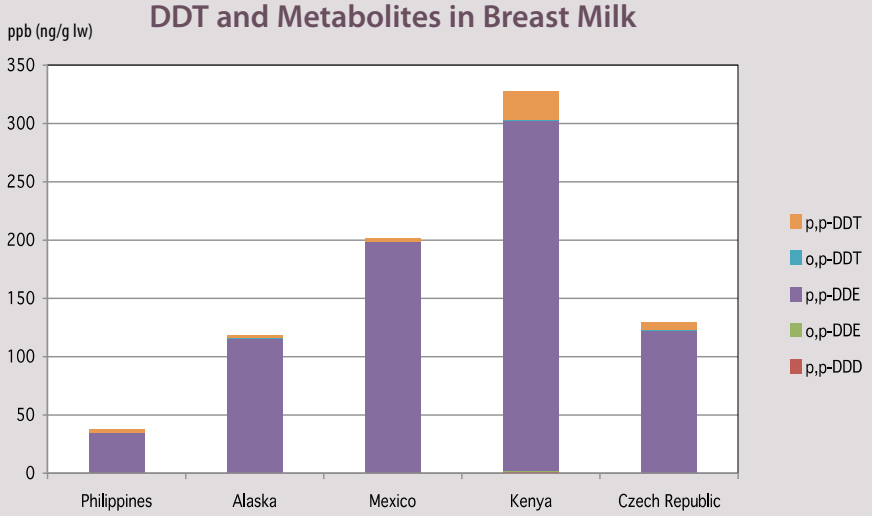
Following the results the survey shows a mixed picture: POPs like PCDD and PCFD have fallen steadily from their earlier high level indicating the effectiveness of intervention measures. PCB decreased over time, but is still considered a human health concern. Chemicals newly listed in the Stockholm Convention in 2009 and 2011 like PFOS could be detected at values above LOQ for a majority of samples in more or less all participating countries. This shows that contamination and human exposure to PFOS in these regions is very concerning.[75] Unfortunately many countries do not take part in the monitoring on a regular base of the WHO/UNEP human milk survey, even if they have the means like e. g. Germany.

Also other harmful chemicals can be found in breast milk. Knowing to have toxins in your breast milk is usually very scary for mothers. Therefore public communication about this topic should be done in a very sensitive way. However, breastfeeding should be maintained because it brings many health benefits for the children and the mothers. IPEN and the World Alliance for Breastfeeding Action (WABA) state together that "The contamination of breast milk is one symptom of the environmental contamination in our communities. Responsibility for this problem belongs to the industrial sources of contamination, not to breastfeeding women."[77]

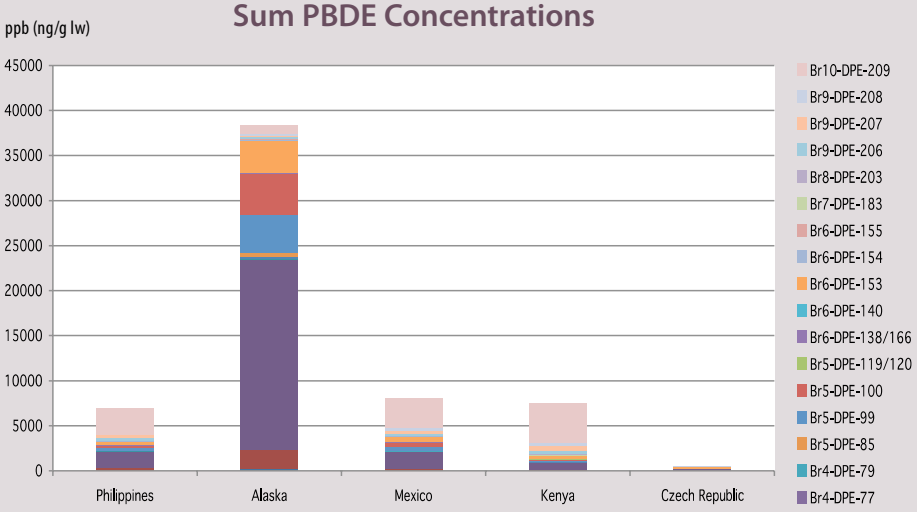
Organochlorine Pesticides in Breast Milk



DDT and Metabolites in Breast Milk



Sum PBDE Concentrations



Results of the MOMs and POPs project[76]

Women in their environment

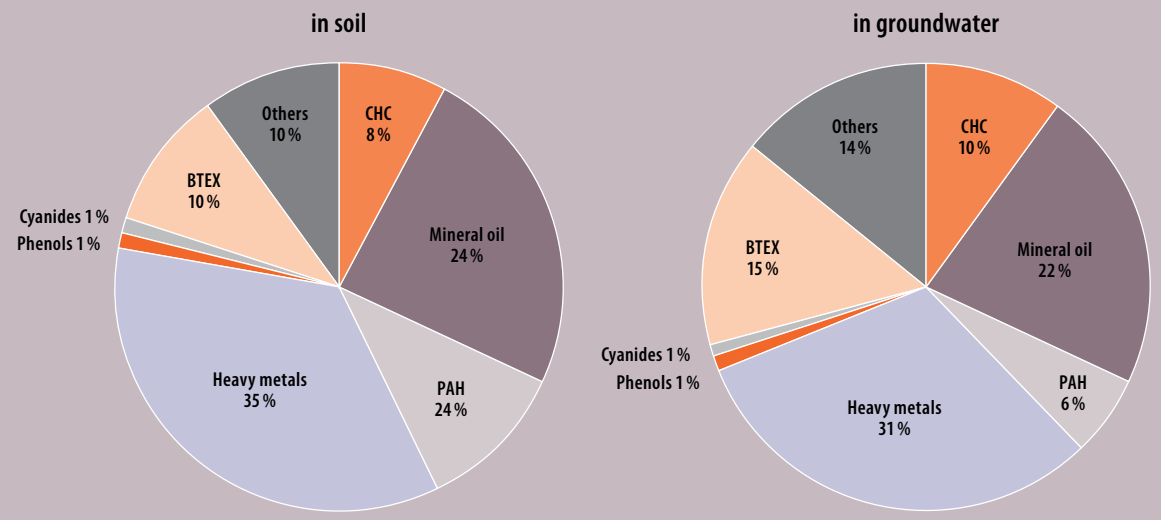
We are all exposed to chemicals which are in the air we breathe, the soil we harvest our food from, and the water we drink. Air pollution via chemicals can occur via industrial emissions, chemical accidents and other sources. Air serves as a long-range transporting vehicle for some pollutants, which makes chemical pollution a trans-boundary concern. Many of the toxins initially emitted to air are later deposited to water. Other chemicals are directly released to water or enter the water system via consumer products, agricultural products, leaking landfills, and industrial discharges. Contaminated soil results mostly from atmospheric deposition, waste dumping, spills from industrial and waste facilities, mining, contaminated water coming from e.g. fracking, and pesticides used in agriculture. Many common pollutants in soil and water are heavy metals and pesticides. In the air some contaminants are persistent organic pollutants, which are partly banned in the Stockholm Convention.

There is only few valid statistical data available about the exposure specifically of women to contaminants in soil, air and water. More gender disaggregated data is urgently needed in this field. We can only assume that on a regular basis, without taking into account hot spots of contamination, women are equally exposed. Nevertheless, they are not equally affected and can develop different negative health effects to men.

However, some examples illustrate gender aspects regarding chemical contamination from their environment. The NGO Breast Cancer Fund (BCF) highlights that "air pollutants account for 35 of the 216 chemicals associated with increase in mammary gland tumours in animals."[79] As main sources of exposure from air pollution BCF lists primary and secondary tobacco smoking, diesel exhaust, and occupational exposure. As main water pollutants pesticides, dioxins and pharmaceuticals are mentioned. A WHO study finds that „differences in vulnerability interact with gender inequalities to affect women's respiratory function. Swedish data show that women report ailments in the form of allergies and respiratory or skin hypersensitivity to a greater extent than men. In Bordeaux, the effects of air pollution were greater for women than for men among the elderly and, in Barcelona, older women were at greater risk of dying as a result of exposure to black smoke than were men." [80]

Living near areas that are highly polluted by obsolete pesticides and POPs dumping, chemical accidents, industrial and military use, and mining, is a severe health threat for women in many areas of the world. International organisations assume that there are 500,000 tons of obsolete chemicals stockpiled worldwide.[82] Countries with the highest stockpiles of obsolete pesticides are the Russian Federation, FYR Macedonia, Ukraine, and Mali.[83] Most of the stockpiles are not safe, with substances stored in unsafe and sometimes open places. Packages and containers deteriorate over time. Often it is unknown what kind of substances are stockpiled. Toxins can leak to groundwater

Most frequently occuring contaminants



The results of a questionnaire compiled recently by the JRC are shown above. The questionnaire was sent to 39 European countries returned the questionnaire.

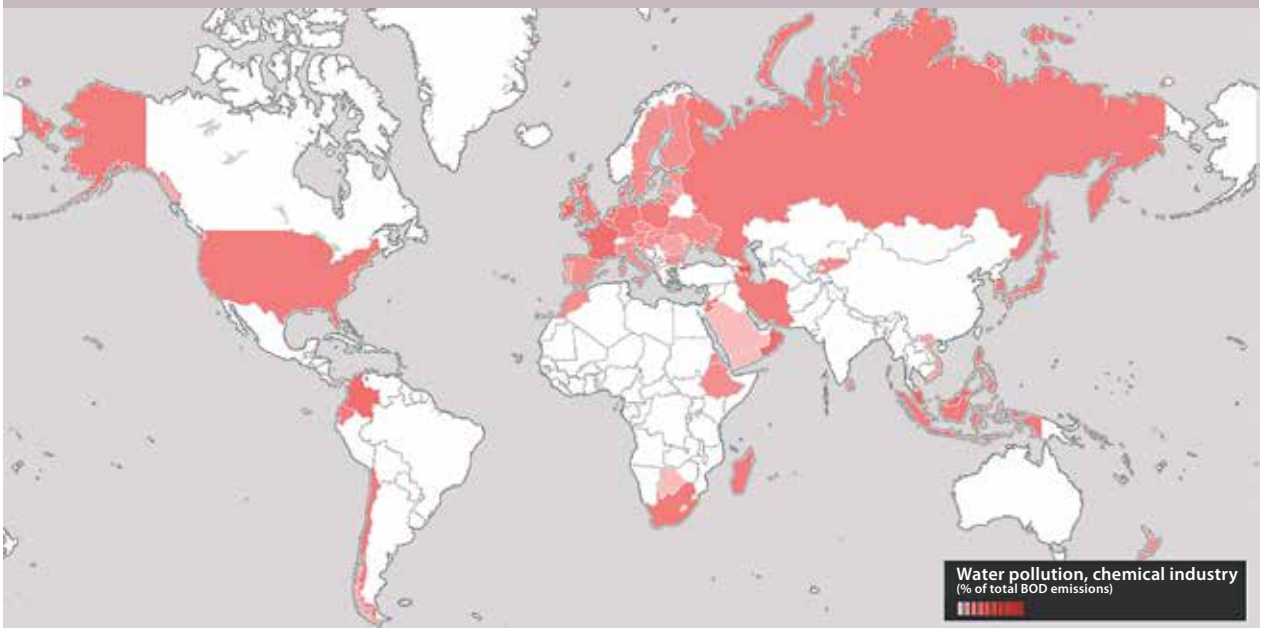
Most frequently occurring contaminants in the EU, from Soil Contamination: Impacts on Human Health Report[78]

and to water systems and emit into the air. They can also contaminate livestock and crops nearby the vicinity. People living near stockpiles have a high risk of developing negative health effects of endocrine, nervous, immune, respiratory, and reproductive systems, which can lead to asthma, cancer, infertility, allergies and other diseases. Clean up of chemical hot spots is incredibly expensive. In many cases only safe storing is undertaken, instead of elimination.

