Briefing Paper: Science, Technology and Innovation (STI)
6th Session of the Open Working Group on SDGs

Addressing the "Technology Divides": Critical Issues in Technology and SDGs

Neth Daño, Kathy Jo Wetter and Silvia Ribeiro, ETC Group
Women's Major Group

The past several decades have seen unprecedented technological development that is massively transforming the planet and impacting people's daily lives. Information and communications technologies (ICTs) may be the most obvious example, but there are other rapidly-developing technologies impacting our world and shaping our future – and not necessarily in the direction of sustainable development:

- In the 1980s, developments in molecular biology resulted in genetically modified organisms (GMOs) being ubiquitous on grocery shelves in many countries and in the environment. Now, the emerging field of synthetic biology, dubbed 'extreme genetic engineering,' is making it possible to move beyond transferring single genes from one species to another; synthetic biology allows the construction of novel microorganisms that aim to mimic "factories" for transforming almost any biomass into almost any bio-product (e.g., grasses into diesel fuel, maize into plastic). Impacts include dangerous exploitation of biomass and intensified disputes over land, water and nutrients (*ETC Group, 2012*).
- New hyper-spectral imaging technologies can facilitate the extraction/exploitation of biomass by making it practically and financially possible to map and measure unique biodiversity across the globe.
- Nanotechnology can dramatically transform the material properties of conventional substances by manipulating them on the scale of atoms and molecules.
- On the planetary scale, geoengineering – the deliberate large-scale manipulation of earth systems (via injection of sunlight-reflecting particles in the stratosphere or by dumping iron-nanoparticles in the oceans to absorb CO_2, for example) – is being promoted as a technological "quick fix" to the climate crisis, although its transboundary impacts could be devastating. (If, for example, an artificial volcano-like eruption were deployed over the Arctic to deflect sunlight – as is being proposed by geoengineers – scientists predict that the resulting changes in rain and wind patterns in Asia and Africa would endanger the water and food supplies of 2 billion people.)

The public and private sectors, mainly in industrialized countries, have poured staggering amounts of R&D funding into these new technologies:

Global public investment in nanotechnology research has exceeded $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 6 of the 10 largest chemical companies, 6 of the 10 largest energy companies, 6 of the 10 largest grain traders and the world's 7 largest pharmaceutical companies (*ETC Group, 2012*). Intellectual property ensures monopoly control over processes and products and allows an oligopoly to rule over all industrial sectors considered essential to life.

Further, products of high-technology can come to market in the absence of long-term safety tests and/or regulations, including labeling requirements. Controversies over the adverse effects of GMOs on human health, biodiversity and the environment have been raging since the mid-1990s. Despite that, it is claimed that GM varieties of maize, soybeans and cotton are cultivated on 160 million hectares of land in about 25 countries (*ISAAA, 2012*). By 2011, more than 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, a low level of technology-awareness prevails in the age of high-technology.

Technology for Sustainable Development?

Technology can be a driver for development but benefits from technologies are not evenly distributed, even while negative impacts may be transboundary.

Economists assert that technological change has contributed the most to recent economic growth. But, overwhelmingly, benefits have accrued to the wealthiest sectors in industrialized countries; for example, 77% of people from developed countries are Internet users, while only 31% in the developing world are. This gap affects access to education and work, as well as democracy and wellbeing. As *IT for Change* has argued, in order for ICTs to contribute significantly to sustainable development, equitable and democratic participation for all must be ensured, including full citizenship in the information society by securing public capacity to allow for connectivity.

Many governments, particularly in developing countries, see access to new technologies as vital to overcoming development challenges and are anxious to ensure that legal and institutional obstacles such as intellectual property regimes and licensing arrangements do not impede access. On the other hand, industry and many governments, particularly in the OECD, are keen to protect proprietary interests, while wanting to tap into developing world markets. Although the claim from developing countries is fair, technology development and transfer rarely, if ever, involve the assessment of the impacts of technologies to human health, environment and livelihoods. Instead of advancing sustainable development, in some cases, technology transfer can amount to dumping untested technologies from industrialized countries onto developing regions. Not recognizing the importance of technology assessment can involve high economic and political costs as well as irreversible impacts on human health and the environment (*ETC Group, March 2012*).

