Who Will Control the Green Economy?
The Case for Technology Assessment at Rio+20

When governments meet at the Rio+20 environmental summit in Brazil in June 2012, proposals for a new Green Economy based on technology transfer will be high on the agenda... but which technologies… and under whose control?

Rio+20: In June next year, the world's governments will gather for a second time in Rio de Janeiro to discuss the environmental state of Planet Earth. Twenty years after the Rio Earth Summit of 1992, "Rio+20" is under intensive negotiation at the United Nations. Given the litany of flawed premises and false promises over the decades, we could also dub this summit, "*Silent Spring* -50" since 2012 marks the half-century anniversary of Rachel Carson's groundbreaking book published in 1962.

Silent Spring -50: When Carson's *Silent Spring* raised the environmental alarm 50 years ago the "cutting edge" thinking about politics and power came from Brazil's "Liberation Theology" – a movement that swept through Latin America and won support around the world. As much (or more) political than theological, the movement called for social policies to address social problems and called upon marginalized peoples to see themselves as social movements. Yet, when governments, industry and multilateral agencies tabled their proposals for Rio +20 at the beginning of November, the dominant theme was overwhelmingly that all our environmental woes can be resolved if we invest more in new technologies.

Liberation Technology? Half a century after the birth of the modern environmental movement, every social problem seems to require -- not policies -- but technological fixes. The antidote to disease is genomics; hunger can be sated with biotechnology; the answer to Peak Oil is synthetic biology; the Limits to Growth can be put off by nanotechnology; the cure for Kyoto is geoengineering; the reply to the 'democratic deficit' is the Internet; and, the end of poverty will come when governments adopt the Green Economy. Political parties don't have to think and politicians don't have to lead, we only have to put our cash and our trust in the next technological revolution. Not Liberation Theology -- Liberation Technology.

New ETC report: Forgotten in governments' love affair with Green Economy technology solutions is the fundamental question of who will monopolize the new technologies. In a first, thoughtful effort to answer that question, ETC Group is releasing its latest report, "*Who Will Control the Green Economy?*" which will be presented during the Rio +20 negotiations at the United Nations in New York December 15-16. The 50+ page study evaluates the top 10 corporate enterprises in each of 14 economic sectors and provides an overall analysis of their strategic influence on the Green Economy proposals. ETC Group's study does not deny the power, importance and usefulness of new technologies. But technologies are tools that must be guided by strong social policies. Climate change and our wider environmental crisis cannot be addressed solely through

transferring technologies between rich and poor… and as ETC's new report explains, we need to track the corporations who control the technologies.

Technology Lobotomy? Since the 1992 Earth Summit, governments have systematically downsized or destroyed their capacity to understand science and monitor technologies. A year after Rio, the UN all but eliminated its Center for Science and Technology for Development (UNCSTD), moved the remnants from New York to UNCTAD in Geneva, and, simultaneously, eradicated its Centre on Transnational Corporations (UNCTC), thus terminating the minimal global capacity that had existed to monitor and advise on new technologies and on private sector technology transfer. In tandem with the decommissioning of UN agencies, the United States wiped out its own Office of Technology Assessment (OTA). In other words, as IT and biotech ushered in the so-called "Knowledge Economy," the UN and US submitted to a frontal lobotomy.

Climate of Change: Considering the importance governments are placing on new technologies, the UN's continuing incapacity is both ridiculous and dangerous. Ten examples of the pace of change...

1. **Knowledge Economy:** We're being told that we are moving from the "Knowledge Economy" of the late 20th century to the "Green Economy" of the 21st but the real change is in ownership and control. The world's markets sell 10 billion products[i] made from 10 million materials[ii] based upon an estimated 100,000 chemicals based upon 100 elements[iii] 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. ETC's report explains that massive multi-element and multi-genome patents are being granted that could create a Knowledge Monopoly.

2. **IT**: From a few clunky mobile phones in 1992, half of Africa now has a mobile, up from one in five six years ago. 3-D hyperspectral imaging from satellites and fixed-wing aircraft make fast, cheap quantitative assessments of forest or savanna biomass possible and allow remote estimates of carbon offset value and even taxonomy, potential genomic traits and, increasingly, varietal identification.[iv] [v] ETC's report explains that 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.