Some hot spots arise from industrial activities and mining. For example, in Albania the former chlor alkali and PVC plant in Vlora directly discharged its wastewater into Vlora bay and dumped its polluted sludge near the shore, where it remains today. The plant operated for 25 years and was closed in 1992. No precautionary measures have been taken in these years and since the shut down. The found mercury levels in a soil sample were 1000 times higher than typical EU thresholds. Vlora bay is an important fish area in Albania.[84] Eating contaminated fish and other food or drinking contaminated water is even more dangerous for pregnant women, as the developing child can suffer later in life from neurological problems like attention deficits, IQ loss and in some cases even deafness and blindness.

It is very difficult to retrieve gender disaggregated data regarding chemical hot spots. However, many studies show that there is a strong link between several diseases such as breast cancer and living near POPs and pesticides hot spots. Much effort is needed to map, store and finally clean up those contaminated sites. Clean up costs are so tremendous that many countries cannot afford it. This is one reason why many NGOs demand for an internalization of cost scheme on international level to implement the polluter pays principle. Furthermore research for cost effective and safe elimination of POPs stockpiles should be supported, as safe alternatives to incineration.

Most frequently occuring contaminants



Water pollution, chemical industry 2009-2013. Source: World Bank[81]

Endnotes chapter 4

1 UNEP (2004): Women and the Environment, Chapter 2, p. 18, http://www.unep.org/PDF/Women/ChapterTwo.pdf
2 Silverstein M.J. and Sayre K.(2009): The Female Economy. Gender Magazine Article, Harvard Business Review, https://hbr.org/2009/09/the-female-economy (Retrieved April 2014)
3 http://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+sustainability/sustainable+business+advisory+services/women+in+business/creating+business+value/win-consumers (retrieved April 2014)
4 Environmental Working Group (2005): Body Burden – The Pollution in Newborns: A benchmark investigation of industrial chemicals, pollutants and pesticides in umbilical cord blood, Executive Summary. http://www.ewg.org/reports/bodyburden2/execsumm.php
5 Based on Finnish Environment Institute (2011): Table 1 p. 16, UNEP,DTIE/ Chemicals Branch (2011), Table 1, p. 7.), SSNC 2012 – p. 20-21
6 http://www.unep.org/chemicalsandwaste/UNEPsWork/ChemicalsinProductsproject/tabid/56141/Default.aspx
7 http://sustainability.hm.com/en/sustainability/commitments/use-natural-resources-responsibly/chemicals.html (retrieved June 2015)
8 http://www.adidas-group.com/en/media/news-archive/sustainability-news/2014/adidas-group-marks-breakthrough-progress-in-chemical-management-programme/ (retrieved June 2014)
9 Campaign for Safe Cosmetics (2004): Exposures Add Up Survey Results June 2004 .http://www.cosmeticsdatabase.com/research/exposures.php (retrieved February 2014)
10 Calafat, Antonia M. et al. (2008): Urinary Concentrations of Triclosan in the U.S. Population: 2003-2004, In: Environmental Health Perspective, 116(3): 303-307
11 Toxicity and Assessment of Chemical Mixtures (2012): European Commission, http://ec.europa.eu/health/scientific_committees/environmental_risks/docs/scher_o_155.pdf (Retrieved April 2014).
12 http://www.australianasbestosnetwork.org.au/Asbestos+History/The+Health+Disaster/The+Three+Waves/default.aspx (retrieved April 2014)
13 http://www.australianasbestosnetwork.org.au/Asbestos+History/Asbestos+at+Home/Asbestos+Inside/default.aspx (retrieved April 2014)
14 http://www.who.int/indoorair/en/ (retrieved April 2014)
15 http://www.who.int/indoorair/guidelines/hhfc/en/ (retrieved 2014)
16 Norbäck, D. et al. (2010): Lung function decline in relation to mould and dampness in the home: the longitudinal European Community Respiratory Health Survey ECRHS II. In: Thorax, Vol 10
17 Karen M. (2011): Indoor Cleaning Services, International Labor Organization, Geneva. http://www.ilo.org/oshenc/part-xvii/personal-and-community-services/item/966-indoor-cleaning-services (Retrieved March 2014)
18 Savitz, DA; Andrews, KW; Brinton, LA. (1995) Occupation and cervical cancer. In: Occupation and Environment Med, 37(3), 357-361
19 ILO: Providing safe and health workplace for both women and men, http://www.ilo.org/wcmsp5/groups/public/@dgreports/@gender/documents/publication/wcms_105060.pdf (retrieved March 2014)
20 ILO Global Employment Trends for Women, March 2009, p. 10
21 WHO (2012): Global Employment Trends for Women 2012, p. viii
22 European Agency for Safety and Health at Work (2004): Mainstreaming gender into occupational safety and health, Proceedings of a seminar organised in Brussels on the 15 June 2004, p. 7.
23 Reiss, C. (2013): NIOSH publishes Study of Cancer among Firefighters, National league of Cities Risk information Sharing Consortium, http://www.nlc.org/Documents/NLC-RISC/NIOSH%20Study%20Analysis%20FINAL%2011-25-2013%20.pdf (Retrieved September 2014)
24 Global Employment Trends for Women 2012/ International Labour Office–Geneva: ILO, http://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/publication/wcms_195447.pdf (Retrieved December 2014
25 http://www.panap.net/sites/default/files/Breast-cancer-pesticides-and-you.pdf
26 Watts, Meriel (2012): Breast cancer, pesticides and you (PAN AP)
27 Heong, Escalada (1997): Pest management of rice farmers in Asia. International Rice Research Institute
28 Cahn (2008): "Women and rural livelihood training: a case study from Papua New Guinea." In: Gender & Development, 16 (1): 133-146
29 International Code of Conduct on Pesticide Management, article 3.6. http://www.fao.org/agricultu re/crops/corethemes /them e/pests /code/en/
30 Public health impact of pesticides used in agriculture. Geneva, World Health Organization, 1990.
31 PSD (1999): Evaluation on the Review of Lindane. Pesticides Safety Directorate
32 Hardell L. (2003): Environmental organochlorine exposure and the risk of breast cancer. In: Jacobs M, Dinham B (eds.) (2003): Silent Invaders: Pesticides, Livelihoods and Women's Health. pp 142-7
33 Watts, Meriel (2012): Breast cancer, pesticides and you, p 38
34 (2008) Poor conditions for women working in African horticulture. Pesticide News 80, p. 20 -22
35 Bretveld, R. (2006): Vruchtbaarheid bij glastuinbouwers. In: Epistel Jahrgang 19, 4 http://www.epidemiologie.nl/uploads/media/epistel2006_4.pdf
36 Petrelli, G. & Figa-Talamanca I. (2001): Reduction in fertility in male greenhouse workers texposed to pesticides. In: European Journal of Epidemiology, Col. 1, No. 7, p. 675-677 http://cat.inist.fr/?aModele=afficheN&cpsidt=13687843
37 ILO (2012): Global Employment Trends for Women 2012, p. 57
38 Zhang, Y. (2009): Chemical Information in Two Textile Supply Chains, A case study of producers in China, Chalmers University of Technology, Goteborg, Sweden, Report No. 2009, 10, p.27 http://publications.lib.chalmers.se/records/fulltext/103455.pdf (retrieved February 2014)
39 Laursen, S. et al. (2003): Danish Environmental Protection Agency. Survey of chemical compounds in textile fabrics. Survey no. 23 http://www.mst.dk/NR/rdonlyres/B9CDE217-9E41-4F27-A8A3-921D5B50A737/0/23.pdf (retrieved February 2014)
40 Laursen, S. et al. (2003): Danish Environmental Protection Agency. Survey of chemical compounds in textile fabrics. Survey no. 23, p.53 http://www.mst.dk/NR/rdonlyres/B9CDE217-9E41-4F27-A8A3-921D5B50A737/0/23.pdf (retrieved February 2014)

41 Pinkerton, L. et al. (2004): Mortality among a cohort of garment workers exposed to formaldehyde http://oem.bmj.com/content/61/3/193.abstract (retrieved February 2014)
42 Labrèche F. et al. (2010): Postmenopausal breast cancer and occupational exposures, Occup Environ Med 2010 http://oem.bmj.com/content/67/4/263.abstract (retrieved February 2014)
43 Wong E. et al. (2009): Dust and Chemical Exposures, and Miscarriage Risk Among Women Textile Workers in Shanghai, China, In: Occupational and Environmental Medicine, 66(3), p.161-168
44 DeMatteo, R. et al. (2012): Chemical Exposures Of Women Workers In the Plastic Industry With Particular Reference To Breast Cancer And Reproductive Hazards. NEW SOLUTIONS: A Journal of Environmental and Occupational Health Policy, p. 427-448
45 Brophy, J. et al. (2012): Breast Cancer Risk in Relation to Occupations with Exposure to Carcinogens and Endocrine Disruptors: A Canadian Case-Control Study, In: Environmental Health 11(87), p.1-17
46 Brophy, J. et al. (2012): Breast Cancer Risk in Relation to Occupations with Exposure to Carcinogens and Endocrine Disruptors: A Canadian Case-Control Study, In: Environmental Health 11(87), p.1-17
47 ILO (2012): Global Employment Trends for Women 2012, p. 57
48 Wilding, B., Curtis, K., Welker-Hood, K. (2009): Hazardous chemicals in health care: A snapshot of chemicals in doctors and nurses. Physicians for Social Responsibility.
49 Environmental Working Group (2009): Nurses` report, http://www.ewg.org/research/nurses-health (retrieved April 2014)
50 Arif AA, Delcos GL, Serra C (2009): Occupational exposures and asthma among nursing professionals. In: Occupational Environmental Medicine, Vol 66, p. 274
51 Lawson, C. et al. (2012): Occupational exposures among nurses and risk of spontaneous abortion. In: American Journal of Obstetrics & Gynecology.
52 http://www.nursingworld.org/MainMenuCategories/ANAMarketplace/Factsheets-and-Toolkits/Safe-Chemicals-Fact-Sheet.pdf (retrieved April 2014)
53 www.no-harm.org
54 Bradshaw L. et al. (2011): Self-reported work-related symptoms in hairdressers. In: Occupational Medicine, Vol 61, p. 328-334
55 Perkins JB and Farrow A. (2005): Prevalence of occupational hand dermatitis in UK hairdressers. In: International Journal of Occupational Environmental Health, Vol 11, p. 289-293.
56 Gala Ortiz G. et al. (2001): Diagnostic approach and management of occupational asthma by persulfate salts in a hairdresser. In: Allergy Asthma Proc, Vol 22(4), p. 235-238
57 http://www.environmentalhealthnews.org/ehs/newscience/2012/10/2012-1207-solvents-pregnancy-raises-birth-defects-risk/
58 http://wiego.org/sites/wiego.org/files/resources/files/Chen_Economic%20Empowerment_WIEGO_Position.pdf (retrieved April 2014)
59 Chaturvedi, B. (2010): Mainstreaming Waste Pickers and the Informal Recycling Sector in the Municipal Solid Waste.
60 Muhammad N.M., Manu, H.I. (2013): Gender roles in informal solid waste management in cities of Northern Nigeria: A case study of Kaduna Metropolis. In: Academic Research International, Vol 4
61 http://www.chintan-india.org/documents/research_and_reports/chintan_study_informal_formal.pdf (retrieved April 2014)
62 http://www.rrcap.ait.asia/projects/awmap/Final%20IS%20Report%2007152009%20%20(NSWMC)_.pdf?docid=2637
63 www.no-burn.org, www.wiego.org, www.globalrec.org
64 http://globalrec.org/2014/03/08/march-8th-women-in-the-struggle-for-inclusive-recycling/ (retrieved April 2014)
65 ILO (2005): International Programme on the Elimination of Child Labor
66 Hinton et al. (2003): Women and artisanal mining: Gender roles and the road ahead, In: Hilson E. et al.: The Socio-Economic Impacts of Artisanal and Small Scale Mining in Developing Countries, Netherlands
67 Barrett, J. et al. (2009): Girl, disrupted. Hormone Disruptors and Women's Reproductive Health
68 For more information see: WHO (2012): Possible developmental early effects of endocrine disrupters on child health. Barrett, J. et al. (2009): Girl, disrupted. ChemTrust (2012): Review of the science linking chemical exposures to the human risk of obesity and diabetes. www.tedex.org. Gies, A. & Soto A. (2013): Bisphenol A: contestet science, divergent safety evaluations, EEA Report: Late lessons from early warnings
69 Crain, DA. et al. (2008): Female reproductive disorders: the roles of endocrine disrupting compounds and developmental timing. Fertil Steril, 90, p. 911-940.
70 http://endocrinedisruption.org/prenatal-origins-of-endocrine-disruption/critical-windows-of-development/timeline-test/ (retrieved March 2014)
71 Woodruff, Tracy et al (2011): Environmental Chemicals in Pregnant Women in the United States: NHANES 2003-2004, In: Environmental Health Perspectives, Vol 119(6), p. 878-885
72 http://www.coe.ucsf.edu/coe/spotlight/toxic_preg.html (retrieved April 2014)
73 http://chm.pops.int/Implementation/GlobalMonitoringPlan/MonitoringActivities/Humanmilksurvey/tabid/270/Default.aspx (retrieved April 2014)
74 WHO/UNEP (2009): Coordinated Exposure Study (2008-2009) on levels of persistent organic pollutants (POPs) in human milk.
75 http://chm.pops.int/Implementation/GlobalMonitoringPlan/MonitoringActivities/Humanmilksurvey/tabid/270/Default.aspx (retrieved April 2014)
76 http://www.momsandpopsproject.org/about.php (retrieved April 2014)
77 WABA, IPEN (2004): Working Together for a Toxic-Free Future. A Joint statement by participating organisations of the World Alliance for Breastfeeding Action (WABA) & International POPS Elimination Network (IPEN). http://www.waba.org/RRR/Joint%20statement%20Mar2004.pdf
78 Science Communication Unit, University of the West of England (2013): Science for Environment Policy In-depth Report: Soil Contamination: Impacts on Human Health. Report produced for the European Commission DG Environment
79 http://www.breastcancerfund.org/clear-science/environmental-breast-cancer-links/air-water/ (retrieved March 2014)
80 WHO Regional Office for Europe (2010): Social and gender inequalities in environment and health, p. 15
81 http://data.worldbank.org/indicator/EE.BOD.CHEM.ZS/countries/1W?display=map (retrieved March 2014)
82 https://www.thegef.org/gef/sites/thegef.org/files/publication/Reducing%20Risks%20of%20Pesticides-sm.pdf (retrieved March 2014)
83 UNEP (2013): Gobal Chemical Outlook
84 IPEN (2013): Global Mercury Hotspots

