

## GREECE 4.0 TOWARDS SUSTAINABLE DEVELOPMENT GOALS

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### ABSTRACT

Sustainability's frameworks and policies follow the dynamics of the economic, social and environmental challenges overtime. In this context, the so-called Industry 4.0 may be affected by both increasing uncertainties at various dimensions or being beneficial to the future of sustainable development. UN's Agenda 2030 is the most recent effort of the UN member states towards sustainable development. It is an action plan, which contains 17 major goals-objectives and multiple sub-targets and indicators, covering all the significant up-to-date aspects of sustainability. The impact of the fourth industrial revolution on sustainability is already under scientific review and the results are still under scrutiny. Literature shows both positive and negative aspects; as an example, ICT adoption has positive impact on some business fields whereas AI technology may increase unemployment rates and poverty underway, at least in the short run <sup>[1-6]</sup>. In this study, the impact of the fourth industrial revolution on Greece's sustainable development future, is presented and discussed.

### INTRODUCTION

Industry 4.0 and its related technologies i.e. Artificial Intelligence, the Internet of Things (IoT), Big Data Analytics, Human-Machine Cooperation, Autonomous Robots, Cyber-Physical systems among others, still have an unknown potential impact on sustainability and the environment. The newly established action plan of the UN member states towards sustainable development, covering all the significant up-to-date aspects of sustainability, expressed with the 17 major SDGs along with 169 associated targets. Greece, has been implemented on the 2030 Agenda for Sustainable Development (law 4440/2016, art. 43), since January 2017 <sup>[7]</sup>. The Agenda consists a holistic approach, based on the 3 pillars of sustainability: economy, society and environment, providing an ambitious and transformative framework for entering an eco-innovation platform, which ensures a balance between economic growth, social cohesion and justice. It is strongly considered that it can really ensure Greece's environmental performance and the protection of its unique ecological wealth <sup>[7]</sup>.

In this paper, taking into account the UN's Agenda 2030 we conduct a literature-based analysis to discuss how technology portfolio of Industry 4.0 provide advances and challenges on SDGs as well as Potential Negative Impacts and Barriers that also may arise.

### INDUSTRY 4.0 EFFECT ON SDGs

Industry 4.0 is mainly based on the integration of information and communication technologies and industrial technologies. It is also strongly dependent on building a Cyber-Physical System (CPS), in order to promote manufacturing, businesses and supply chains to optimize productivity and competitiveness. It tends to refer though to a broader concept involving several technologies, which include among others: artificial intelligence (AI), horizontal and vertical system integration, simulation, autonomous robot systems, vehicles and machines, big data analysis, augmentable reality, the industrial internet of things, cyber security, the cloud computing, additive manufacturing, blockchain technology.

The sustainability's Agenda 2030, raised by the United Nation with the 17 major SDGs represents an important industrial map that should also be tackled within the fourth Industrial Revolution. On one hand, we are facing the challenge of producing increasing outputs from depleting resources, causing less pollution and harm, for meeting growing consumption. On the other hand, the emergence of Industry 4.0 is often causing the fear of job loss and growing inequality. Nowadays, two schools of thought have occurred: those who see a huge incoming labor substitution and subsequent job displacement, and those who expect unlimited opportunities and new job categories.

Three pillars of Industry 4.0 are the main focus of this paper and are further analyzed and discussed: a) Artificial Intelligence (AI), b) Internet of Things (IoT) and Autonomous Robots. In that context, herebelow, the effect of industry 4.0 on UN's SDG's based in the literature, is summarized briefly [8]:

1. Artificial Intelligence. Some indicative applications are the following [8] :

1. *Advances and breakthroughs in medical research, material sciences and energy technologies.*
2. *Automated monitoring and analysis of the environment as well as satellite imagery.*
3. *Automation of vehicles reducing pollution and traffic deaths.*
4. *Intelligent automated supply chains reducing the waste and driving efficiency.*

The aforementioned applications could be linked with the following SDGs and have a Positive impact (+):

SDG 2 (End hunger):

- Analyze seed genetic data to create crops that can thrive and adapt in changing conditions.
- Increase effectiveness of food supply chains by using AI technologies to drive insights that improve efficiency and reduce wastage.
- Support for farmers' decision-making and increases in productivity.