3. **Biotech**: At a cost of $60-$100 million per trait, 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 immersed in proprietary chemicals. ETC's report shows that three multinationals control 53% of the global commercial seed trade.

4. **Genomics**: The speed and cost of mapping the human genome has dropped from 13 years and $2.3 billion to 14 days and $5000 *en route* to 15 minutes and a few

hundred dollars soon after 2012; ETCs report shows that six multinational chemical and seed companies control 77% of so-called 'climate-ready' multi-genome patents.

5. **Nanotechnology**: 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. A 2011 ETC report, *The Big Downturn*[vi], provides the details.

6. **Synthetic biology**: Undergraduates with $400 gene synthesizers can download templates to build DNA while scientists can create self-replicating artificial microbes; six letter DNA; and 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. ETC's latest report reveals that six of the world's top 10 energy, chemical and grain-trading corporations have partnerships with synthetic biology start-ups.[vii] $20 billion worth of high value flavor and fragrance commodities may become redundant. More information is available in ETCs 2010 report, *The New Biomassters*[viii].

7. **Robotics**: Amateurs with $1300 3-D printers can collaborate to build unmanned aircraft (surveillance and/or attack drones) in seven days for around $8000. They can also build shoebox size satellites and aircraft from off-the-shelf parts available in electronics shops.

8. **Convergence**: Governments and scientific institutions are predicting the unification of "Bits, Atoms, Neurons and Genes" (BANG) as the next Industrial Revolution transforming trade, economies and industrial production. There are immediate implications for the global South's commodity 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 and costs the world $400 billion.[ix] 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. Since the 1970s industrial warming has led to a five-fold increase in extreme hydro-meteorological disasters.[x]

10. **Geoengineering**: Since 1993, governments and/or corporate consortia have conducted a dozen major ocean fertilization experiments and are proposing solar radiation management techniques that could alter the global climate for as little as $25-$50 billion per year -- vastly less expensive than annual $100 billion transfers to the global South or retooling industry. ETC's report of 2010, *Geopiracy*[xi], provides details.

The Case for Technology Assessment: In the 1970s, there was an unconfirmed assumption that at least one third of Ireland's patent royalty payments to foreign enterprises were for off-patent technologies for whom payment was no longer required. National companies and governments are often unaware of the range of choices available to them or the possibility that the technology being offered maybe overpriced or obsolete due to pending technological developments.

Technologies are, by definition, cultural artefacts that may function differently in different cultures and environments. The engine lubricant that works year-round in Kenya will seize up in a Canadian winter. (Left-hand driven Canadian cars will also underperform in Kenya -- abruptly.) Technologies that have been assessed to serve well in one climate or culture may cause problems in another.

The risk environment has also changed dramatically. Prior to the dominance of the steam engine, new technologies (products and processes) were usually introduced by people known to the recipient's and retribution and recall were relatively straightforward. As the pace of technological change sped up and its incubation became more remote, more complex systems for insuring against disaster became important. Today, technology impacts can be global and instantaneous requiring early identification and ongoing assessment before the new technologies are commercialized. There is now need for both a global overview as well as regional or national technology assessment to address different environments and cultures.

A trusted, transparent pathway for technological advancement would be beneficial for societies, governments and those proposing new technologies. Innovators and their backers seek to minimize risk. Especially, re-insurers and investors welcome steps that make government intervention and/or public responses more predictable.

No one can accurately predict the past but had the United Nations maintained its monitoring capacity over the last two decades -- and had civil society been vigilant -- the world might have saved itself billions of dollars, millions of lives, and much time. A few examples since the 1992 Earth Summit…

1996 **Mad-cow disease/Bovine spongiform encephalopathy (BSE):** Although British regulators knew in the 1970s that the public was being exposed to BSE, the information was covered up until 1996.[xii] A transparent global monitoring capacity could have made the secrecy unlikely. The fallout from the regulatory failure has meant continuing societal distrust of scientists and regulators.

1996 **GM crops:** Civil society initially warned that the biotech industry was developing herbicide-tolerant plant varieties in 1981. Governments were nevertheless shocked when, 15 years later, the first genetically modified crops were planted. In several parts of the world, small-scale producers immediately opposed the GM seeds as a potential threat to their environment, their health and their markets. Likewise, many food retailers and their customers opposed GM foods in the absence of scientific evidence that the products were safe – or had even been

tested. Because some governments adopted the precautionary principle while others simply adopted the technology, markets and global trade became uncertain and many parts of the food system suffered. The story of GM crops is the textbook example of how governments and industry should not function.