Women as agents of change

The UN Universal Declaration of Human Rights[1] and the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW)[2] call on all states to ensure that women and men enjoy equal rights and opportunities. However, traditional gender roles persist in many countries, and more than 100 countries still have norms and laws that discriminate against women and girls.[3] Due to these different social "gender" roles women often have different needs and priorities in regards to environmental policies and practices.

The biological difference between women and men is probably also one of the reasons why surveys show slight differences between priorities of women and men, and why many environmental activists and scientists have been women, for example Dr. Rachel Carson who observed the reproductive health effects of DDT in birds and worried what it would mean for children.[5]

Many other women have become well-known environmental activists and scientists, from Vandana Shiva to Wangari Matthai. The motivation to engage in environmental and chemical activities has regularly been linked to personal experience. For Sandra Steingraber, a well-known biologist, it was the question why she and so many of her family had developed cancer and how this was related to environmental causes, as she explains in her book "Living Downstream"[6]. Steingraber writes "Cancer survivors can be a powerful lobby for change. We can show the human cost of past polluting practices. We can re-imagine a future built on the principle of precaution, green chemistry, and green engineering. But only if we don't confine ourselves to the present moment. Living each day as if it were your last is not all it's cracked up to be. In fact, discounting the future and ignoring the past is how we've contaminated the world with toxic chemical in the first place."[7] During her laureate speech as Goldman Prize Award recipient, Yuyun Ismawati said "I had my passion guide my work for our environment as well as for future generations. As someone who has useful knowledge I feel obliged to help change the world for the better."[8] Kaisha Atakhanova from Kazakhstan said, "I knew my scientific work was meaning-

less, if I didn't also help the victims of the nuclear testing. So I decided to work with them and help them defend their ecological rights."[9] Olga Speranskaya stresses, "only cooperation and global partnership, and comprehensive work will make a change. For communities impacted by chemical pollution in Kazakhstan, Georgia and Armenia, I try to make their lives a little bit better."[10]

There is little research on the differences between men and women regarding their engagement for environmental protection. A study[11] by Hemmati, shows there is some evidence that women are more environmentally aware and engage more in environmental issues, such as recycling, reuse and environmental friendly consumer behaviour, than do men. Yet more empirical research is needed in this area. Hemati links this difference also to the different gender roles of women and men with women being the main caretakers of their children and families, they are also more driven to protect them.

A recent study, "More Work for Mother, Chemical Body Burdens as a Maternal Responsibility" [12], explores how women who are pregnant and mothers practice 'precautionary consumption' to guard their child from environmental chemicals. Mackendrick concluded that „nearly all of the participants believed that precautionary consumption was primarily a mother's responsibility, and these women felt deeply responsible for their children's health." It can be put forward as a hypothesis that women are more likely to change their consumption patterns to become more environmentally aware when they are planning or expecting a baby.

Women's environment NGOs such as WECF[13] receive many questions from consumers, almost all women, asking advice about hazardous chemicals and health. In response, WECF collaborates with scientists and responsible entrepreneurs to provide information via websites, APPs and consumer guides on, for example, toys, textiles, detergents and body care products. The WECF "Nesting" programme has recently been expanded to provide information to health and childcare professionals on how to avoid exposure to hazardous chemicals of children, as the health impacts are much greater, and often irreversible, than the same exposure levels for adults.

That women have different priorities than men based on their different biology and gender roles does not mean that these priorities are not or less important. On the contrary, they are very important but often under-represented in policy decisions and mainstream media. Women should be empowerment to ensure their priorities are fully reflected in decision-making. More and more women have been assigned as environment ministers in recent years, with an average of 14 per cent in the last years, which is quite low, but still much higher than for other ministries such as finance of transport[14]. The Network of Women Ministers and Leaders for the Environment (NWMLW) was established during the 2009 UNEP Governing Council, to strengthen joint positions on gender equality in environmental policies[15]. Several women in policy making have taken the priorities of women on board to create policy change, including the European Commissioner for the Environment, Ms Margot Wallström, who was the driving force behind the ground-breaking chemicals EU Reg. No. 1907/2006 "REACH"[16], with a focus on reducing health risks for children. Key persons are, inter alia, Lisa P. Jackson, Chief Administrator of the US Environmental Protection Agency who is committed to prevent exposure to toxic contamination focussing on vulnerable groups, including children, the elderly and low-income communities. Also Wangari Maathai, Nobel Peace Prize winner, and founder of the Green Belt Movement, who prioritised support for local women's groups to plant forests, – which she called the "water towers" – thus protecting against climate change, and at the same time ensuring income for the local communities from seedlings and building materials.

Women are agents of change and should be empowered to advance their priorities for a toxic-free environment, as policy makers, consumers, civil society activists or researchers, and often independent of the motivation to respond to own needs, rather focussing on the priorities of other women, or that of children, family members or society as a whole.

Endnotes chapter 5

1 Universal Declaration of Human Rights, 1948 (see: http://www.un.org/en/documents/udhr/).
2 Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW), 1979 (see: http://www.un.org/womenwatch/daw/cedaw/).
3 The 2012 World Development Report on Gender Equality and Development (see: http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/EXTWDRS/EXTWDR2012/0,,contentMDK:22999750~menuPK:8154981~pagePK:64167689~piPK:64167673~theSitePK:7778063,00.html)
4 EC, Special Eurobarometer 295, Report: Attitudes of European Citizens Towards the Environment, 2008 (see: http://ec.europa.eu/public_opinion/archives/ebs/ebs_295_en.pdf).
5 Carson, R., Silent Spring, Boston 2002.
6 Steingraber, S., Living Downstream, 2010 second edition.
7 See Endnote vi.
8 See for quote here: http://www.youtube.com/watch?v=eROrNGFr0yw (retrieved April 2014).
9 See for quote here: http://www.goldmanprize.org/2005/asia (retrieved April 2014).
10 See for quote here: http://www.goldmanprize.org/2009/europe (retrieved April 2014).
11 Hemmati, M., Gender-Specific Patterns of Poverty and (Over-) Consumption in Developing and Developed Countries, in: E. Jochem, J. Sathaye and Daniel Biulle (Eds.): Society, Behaviour, and Climate Change Mitigation. Proceedings of IPCC Expert Group Meeting on Social Scientific Approaches to Climate Change Mitigation, 2000.
12 Mackendrick, N., More Work for Mother: Chemical Body Burdens as a Maternal Responsibility, in: Gender & Society, October 2014, vol. 28 no. 5, pg. 705-728.
13 Women in Europe for a Common Future is an international network of women's and environment organisations taking action for a healthy environment and sustainable development (see here: http://www.wecf.org).
14 IUCN, Environment Gender Index: Women in Environmental Decision Making, 2013 (see: http://genderandenvironment.org/egi/).
15 See here: http://www.unep.org/GC/GC25/nwmle.asp.
16 Reg. No. 1907/2005 of 18 December 2006 „Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)".

THE KNOWLEDGE ON SOCIO-ECONOMIC EFFECTS OF HAZARDOUS CHEMICALS ON WOMEN IS NEGLIGIBLE.

What are the main harmful substances that women are exposed to?

Thousands of chemicals are currently on the market worldwide. Exact numbers are difficult to know. In the EU there are more than 140 000 chemicals used and traded. According to the US Environmental Protection Agency, about 700 new chemicals are introduced each year.[1]

For the majority of chemicals on the market we do not know their full environmental and health effects – not to mention the lack of knowledge on mixtures of those chemicals. One of the biggest unknowns at the moment is probably manufactured nanomaterials. They are not adequately controlled by regulation, nor undergo sufficient hazard and risk assessment. Despite the fact that we know very little in general about environmental and health effects of chemicals, we know even less about harmful effects of chemicals for women's health. The current knowledge on socioeconomic and health effects of hazardous chemicals on women is minuscule. Much more research is needed to gain gender disaggregated data on exposure scenarios and socioeconomic and health effects of chemicals. Ultimately this data could be basis of precautionary based legislation.

Limited comprehensive information is available, but some institutions do list chemicals of concern, also for women.

