Pollution Control 2019: Environmental Future and Fourth Industrial Revolution- Ahmed T Tawfik- Scientific Management for Consultancy and Research, Egypt

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The environment provides natural resources that fuel the growth of industries and economies. It influences public issues as diverse as health, natural disaster response and recovery, and food and energy security. With the planet increasingly under stress, action on environmental issues – such as climate change, biodiversity, and ocean health – constitute some of the most urgent and large-scale challenges. The innovations of the Fourth Industrial Revolution (4IR) hold great potential for improving management and governance of the global environment and delivering the systems change required to create clean, resource-secure and inclusive economies.

Sustainable Development (SD) is the biggest challenge to the 21st century and transition to the Fourth Industrial Revolution (4IR). The United Nations Food and Agriculture Organization (FAO) has estimated that global demand for food will increase 60% between 2006 and 2050, this will require the world's farmers to produce more food in the next 40 years than they have done in the last 10,000 years, The International Energy Agency (IEA) forecasts that an increase in global energy consumption approximately 30% by 2040, with a 71% increase in non-OECD economies this will lead to a 34% rise in global energy-related CO2 emissions by 2040 compared to 2012. Meanwhile, the OECD's International Transport Forum forecasts that there will be approximately 2.5 billion cars on the road by 2050, up from just over 1 billion today.

Aircraft manufacturer, Boeing, estimates that global demand for commercial airliners will reach almost 40,000 in the next two decades, which is double today's total fleet. New technologies are enabling societal shifts by affecting economics, values, identities and possibilities for future generations.

The smartphone has become essential; in 2016 approximately 3.8 billion people had a smartphone subscription, a figure that is projected to rise to nearly 6 billion by 2021, by smaller and more powerful sensors that are becoming ever cheaper, and characterized by artificial intelligence and machine learning as the Fourth Industrial Revolution.

This is especially true for innovations that reduce human-to-human interaction or contact, automate processes and increase productivity amid social distancing. Many organizations, either public or private, resonated with the idea of using emerging technologies of the fourth industrial revolution to accelerate the digital trans-formation such as Digital platforms, Mobile technology, Dashboards, Internet of things (IoT), Big Data analytics, 3D printing, Artificial Intelligence (AI), Blockchain, Augmented Reality (AR), Virtual Reality (VR), Geospatial technologies, Drones, etc. to name few. Irrespective of the profession, organizations and people are coming together to build technologies and solutions that can be used, enabling societal shifts by seismically impacting economies, values, identities and possibilities for future generations. Everybody is trying their best to innovate and contribute to this fight in one way or the other, and no stone is left unturned to save the humans from this disease. In this chapter, I have identified a collection of tens of innovations (with focus on the smart ones using smart technologies and especially AI).

The following descriptions are provided as background and are not intended to be exhaustive.

-Artificial Intelligence. Computer science learning algorithms capable of performing tasks that usually require human intelligence and beyond (e.g. visual perception, speech recognition and decision-making).

1. Robotics. Electro-mechanical, biological and hybrid machines enabled by AI that automate, augment or assist human activities, autonomously or according to set instructions.
2. Drones & autonomous vehicles. Enabled by robots, autonomous vehicles can operate and navigate with little or no human control. Drones fly or move in water without a pilot and can operate autonomously or be controlled remotely.

3. Biotechnologies. Encompassing bioengineering, biomedical engineering, genomics, gene editing, and proteomics, biomimicry, and synthetic biology this technology set has applications in areas like energy, material, chemical, pharmaceutical, agricultural and medical industries.

4. 3D Printing. Additive manufacturing techniques used to create three-dimensional objects based on "printing" successive layers of materials.

5. Internet of things. A network of advanced sensors and actuators in the land, air, oceans and space embedded with software, network connectivity and computer capability, which can collect and exchange data over the internet and enable automated solutions to multiple problem sets.

6. Blockchain (and distributed ledger). Distributed electronic ledger that uses cryptographic software algorithms to record and confirm immutable transactions and /or assets with reliability and anonymity. It has no central authority and allows for automated contracts that relate to those assets and transactions (smart contracts).

7. New computing technologies. This includes technologies such as quantum computing, DNA-based solid-state hard drives and the combining of Third Industrial Revolution technologies (e.g. big data, cloud) with the other technologies (e.g. IoT, advanced sensor platforms). Quantum computers make direct use of quantum-mechanical phenomena such as entanglement to perform the large-scale computation of a particular class of currently impossible tasks by traditional computing approaches.

8. Advanced sensor platforms (including satellites). Advanced fixed and mobile physical, chemical and biological sensors for direct and indirect (remote sensing) of myriad environmental, natural resource and biological asset variables from fixed locations or in autonomous or semi-autonomous vehicles in the land, machines, air, oceans and space.

9. Virtual, augmented and mixed reality. Computer-generated simulation of a three-dimensional space overlaid to the physical world (AR) or a complete environment (VR).

10. Energy capture, storage, and transmission. New energy technologies range from advanced battery technologies through to intelligent virtual grids, organic solar cells, spray-on solar, liquid biofuels for electricity generation and transport, and nuclear fusion

11. Neurotechnologies. Technologies that enable humans to influence consciousness and thought through decoding what they are thinking in fine levels of detail through new chemicals that influence brains for enhanced functionality and enable interaction with the world in new ways.

This article will discuss the needs to transform the management of our environmental surroundings appears boundless radically. The needs are focusing on employee productivity, green technologies, education and skills for green economy, social and environment. New types of skills and competencies will need to incorporate into existing occupational profiles of the workforces. Green skills are one of the strategic thrusts that will enable the world to stay ahead of environmental challenges and opportunities in a fast-changing global and political landscape.
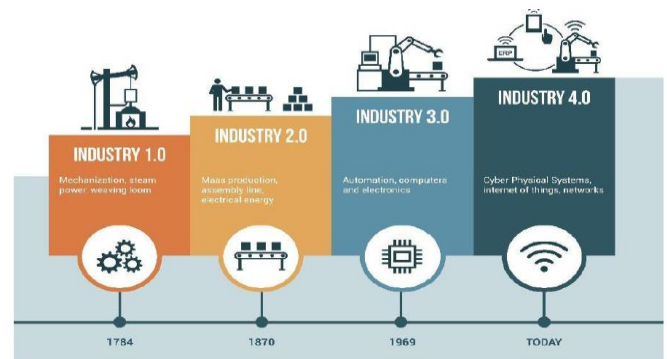

Figure 1: Industrial Revolutions History

Descriptions are provided in the context of the Fourth Industrial Revolution for the Earth initiative and were compiled by project partners from commonly available sources