2001 **Foot and mouth disease:** The regulatory scandal and financial losses from the outbreak of foot and mouth disease in the UK (and then Europe) again undermined citizen confidence in government regulation. In the end, the outbreak's cost totalled $16 billion in the UK, where 7 million sheep and cattle were killed. Governments haven't learned from 15 other outbreaks of the virus – including another in the UK in 2007. According to the US government, the risk of an accidental escape of foot and mouth disease virus from a federal lab is 70% over 50 years at a cost between $9 billion and $50 billion. The US National Academy of Sciences says the government's estimate is low.[xiii]

2006 **Nanoparticles:** The estimated annual global market for nanotechnology varies widely between about $100 million and $100 billion and predictions for the near-term range from hundreds of billions to almost $3 trillion. There is agreement, however, that governments have spent more than $50 billion on nanotech R&D since 2001 and industry is now outspending governments in nano research. Several thousand products – including pesticides, sunscreens and cosmetics – are in the marketplace today. Where so much money has been spent (and so many products are already on the shelf), it is unlikely that governments will respond well to scientific concerns for health and environmental risk. There is still neither an inter-governmentally accepted definition of nanotechnology nor agreed methods for measuring or evaluating nanoparticles. In 2006, a bathroom-cleaning product called "Magic Nano" was briefly on shelves in Germany but was withdrawn when nearly 100 consumers telephoned poison-control centers claiming respiratory ailments. In the absence of an agreed definition and fearing that their nanotechnology would be flushed down the toilet, industry successfully argued that the product was not actually "nano". Recently, seven female workers in China who were exposed to a paint containing nanoparticles developed respiratory problems; two of them died. Examination of all seven women, found nanoparticles lodged in cells of the lungs.[xiv] The only certainty is that nanotechnology is virtually unregulated anywhere in the world. If nanoparticles turn out - as some researchers suggest -- to be the "new asbestos", governments will have jeopardized more than $50 billion in taxpayer money -- along with the taxpayers.

2007 **Agrofuels:** In October 2011, a special report commissioned by the High-Level Panel of Experts of the UN Committee on World Food Security concluded that the world food price crisis that became evident at the end of 2007 was greatly exacerbated by the rapid rise in production of so-called bio or agrofuels. Since 2007, industry has insisted that a second or third generation of biofuels will soon be available that will allow cars and people to be fuelled and fed simultaneously. Four years later, the world is still waiting. Europe and the US have been wasting

$11 billion per year in biofuel industry subsidies.[xv] If the UN had had a technology assessment capacity in place, the biofuels illusion would not have prevailed and many of the 170 million newly malnourished people could have been spared.

2009 **Intellectual Property Distortions:** IP is a different kind of technology monitoring failure. There is widespread agreement that the intellectual property system, rather than facilitating innovation, is a financial and legal barrier to new technologies. According to a 2009 study, total US corporate profits from patents (excluding pharmaceuticals) average around $4 billion annually – but the associated litigation costs are $14 billion per year.[xvi] We are losing our capacity to innovate when we need it most.

2010 **Deep Water Drilling:** The BP Gulf of Mexico oil disaster of 2010 is well documented. Less known is that in 2008, a near-disastrous offshore gas leak in Azerbaijan led to the biggest personnel evacuation in the driller's history. That company, too, was BP and a WikiLeaks disclosure says that company officials at the time blamed the leak on faulty cement casings – the same problem identified in BP's Deepwater Horizon spill 18 months later.[xvii] BP estimates that the cost of the Gulf of Mexico spill could reach $40 billion.[xviii] 760 million litres of oil spill into the world's oceans annually – that's a BP Gulf disaster every year.[xix]