Existing lists of harmful chemicals

Many different kinds of lists exist and are mainly used as tools for prioritizing action. The Global Chemical Outlook 2013 presents an excellent compilation of existing lists from governments, NGOs, trade unions and industry.[2] None of the lists mentioned address specifically the needs of women or take women's different susceptibility specifically into account. The only ones that have a more direct link to women are the lists referring to cosmetics, like the skin deep database of the US based NGO Environmental Working Group, which provides information about the ingredients in cosmetics. Other lists like the GoodGuide inform about chemicals in products such as food, detergents or personal care products. Third party labels like the Nordic Swan, EU Ecolabel or the German Blue Angel should guide consumers towards more environmentally friendly products.

FAO and WHO developed criteria to identify highly hazardous pesticides (HHPs) including for acute toxicity; carcinogenicity, mutagenicity and reproductive toxicity based on categories 1A and 1B of the Global Harmonized System (GHS); and pesticides known to cause a high incidence of severe or irreversible adverse effects. The NGO Pesticide Action Network (PAN) developed a list of HHPs, based on the FAO/WHO criteria with additional indicators for endocrine disruption, high environmental concern and hazard to ecosystem services. This list contains currently 426 pesticide active ingredients.[3] Neither sets of criteria differentiate between harmful effects on women and men.

Chemicals discussed: EDCs, highly hazardous pesticides, POPs, lead and mercury

Some groups of chemicals are currently discussed more intensely in political debates. Endocrine disrupting chemicals are a new emerging issue under the Strategic Approach on International Chemicals Management (SAICM). For highly hazardous pesticides the international community calls for more protection and activities. POPs are still a major threat for human health and the environment. The elimination of lead in paint is high on the agenda in many countries. And for mercury a new UN Convention was finally adopted in 2013. All these chemicals pose a threat to human health, some with additional threats to women, as well as, to the foetal health when women are exposed in pregnancy during critical windows of developmental sensitivity for the foetus. In this study we can give only a brief overview of important groups of chemicals that have negative effects on women.

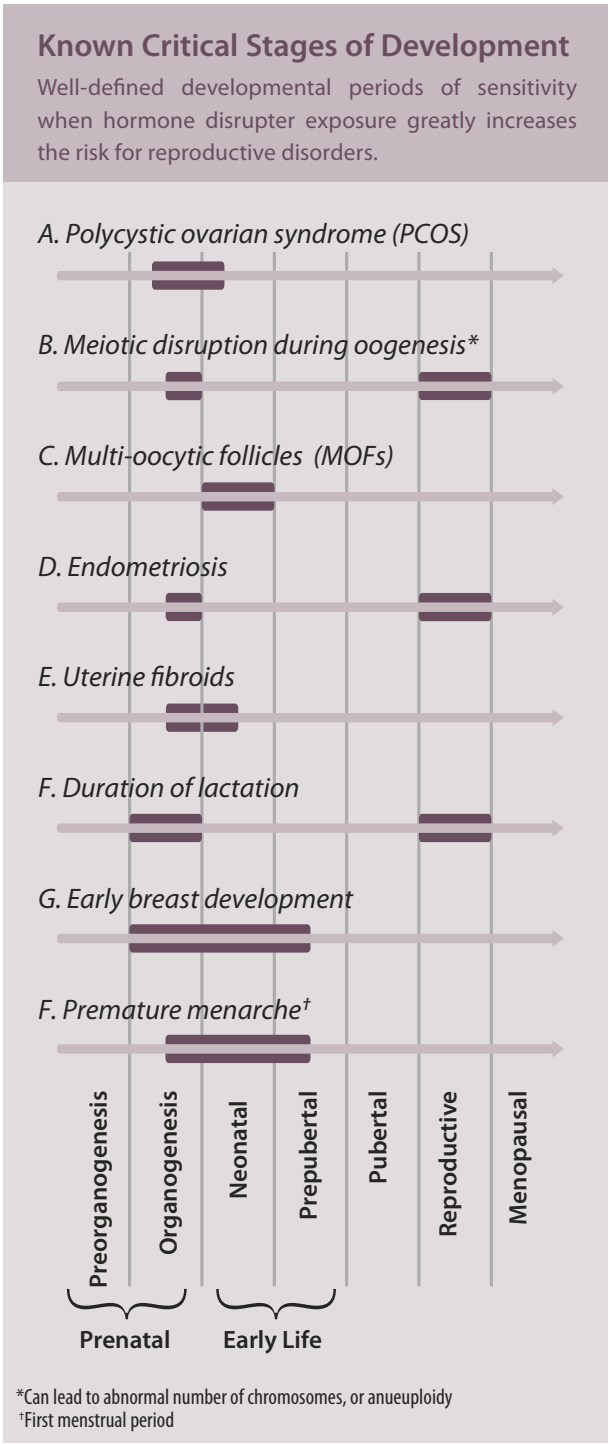
Endocrine Disrupting Chemicals (EDCs)

One group of chemicals, well known to harm women during susceptible windows, is currently high on the chemical policy agenda: Endocrine Disrupting Chemicals (EDCs). At the 3rd International Conference on Chemical Managment, 31 countries unanimously agreed to treat EDCs as an emerging policy issue. Also, the EU attempts to fit EDCs into their chemical regulation.

We know that endocrine disrupting chemicals can mimic natural hormones. Therefore they can attach to receptors and trigger a hormonal process at the wrong time. Other EDCs can hinder natural hormones attaching to their receptors at the appropriate time, keeping the right message from being sent.

Some EDCs can change the process of certain genes being read and understood appropriately. They can also interrupt the process of genes being turned on and off at critical stages of development. Furthermore, they can falsely determine the development and production, the destruction, reduction and secretion of certain hormones.

Some EDCs have the ability to interfere with normal hormone messaging through several of these mechanisms. Some of these actions can be triggered by very low doses of EDCs, especially during critical windows of development.[4] This can lead to serious diseases, mostly later in life, like breast cancer, thyroid cancer, infertility, obesity, diabetes etc.[5,6] Women-related diseases linked to EDCs include breast cancer, infertility, early puberty, aneuplodia, miscarriage, premature birth, preeclampsia, menstrual irregularities, polycystic ovary syndrome, polyovular follicles, uterine fibroids, endometriosis, shortened lactation, and early menopause.[7]



The known critical stages of development for several female reproductive disorders.[7] Exposure to hormone disruptors during these windows increases a woman's risk of developing the associated health problem(s). Redrawn from Crain et al. (2008)[8]

Highly Hazardous Pesticides (HHPs)

In the previous chapters highly hazardous pesticides and their effect on women, especially pregnant women, were already mentioned. Women working on small farms as well as women working in the agricultural industry, including in the flower industry, are exposed to these pesticides. Women ingest pesticides via contaminated food or via breathing when living close to agricultural sites. Pesticides are a growing issue of concern as the pesticides market continues to expand. From 2009 to 2014 the volume of sales of pesticides rose from 38 billion US Dollars to 52 billion US Dollars. In the future growth in pesticides sales is especially expected in Central and South America, Africa and the Middle East.[9] These are all regions where women are highly engaged in the agricultural sector. For this reason the Latinamerican (GRULAC) region, among others, called in their recent SAICM resolution (August 2013) for the development of health risk reduction programs for vulnerable and at risk populations, including women. It also called for better protection from HHPs. Health problems for women caused by pesticides include acute poisonings (including deadly ones), uterine and breast cancer, infertility, delayed menopause, and other diseases. Although some of the risks for women from HHPs are well known, there are few awareness-raising and capacity-building activities addressing women's needs. Stricter laws that would phase-out HHPs and pesticides that contain endocrine disrupting substances, replacing them with safer alternatives, should be urgently implemented.

Persistent Organic Pollutants (POPs)

The Stockholm Convention bans POPs almost worldwide. At the moment the production and use of 25 chemicals (14 of them pesticides) is prohibited. This ban includes chemicals like lindane, PCB, endosulfan, aldrin and heptachlor. For DDT the use is severely restricted, and only allowed for malaria control. Many biomonitoring studies show that POPs can be found in human bodies, even some that have been prohibited for a long time. POPs accumulate in fatty tissue, and women generally have more of this than men. They enter and contaminate the foetus while it is still in the mother's womb. Breast milk also contains POPs, so children are further exposed to them during nursing. However, breastfeeding is general the best option for the child..[10] POPs are linked to many health problems that women suffer from: various cancers, neurological disorders, immune suppression, reproductive disorders like miscarriages, pre-term delivery, menstrual disorders, shortened period of lactation in nursing mothers, and other diseases like endometriosis and type II diabetes. Since POPs are most harmful to the foetus, preventing exposure of pregnant women is critical.

Heavy metals – lead and mercury

Mercury

Women are exposed to mercury directly as well as indirectly from the air they inhale and from the water and the food that they consume every day. As tests have shown, already many women have elevated levels of mercury in the blood, hair, urine, and breast milk.

Mercury is toxic for the nervous system, the cardiovascular system and the kidneys. "It is generally accepted that developing organ systems (such as the foetal nervous system) are the most sensitive to toxic effects of mercury. Foetal brain mercury levels appear to be significantly higher than in maternal blood, and the developing central nervous system of the foetus is currently regarded as the main system of concern as it demonstrates the greatest sensitivity. Other systems that may be affected include the respiratory, gastrointestinal, hematologic, immune, and reproductive systems." [11] Methylmercury crosses the blood-brain barrier and also the placenta from mother to baby. It can cause mental impairments and learning disabilities, eye and hearing damage during pregnancy as a result of their mother's exposure. Mercury can be passed on to the baby though breast milk.[12] Pregnant women are recommended as far as possible to not eat certain fish, since methylmercury bioaccumulates in the food chain, especially in fish. Mercury is also found in non-food products like cosmetics and medical accessories and aids such as dental amalgam fillings and thermometers.

Lead

Exposure to lead is extremely harmful to children and adults, since the health effects are generally irreversible and can have a lifelong impact. Most vulnerable the prenatal phase, as pregnant women can transfer lead to the foetus. The younger the child, the more harmful lead can be. WHO counts lead as a modifiable environmental factor among the top ten causes for the most dangerous children's diseases.[13] Lead has also multigenerational effects, since it is mainly carried in the bone and can be mobilized during pregnancy. Thus, lead exposure in a pregnant woman's history may affect the health of her children.[14] Common sources of lead exposure are paints, water from lead water pipes, contaminated soil and products such as toys, jewelry and cosmetics.

