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Gender, Mitigation Technologies and the Need for Technology Assessment

Unsustainable technology revolution

The past few decades have seen unprecedented technological advances, which are massively transforming the planet and impacting people's daily lives. While the dramatic leaps and bounds in information and communications technology (ICT) development are perhaps the most obvious, there are many other emerging technologies purporting to mitigate the adverse impacts of climate change that are also impacting our world and shaping our future, just as significantly but much less visibly — and not necessarily in the direction of sustainable development.

Technological developments in molecular biology in the 1980s have led to a situation in which genetically modified organisms (GMOs) are now ubiquitous on farms and grocery shelves in many countries around the world. However, a more recent but related technology, synthetic biology,[1] has taken biotechnology a step further: it is now possible to shift from transferring single genes from one species to another to build made-to-order stretches of DNA, one base pair at a time. Both GMOs and synthetic biology are now being presented as mitigation technologies such as by absorbing more carbon dioxide from the atmosphere, by reflecting sunlight or by transforming biomass into bio-products. Novel genomes produced through synthetic biology, for example, claim to transform microorganisms into tiny 'biological factories' which can process almost any biomass to make almost any bio-product (eg. grasses to diesel fuel, or maize to plastic).

In addition, a suite of techniques to manipulate matter on the scale of atoms and molecules, referred to as nanotechnology, can dramatically transform the material properties of conventional substances by taking advantage of 'quantum effects'. With only a reduction in size (to around 300 nm or smaller in at least one dimension) and no change in substance, materials can exhibit new characteristics – such as electrical conductivity, increased bioavailability, elasticity, greater strength or reactivity – properties that the very same substances may not exhibit at larger scales. But the qualities that make nanomaterials so attractive to industry across a wide range of fields – their mobility and small size, on the same scale as biological processes, and their unusual properties – turn out to be the same qualities that can make them harmful to the environment and to human health. Nanoscale particles can easily enter most cells, often without triggering any kind of immune response. While there is great uncertainty about the toxicity of nanoparticles, hundreds of published

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1 "Synthetic biology is the engineering of biology: the synthesis of complex, biologically based (or inspired) systems, which display functions that do not exist in nature." http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2174633/

2 In the face of perennially low and volatile prices for primary export commodities, and the persistent poverty experienced by many workers who produce commodities, few would argue in favour of preserving

studies now exist that show manufactured nanoparticles, currently in widespread commercial use (including zinc, zinc oxide, silver and titanium dioxide) can be toxic.

On the planetary scale, geo-engineering — the deliberate large-scale manipulation of the earth's systems (by injecting sunlight-reflecting particles into the stratosphere, for example) — is being pushed as a technological 'quick fix' to the climate crisis and for other ecological crises, such as ocean acidification and water cycle imbalances.

In addition to the potential ecological and health issues that surround these untested technologies and products, there is a concern that they are collectively creating industrial platforms that demand entirely new production and/or processing systems. The most direct impact of new designer materials created using nanotechnology or synthetic biology, for example, is multiple raw-material options for industrial manufacturers, which could mean major disruptions to traditional commodity markets. It is too early to predict with certainty which commodities or workers will be affected and how quickly. However, if a new nano-engineered material or a new bioproduct created using synthetic biology equals or outperforms a conventional commodity and can be produced at a comparable cost, it is likely to replace the conventional commodity. Modern history is replete with examples of new technological products and processes replacing traditional commodities, causing massive displacements in livelihood and employment.[2]

The new technologies thus have the potential to have a profound impact on communities and peoples' livelihoods, especially women in rural areas involved in commodity production and those in urban areas engaged in processing and manufacturing. Their suitability in terms of meeting national and local needs is also highly speculative. The global South and marginalized sectors, especially women, are already bearing the brunt of environmental deterioration and climate change and are also likely be the guinea pig for testing these powerful technological packages.

The public and private sectors, mainly in rich countries, have poured staggering quantities of research and development funds into these technologies. For example, agribusiness invests at least US$100 million to develop each herbicide-tolerant crop variety that is marketed together with the companies' proprietary chemicals as "climate-ready" or "climate-smart agriculture". Global public investment in nanotechnology research has exceeded US$50 billion since 2000, with more than 60 countries now having national nanotechnology initiatives (ETC Group, 2010). The leading global investors and developers of synthetic biology products include six of the ten largest chemical companies, six of the ten largest energy companies, six of the ten largest grain traders, and the world's seven largest pharmaceutical companies (ETC Group, 2012). All the processes and products developed by these companies are protected by intellectual property rights that ensure monopoly control, and profits.

Many governments in developing countries see access to new technologies as vital to their ability to respond to developmental and environmental challenges. They are therefore anxious to ensure that legal and institutional obstacles such as intellectual property rights regimes and licensing arrangements do not impede access. Technology development and transfer, however, do not necessarily involve assessment of the impacts that such

[2] In the face of perennially low and volatile prices for primary export commodities, and the persistent poverty experienced by many workers who produce commodities, few would argue in favour of preserving the status quo; however, preserving the status quo is not the issue. The immediate and most pressing issue is that new technologies are likely to bring huge socio-economic disruptions for which society is not prepared.

technologies may have on human health, environment and livelihoods. Thus, as the tragic history of many technologies has already shown, technology transfer can amount to dumping unwanted and untested technologies from industrialized countries onto developing regions. Not recognizing the importance of technology assessment and mechanisms involves high economic and political costs for proponents and regulators respectively, and can often have irreversible impacts on human health and the environment (ETC Group, March 2012).

