Why Technology Assessment?

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Summary

International efforts to address the food, energy and climate crises tend to regard technology as an important part of the solution. This optimism about technology also prevails in debates around the Green Economy and international environmental governance. And of course technology does hold some potential solutions to some important problems. However, two decades of accelerating technological development and deployment, in the context of massive trade and investment liberalization, has left the globe in far worse straits than it was when the very concept of sustainable development was in its infancy. And now, it is time for a technological re-think. New high-risk technologies, ranging from the very small (synthetic biology, nanotechnology) to the very large (geoengineering), are rapidly developing. Their promoters promise that they hold the keys to solving climate change, world hunger, energy shortages and biodiversity loss and the precautionary principle and social and economic impacts are often ignored in the rush to deploy the latest technofix.

"The international community... should build up technology assessment capacity for the management of environmentally sound technology, including environmental impact and risk assessment, with due regard to appropriate safeguards on the transfer of technologies subject to prohibition on environmental or health grounds..." Agenda 21 (34.26A)

Without the strict application of the precautionary principle, and a transparent and participatory form of technology assessment, some of these new technologies could wreak even more havoc on this fragile planet, already bruised and battered by reckless and unsustainable forms of production that serve the few at the expense of the many.

Take the examples of nanotechnology, synthetic biology and geoengineering – three fields under rapid development where precaution MUST prevail. Agenda 21 included some modest language on technology assessment – it needs to be reviewed, revived, and put into practice.

What technologies are we talking about?

Nanotechnology is a suite of techniques used to manipulate matter at the scale of molecules and atoms and there are already a wide variety of commercial applications ranging from sunscreen to industrial packaging.

Geoengineering is the intentional, large-scale manipulation of the Earth's systems by artificially changing oceans, soils and the atmosphere. It includes cloud whitening, ocean fertilization, stratospheric aerosols, ostensibly as a response to climate change.

Synthetic Biology is a form of extreme genetic engineering, where synthetic organisms are built from scratch. The field is opening a Pandora's box of potential impacts when such organisms will be released, intentionally or not, into the environment.

What needs to be done to ensure unsafe technologies with negative impacts on vulnerable populations are not deployed?

A precautionary assessment of the impacts of emerging technologies has become more urgent than ever before, particularly as converging technologies (nanotechnology, computer science, genetics, engineering) work in concert, and as a small number of large corporations control greater and greater portions of the natural world. This concentration of scientific know-how can undermine the ability of countries and peoples to decide what technologies are appropriate for their own circumstances.

Precaution demands the careful assessment of technologies before, not after, governments and inter-governmental bodies start funding their development and aiding their deployment around the globe. There is already a precedent in international law: the Cartagena Protocol on Biosafety, ratified by 157 countries, gives effect to this principle on genetically modified organisms. National and international programs of public consultation, with the participation of the people who are directly affected, are critical. People must have the ability to decide which technologies they want, and to reject technologies that are neither environmentally sound nor socially equitable.

Lack of international governance for new technologies

- There is no multilateral body specifically mandated to take on the governance and regulation of emerging technologies, making the world into an experimental ¨Wild West" where anything goes for those with the money and capacity to act.
- The technology cycle is seen as "research, development, diffusion, deployment" but there is no international process where technologies are carefully evaluated for their social, environmental and other impacts before they are rushed out to market.
- Who decides what technologies get deployed and under what conditions? How can we avoid "jurisdiction shopping" whereby a technology prohibited in one country does not simply move to the next, which may be less aware and therefore less vigilant about its risks?
- With new technologies that purport to manipulate entire planetary systems and build new life forms from scratch, an international governance mechanism has become an urgent matter.

The United Nations should adopt a multilateral mechanism for information sharing, assessment and governance of new and emerging technologies based on the following principles:

- Strict application of precautionary principle – too much is at stake
- Ensuring environmental integrity
- No unilateral deployment of technologies with trans-border impacts
- Full consideration of potential negative social, economic and environmental impacts
- Open and transparent process with full civil society participation
- Fair, full and equitable representation and participation of developing countries and vulnerable communities and Indigenous Peoples
- Involvement of relevant UN treaty bodies

The need for such a treaty (the ICENT, International Convention for the Evaluation of New Technologies) does not fall neatly into the remit of an existing body. But any serious discussion of sustainable development – not to mention agriculture, climate change or biodiversity loss – must include technology assessment and evaluation.

ETC Group urges civil society organizations to be clear in their recommendations to those who are developing the agenda for Rio+20 that technology assessment based on the precautionary principle with full civil society participation to assess the social and environmental impacts must be on the agenda. Otherwise, we shall have more false solutions that will only exacerbate existing problems.