Endnotes chapter 6

1 Global Chemical Outlook (2013), p.10
2 Global Chemical Outlook (2013), p. 187ff
3 PAN International (2013): List of Highly Hazardous Pesticides http://www.pan-germany.org/download/PAN_HHP_List_140527_F
4 Barrett, J. et al. (2009): Girl, disrupted. Hormone Disruptors and Women's Reproductive Health. p. 9-11
5 UNEP/WHO (2012): State of the Science of Endocrine Disrupting Chemicals
6 www.endocrinedisruption.org
7 Barrett, J. et al. (2009): Girl, disrupted. Hormone Disruptors and Women's Reproductive Health
8 Crain, DA. et al. (2008): Female reproductive disorders: the roles of endocrine disrupting compounds and developmental timing. In: Fertility and Sterility. 90, p. 911-940. www.fertstert.org/article/S0015–0282(08)03555-3/abstract (retrieved February 2014)
9 Global Chemical Outlook (2013), p. 33
10 http://www.pops-gmp.org/index.php?pg=gmp-data-warehouse (retrieved May 2014)
11 UNEP DTIE and WHO (2008): Guidance for Identifying Populations at Risk from Mercury Exposure, p.4 http://www.unep.org/hazardoussubstances/Mercury/MercuryPublications/GuidanceTrainingmaterialToolkits/GuidanceforIdentifyingPopulationsatRisk/tabid/3616/language/en-U.S./Default.aspx
12 UNEP (2008): Mercury, A priority for action, Introduction booklet, p. 5
13 http://www.who.int/quantifying_ehimpacts/publications/preventingdisease.pdf
14 http://www.chem.unep.ch/pops/pdf/lead/leadexp.pdf, p.12

Existing initiatives

7

International Organisations

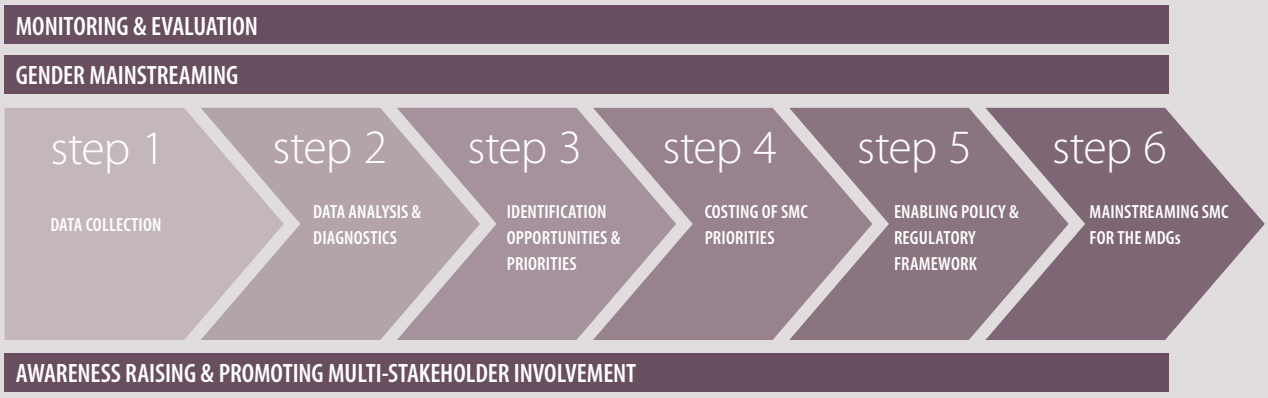
The topic of women and chemicals is linked to many activities of International Organisations and several UN bodies. A major concern in the sound management of chemicals is the impact on human health, as well as the impact on the environment. Often vulnerable groups are specifically mentioned in texts of chemical treaties or SAICM. However, almost no intergovernmental organisation has a special programme in place dealing with women and chemicals, except UNDP (see below). Compared to other topics like women and climate change or women and water, the issue of women and chemicals is underrepresented. It is time to find synergies among the gender relevant activities in international chemical policy and initiate a joint approach to reduce the burden of exposure to toxic chemicals for women.

United Nations Development Programme (UNDP)

UNDP, so far, is the only UN agency to provide a publication including recommendations that focus specifically on gender and chemicals.[1] The guidance document describes important linkages between development, gender, and chemicals management. It also contains case studies and scenarios on the impact of exposure to chemicals like cadmium or nickel. It describes those chemicals that are of greatest concern with regard to female health like endocrine disruptors, POPs, and heavy metals. A comprehensive sixstep approach, including checklists, aims to integrate gender sensitive safe chemical management in national development strategies.

The checklist provides an excellent and easy to handle tool for governments, which can be implemented with the support of UNDP. Unfortunately it seems that the urgency of this topic is not yet fully recognized by most countries. Further awareness raising is needed.

Steps for Mainstreaming SMC in National Development Strategies



UNDP steps for mainstreaming safety management of chemicals in national development strategies, UNDP (20011), p. 8

United Nations Entity for Gender Equality and the Empowerment of Women (UN Women)

The UN Women website and publications currently have no specific information on women and chemicals. However, the topic could and should be integrated in the strategic objectives of the Women and Environment Diagnosis of UN Women which reads:[2]

- Involve women actively in environmental decision-making at all levels;
- Integrate gender concerns and perspectives in policies and programs for sustainable development;
- Strengthen or establish mechanisms at the national, regional, and international levels to assess the impact of development and environmental policies on women.

It may be an asset to involve UN Women in future activities on the issue of women and chemicals.

Basel, Rotterdam and Stockholm Conventions Secretariat

The Secretariat of the Basel, Rotterdam and Stockholm Conventions developed a gender action plan (GAP) for 2014-2015.[3] The Basel, Rotterdam and Stockholm Conventions, and many decisions of the respective Conventions' bodies, make reference to gender issues at various points, e.g. through the BRS publication on "Gender Heroes". Gender equality is an integral part of the implementation of BRS Conventions including Secretariat activities. BRS-GAP provides the blueprint for actions to promote gender equality within the Secretariat and gender mainstreaming practices in its programme of work and activities, including those undertaken in partnership with other stakeholders.

The goal is to incorporate gender equality into achieving the common objective of the Conventions, namely protecting human health and the environment. It is also hoped that the activities of BRS-GAP would lead to a greater recognition of the links between gender, poverty and hazardous chemicals and wastes. The proposed action aims to establish a framework for gender mainstreaming to assess the results for the short to medium term (2014-2015) and to review and update present documents in 2015.

Women are specifically mentioned in the SAICM documents as follows:

Dubai Declaration

18. We will work towards effective and efficient governance of chemicals management by means of transparency, public participation and accountability involving all sectors of society, in particular striving for the equal participation of women in chemicals management.

SAICM introduction

The involvement of all relevant sectors and stakeholders, including at the local, national, regional and global levels, is seen as key to achieving the objectives of the Strategic Approach, as is a transparent and open implementation process and public participation in decision-making, featuring in particular a strengthened role for women.

OPS Risk Reduction

Risk reduction measures need to be improved to prevent the adverse effects of chemicals on the health of children, pregnant women, fertile populations, the elderly, the poor, workers and other vulnerable groups and susceptible environments.

OPS Governance

(…) that in many countries some stakeholders, particularly women and indigenous communities, still do not participate in all aspects of decision-making related to the sound management of chemicals, a situation which needs to be addressed.

(…) to promote and support meaningful and active participation by all sectors of civil society, particularly women, workers and indigenous communities, in regulatory and other decision-making processes that relate to chemical safety.

(…) to ensure equal participation of women in decision-making on chemicals policy and management.

Global Plan of Action

Examples of measures to safeguard the health of women and children are the minimization of chemical exposures before conception and through gestation, infancy, childhood and adolescence.

Important proposed actions include communication of gender related information to staff and partners, training and skill development on gender related issues, monitoring and reporting on mainstreaming within the Secretariat, and promotion of gender equality through the Standard Operating Procedures.

Strategic Approach to International Chemicals Management (SAICM)

The Strategic Approach to International Chemicals Management (SAICM) has no specific gender approach. However, in the Dubai Declaration and the SAICM Global Plan of Action women are referred to as a highly vulnerable group whose protection is to be a priority issue in many working areas.

The expert workshop, which was held as a preparatory activity for this report, highly recommended to make the issue of women and chemicals a future priority issue under SAICM. SAICM was perceived as one of the most suitable policy forums to discuss the issue further, especially due to its multi-stakeholder approach.

World Health Organisation (WHO)

The World Health Organization focuses on the enhancement of the health situation of women in many different ways. Its Gender, Women and Health Network offers gender mainstreaming, education and training programs on important topics such as maternal health, reproductive rights provided by focal points and experts in six regional offices and the headquarters.[4] Many WHO publications on the impact of chemicals on human health have been published. WHO is also actively engaged in the SAICM process.

The WHO Euro report "Social and gender inequalities in environment and health"[5] describes many examples from the chemical sector. In some thematic working areas chemicals and women are covered. One example are the soon to be published housing and health guidelines. They will focus on scaling up work on indoor environments and the prevention of communicable and non-communicable diseases through non-health sectors. Since women spend more time at home than men, this is a very important issue for women's health. The specific objectives for the housing and health guidelines are: to identify evidence-based recommendations on healthy housing conditions that have not yet been covered by existing guidelines and to provide health-based performance and design criteria enabling housing actors to produce healthy housing and healthy housing interventions. The developed recommendations and criteria will focus on the avoidance or reduction of housing-related risk factors (hazardous or unacceptable housing conditions such as indoor cold and heat, design-related injury risks, or crowding, exposure to chemicals such as lead). They may also cover health-enhancing factors in housing (such as access for different levels of physical ability)..

United Nation Environment Programme (UNEP)

In 2010, UNEP initiated its medium-term strategy for 2010-13, which marks a new track with an emphasis on six crucial areas: climate change; ecosystem management; disasters and conflicts; environmental governance; harmful substances and hazardous waste; and resource efficiency, sustainable consumption, and production. Regarding chemicals and hazardous waste, UNEP is a leading influential force in the UN system for international activities associated with the sound management of chemicals. Concerning women and chemicals, UNEP is touching the issue in various ways, e.g. in the UNPE Global Chemicals Outlook (2013). UNEP's Global Gender Environment Outlook (GGEO) will be the first global assessment of its kind, and it represents UNEP's commitment in response to the call of the Network of Women Ministers and Leaders for the Environment (NWMLE) to lead a global assessment on gender and environment. UNEP's response resonates with the commitment made by Member States in the Rio+20 Conference Outcome document, which renewed the call for gender equality and the empowerment of women to achieve sustainable development. UNEP promotes chemical safety by providing policy advice including activities on women and chemicals related to the implementation of the Strategic Approach to International Chemicals Management (SAICM) and gender action plan (GAP) to promote gender equality within secretariat and Convention Basel, Stockholm and Rotterdam (BRS-GAP).

International Labour Organisation (ILO)

In ILO's policies and strategies the promotion of the equality between women and men is an integral part. Gender mainstreaming is the main strategy to achieve gender equality as an essential feature of decent work. Means to gain gender equality are:[6]

- Promoting the ratification and application of labour standards relevant to equality, in particular the four key gender equality conventions
- Establishing advisory services and guidance on gender equality and gender mainstreaming to constituents aiming to make positive changes in their policies, legislation, programmes and institutions, and to ILO units at headquarters and field offices
- Facilitating dissemination of research and information on issues concerning gender equality in the world of work
- Offering technical cooperation for development in the context of ILO's technical cooperation programme
- Supporting knowledge development activities by training and capacity-building that provide methodologies and tools for integrating gender equality into analysis, planning and practice.

The Gender and Non-Discrimination Program of the ILO Training Centre in Turin offers regular training courses in gender mainstreaming and publishes a wide range of gender specific training materials.

Although ILO conducts much work on women-related topics, like equal pay, maternity, and occupational health, specific and recent information about women and chemicals was not available. In a new report „Safety and Health in the Use of Chemicals at Work" (2014)[7] very much useful information is compiled about how to deal with chemicals at the workplace. However, no gender mainstreaming or gender disaggregated data is mentioned.

Non-governmental organisations

Many implementation projects in the field and some research on the issue of chemicals and women come from non-governmental organisations. They are active in all areas covered by this study like research, awareness raising, capacity building, information campaigns, and advocacy work on the national, regional and international level. They also take care of victims of chemical-related diseases and accidents and act as watch dogs for corruption and bad governance of companies. International networks working on chemicals include the International POPs Elimination Network (IPEN), the Pesticides Action Network (PAN), Women International for a Common Future (WICF), Health Care Without Harm (HCWH), and the International Society for Doctors for the Environment (ISDE) among others. We estimate that there are around 1000 NGOs worldwide working on chemicals and pesticides. Examples of their work are highlighted in this study as boxes linked to the related content issues.