2011 **Nuclear power:** The Fukushima tragedy that began March 11, 2011 is the latest in a succession of scandals that has befallen the commercial nuclear power industry since its inception in 1953. The Fukushima facility was assessed to be tsunami-resistant because a high cliff separated the construction site from the ocean. Immediately following this assessment, however, the cliff was removed to allow boats to bring heavy equipment to the site. Following the tsunami, Fukushima was plagued by a number of other technical and political failures. The nuclear power industry's situation worsened when subsequent studies revealed that 88 of the world's 442 operational nuclear plants have been built on seismic faults.[xx] For almost 60 years, the industry has struggled with nuclear waste disposal. Despite constant assurances, no country has solved the problem. A 2011 UN report noted that the industry originally adopted nuclear-powered submarine standards that prioritized compactness and mobility and undervalued safety– standards unhelpful to commercial power plants.[xxi] The decision caused delays and cost overruns. By the 1970s, the nuclear companies were confronted with new regulations every day, forcing the near-collapse of one of the world's most powerfully-backed technologies. Fukushima's nuclear meltdown is expected to cost Japan at least $64 billion.[xxii] The estimated cleanup costs for one major US nuclear weapons manufacturing facility range from $100 billion-$1 trillion over 75 years. [xxiii]

So-called Green techno-fixes for environmental problems has become the Rio summit's mantra. The focuses are almost exclusively on getting access to new technologies rather than determining whether or not the technologies work or are needed. The heavy

emphasis on new technologies obliges a strengthened global, regional and national capacity to monitor and assess the technologies. To do otherwise would be to incite more distrust and invite disaster. Sir Martin Rees, the retired president of the UK's Royal Society, estimated in 2003 that the likelihood of a technological disaster wiping out at least 1 million lies before 2020 are 50-50. If he is right, UN failure to adopt a technology assessment mechanism at Rio in 2012 would be tantamount to criminal negligence.

The Argument Against Assessment: When calls are first made to monitor a new technology, its practitioners or investors roll out five standardized and sequential responses...

Too Soon: It is always premature to monitor or regulate. Governments and societies are assured that significant deployment is far off because fundamental scientific knowledge has much to learn before commercialization is feasible. In fact, technological deployment often comes long before scientific understanding. The energy and chemical industries, for example, used catalysis for decades, spending billions on manufacturing facilities depending upon it, without any clear understanding of the science behind it.[xxiv] Likewise, since the 1940s, US agribusiness has been dumping as much as 25 million pounds a year of antibiotics into animal feed without understanding how the antibiotics ratchet up livestock weight.[xxv] Since 1804, medical science has administered anesthetics to tens of thousands of patients about to go under the knife without knowing exactly how the chemical concoctions work.[xxvi] The biotech industry has been selling modified DNA for decades while scientific understanding of the double helix continues to evolve in unexpected directions. Industry doesn't need to know what it's doing in order to make money. More alarmingly, technologies can make money without actually working. Industry can use the hype about a technological breakthrough to clear away anti-competition and other regulatory barriers, intimidate competitors, and create demand for an inferior or ineffective technology. GM crops are an excellent example of the biotech industry creating a seed monopoly out of a sloppy technology.

Too Much: Industry also argues that there is no single technology... that there has been a misunderstanding or at least a misnaming... there is really a suite of technologies that can't possibly be monitored or regulated collectively. In a debate before EU parliamentarians a few years ago, the head of the European Nanotechnology Business Alliance argued that there was no such thing as nanotechnology -- prompting the obvious question as to when she's going to change the name of her trade Association.[xxvii] At another meeting on biotechnology outside of London, the negotiator of a major biotech enterprise complained bitterly that environmentalists had given them the term "genetic engineering" and had to be advised by his colleagues that the term had come from industry.[xxviii] What was first ‘Genetic Engineering’ later became ‘Genetic Modification’ en route to ‘Living Modified Organisms’ or ‘Functional Foods’ (raising new questions about the functionality of other foods!). Despite everything, BIO -- the Biotech Industry

Organization -- soldiers on searching for linguistic loopholes. 'Geoengineering' is already transitioning to 'climate management'.

Too Late: Once the technology is fully invested and deployed, however, the argument is that it is much too late to withdraw it. Absent a major and politically-embarrassing catastrophe, industry argues that regulations, or recall, will undermine national competitiveness, destroy jobs, devastate the economy or smother innovation. These -- essentially political -- arguments intimidate regulators and policymakers. During the 20th century there was an average 30 year gap between the early warnings of scientists and the late listenings of governments (see table). Products and technologies are almost without exception only withdrawn when (1) industry has found an alternative product or process that it can control and profitably exploit; and (2) when it has fully written off - and ready to replace its manufacturing facilities to adapt to the new requirements.

