

## SINCE 1992...

Know-How

Technology Transfer

Know-What

Technology Assessment

Know-Why

Who Benefits?

It's not just that we are facing "something new," we are facing "something else." The speed, breadth and depth of technological change is out-pacing and out-scoping policymakers. Since 1992, the convergence of technologies (living and inert) at the atomic- or nano-scale is adding new dimensions to the nature of technological transformation. Governments need global tools to respond to "something else." The following ten technology leaps make the case for prioritizing Technology Assessment at the UN...

- 1. KNOWLEDGE ECONOMY:** The 1992 Earth Summit celebrated the advent of the "Knowledge Economy" and Rio+20 is contemplating the birth of the "Green Economy." The difference is mostly one of ownership and control. The world's markets sell 10 billion products<sup>1</sup> made from 10 million materials<sup>2</sup> from 100,000 chemical compounds<sup>3</sup> based on 100 elements<sup>4</sup> and the four nucleotide bases that comprise DNA. Whoever controls the table of elements and the base pairs of DNA controls the fate of sustainable economies. Massive multi-element and multi-genome patents could lead to a Green Knowledge Monopoly.
- 2. IT:** From a few clunky mobile phones in 1992, one out of every two people living in Africa now has a mobile, up from one in five six years ago. 3-D hyperspectral imaging from satellites and air planes make fast, cheap quantitative assessments of forest or savanna biomass possible and allow remote estimates of carbon (and carbon offset value) and even of genomic traits and, increasingly, varietal identification.<sup>5,6</sup> Smartphone apps will soon be able to assay plant genomes on the ground and beam up digital DNA to Internet clouds for others to download and synthesize.



Illustration 1: Ocean Fertilization by Liz Snooks

### RIO+20 AND TECHNOLOGY ASSESSMENT

Technology Transfer ("Know-How") without Technology Assessment ("Know What") is like buying airplanes and training pilots without building airports and training air-traffic controllers. ETC's series of issue papers and case studies call upon Rio+20 to establish UN-level Technology Assessment either through an Office of Technology Assessment attached to the UN General Assembly or through a specialized unit attached to a new sustainability facility associated with ECOSOC, UNCSD or UNEP.

- 3. BIOTECH:** At a cost of \$136 million per variety, biotech has invented herbicide-tolerant crops, Terminator seeds that die at harvest, forcing farmers to buy seed every season; and (under development), Zombie seeds that can only regenerate when soaked in proprietary chemicals. In the early 1990s the world's top 10 seed companies controlled less than one third of the global

market; today, 3 multinationals control 53% of the global commercial seed trade.<sup>7</sup>

4. **GENOMICS:** The project to map the human genome was just getting underway in 1992. Today, the speed and cost of genome mapping has dropped from 13 years and \$2.3 billion to 27 hours<sup>8</sup> and less than \$2000 en route to 15 minutes and a few hundred dollars soon after 2012. Six multinational chemical and seed companies control 77% of so-called 'climate-ready' multi-genome patents.<sup>9</sup>
5. **NANOTECHNOLOGY:** In 1992, only a handful of scientists had heard of nanotech but since Rio+10 in Johannesburg, governments have spent more than \$50 billion on nanotech R&D; the cost of carbon nanotubes has dropped by a factor of 20 in a decade; there are thousands of consumer products; and, there is no globally-agreed nanotech definition or regulation.<sup>10</sup>
6. **SYNTHETIC BIOLOGY:** In the early '90s, synthesizing the genome of a simple bacterium took hundreds of scientists and millions of dollars; today, undergraduates with \$400 second-hand gene synthesizers can download templates to build DNA while scientists can create self-replicating synthetic microbes and six letter DNA; can trick cells to produce – not 20 – but 276 amino acids – meaning that there can be more unnatural 'biodiversity' in a test tube than there is natural biodiversity in the Amazon.<sup>11</sup> Six of the world's top 10 energy, chemical, pharmaceutical and grain-trading corporations have partnerships with synthetic biology start-ups.<sup>12</sup> Farmers growing \$22 billion worth of high value flavour and fragrance commodities could lose their export market.
7. **ROBOTICS:** The "next big thing" since WWII, amateurs with \$1300 3-D printers can collaborate to build unmanned aircraft (surveillance and/or attack drones) in seven days for around \$8000.<sup>13</sup> Novices can also build shoebox size satellites and aircraft from off-the-shelf parts available in electronics shops.
8. **CONVERGENCE:** In 1992 the life sciences were "in" and physics and chemistry were "out." Today, governments and scientific institutions are predicting the unification of "Bits, Atoms, Neurons and Genes" (BANG) as a multi-trillion dollar Industrial Revolution transforming trade, economies and industrial production. There are immediate implications for the global South's commodity and manufacturing exports.
9. **ENGINEERING:** Industry now displaces more earth *per annum* than is lost through natural erosion. Annually, industrial farming incurs a loss of 75 billion tonnes of topsoil and costs the world \$400 billion.<sup>14</sup> The annual runoff from aquifer mining nearly matches the sea level rise from the "melt" of Polar glaciers; and there is 3 to 6 times (depending on season) more water behind dams than in natural rivers. Because of climate change, the number of extreme weather events causing major damage has increased five fold since the 1970s.<sup>15</sup>
10. **GEOENGINEERING:** Immediately after the Earth Summit, governments and/or corporate consortia began conducting a dozen major ocean fertilization experiments and are now proposing solar radiation management techniques that could alter the global climate for as little as \$25-\$50 billion per year – vastly cheaper than annual \$100 billion transfers to the global South or retooling industry.<sup>16</sup>

## FOR MORE INFORMATION

ETC Group has published several documents on issues related to Rio+20 and new technologies, including *Who Will Control the Green Economy?*, *Tackling Technology: Three Proposals for Rio (Submission to Zero Draft)*, *The New Biomasters. Synthetic Biology and the Next Assault on Biodiversity and Livelihoods*, *The Big Downturn. Nanogeopolitics* and *Geopiracy. The Case against Geoengineering* available on our website:

[www.etcgroup.org](http://www.etcgroup.org)

See also: *The Potential Impacts of Synthetic Biology on the Conservation & Sustainable Use of Biodiversity: A Submission to the Convention on Biological Diversity's Subsidiary Body on Scientific, Technical & Technological Advice (A Submission from Civil Society)*

<http://www.etcgroup.org/en/node/5291>

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- 3 J. R. McNeill, *Something New Under the Sun, An Environmental History of the Twentieth-Century World*, W.W. Norton, 2000, p.29. McNeill estimates that 10 million chemical compounds have been synthesized since the 1940s and 150,000 chemicals have been commercialized but only 100,000 are in current use.
- 4 The periodic table, of course, has more than 100 elements but more than a dozen do not occur naturally -- or, at least, outside the lab or particle accelerator.
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