The *"Great Technology Divides"*

While the North-South divide in access to technology remains a central issue that has to be tackled based on global equity, there are equally important "divides" in the technology discourse that need to be addressed to ensure that technology becomes an effective and equitable means to attain socially and ecologically sustainable development.

Traditional vs. new technologies. In many cases, there are endogenous, indigenous and traditional technologies that are proven to be useful to confront, for instance, climate and food crises; those technologies are also environmentally friendly, socially and culturally appropriate and commonly in the hands of many people and not subject to intellectual property rights. The introduction of new technologies can displace or hinder the use of these historically proven useful technologies. Therefore, protecting and conserving indigenous technologies should be ensured, including in well-intentioned efforts to "integrate" traditional knowledge systems with new technologies.

Gender and Technology. Gender divides related to technology are often overlooked (*Faulkner, 2000*). As the minority in "hard technology" fields such as engineering, women are generally regarded as mere consumers and recipients of technologies, and the power of women to make decisions about technologies is limited, at best, to choosing technologies that are already available commercially. Women are at the forefront of dealing with the unintended and unpredictable consequences of new technologies and yet are not empowered to assess their relevance, alternatives and potential impacts before being exposed to them.

New technology platforms such as nanotechnology and synthetic biology will impact women in many ways, such as through competition for uses, employment and manufacturing locations as well as the global market for natural resources ranging from copper to cotton or from natural fibers

to vegetable oils on which livelihoods of millions of rural women depend. As synthetic biology is allowing the production of high-value compounds that are conventionally derived from crops, and nanotechnology aims to alter substances to exhibit new properties, the impacts of these technologies on producers and exporters of natural commodities (mainly produced in developing countries) will be profound, while the products themselves could end up being hazardous.

An example is artemisinin, a vital antimalarial compound, currently produced by African small farmers who grow *Artemisia annua* from which the compound is derived, but soon to be replaced by synthetic biology-derived artemisinin sold by Sanofi-Aventis. The risk of livelihood displacement is especially relevant for women in developing countries where, on average, women make at least 43 percent of the total agricultural labor force (although only 20 percent of landholders are women) (*UNDP, 2011; FAO, 2010*).

Strategies must be developed to integrate grassroots participation and gender concerns in decision-making in technology development and its prior evaluation, including in the design of technologies as well as in the context of use. However, the increased and active participation of local people and women in decision-making will lead to sustainable development only 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*), taking into account environmental, social, economic and equity concerns.

Beyond Technology Transfer: Technology Assessment. Consumers and workers are among those most exposed to the risks of genetic engineering, nanotechnology and synthetic biology, often with no or little information provided to them by technology owners/sellers. In the event of unexpected consequences, it is likely that the technology will be entrenched so deeply that it will be difficult or impossible to recall (referred to as the "Collingridge Dilemma").

Therefore, technology assessment – the analysis and evaluation of actual and potential consequences of technology choices to ensure that they contribute to sustainable development – must be made an integral component of technology governance. Assessment must be based on the application of the precautionary principle and founded on the need to involve various actors – particularly the intended users of a particular technology and those who will most likely be impacted – in decision-making across the technology development process.

Democratic, transparent and participatory mechanisms for evaluation of new technologies, which provide meaningful and timely opportunities for recipients and users of technology, including women, to participate in the decision-making and assessment of the potential impacts of technologies on health, economy, livelihood, culture and the environment must be put in place at the global and national levels.