ETC Group

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ETC Group is dedicated to the conservation and sustainable advancement of cultural and ecological diversity and human rights. To this end, ETC Group supports socially responsible developments of technologies useful to the poor and marginalized and it addresses international governance issues and corporate power as they relate to new technologies. ETC Group publications are available at **www.etcgroup.org**

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The promise and the problems: new technologies and Rio2012

	Nanotechnology	Geoengineering	Synthetic Biology
Background: *the basics*	Several nanotechnology researchers in partnership with commercial water companies are developing tiny engineered particles, known as nanoparticles, for addition to water to clean up bacteria and other contaminants. Nano-sized particles are receiving increasing interest and investment because they exhibit novel properties (changes in colour, reactivity and conductivity) that can be harnessed for industrial purposes by controlling the shape and precise size of the particles.	Geoengineering the Earth's temperature by deploying sulphate and metallic aerosols in the stratosphere, thereby reflecting heat back to space and lowering the Earth's temperature is known as Solar Radiation Management. With global progress on reducing greenhouse gas emissions proving glacially slow there is increasing interest in high-risk large-scale climate-cooling technologies, collectively referred to as geoengineering. Such a cloud of human-made particles could be released continuously from a long hose, from artillery cannon or from the back of aircraft, dispersing around the globe and staying aloft for an extended period.	A new field of extreme genetic engineering is providing techniques to radically 'reprogramme' the DNA of microbes such as yeast, algae and bacteria. Synthetic biologists working with energy and chemical companies are adding new strands of synthetic DNA (built mechanically in a lab from chemicals) hijacking the workings of living cells so that they can secrete industrially useful products such as transport fuels, high-value chemicals and plastics. The microbes are engineered to feed off sugars and plant materials that are then fermented into industrial raw materials.
Promise: *the hype*	Engineered nanoparticles will enable cheaper, efficient water clean up for the south helping meet the aim of MDG 7 to halve the number of people who do not have access to safe drinking water by 2015.	Re-engineering the climate will allow society to stave off the worst effects of climate change, buying time for more long-term solutions. It is fast and cheap.	Engineered synthetic bacteria will enable biomass to replace petroleum as the key feedstock for production of fuels and chemicals – reducing dependency on oil and greenhouse gas emissions.
Problem: *risks and impacts*	Far from being inert and harmless, nanoparticles may be a new form of chemical pollution. Nanoparticles have demonstrated a greater propensity to exhibit toxic effects. They travel more quickly through the environment, enter organs and cross membranes that are usually impervious to outside contaminants. Unintentional nano-sized particles are already widely implicated in respiratory diseases such as mesethelioma and air pollution related mortality. The ecological impacts of engineered nanoparticles on other species, plants and wider ecosystems has yet to be studied. Experts suggest they require entirely new safety assessment methodologies that do not yet exist. The application of hi-tech patented technologies on water could impact biodiversity or crop growth and food production could also be harmed. The production of nanoparticles is also highly energy intensive.	Atmospheric temperatures have always been tightly coupled to greenhouse emissions and we have no historical precedent for decoupling temperature from atmospheric concentrations except for the occasional volcanic eruption. We know however that when large volcanoes eject particles into the stratosphere the effect is not merely to cool global temperatures but also to create artificial regional variations in weather including suppression of monsoons in tropical zones leading to crop failures. Continual injection of aerosol particles in the sky will alter the light reaching terrestrial plant life, potentially decreasing the photosynthetic activity of natural carbon sinks. Such particles may also worsen ozone destruction and exacerbate air pollution with adverse effects on human health. International disputes over control of geoengineering technologies could worsen international co-operation efforts and even provoke wars.	Synthetic organisms are novel species whose ecological impact is unproven and may be dangerous for biodiversity and human health. By designing entirely novel genetic sequences, synthetic biologists could be creating living pollution that could speed up biodiversity loss should their creations escape into the wild. Switching feedstocks for fuel and chemicals production to plant and sugar carries a heavy environmental burden. Human appropriation of biomass (plant life) is already regarded as beyond the natural carrying capacity of the planet. Appropriation of land, water and soils for industrial biomass has already led to displacement of poor and indigenous communities, worsening food security. The new application of synthetic microbes to transform biomass to industrial products is likely to worsen this trend.
More info	ETC Group, ***The Big Downturn? Nanogeopolitics***, 2010 at www.etcgroup.org/en/node/5245	ETC Group, ***Geopiracy: The Case Against Geoengineering***, 2010 at www.etcgroup.org/en/node/5217	ETC Group, ***The New Biomassters: Synthetic Biology and the Next Assault on Biodiversity and Livelihoods***, 2010 at www.etcgroup.org/en/node/5232