Early Warnings without Early Listeners

Early Warning	Problem	Late Listening	Years Delayed
1602	**Tobacco**[xxix]	1970s	>370
Early 1700s	**Caffeine**[xxx]	?	?
1866	**Fish stocks**	1970s	100
1896	**Radiation**	1928	32
1897	**Benzene**	1977	80
1898	**Asbestos**	1931	33
1899	**PCBs**	1972	73
1907	**CFCs**	1977	70
1938	**Halocarbons**	1997	59
1938	**DES**	1971	33
1945	**Antimicrobials**	>1970	>25
1952	**Sulphur dioxide**	1979	27
1954	**MTBE**	2000	46
1962	**DDT**	1969	7
1970	**TBT**	1982	12
1970	**Hormones**	1982	12
>1970	**BSE**	1996	>20
1980	**GMOs -**	2003	23
2002	**Nanoparticles**	>2003	?

Source: Adapted from *Late Lessons from Early Warnings*: *The Precautionary Principle 1896-2000*, Environmental Issues Report, EEA, 2001, with additional examples from ETC Group.

Too Fast: Even when a technology -- or one of its products or processes -- is found either too risky or reprehensible to remain, industry has been remarkably successful at delaying change until it has wrung out all the profit it can from the old practice or

product. These delays have cost both lives and money. The most egregious example is Britain's emancipation of overseas slaves when Parliament offered plantation owners 12 years of "uncompensated apprenticeship" as well as £20 million to phase in the human rights of more than 800,000 slaves. (Under pressure, the lag time was eventually reduced to four years.) [xxxi] In the 20th century, industry succeeded in delaying the removal of a long list of toxic chemicals such as PCBs, halocarbons and DES until profitable alternatives were comfortably available.[xxxii] More recently, when lead was found in toys manufactured in China, the US government gave retailers almost a year to pull them off the shelves. Because of the adverse publicity, the big retailers sold their Chinese toy consignments to small retailers who took advantage of Christmas sales to dispose of their toxic inventory.[xxxiii] No you haven't, Mr. Obama, "Business, as usual, has options."

Too Old: Industry also argues that the so-called "new" technology is nothing more than a modest evolution of very old technologies. Biotech was just a slight advancement on beer, wine and cheese making, for example. Transgenics was just the next modest step in plant breeding and DNA crosses species boundaries all the time. Nano was used by Roman glassblowers and climate change (and, hence geoengineering) began with the mass killing of large mammals, the smelting of copper for coins, and the 12,000 year long spread of agriculture. The Dutch chemical giant, DSM, was so convincing about nanotech's antiquity that some participants at a UN chemicals meeting accused the company of being on the cutting edge of the Bronze Age.[xxxiv]

Industries ultimate goal is not so much to win as to delay. Once the technology is mature and established and the gaggle of start-up companies has been merged or massacred and a handful of lead enterprises are in place,, regulation is a welcome barrier to entry for newcomers, patents are a tool to intimidate interlopers and governments provide "plausible denial" that allows companies to shift responsibility - reducing insurance risk and litigation costs.

The Sounds of Science? OECD states generally argue that technology assessment must be an exclusively "technical" process untarnished by politics and opinion. The mantra is that "sound science" must make the decision. This assumes that there is a firewall between science and society that guarantees independent disinterested decisions. Yet, in the last few years, a series of investigative reports has disclosed that both science research grants and acceptance of peer reviewed studies is habitually biased by gender (where one 2007 study conclude that women had a 7% less chance of receiving grants than men of equal training and experience) [xxxv] and race (where a 2011 study concluded that African-Americans and Asian-Americans were, respectively, 13% and 4% less likely to win grants than Euro-Americans with the same qualifications).[xxxvi] The political problems of peer-review are most evident in medical research where leading journals have had to lower their standards for "conflict of interest" because they can't find enough qualified scientists without conflicts.[xxxvii]