This is especially the case with these new technologies, many of which are being allowed to reach the market without long-term safety tests and/or regulations, and often without labels and adequate information about the processes and risks involved being made available to the consumer. Controversies over the adverse effects of GMOs on human health, biodiversity and the environment have been raging since the mid-1990s for example. Despite that, GM varieties of maize, soybeans and cotton are now cultivated on an estimated 160 million hectares of land in about 25 countries (ISAAA, 2012). Similarly, by 2011, over 1,300 products of nanotechnology had come to market, with virtually no regulation in place despite dozens of scientific studies showing the toxic effects of some nanomaterials (Wilson Center, PEN online inventory). Ironically, low technology-awareness prevails in the age of high-tech.

More worryingly still, the UNEP Foresight Report, "21 Issues for the 21st Century," notes that the pace of introducing new technologies has increased while the role played by regulatory bodies in protecting the public from the consequences of new technologies has actually diminished (UNEP, 2012: 40). The situation is both ironic and alarming given the rapid introduction of new technology products into ecosystems and the food chain. These lapses in technology governance are happening at precisely the same time that citizen concern over the safety of technologies is growing and the public's lack of confidence in the ability of governments to protect its interests is increasing. Technology-related disasters, including 'Mad Cow' disease and Foot and Mouth disease (mostly in industrialized countries) and, later, the rapid spread of genetically modified crops, have contributed to this distrust (ETC Group, 2012). The meltdowns at three of Fukushima's reactors in 2011 did nothing to improve the situation – in the face of long-running claim of the nuclear energy industry on its contribution to mitigation of climate change impacts.

The situation in the conventional chemicals sector is relevant and revealing. According to an OECD study cited in the UNEP Foresight Report, very few of the 1,500 most commonly used chemical substances in industrialized countries have been adequately assessed for their health risks; 10% have not been examined at all; and virtually none have been examined for their environmental effects (UNEP, 2012: 40). Yet, global chemical markets, including agrochemicals/pesticides that are promoted by some sectors as part of "climate-smart agriculture", are growing and becoming increasingly concentrated (ETC Group, 2011). The ten biggest agrochemical companies control more than 90% of the global market, for example. A disturbing trend cited in the "OECD Environmental Outlook to 2030" is the shift of chemicals production from traditional hubs in industrialized countries to emerging economies in developing countries, where regulatory regimes are even less stringent and oversight capacity is much lower (OECD, 2008).

These developments and trends have understandably contributed to a widespread view that risks and unintended side effects multiply in parallel to scientific-technical progress and as a result of that progress (Maasen and Merz, 2006:10). As the recent history of global controversies over technologies involved in nuclear power, GMOs and industrial food production shows, different experts can hold different, often contradictory views while claiming a grounding in 'sound science,' leaving the public confused, feeling powerless and distrustful of the experts relaying the information. As a result, science is no longer regarded as a producer of unambiguous knowledge (Grunwald, 2002 in Maasen and Merz, 2006).

The invisible dimension: gender and technology

Gender concerns in technology are often overlooked. As one feminist scholar has observed, the "technology question in feminism is generally neglected" (Faulkner, 2000). Gender being a 'non-issue' in technological discourses is largely due to the pervasiveness of the concept of 'technology neutrality.'

As the minority in 'hard technology' fields such as engineering, women are generally regarded as recipients of technology rather than creators of technology, while, conversely, they are regarded as nurturers of nature and the environment (McIlwee and Robinson, 1992 and Edwards, 1996 in Faulkner, 2000). As a result, women's power with regards to technology is relegated to exercising 'consumer choice' over products that are made commercially available to them (Faulkner, 2000:15). But as consumers, women are being exposed to the risks involved in food and consumer products of genetic engineering, nanotechnology and synthetic biology, often with no or little information being provided to them by technology owners/sellers. Indeed, it is often the case that the adverse consequences of these new technologies are not known, and by the time unexpected consequences become apparent, the technology is already well-entrenched (referred to as the 'Collingridge Dilemma'), often with irreversible impacts. This quandary is evident in the case of GM crops and foods whose risks to human health and the environment came to global attention only after the products had been introduced into the human food and animal feed supply systems (UCS, 2004). The same story is echoed in products of nanotechnology, which are prematurely designated as 'clean' even though credible institutions have barely begun to look into the safety of the technology.