Ownership and Control of Technology and Innovation. The current intellectual property rights (IPR) system has allowed corporate titans to dominate vital industries globally, including the areas of food and agriculture. In 2011, 10 companies accounted for 76% of the world's commercial seed sales; 95% of the global agrochemical market is controlled by 10 companies; and only 4 transnational companies control 97% of the world's poultry genetics (*ETC Group, 2013*). Through patent-sharing, cross-licensing and joint ventures that are often presented as collaborative efforts beneficial to society, fewer and bigger corporations have come to dominate key technology-based industries in the mode of cartels, generally tolerated by regulators despite competition laws and anti-combine policies. The increasing dominance of a few giant corporations within and across key industrial sectors casts serious doubts on the supposed role of IPR as incentive for innovation when others are prevented from adapting existing technologies based on their needs and specific capacities.

The IPR system adversely impacts women in various ways. The traditional rights of women as conservers of knowledge and seeds are directly threatened by proprietary claims on "innovations" on local seeds and knowledge through biopiracy and the patent system. Massive promotion of

seeds protected by patents and plant breeders' rights leads to genetic uniformity and erosion of the genetic base of crops and animal breeds. Cartel practices facilitate price-fixing that harms women as consumers of food, agricultural inputs and other products of these corporations. The individual property-orientation of the IPR system reinforces patriarchy and runs counter to the historical practice of innovation-sharing by women.

To attain sustainable development, IPR barriers to technological innovations and policies that erode the capacity of women and communities to innovate using local capacities and resources must be removed. The collective nature of knowledge-generation to serve the common good has to be respected.

Addressing the "Technology Divides" through the SDGs

A **technology-related sustainable development goal** could guide sound policymaking, including the consideration of crucial aspects of protecting traditional and indigenous knowledge systems and affirming gender and social equity as well as the precautionary principle. An SDG on technology should also commit governments to ensure that an increasing share of economically and environmentally beneficial technological changes takes place within – and for – developing countries and countries in transition, and that these countries have facilitated access to the best of proven, appropriate and environmentally sound technologies.

SDGs related to technology should be developed taking into account the following elements, which should likewise be reflected in the targets and indicators:

1. Strengthen recognition of – and ensure development and use of – sustainable indigenous and local knowledge systems and technological developments;
2. Strengthen local and community control over the commons – traditionally critical to women's well being and to their pursuit of life and livelihoods;
3. Conserve indigenous and local knowledge systems, practices and languages, and embed them in the concept of Human Rights, including the Right to Food and Health and in the protection of genetic and biological diversity and the integrity of ecosystems;
4. Ensure that developing countries and countries in transition have fair and equitable access to technologies that have been proven to be environmentally sound, including the removal of intellectual property barriers and the application of strict regulation of cartel-like practices and enforcement of competition policies;
5. Apply the precautionary principle on technology development, transfer and deployment;
6. Establish an international mechanism for the evaluation of ecological, social, cultural and economic impacts of technologies with attention to the participation of the potentially affected social groups;
7. Strengthen the capacity at the regional, national and local levels to evaluate the potential impacts of new technologies;
8. Ban the development and deployment of technologies that have the potential to damage Earth systems, such as geoengineering;
9. Increase and enable the active and direct participation of women in decision-making in all stages of technology development, including assessment; and
10. Increase to at least 30% the share of global peer-reviewed scientific papers originating in developing countries and countries in transition by 2030 including studies resulting from indigenous and local knowledge systems;

The Campaign for People's Goals for Sustainable Development, comprised of a global network of grassroots organizations, labor unions, social movements, NGOs and other institutions, is pushing for a goal to "*Ensure sharing of safe, appropriate and ecologically sound technologies*" that includes these targets*: (1) Take steps to establish an international public system for the diffusion of green technologies that includes a participatory and transparent mechanism for assessing technologies according to their social, economic and environmental impacts; and (2) Reorient intellectual property rights regime to allow for easier diffusion and development of green technologies.* (http://peoplesgoals.org/environment-sus/)

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