But the practice of "sound science" in peer-review are manifold and complex... In September 2011, Bayer reported that two thirds of the drugs they pursued based upon peer-reviewed reports had to be dropped because the results could not be repeated. A Stanford researcher found that 16 of the 18 peer-reviewed papers accepted by *Nature Genetics* couldn't be replicated probably because the published articles didn't disclose sufficient information. Companies like Bayer and Amgen believe that half or more of all peer-reviewed scientific publications cannot be replicated. One reason for this, many believe, is that the authors won't make all their raw data available to rivals. Researchers and their corporate bosses are also shy of reporting bad news. In one study of drugs recently submitted for trial, investigators found that a quarter of the trials—mostly unfavourable—were not submitted for publication. Many regard this as unethical since the drugs required human experimentation. The quality of medical research may be worsening as a result. According to *Nature Reviews* in May 2011, the success rate of Phase 2 human trials has fallen from 28% to 18% in the last four years.[xxxviii]

Classically "scientific" queries, in the early stages of a new technology, can be less insightful than broad historic and socioeconomic overviews. When scientists aren't able to replicate another researchers results, it is often because of extraordinarily minor differences in methodology or context (including geographic location). In a review of the US National Nanotechnology Initiative in 2010, for example, scientists agreed that the same test of presumably identical carbon nano tubes conducted in Boston, Houston or Berkeley could lead to very different results.[xxxix] "Sound science" should be more open to learning from experience: the advent of the microscope led to major disputes among the researchers looking through them who -- depending on the quality of the lenses (and their own eyesight) -- often saw different things. [xl] Dependence on scientific inquiries, then, could be misleading whereas a wider public evaluation could offer useful guidance.

Two-Track Technology Assessment: Just as "sound science" can be subverted by political interests, government agencies can also be bullied, bribed or blind-sided into either accepting or rejecting technologies. In November 2011, for example, a citizen watchdog group independently testing for radioactive materials in food products discovered low levels of caesium in Japan's most popular canned baby food. In early December both the company and the government conceded that the contamination was real. Contamination was previously discovered in locally-produced beef and rice.[xli]

Technology assessment cannot be properly done by governments alone. Enormous financial and political interests are often mobilized to block "game-changing" new technologies from disrupting the *status quo*; or, as often, to propel new technologies into the marketplace prematurely to gain first-mover advantage. Given the importance of new technologies in government and social planning, "backup" assessment mechanisms are necessary. The intergovernmental assessment system must be supplemented by a civil society mechanism that can offer alternative perspectives.

The United Nations' Role: Rio+20 should ensure that the UN will expeditiously develop the institutional capacity to identify and monitor significant technologies, and to provide an evaluation of the technologies' social, economic, cultural, health and environmental

implications. Assessments must be completed before a new technology is released. Preferably, the monitoring process should accompany the development of the technology from science to shelf to minimize waste and risk. UN monitoring and assessment of new technologies should be based on the Precautionary Principle. Ideally, Rio should set the timetable for negotiations to develop an International Convention for the Evaluation of New Technologies (ICENT). The Convention would have a governing body supported by a scientific panel capable of convening specific technology working groups as required. Each working group would include a diversity of experience in science and other forms of knowledge, as well as a range of stakeholders. Reports of working groups would be submitted to the governing body which would advise governments on the problem/potential of the new technology and its alternatives. Regardless of the decision of the governing body, the working groups' reports would be appended to the final ICENT report and recommendations.

As a regular activity, ICENT should also monitor and report on technological diversity and ensure the safe archiving of technologies no longer (or seldom) in use. Further, ICENT should support regional and national technology assessment and work with governments to monitor and support appropriate technology transfer.

Civil Societies' Role: Recognizing the political forces at play in accepting or rejecting new technologies, the United Nations should encourage the formation of dynamic civil society mechanisms that can offer an independent monitoring and assessment capacity to accompany intergovernmental processes. This initiative should encourage the formation of self-organized civil society structures at the regional and inter-regional level that could guide Technology Observation Platforms (TOPs) capable of undertaking regionally-relevant reports on technology risks and opportunities to be considered by the UN. Secondly, the United Nations should encourage the formation of a "Technopedia" as an open access, web-based technology assessment tool monitored and maintained in the participatory style of Wikipedia.

As Rachel Carson wrote *Silent Spring*, one of her earliest supporters, US President Kennedy told the world that the application of new technologies could end hunger and poverty within our lifetime. The rich have not met that crisis either. At the very least, the half-century anniversary of *Silent Spring* should be met with a UN commitment to technology monitoring and assessment in order to save lives, save money, and make sure that technologies don't manufacture a Greed Economy Rachel Carson could never have imagined.

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