Business

Chemical business associations focus in their work mainly on women in their role as scientists and corporate leaders. In 2011 Cefic, the European Chemical Industry Association hosted an event called "European Women: Innovating for Smart, Sustainable and Inclusive Growth", which addressed topics like "lessons learned by leading women in science and innovation in Europe" and "opportunities for increasing women's role in achieving the Europe 2020 vision through science and innovation". Dow Chemicals Women's Innovation Network (WIN) focuses on "engaging women and catalysing culture change".[8] WIN offers mentoring and networking opportunities, and provides access to professional development tailored to the unique needs of women at critical career stages, mainly within the company.[9] It is hard to find industry data and projects addressing directly women who are exposed to chemicals at their living or work place. The Re-

List of NGOs working on women and chemicals issues (not comprehensive):

International POPs Elimination Network (IPEN), www.ipen.org

Women International for a Common Future (WICF/WECF), www.wecf.eu

Pesticides Action Network (PAN), www.pan.org

The Collaborative on Health and Environment (CHE), www.healthandenvironment.org

Health Care Without Harm (HCWH), www.noharm.org

Commonweal, www.commonweal.org

Health and Environment Alliance (HEAL), www.env-health.org

Eco Accord (Russia), www.ecoaccord.org

Women´s Voices for the Earth, (USA), www.womensvoices.org

Global Alliance for Incinerator Alternatives (GAIA), www.no-burn.org

Sustainlabour, www.sustainlabour.org

Balifokus (Indonesia), www.balifokus.asia

National Toxics Network (Australia), www.ntn.org.au

Greenwomen (Kazakhstan), www.greenwomen.kz

Social-Eco Fund (Kazakhstan)

Breast Cancer Fund (USA), www.breastcancerfund.org

Breast Cancer UK, www.breastcanceruk.org

Environmental Working Group (USA), www.ewg.org

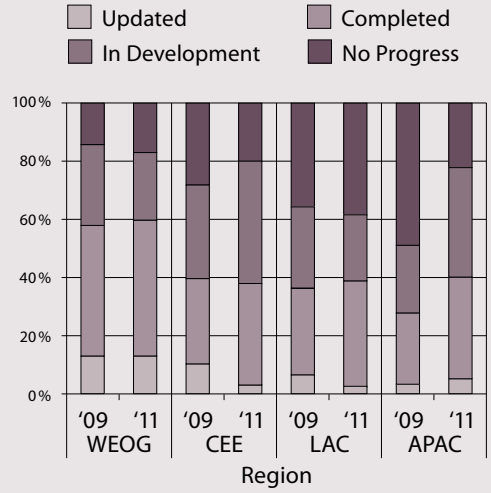
Alaska Community Action on Toxics (ACAT), www.akaction.org

Center for Environmental Justice (Sri Lanka), www.ejustice.lk

LEADERS (Nepal), www.leadersnepal.org.np

European Environmental Bureau www.eeb.org

SAICM Ind. No. 7: Communicating information on the risks associated with chemicals to vulnerable groups



ICCA (2012) 2nd Update Report for the UN SAICM Implementation Indicators

sponsible Care Charter, which is the global chemical industry`s environmental, health and safety initiative, does not refer to women or gender. However, the ICCA 2nd update report on SAICM indicators[10] shows that many companies fail to achieve SAICM indicator 7, which lists those countries (and organisations) that have specific strategies in place for communicating information on the risks associated with chemicals to vulnerable groups. For a greater impact, the data collection should also include consultative processes and training directed at vulnerable groups, such as women, children, the elderly and migrant workers, and take into consideration social and economic conditions. Clearly there is a need for more information and awareness raising among companies to recognize this important issue, and take measures in order to achieve the 2020 goal of SAICM.

Governments

The activities of governments on the issue of chemicals and women reflect the wide range and diversity of aspects to be addressed. They range from legislative action protecting women from hazardous chemicals and information campaigns on the issue to activities in international multi-stakeholder initiatives. In most cases the activities are embedded in broader fields like occupational health, gender mainstreaming, and chemicals management. This fact makes it difficult to gain a comprehensive overview.

Some countries have policies in place on e.g. maternal health, but still difficulties can occur. Breadley describes that in Canada, "maternal health protection is provided through a mosaic of federal and provincial/territorial legislation and regulation and individual workplace policies. The result of these separate spheres is that there are gaps, overlaps and contradictions between and among federal, provincial and territorial legislation."[11] The same can be stated for many countries worldwide.

Yet some governments recently took specific measures to inform and protect pregnant women from exposure to endocrine disrupting chemicals. Denmark is one of the pioneers with its awareness-raising campaign that informs pregnant women about hazardous chemicals and their potential impact on the health of their developing babies.[12] In Austria, pregnant women can find information via an online brochure.[13]

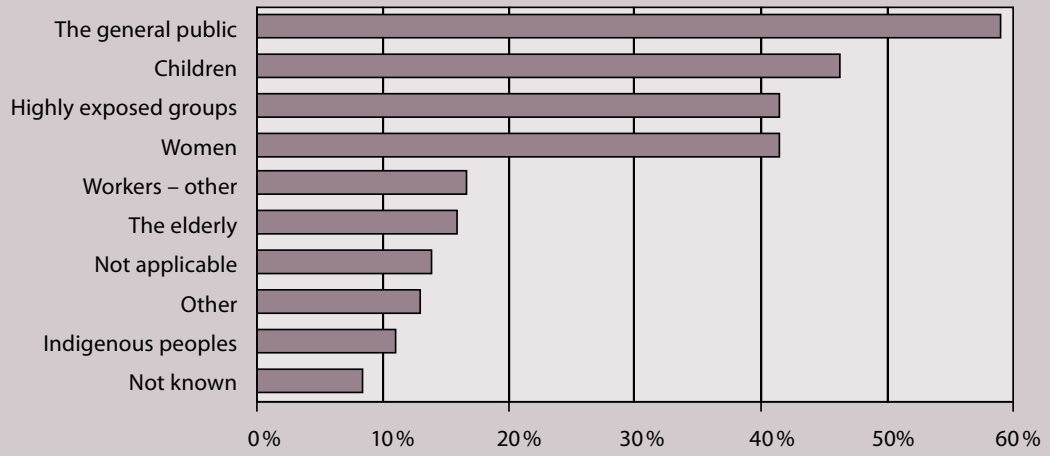
In December 2013, France passed a bill banning Bisphenol A, a known endocrine disruptor, in food contact materials. The ban took effect in January 2013 for all food contact materials for children under the age of three years; and by January 2015 for pacifiers and teething rings. In the interim, a warning label for pregnant women indicating Bisphenol A (BPA) as an ingredient in a specific product, was designed to make it possible for people to reduce their exposure. Moreover, the law also bans the use of DEHP, a reprotoxic phthalate, in infusion tubes used in neonatology departments and by pregnant and breastfeeding women, from January 2015.

The EU has a directive protecting women from hazardous chemicals at the workplace while being pregnant, directly after given birth and while breastfeeding. This directive includes a broad range of chemicals. However, it lacks endocrine disrupting substances.

As stated, it is difficult to get a significant overview on all initiatives of governments. A good indicator is the first SAICM report on the progress in the implementation of the Strategic Approach: Results of preliminary data collection for 2009 and 2010.[14] For this report countries have been asked to share any specific communication strategies by which they would raise awareness on the risks associated with chemicals to vulnerable groups. From the 92 responses, not only countries but also other stakeholders, more than 40 per cent claimed to communicate chemical safety to women.

However, the governments were not obliged to share the content of these strategies. To take a further step, it would be well worth to amend the questionnaire used for this report and ask for more specific information about the activities taken.

Percentage of SAICM stakeholders with strategies for communicating on chemical safety to specific vulnerable groups (n=92)



SAICM report on the progress in the implementation of the Strategic Approach[17]

Endnotes chapter 7

1 UNDP Environment and Energy Group (2011): Chemicals and gender. http://www.undp.org/content/undp/en/home/librarypage/environment-energy/chemicals_management/chemicals-and-gender/

2 http://www.un.org/womenwatch/daw/beijing/platform/environ.htm (retrieved April 2014)

3 http://synergies.pops.int/ManagementReports/Gender/BRSGenderActionPlan/tabid/3652/language/en-US/Default.aspx (retrieved March 2014)

4 See WHO mid term review of its gender strategy http://whqlibdoc.who.int/publications/2011/9789241502337_eng.pdf?ua=1

5 http://www.euro.who.int/__data/assets/pdf_file/0010/76519/Parma_EH_Conf_pb1.pdf (retrieved April 2014)

6 ILO website http://www.ilo.org/gender/Aboutus/lang--en/index.htm

7 http://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---safework/documents/publication/wcms_235085.pdf (retrieved April 2014)

8 http://www.dow.com/company/diversity/environment/woman.htm

9 http://www.dow.com/company/diversity/environment/woman.htm

10 ICCA (2012) 2nd Update Report fort he UN SAICM Implementation Indicators; http://www.icca-chem.org/ICCADocs/120805_FINAL%20APPROVED_2nd_Update_SAICM_Indicators.pdf

11 Susan Breadley (2009): How do Work Environments Affect Women's Maternal Health; In: Women and Environments International Magazine, No 80/81, 2009, p. 9

12 http://www.mst.dk/English/Chemicals/consumers_consumer_products/information_campaigns/Good_Chemistry_pregnant/

13 http://www.lebensministerium.at/publikationen/umwelt/gefaehrliche_stoffe/gesunder_start.html

14 http://www.saicm.org/images/saicm_documents/_menu_items/OEWG1%20INF%202_first%20progress%20report-final.pdf

Conclusions and recommendations

During the expert workshop on women and chemicals, which took place in preparation for this study, it became very clear that "chemicals and women" is an emerging issue in the scientific community. Most of the studies in this field have been completed just in recent years and there are many more in the working. However, there is yet a lack of comprehensive compilation studies that offer a substantial overview on specific aspects related to women and chemicals. One of the very few overviews in the field is the book "Breast cancer, pesticides and you" by Meriel Watts. Compared to issues like gender and climate change and energy, gender and water and sanitation, and gender and biodiversity, the issue of gender/women and chemicals is scientifically not yet well researched. More needs to be done in the fields of chemistry and biology on the impact of chemicals to the female body and secondly on the socio-economic dimensions of exposure of women to specific hazardous chemicals. In all these areas more information and especially gender disaggregated data need to be gained.

Recommendations

This study is only the first step, as more information needs to be explored and compiled by:

- searching for best practice projects in implementation, capacity building and awareness raising and their indicators for success;
- collecting more gender and sex disaggregated data on issues like exposure scenarios, impacts of hazardous chemicals on women's health, activities to reduce exposures for women;
- developing indicators for better measurement of hazardous chemicals' impacts on women, especially through more research on sources and pathways of exposure.

Yet with the information at hand, immediate concrete action can be taken by:

- issuing a handbook on women and chemicals, with articles from experts presenting the latest in-depth information and research on women and chemicals;
- supporting the issue of women and chemicals as a priority issue under the Strategic Approach to International Chemicals Management (SAICM);
- integrating a gender focus into existing funding schemes;
- allocating and providing funding for projects on women and chemicals.

To support the goal of empowering women and protecting them from hazardous chemicals, the following immediate action points are recommended:

- make the most vulnerable group, in this case children and pregnant women, the norm (and not the exception) for developing threshold limits, where there are safe threshold limits;
- support mandatory labelling of all chemicals in products to ensure the right to know;
- strengthen women's rights, in particular their participatory rights, in all aspects of decision making, chemical production, use and disposal;
- clean up all chemical and heavy metal polluted 'hot spots' to protect the population living nearby and avoid further contamination;
- implement the precautionary principle for chemicals which are harmful or suspected to be harmful to human health and environment, by regulatory measures.

MORE RESEARCH ON GENDER, WOMEN AND CHEMICALS IS URGENTLY NEEDED

Bibliography

Apelberg, BJ. et al. (2007): Cord serum concentrations of perfluorooctane sulfonate (PFOS) and perfluorooctanoate (PFOA) in relation to weight and size at birth. Environ Health Perspect, 115(11), p. 1670-6.

