Strategic Environmental and Social Assessment of Automation: Scoping Summary

Jiri Dusik, 16 July 2018

The issue

The Fourth Industrial Revolution, connected in particular with an uptake of digital and highly automated systems, is widely expected to transform global economies over the next 10-20 years. Disruptive innovations such as 3D printing, advanced industrial robotics, autonomous transport, Internet of Things, and Artificial Intelligence hold a promise of increased productivity; improved predictive analytics and customer outreach; and establishing new models of producer-customer relationships. Whilst specific prognoses vary due to uncertainties, assumptions and perspectives taken by different observers, there is growing evidence that gradual diffusion of these new general purpose technologies brings about a multitude of changes to societies globally.

Current debates surrounding the Fourth Industrial Revolution often focus on the changing role of human labour in an age of automated systems and many experts predict that up to about half of the current tasks (NB: not jobs) are technically automatable by using already existing technologies. However, many analysts point out that diffusion of new technologies is often a slow process and workers, if properly assisted, can adjust and retrain to perform new tasks. Furthermore, in the past, technological changes have always been associated with generation of new jobs, in particular due to an expansion of economies. With these assumptions, the latest prognoses suggest that between 3 and 14 percent of the global labour force may need to find new jobs by 2030. Irrespective of what exactly the final figure will be, the scale is expected to be significant and requires a robust response in terms of managing adverse side effects.

Like previous industrial revolutions, the Fourth Industrial Revolution is expected to also profoundly affect environmental and natural resource use. Specific impacts are difficult to predict since these next-generation technologies are still evolving, and will probably continue evolving with an increased speed. Corporate studies that tend to assume an uptake of best business practices and environmentally friendly consumer preferences suggest, that emerging production and consumption patterns will help to address challenges to environmental sustainability, including climate change, resource use and sustainable utilisation of ecosystems. However, and in line with what had been observed in the past whenever new technologies were introduced, a growing body of research suggests that environmental outcomes of the forthcoming next generation technologies may be rather diverse. Whether they turn out to be positive or negative largely depends on new production and consumption relationships and environmental frameworks (e.g. goals, obligations, monitoring and management systems) that will be put in place.

On one hand, compared with production and management systems used today, many emerging technologies offer a technical potential to reduce non-GHG emissions and improve resource use efficiency. However, on the other hand, changes in consumption-production patterns could increase the total demand for energy (and increase GHG emissions, depending on the carbon footprints of the power sources used). Furthermore, they could enhance unsustainable exploitation of natural resources (especially rare metals needed for the production of electronic equipment). Also, adverse impacts on ecosystems may arise in particular in low-/mid-income countries with export-oriented economies and high population growth rates, where an associated large-scale dislocation of the labour force could lead to an intensified utilisation of available natural resources for livelihood purposes. Best-case and the worst-case environmental outcomes of the transition from current practices to automated production and management systems are visualised in two tables below, based on what various experts are currently predicting.

Table: Environmental impacts of automation technologies: best and worst case scenarios

Best case scenario	Energy use	Non-GHG emissions	Resource use	Ecosystem use
3D printing & custom manufacturing				
Advanced industrial robotics				
Autonomous transport				
Internet of Things				
Artificial Intelligence				
Shifts in occupations and livelihoods				

Worst case scenario	Energy use	Non-GHG emissions	Resource use	Ecosystem use
3D printing & custom manufacturing				
Advanced industrial robotics				
Autonomous transport				
Internet of Things				
Artificial Intelligence				
Shifts in occupations and livelihoods				

Key: Source: Author

Significant positive impact	Moderate positive impact	Limited or no impact	Moderate adverse impact	Significant adverse impact

Proposition

There are presently no guarantees that our new technological capabilities will automatically foster environmental sustainability. The forthcoming disruptive technologies may generate diverse outcomes based on the specific rules of their deployment. There is therefore a need to explore linkages between these forthcoming general purpose technologies, changing economic premises, as well as social and environmental agendas. Furthermore, conditions for the future sustainable use of technologies need to be identified. For instance, there are emerging calls for an expanded use of environmental and carbon taxes in order to generate revenues for social support programmes in the age of automated systems, to protect remaining natural resources from over-exploitation and to stimulate the uptake of resource- and energy-efficient innovations. Other proposals may emerge in future targeted enquiries.

In this context, current debates on digitisation and automation open up opportunities to discuss environmental management systems for the new era. However, as advised by Klaus Schwab[1], before devising strategies on how to cope with the Fourth Industrial Revolution, we must first properly understand it. It may be therefore timely to accept an invitation to analyse aggregate impacts of these forthcoming technological changes, and to do so with a specific focus on their environmental and social implications and interlinkages with economic considerations.

Foresight studies may benefit from strategic environmental (and social) assessments (SEAs/SESAs) of policies, plans and programs that pave the way for a future use of these emerging technologies. SEAs/SESAs are used to assess cumulative and synergistic impacts of strategic decisions on key issues of concern and compare their environmental and related social risks and opportunities. They are practiced in all major world economies and offer globally established tools to support decision-making.

Our separate scoping paper for a SESA of Automation offers an initial framework for identification of emerging issues of concern, invites comments and suggests potential future steps in this deliberative enquiry. Next, open discussion fora could be initiated on the issues identified and platform(s) be established with key stakeholders wishing to proceed with more in-depth studies and consultations.

[1] https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/