SDG 3 (Ensure healthy lives):

- Review healthcare records to improve the quality of treatments and provide better and faster health care services.
- Analysis of large-scale genetic data sets to invent new types of treatment and precision medicines adapted for individuals.
- Provide expert assistance in diagnosis especially in repetitive tasks such as analysis of images and large bodies of research information.
- Provide immediate first line consultants to benefit the time before to visit a doctor.
- Reduce the pressure on frontline workers by using robots in healthcare.
- Accelerate the development of new drugs so make treatments to reach those who need them more quickly.

SDG 4 (Inclusive and lifelong learning):

- Improve learning outcomes through the analysis of data about individual learning, social and learning contexts, and personal interests.
- Provide virtual mentors for learners by integrating modeling, social simulation and knowledge representation.
- Provide lifelong learning companions that help the learner to adapt and build new skills throughout their lifetime.

SDG 7 (Modern energy):

- Optimize energy generation and reduce environmental impact through analysis of operational and environmental data.
- Help consumers to find the most affordable and clean energy deals by using AI agents.

SDG 9 (Sustainable industrialization, infrastructure and innovation)

- Help employees to make better decisions by providing insights based upon the analysis of complex data settings.
- Accelerate innovation cycles and improve time to market by using machine learning and predictive analytics.
- TouristTech, AgroTech

SDG 11 (Make cities and human settlement sustainable):

- Achieve smarter and more efficient design of cities and communities, by matching the relationships between design decisions and their impacts on people's daily lives.
- Enhance citizens to make wiser choices for themselves and their own communities.
- Organize and optimize traffic flows and energy allocation within cities, as well as the use of wider physical and human resources to enhance benefits.

SDG 13 (Combat climate change):

- Improve actions to control climate change through better modeling and multifactorial analysis of big data.

SDG 14/15 (Conserve and sustain oceans, seas, and marine resources/ Increase sustainability of ecosystems, and biodiversity):

- Generate insight to help to improve the sustainable management of land resources – soil, forests, biodiversity and allow greater understanding of the impact of land use choices through predictive analytics and machine learning.

On the other hand we can identify Potential Negative Impacts (-) and Barriers as well:

- As with many emerging technologies, the military is one of the early adopters, meaning those countries with larger defense budgets may benefit from early applications. AI inevitably may be deployed for criminal purposes, and in warfare, with implications for current legal and ethical frameworks.
- AI may lead to unemployment in many industries and professions<sup>[9]</sup>. According to the World Economic forum<sup>[10]</sup> and also McKisney Institute, 7.1 million jobs may be lost until the middle of the next decade and characteristically it can affect the class of blue collars (manual workers) as well as "white" (scientists, professionals).

II. Internet of things. Some indicative applications are the following<sup>[11]</sup> :

1. *Consumer: Smart home, Elder care.*

2. *Commercial: Medical and healthcare, Transportation, Building and home automation.*

3. *Industrial: Manufacturing, Agriculture.*

4. *Infrastructure: Metropolitan scale deployments, Energy management, Environmental monitoring, Living Lab.*

The aforementioned applications could be linked with the following SDGs and have a positive impact:

SDG 9 (Build resilient, infrastructure, promote inclusive and sustainable industrialization and foster innovation).

SDG7 (Ensure access to affordable, reliable, sustainable and modern energy for all).

- Accessing more data.
- IoT enabled inventory management process.
- Employees working remotely.
- Rapid and easy accessibility.
- Efficiency and productivity.
- Enhance finding new consumers with new needs.
- New staffing members required.
- Continuous customer engagement.

On the negative side we can pinpoint <sup>[12, 13]</sup> :

- Wallet off internet (Cyber-attacks).
- Cloud Attacks: Given that a large amount of the data that will run the IoT will be stored in the cloud, it is likely that cloud providers will be one of the principle targets in this kind of war. A single cloud provider could cause \$50 billion to \$120 billion of economic damage.
- Botnet Problems: IoT botnets can direct enormous swarms of connected sensors like thermostats or sprinkler controllers to cause damaging and unpredictable spikes in infrastructure use, leading to things like power surges, destructive water hammer attacks, or reduced availability of critical infrastructure on a city or statewide level.
- Lack of Confidence: There is little confidence that IoT service providers and device manufacturers will be able to protect IoT devices and more importantly the integrity of the data created, stored and transmitted by these devices <sup>[14]</sup> .
- Environmental sustainability impact: Modern electronics are replete with a wide variety of heavy metals and rare-earth metals, as well as highly toxic synthetic chemicals. This makes them extremely difficult to properly recycle <sup>[15]</sup> .