Arif AA, Delcos GL, Serra C (2009): Occupational exposures and asthma among nursing professionals. In: Occupational Environmental Medicine, Vol 66, p. 274

Baan, R. et al. (2009): A review of human carcinogens – Part F: chemical agents and related occupations. Lancet Oncol, 10(12), p. 1143-4.

Baillie-Hamilton, PF. (2002): Chemical toxins: a hypothesis to explain the global obesity epidemic. J Altern Complement Med, 8(2), p. 185-92.

Barrett, J. et al. (2009): Girl, disrupted. Hormonphililp-johnse Disruptors and Women's Reproductive Health.

Bergman, A. et al. (2012): WHO. State of the Science of Endocrine Disrupting Chemicals – 2012.

Blanck, HM. et al. (2002): Growth in girls exposed in utero and postnatally to polybrominated biphenyls and polychlorinated biphenyls. Epidemiology, 13(2), p. 205-10.

Bogh, I.B., et al. (2001): Endocrine disrupting compounds: effect of octylphenol on reproduction over three generations. Theriogenology, 55(1), p. 131-50

Bonefeld-Jorgensen, EC. et al. (2007): Endocrine-disrupting potental of bisphenol A, bisphenol A dimethacrylate, 4-n-nonylphenol, and 4-n-ocylphenol in vitro: new data and a brief review. Environ Health Perspect, 115,1, p.69-76.

Breadley, S. (2009): How do Work Environments Affect Women's Maternal Health; In: Women and Environments International Magazine, No 80/81, 2009, p. 9

Bradshaw, L. et al. (2011): Self-reported work related symptoms in hairdressers. In: Occupational Medicine, Vol 61, p. 328-334

Brody, J. et al. (2007): Environmental Pollutants and Breast Cancer Epidemiologic Studies. CANCER Supplement. Vol 109. No. 12.

Brophy, J. et al. (2012): Breast Cancer Risk in Relation to Occupations with Exposure to Carcinogens and Endocrine Disruptors: A Canadian Case-Control Study," Environmental Health 11(87), p. 1-17

Brophy, J. et al. (2012): Plastics Industry Workers and Breast Cancer Risk: Are We Heeding the Warnings?" in Consuming Chemicals: Law, Science and Policy for Women's Health,Vancouver: University of British Columbia Press

Calafat, Antonia M. et al. (2008): Uninary Concentrations of Triclosan in the U.S Population: 2003-2004, In: Environmental Health Perspective, 116 (3), p. 303-307

Cameron, P. & Smolka, S. (2006): Toxic Inheritance. Friends of the Earth. Europe/BUND.

Campaign for Safe Cosmetics (2004): Exposures Add Up Survey Results June 2004.

Centers for Disease Control and Prevention (CDC) (2003): Second National Report on Human Exposure to Environmental Chemicals. Department of Health and Human Services. NCEH Pub No. 02-0716., p. 1-257.

Chaturvedi, B. (2010): Mainstreaming Waste Pickers and the Informal Recycling Sector in the Municipal Solid Waste.

ChemTrust(2012): Review of the science linking chemical exposures to the human risk of obesity and diabetes.

Cohn, BA. et al. (2007). DDT & breast cancer in young women: new date on the significance of age at exposure. Environmental Health Perspectives, 115(10), p. 1406-1414.

Correa, A. et al. (1996): Ethylene glycol ethers and risks of spontaneous abortion and subfertility. Am J Epidemiol,143(7), p. 707-717

Correll, CU. et al. (2009): Cardiometabolic risk of second-generation antipsychotic medications during first-time use in children and adolescents. Jama, 302(16), p. 1765-73.

Crain, DA. et al. (2008): Female reproductive disorders: the roles of endocrine disrupting compounds and developmental timing. Fertil Steril. 90, p. 911-940

DeMatteo, R. et al. (2012): Chemical Exposures Of Women Workers In the Plastic Industry With Particular Reference To Breast Cancer And Reproductive Hazards. NEW SOLUTIONS: A Journal of Environmental and Occupational Health Policy, p. 427-448

Durmus, B. et al. (2011): Parental smoking during pregnancy, early growth, and risk of obesity in preschool children: the Generation R Study. Am J Clin Nutr, 94(1), p. 164-71.

EPA United Agency (2005): Phthalates TEACH Chemical Summary: Toxicity and Exposure Assessment for Children's Health. http://www.epa.gov/teach/chem_summ/phthalates_summary.pdf (retrieved February 2014)

Falconer, J. & Koppell C. (1990): The Major Significance of "Minor" Forest Products: The Local Use and Value of Forests in the West African Humid Forest Zone.

Finnish Environment Institute (2011): Table 1 p.16, UNEP, DTIE/Chemicals Branch (2011), Table 1, p.7.), SSNC 2012, p. 20-21

Gala Ortiz G. et al. (2001): Diagnostic approach and management of occupational asthma by persulfate salts in a hairdresser. In: Allergy Asthma Proc, Vol 22(4), p. 235-238

Gee, JR. & Moser, VC. (2008): Acute postnatal exposure to brominated diphenylether 47 delays neuromotor ontogeny and alters motor activity in mice. Neurotoxicol Teratol, 30(2), p. 79-87.

Gender Action Plan of the Secretariat of the Basel, Rotterdam and Stockholm conventions (BRS-GAP) for 2014-2015: Final Draft

Gerd M & Jasmin G. (2005): Handbuch Nachhaltigkeits-kommunikation, Grundlagen und Praxis.

Gies, A. & Soto A. (2013): Bisphenol A: contestet science, divergent safety evaluations, EEA Report: Late lessons from early warnings

Greenpeace (2011): Dirty Laundry, Unravelling the corporate connections to toxic water pollution in China

Grun, F. & Blumberg, B. (2006): Environmental obesogens: organotins and endocrine disruption via nuclear receptor signaling. Endocrinology, 147(6. Suppl), p. 50-5.

Grun, F. & Blumberg, B. (2007): Perturbed nuclear receptor signaling by environmental obesogens as emerging factors in the obesity crisis. Rev Endocr Metab Disord, (2), 16, p. 1-71.

Grun, F. & Blumberg, B. (2009): Endocrine disrupters as obesogens. Mol Cell Endocrinol, 304(1-2), p. 19-29.

Herbst A. et al. (1971): Adenocarcinoma of the vagina. Association of maternal stilbestrol therapy with tumor appearance in young women. In: New England Journal of Medicine, Vol 284, p.878-881

Hruska, K.S. et al. (2000): Environmental factors in infertility. Clin Obstet Gynecol, 43(4), p. 821-829

Hunt, PA. et al. (2003): Bisphenol A exposure causes meiotic aneuploidy in the female mouse. Curr Biol. 13(7), p. 546-553

Irigaray, P. et al. (2006): Benzo(a)pyrene impairs beta-adrenergic stimulation of adipose tissue lipolysis and causes weight gain in mice. A novel molecular mechanism of toxicity for a common food pollutant. Febs J, 273(7), p. 1362-72.

Janesick, A. & Blumberg, B. (2011): Minireview: PPARgamma as the target of obesogens. J Steroid Biochem Mol Biol., 127 (1-2), p. 4-8.

Karmaus, W. et al.(2009): Maternal levels of dichlorodiphenyl-dichloroethylene (DDE) may increase weight and body mass index in adult female offspring. Occup Environ Med, 66(3), p. 143-9.

Keith, M. et al. (2011): Exploration of Farming, Health Care and Automotive Manufacturing Exposures in Relation to Possible Breast Cancer Risk, and supplementary interviews conducted in collaboration with National Network on Environments and Women's Health (2011).

Kim, R. et al. (1995): A longitudinal study of chronic lead exposure and physical growth in Boston children. Environ Health Perspect, 103 (10), p. 952-7.

Kortenkamp, A. (2008): Breast cancer and exposure to hormonally active chemicals, A background briefing paper, Head of the Centre for Toxicology, The School of Pharmacy, University of London, p.3

Kortenkamp, A. (2011): Are cadmium and other heavy metal compounds acting as endocrine disrupters? Metal Ions in Life Sciences, 8, p. 305-317.

Labrèche F. et al. (2010): Postmenopausal breast cancer and occupational exposures, Occup Environ Med 2010

Lau, C. et al. (2004): The developmental toxicity of perfluoroalkyl acids and their derivatives. Toxicol Appl Pharmacol,198(2), p. 231-41

Laursen, S. et al. (2003): Danish Environmental Protection Agency. Survey of chemical compounds in textile fabrics. Survey no. 23

Lawson, C. et al. (2012): Occupational exposures among nurses and risk of spontaneous abortion. In: American journal of Obstetrics and Gynecology

Lee, DH. et al. (2012): Associations of persistent organic pollutants with abdominal obesity in the elderly: The Prospective Investigation of the Vasculature in Uppsala Seniors (PIVUS) study. Environ Int. , 40, p. 170-8.

Lee, DH. et al. (2011): Low Dose Organochlorine Pesticides and Polychlorinated Biphenyls Predict Obesity, Dyslipidemia, and Insulin Resistance among People Free of Diabetes. PloS ONE, (6),1.

Lee, PN. & Hamling, J. (2006): Environmental tobacco smoke exposure and risk of breast cancer in nonsmoking women: A review with meta analyses. Inhalation Toxicology, 18, p. 1053-70.

Lichtenstein, P. et al. (2000). Environmental and heritable factors in the causation of cancer – Analyses of cohorts of twins from Sweden, Denmark, and Finland. N Engl J Med 343, p. 78-85.

Lim, S. et al. (2009): Chronic exposure to the herbicide, atrazine, causes mitochondrial dysfunction and insulin resistance. PLoS One,4(4), e5186.

Luke, B. et al. (2005): Gender mix in twins and fetal growth, length of gestation and adult cancer risk. Paediatric and Perinatal Epidemiology, 19:p. 41-47.

Luoma, J. (2005): Challenged Conceptions: Environmental Chemicals and Fertility, p. 5-6

Malisch WHO/UNEP-Coordinated Exposure Study (2008-2009) on levels of Persistent Organic Pollutants (Pops) In Human Milk with regard to the Global Monitoring Plan

Manikkam, M. et al. (2012): Transgenerational actions of environmental compounds on reproductive disease and identification of epigenetic biomarkers of ancestral exposures. PLoS ONE 7 (2).

Muhammad N.M. and Manu, H.I. (2013): Gender roles in informal solid waste management in cities of Northern Nigeria: A case study of Kaduna Metropolis. In: Academic Research International, Vol 4.

Murray, TJ. et al. (2007): Induction of mammary gland ductal hyperplasias and carcinoma in situ following fetal Bisphenol A exposure. Reprod Toxicol, 23, p. 383-90.

Newbold, RR. (2010): Impact of environmental endocrine disrupting chemicals on the development of obesity. Hormones (Athens), 9(3), p. 206-17.

Newbold, RR. et al. (2009): Environmental estrogens and obesity. Mol Cell Endocrinol, 304(1-2), p. 84-9.

Newbold, RR. et al. (2008): Effects of endocrine disruptors on obesity. Int J Androl, 31(2), p. 201-8.

Newbold, RR. et al. (2005): Developmental exposure to estrogenic compounds and obesity. Birth Defects Res A Clin Mol Teratol, 73 (7), p. 478-80.

Palmer, JR. et al. (2006): Prenatal diethylstilbestrol exposure and risk of breast cancer. Cancer Epidemiol Biomarkers, Prev. 15, p. 1509-14.