The new manufacturing methods involved in technology platforms such as nanotechnology and synthetic biology will also impact women in other ways as well, including through commodity replacement or displacement, as described above; choice of employment and manufacturing locations; and impacts on global markets for natural resources ranging from copper to cotton and from natural fibers to vegetable oils, on which the livelihoods of millions of rural women depend. In particular, as synthetic biology aims to produce high-value compounds through new bio-fermentation methods and nanotechnology aims to alter substances to exhibit new properties, the impacts of these technologies on the exporters of natural commodities (mainly produced in developing countries) could be profound, while the products themselves could end up being hazardous. The risk of livelihood displacement is especially relevant for women in developing countries: on average, women make up 43% of the total agricultural labour force in developing countries (although only 20% of landholders are women) (UN, 2012; FAO, 2010).

Muted right: women and technology

As the principal international legal instrument on women's rights, the Convention on the Elimination of Discrimination against Women (CEDAW) enshrines the right of women in rural areas to access appropriate technology (along with access to credit and loans, marketing facilities, and equal treatment in land and agrarian reform and in land resettlement schemes). However, CEDAW is silent on the right of women in urban and peri-urban areas to appropriate technology and completely fails to acknowledge gender concerns in technology. With its silence on the relationship between technology and women, CEDAW implicitly perpetuates the prevailing condition of women being passive recipients of new technologies with no active role in decision-making with respect to the technology development process.

Just like all other intergovernmental agreements and processes that involve years of negotiations and compromises, CEDAW has greatly underestimated the speed of technological change and the impact some key technologies may have on the global environment, climate change, and the South's economy. The massive influence of new technologies in shaping today's world economy and socio-political relations merits a review of CEDAW and other international legal instruments on the protection of the rights of women, taking the gender dimension of new technologies into account.

Facing a blank wall: where's gender in technology governance?

There is a consensus view among global institutions and experts that there is little substantive effort to assess, let alone try and control the introduction of new technologies to minimize harmful effects (UNEP, 2012; ETC Group, 2011; Unger, 2002). Technology governance is virtually absent in today's real world where the products of high technology dominate many peoples' lives.

Conducting a literature search on the gender dimension of technology governance can be likened to searching for the proverbial needle in a haystack. Scholarly writing or documentation of actual experiences and reflections on this topic is virtually non-existent – beyond the sparse literature on the gender question in technology in general and the more recent focus on gender and governance in the ICT sector.

Women are at the forefront of dealing with the unintended and unpredictable consequences of new technologies including those that are supposed to mitigate the impacts of climate change, but are not yet empowered to assess their relevance, alternatives and potential impacts. Gender concerns cannot be dismissed and women's rights as active actors cannot remain muted if technology is to become a tool to attain sustainable development.

Making mitigation technologies gender-responsive

To ensure that mitigation technologies will be gender-responsive, strategies must be developed to integrate grassroots participation and gender concerns in decision-making in research and development on mitigation technologies, including in the design of technologies as well as in the context of their use. Increased and active participation of local people and women in decision-making about new technologies will only be meaningful if it is linked to a radical vision and agenda for the transformation of technology into "a practice that is more democratic and respectful of diversity, and with products which are safer, friendlier and more useful" (Faulkner, 2000: 18).

Technology assessment must be made an integral component of technology governance; and gender perspectives on technology must be integral to any such technology assessment framework. Women must be key actors in technology assessment at different levels and stages of the technology development process. To this end democratic mechanisms for assessing new technologies must provide meaningful opportunities for recipients and users of the technology, including women, to participate in the design, decision-making and assessment of the potential impacts that mitigation technologies might have on health, economy, livelihood, culture and the environment. These processes must be put in place at the local, national and regional levels.

At the intergovernmental level, the logical prerequisite to technology development and transfer is the integration of technology evaluation and monitoring mechanism in the UNFCCC's Technology Mechanism that is based on the precautionary principle, supports national sovereignty and technology policy choices and multistakeholder in nature. As reaffirmed in the Rio+20 outcome document, governments must go beyond rhetoric and operationalize the commitment to strengthen "international, regional and national capacities in research and technology assessment, especially in view of the rapid development and possible deployment of new technologies that may also have unintended negative impacts, in particular on biodiversity and health, or other unforeseen consequences." (UNCSD, 2012: para. 275)

The UNEP Foresight Report itself urges policy makers to "consider…organizing a new international governance system which would produce, and potentially oversee, new international procedures to identify dangerous side effects of technologies and chemicals before they are produced" (UNEP, 2012). It suggests that such a governance system would be anticipatory, impartial, aware of the need to deal with the risks arising from interactions among multiple technologies developed for different purposes, and universal. It must also ensure that individual countries and their corporate interests do not make decisions that can have global impacts unilaterally (UNEP, 2012). The report urges policymakers to work together with the scientific, environmental and other stakeholder communities to determine what a new governance system should look like.

A report submitted by the UN Secretary-General to the UNGA in 2012, in response to the request made by member-states in the Rio+20 outcome document, recommended the establishment of an international network of technology assessment centres and/or national and global advisory groups on technology assessment and ethics as important elements of a global technology facilitation mechanism (UNGA, 2012: 16). Any such technology assessment platforms must be democratic, participatory, inclusive, comprehensive and proactive. Women, as key users and consumers of products of most emerging technologies, must be actively involved in technology assessment processes, as well as indigenous and local communities, which are generally the least prepared to deal with the unforeseen consequences of technologies and are virtually never consulted in the technology development process.

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