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Trapped in the Technosphere

Contribution to GTI Forum [Technology and the Future](#)

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A sound prognosis on the role of technology in the Anthropocene must take into account current conditions and trends, as well as associated costs and benefits. Population growth and resource depletion (including food and water) are bound to cause per capita resource allocation to shrink. An additional source of insecurity for many people is the widening economic inequality. The diverse manifestations of climate change and the associated population displacement contribute to sociopolitical insecurity and strife. Pollutants pose new threats to public health. Those phenomena define the context of the Anthropocene “polycrisis,” in which technological development will take place during this century.

Most of the costs and benefits of new technologies are neither foreseeable nor economic. The more costly a technological innovation, the more decisive will be the role played by power interests behind the scenes. The merits and dangers of innovations are addressed by two famous questions: (1) “Who benefits?” (credited to Jürgen Habermas), addressing power issues and motives, and (2) “And then what?” (credited to Garrett Hardin), focusing on downstream implications and consequences.¹ Both questions focus on real costs and benefits in terms of all the types of capital at stake—economic, social, cultural, environmental—along with potential long-term implications.

Ultimately, it is of course the living biosphere that bears the costs in terms of materials and ecosystem services, and those costs are too often neglected. The technosphere humanity has created has never been self-sustaining and therefore relies on environmental support structures. It consumes energy and materials in order to replace natural systems with artificial ones, dependent on high-energy inputs and complex maintenance regimes.² That technological

assault on the biosphere and its material boon have weakened our capacity to pay attention to what matters. Even in cases where a new technology promises a way to mitigate the polycrisis (e.g., genetically modified crops), costs and benefits to the biosphere are typically ignored in favor of human interests—in stark contrast to the biosphere’s fundamental significance as the support base for all development and for all life.

The fundamental problem with technological innovation, then, lies with its origin: the technosphere. It functions according to its own imperative to grow at any cost and to build technological artifacts that efficiently dominate human affairs and the biosphere, driving global ecological overshoot.³ The consumptive demands of the technosphere, along with population growth, are primarily responsible for humanity’s overshoot—the fact that we now consume about 170% of the resources that the biosphere can deliver at a sustainable maximum.⁴ Overshoot imposes its own conditions; viewed globally, it is that addiction to “living beyond our means,” along with its unequal distribution across humanity, that continues to aggravate the Anthropocene polycrisis.⁵ The costs and benefits of new technologies merely superimpose themselves on that background.

The eventual consequences of ecological overshoot will include crises that manifest regionally as economic, environmental, and social collapse events. Any remaining chances at a Great Transition depend on timely preparations in terms of developing resilience, relinquishing counterproductive ideals, restoring values and traditions that used to support sustainability, and reconciling cultures with the physical limits of our planetary home.⁶ However, the technosphere and its supporting ideologies are making that difficult. Precedents such as the Internet, plastics, and fossil fuel energy suggest that technological development, as much as it is a result of deliberate planning, does not follow sound considerations of benefits and harms or prudent preparations. Instead, it is pushed by estimates of short-term commercial potential, short-term costs, and ad hoc solutions to urgent needs. It cannot, therefore, be regarded as a reliable instrument for bringing about a Great Transition. Its contributions remain spurious and inadvertent, and dependent on population size.

The size of the global human population crucially determines how much political latitude will be available to governments in the future and to what degree new technologies, such as bioengineering, artificial intelligence, and the digital economy may at all contribute to a Great

Transition. From a biological perspective, the present global population represents an extreme anomaly.⁴ Before the advent of the technosphere, and specifically of fossil fuels, the global population never exceeded one billion. Regional populations were naturally regulated by resource availability and infectious disease, as is still the case in some “underdeveloped” regions. With development aid being cut and with the technosphere exerting ever-increasing costs, it cannot be taken for granted that the population will increase much further or even remain at its current level. It seems equally likely that it is substantially reduced as a result of natural adjustments.⁷ Extending on that uncertainty, three possible trajectories emerge, setting different parameters for technological innovation and its effects.

(A) The global population increases beyond 8 billion, as projected in UN models.⁸ The large size of the population, and weakened economies, would prohibit distributing the benefits of new technologies equitably. Instead, technological development will continue to be driven by the interests of affluent countries and dominant industries. Costs and harms are likely to be pushed on the least empowered regions and countries, and on future generations. This trajectory is the domain of Fortress World scenarios. The benefits of future innovations in high-tech diagnostics and therapies will be distributed as unequally as today’s vaccine technology. In the context of mounting emergencies, climate disasters, and exploding populations, emerging technologies are unlikely to contribute enough equitable benefits towards a Great Transition.⁹ At the same time, global overshoot and its harmful effects will worsen. Their technological remediation will be spotty at best. The potential for political conflicts and alliances between competing “fortresses” will further diminish the likelihood of international cooperation and global solutions. More likely is an eventual collapse of major proportions, leading towards trajectory B or C.

(B) The global population shrinks to 2 billion or fewer, a medium estimate of a sustainable population with equitable welfare and the standard of living of a moderately developed country.¹¹ This could pave the way for a Great Transition. The costs for equitably extending new technologies to all in that population will be relatively moderate and can be shared. The population decrease, by whatever means it came about, will have afforded opportunities for a great relinquishment of counterproductive ideals, beliefs, values, and attitudes that previously impeded the Transition. Instead, ideals of sufficiency, frugality, and adaptation inspire new sustainable lifestyles and the

equitable use of beneficial technologies.¹² Possible negative impacts and side effects remain below critical levels, and eventually even our overshoot can be deliberately reversed.

The smaller population will also allow for a more equitable sharing of specific technological benefits. Bioengineering at the ecosystem level has the potential to help us re-establish a sustainable balance between lands that are utilized to meet human needs and lands that are left as “wild” as possible. Artificial environments for controlled photosynthesis could enhance the spectrum of sustainable energy industries and revolutionize urban communities. Further developments in artificial intelligence could help with logistics, planning, and design. The digital economy might provide a stepping stone on the way towards a post-capitalist and post-growth economic order—a necessary condition for escaping overshoot.

(C) The global population fluctuates around present-day levels. This trajectory is the realm of Conventional Worlds, where business as usual remains the norm for a time. The gradual worsening of the polycrisis according to dominant trends will cause a gradual decline of human security in most regions. Population growth is more or less balanced by pandemics, famines, environmental toxicity, warfare, and reduced fertility; hectic regional fiddling with acute crises may involve new technologies in diverse local contexts, but without global coordination or internationally organized regimes. This kind of trajectory is unsustainable in the long run.

Endnotes

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