Perkins JB and Farrow A. (2005): Prevalence of occupational hand dermatitis in UK hairdressers. In International Journal of Occupational Environmental Health, Vol 11, p. 289-293

Petrelli, G. & Figa-Talamanca I. (2001): Reduction in fertility in male greenhouse workers texposed to pesticides. In: European journal of epidemiology 2001, vol. 1, No. 7, p. 675-677

Philip J. L and Ruth A. E. (2014): Textbook of Children's Environmental Health. Oxford University Press.

Pinkerton, L. et al. (2004): Mortality among a cohort of garment workers exposed to formaldehyde.

Pischon, T. et al. (2008): General and abdominal adiposity and risk of death in Europe. N Engl J Med, 359(20), p. 2105-20.

Porta, M. & Lee, DH. (2012): Review of the science linking chemical exposures to the human risk of obesity and diabetes, A CHEM Trust report, p. 2-3.

Raum, E. et al. (2011): Tobacco Smoke Exposure Before, During, and After Pregnancy and Risk of Overweight at Age 6. Obesity (Silver Spring).

Rehan, VK. et al. (2012): Perinatal nicotine exposure induces asthma in second generation offspring. BMC Med 10:129

Rehan, VK. (2013): Perinatal nicotine-induced asthma. Am J Physiol Lung Cell Mol Physiol. 1;305 (7):L501-7

Rubenstrunk, A. et al. (2007): Safety issues and prospects for future generations of PPAR modulators. Biochim Biophys Acta, 1171(8), p. 1065-81.

Rudel RA. et al. (2007): Chemicals causing mammary gland tumors in animals signal new directions for epidemiology, chemicals testing, and risk assessment for breast cancer prevention. Cancer 2007; 109, p. 2635-66.

Ryan, KK. et al. (2010): Perinatal exposure to bisphenol-a and the development of metabolic syndrome in CD-1 mice. Endocrinology, 151(6.): p. 2603-12.

Sasco. A. (2001): Epidemiology of breast cancer: an environmental disease? APMIS 109: p. 321-32

Schreder, E.: Earliest Exposures: A Research Project by Washington Toxics Coalition

Schuiling, J. & Van der Naald, W. (2005): A present for life: hazardous chemicals in umbilical cord blood. Greenpeace/WWF

Sharara, F. et al. (1998): Environmental toxicants and female reproduction. Fertil Steril, 70(4), p. 613-22.

Silverstein MJ. and Sayre K. (2009): The Female Economy. Gender Magazine Article, Harvard Business Review, https://hbr.org/2009/09/the-female-economy (Retrieved April 2014).

Slotkin, TA. (2011): Does early-life exposure to organophosphate insecticides lead to prediabetes and obesity? Reprod Toxicol, 31(3), p. 297-301.

Smith K.R. (2006): Health Impacts of household fuelwood use in developing countries. In FAO unasylva 224, Vol 57.

Somm, E. et al. (2009): Perinatal exposure to bisphenol a alters early adipogenesis in the rat. Environ Health Perspect, 117(10), p. 1549-55.

Stahlhut, RW. et al. (2007): Concentrations of urinary phthalate metabolities are associated with increased waist circumference and insulin resistance in adult U.S. males. Environ Health Perspect, 115(6), p. 876-82.

Steingraber, S. (2007): The Falling Age of Puberty in US girls. Published by the Breast Cancer Fund.

Szabo, L. (2011): Study finds toxic chemicals in pregnant women's bodies published in USA Today. http://usatoday30.usatoday.com/yourlife/parenting-family/pregnancy/2011-01-14-chemicals14_st_N.htm

Taylor, JA. et al. (2011): Similarity of bisphenol A pharmacokinetics in rhesus monkeys and mice: relevance for human exposure. Environ Health Perspect, 119(4), p. 422-30.

Titus-Ernsthoff, L. et al. (2006): Menstrual and repoductive characteristics of women whose mothers were exposed in utero to diethylstilbestrol (DES). In: International Journal of Epidemiology, Vol. 35

Toschke, AM. et al. (2003): Early intrauterine exposure to tobacco-inhaled products and obesity. Am J Epidemiol, 158(11), p. 1068-74.

Travis, RC. & Key, TJ. (2003): Estrogen exposure and breast cancer risk. Breast Cancer Research, 5(5) p. 239-247.

Troisi, R. et al. (2007): Cancer risk in women prenatally exposed to diethylstilbestrol. Int J Cancer 2007; 121: p. 356-60.

Uncertain Inheritance – Transgenerational Effects of Environmental Exposures. In Environmental Health Perspectives, Vol 121, October 2013

UNDP Environment and Energy Group (2011): Energy & Environment Practice Gender Mainstreaming Guidance Series Chemicals Management-Chemicals and Gender

UNEP (2013): Global Chemicals Outlook, Towards Sound Management of Chemicals

UNSTATS: The World's Women 2010 Trends and statistics Report. Department of Economic and social affairs. http://unstats.un.org/unsd/demographic/products/Worlds-women/WW_full%20report_color.pdf

Vandenberg, LN. (2007): Exposure to environmentally relevant doses of the xenoestrogen Bisphenol A alters development of the fetal mouse mammary gland. Endocrinology, 148, p. 116-27.

Verhulst, SL. et al. (2009): Intrauterine exposure to environmental pollutants and body mass index during the first 3 years of life. Environ Health Perspect, 117(1), p. 122-6.

Wang, RY. et al. (2005): Effects of Environmental Agents on the Attainment of Puberty: Considerations When Assessing Exposure to Environmental Chemicals in the National Children's Study. EHP Volume 113, No. 8

Watts, M. (2012): Breast Cancer, Pesticides and YOU! Pesticide Action Network Asia and Pacific (PAN AP).

WECF (2004): Working Towards a Toxic Free Future-Toolkit.

WECF (2005): Frauen für eine giftfreie Zukunft – Chemikalien im Alltag. http://www.wecf.eu/download/2009/June/19-06-09frauen_giftfrei_zukunft.pdf (Retrieved March 2014).

WECF (2006): Women and their Toxic World by Daniela Rosche.

WECF (2012): Brustkrebs und Umwelteinfluesse.

WECF (2012): Politics and Prevention: Linking Breast cancer and our environment.

WHO (2010): Who Guidelines for Indoor Air Quality-Selected Pollutants

WHO (2012): Possible developmental early effects of endocrine disrupters on child health

Wilding, B., Curtis, K., Welker-Hood, K. (2009): Hazardous chemicals in health care: Asnapshot of chemicals in doctors and nurses. Physicians for Social Responsibility

Windham, G. et al. (2003): Chlorination by-products in drinking water and menstrual cycle function. Environ Health Perspect, 111(7), p. 935-941

Women's Environmental Network (2005): Why Women and the Environment? http://www.wecf.eu/cms/download/2004-2005/why_women.pdf (Retrieved July 2014).

Wong E. et al. (2009): Dust and Chemical Exposures, and Miscarriage Risk Among Women Textile Workers in Shanghai, China, Occup Environ Med, 66(3), p.161-168

Woodruff, T. et al. (2011): Environmental Chemicals in Pregnant Women in the united States: NHANES 2003-2004, In: Environmental Health Perspectives, Vol 119(6), p. 878-885

WWF-UK. (2003): ContamiNation: The results of WWF bio-monitoring survey

WWF-UK (2004): ContamiNation- the next generation: Results of the family chemical contamination survey.

Younglai, E.V. et al. (2005): Environmental and occupational factors affecting fertility and IVF success. Hum Reprod Update, 11(1), p. 43-57

Zhang, Y. (2009): Chemical Information in Two Textile Supply Chains, A case study of producers in China, Chalmers University of Technology, Goteborg, Sweden, Report No. 2009, 10, p. 27

Internet

http://www.who.int/ceh/publications/endocrine/en/
(retrieved February 2014)

http://www.env-health.org/resources/publications/article/male-reproductive-health-disorders-829
(retrieved February 2014)

http://www.undp.org/content/undp/en/home/ourwork/povertyreduction/focus_areas/focus_gender_and_poverty/ (retrieved March 2014)

http://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+sustainability/sustainable+business+advisory+services/women+in+business/creating+business+value/win-consumers
(retrieved April 2014)

http://www.who.int/indoorair/en/
(retrieved April 2014)

http://www.womensvoices.org/about/why-a-womens-organization/
(retrieved May 2014)

http://www.wecf.eu/english/publications/2012/genderissue-wecf.php
(retrieved March 2014)

http://synergies.pops.int/ManagementReports/Gender/BRSGenderActionPlan/tabid/3652/language/en-US/Default.aspx
(retrieved February 2014)

http://www.fao.org/docrep/013/i1638e/i1638e.pdf
(retrieved February 2014)

http://www.medscape.com/viewarticle/452831

http://www.who.int/gho/ncd/risk_factors/obesity_text/en/

http://chm.pops.int/Implementation/GlobalMonitoringPlan/MonitoringActivities/Humanmilksurvey/tabid/270/Default.aspx
(retrieved August 2014)

http://www.scientificamerican.com/article/bisphenol-bpa-linda-birnbaum-health-chemical-contaminants/
(retrieved February 2014)

Abbreviations

ASGM	Artisanal and small-scale Gold Mining
BCF	Breast Cancer Fund
BFRs	Brominated Fire Retardants
BPA	Bisphenol
BRS	Basel-Rotterdam-Stockholm Convention
C	Carcinogen
CDC	Center for Disease Control and Prevention
CSD	Commission on Sustainable Development
CSO	Central Statistical Office
CVD	Cardiovascular Disease
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
DEHP	Di (2-ethylhexyl) phthalate
DES	Deethylstilbestrol
EDC	Endocrine Disruptive Chemicals
GAP	Gender Action Plan
GDP	Gross Domestic Product
GGEO Outlook	Global Gender and Environment
GHS	Global Harmonized System
GRULAC	Group of Latin American and Caribbean Countries in the United Nations
HBCD	Hexabromocyclododecone
HCWH	Health Care Without Harm
HHP	Highly Hazardous Pesticides
HSE	Health and Safety Executive
IARC	International Agency for Research on Cancer
ICCA	International Council for Chemical Associations
ILO	International Labor Organization
IPEN	International POPs Elimination Network
ISDE	International Society for Doctors for the Environment
LOQ	Limit of Quantitation
LPGs	Liquefied petroleum gas
NCD	Non-Communicable Disease
NGO	Non-Government Organization
NIEHS	National Institute of Environmental Health Sciences
NWMLW	Network of Women Ministers and Leaders for the Environment
OCPs	Organochlorine Pesticides
OSH	Occupational Safety and Health
PAHs	Polycyclic aromatic hydrocarbons
PAN	Pesticide Action Network
PBDE	Poly-Brominated Diphenyl Ethers
PCB	Polychlorinated Biphenyls
PCDD	Polychlorinated dibenzodioxins
PCOS	Polycystic Ovary Syndrome
PCP	Pentachlorophenol
PCP	Pentachlorophenol
PFC	Polyfluorinated Chemicals
PFCs	Perfluorinated Chemicals
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanesulfonic
POPs	Persistent Organic Pollutant
PPE	Personal Protective Equipment
PVC	Polyvinylchlorid
SAICM	Strategic Approach for International Chemicals Management
TTP	Time-To-Pregnancy
UNDP	United Nation Development Programme
USAID	United States Agency for International Development
WABA	World Alliance for Breastfeeding Action
WECF	Women in Europe for Common Future
WHO	World Health Organization
WICF	Women International for a Common Future
WIEGO	Women in informal Employment: Globalizing and Organizing
WIN	Women's Innovation Network

WECF WICF

WECF I Women in Europe for a Common Future
Women International for a Common Future I WICF