How sustainable is the digital world?

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The world we live in is characterized by rapid change. Even people who lived around the middle of the 20th century would hardly be able to find their way around today. Internet, computers, mobility, communication, robots are just some of the modern side effects of the manifold transformations in technology and society. This is especially true for the topic of digitalization, which is the main focus of this *GAIA* issue.

Digitalization emerged in three stages: automation, algorithmization and autonomization. With the new Chat GPT service, progress in these stages has reached the wider society.[1] But with all this development, the question remains: how sustainable is this development? What are the impacts on the ecological, economic and social dimensions of sustainability?[2] On the one hand, there are high gains in convenience and efficiency, better possibilities for recording and controlling material and energy flows in models of the circular economy, and more opportunities for individuals and groups to develop their own agendas. On the other hand, digital systems require vast amounts of energy, encourage increasing consumption, and may also lead to restrictions on personal freedoms and loss of identity. Cyber risks threaten to cripple entire functions of a society. Abuse of power and possible loss of autonomy due to progressive algorithmization are also among the systemic risks. At the same time, digitized processes offer the opportunity to both strengthen democratic structures (transparency, simplified access to political participation, e-democracy), but also the risk of significantly weakening them (bots, latent manipulation, echo bubbles).

The tension between digitalization and sustainable development is exemplified by smart industrial production, known in Germany as "Industry 4.0". Innovations in the direction of Industry 4.0 allow less material input, less emissions and waste and more efficient use of resources, but can also restrict individual autonomy, reduce one's agency and become a threat to one's own identity. Furthermore, resource and energy consumption, the opposite of what is envisioned, can increase as a result of higher production and operation of the digital devices. A comprehensive risk-benefit assessment is required.

Another focus of digital transformation is the application in private settings. Keywords such as "smart home" or "smart cities" describe a new reality of life in which intelligent services ranging from energy, security and health monitoring to entertainment and communication are largely performed autonomously by intelligent control units.[3] To what extent this smart living world supports or hinders sustainable structures in terms of ecology, economy and social functions is still an open question.

The articles in this issue shed light on these questions and provide initial answers to the challenges of digitalization. It becomes clear that digitalization will not reduce the ambivalence of technological change. What matters now is to improve and support the positive opportunities and minimize the associated risks through wise and foreseeable regulation. To do this, we need further committed research and courageous policies.

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1 Van Dis, E.A., J. Bollen, W. Zuidema, R. van Rooij, C.L. Bockting. 2023. ChatGPT: Five priorities for research. *Nature* 614/7947: 224–226.
2 Renn, O., G. Beier, P.-J. Schweizer. 2021. The opportunities and risks of digitalisation for sustainable development: A systemic perspective. *GAIA* 30/1: 23–28. *https://doi.org/10.14512/gaia.30.1.6.*
3 Elder-Vass, D. 2018. Lifeworld and systems in the digital economy. *European Journal of Social Theory* 21/2: 227–244. *https://doi.org/10.1177/1368431017709703.*