III. Autonomous Robots. Some indicative applications may include<sup>[16]</sup> :

1. *Self-maintenance*
2. *Sensing the environment*
3. *Task performance: Personal Delivery Devices*
4. *Autonomous Indoor and outdoor navigation*

Positive impacts on SDGs can be identified in the following areas:

SDG 4 (Inclusive and lifelong learning).

SDG 3 (Ensure healthy lives): daVinci, Actuated and sensory prostheses, Endoscopy-Bot Orthoses (AKA Exoskeletons), Disinfectant bots, Clinical Training Bots, Companion bots, Telepresence Robot Surrogates, Robotic nurses, Pharma-Botics, Robotic Assisted Biopsy, Antibacterial nanorobots.

SDG 9 (Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation): Personal Delivery Devices, Iron Ox, Agri Farm.

SDG 10 (Reduce inequality within and among countries) / SDG 2 (End hunger, achieve food security and improved nutrition and promote sustainable agriculture): Nursery Planting, Crop Seeding, Crop Monitoring and Analysis, Fertilizing and Irrigation, Crop Weeding and Spraying, Thinning and Pruning, Autonomous Tractors, Picking and Harvesting, Shepherding and Herding, Milking.

SDG 14 (Conserve and sustain oceans, seas, and marine resources): OceanOne, robotic pigs.

On the other hand, negative impacts that may arise include:

- Given that the use of robots requires a high level of expertise and know-how rather than low-cost workers, replacement of machine operators could worsen the gap between employee wages and create greater inequality, especially in manual workers <sup>[9,10]</sup> . It is estimated that in 2030, 800 million jobs will be replaced by robots – corresponding to 1/5 of the world's current workforce <sup>[12, 17]</sup> .
- Another potential problem is the intelligent control part, that included in the so-called Robot ethics, a sub-field of ethics of technology, specifically information technology, and it has close links to legal as well as socio-economic concerns. Researchers from diverse areas are beginning to tackle ethical questions about creating robotic technology and implementing it in societies, in a way that will still ensure the safety of the human race <sup>[18]</sup> .

- An addition problem is discussed last years with the capacity of the robots to find their own resources through foraging (looking for food, which includes both energy and spare parts)<sup>[19]</sup>.

### **GREECE 4.0 TOWARDS SDGs**

According to the recent report of Bertelsmann Stiftung SDSN<sup>[20]</sup>, Greece ranks 48<sup>th</sup> out of the 156 countries that were rated globally. Of the 28 countries of the European Union, however, Greece only ranks above Bulgaria and Cyprus. Among European countries 8 of them are in the top ten<sup>[20]</sup>.

The Hellenic Federation of Enterprises' Council on Sustainable Development, undertook a study regarding the level of awareness, readiness and willingness of Greek companies towards integrating the SDGs in their strategy<sup>[21]</sup>. Based on their answers, the following remarks can be drawn:<sup>[7]</sup>

1. SDG 8 (Sustained economic Growth and productive employment) and SDG 9 (Sustainable industrialization, infrastructure and innovation) are prioritized by the majority of respondents, regardless of company size or business sector, while the highest priority SDGs are related to all three pillars of Sustainable Development –economic, social and environmental. This implies that the country's development planning should incorporate the SDGs and intensity of the effort required to achieve these Goals. Next on the relevant ranking are SDG 7 (Affordable and Clean Energy), SDG 4 (Quality Education), SDG 17 (Partnerships for the Goals), SDG 5 (Gender Equality) and SDG 13 (Climate Action).
2. Large companies are better prepared; nevertheless, the majority, regardless of size, acknowledges the significance of the goals even for those that have not yet begun any efforts for integration.
3. Senior executives, regardless of company size, have a high level of knowledge of sustainable development issues related to the Goals. The engagement and awareness of middle management executives on sustainable development issues related to the Goals constitute a crucial factor for their successful implementation.
4. Large companies are more willing to proceed to the next level of SDG integration, related to their activities, in relation to medium and small ones.
5. The limited implementation and in some cases the lack of regulatory framework and incentives emerge as the main barriers for the majority of participants, although different integration difficulties remain depending on size, sector and existing level of maturity, creating the need for tailor-made initiatives from both the State and business community.

### **CONCLUSIONS**

As the era of Industry 4.0 has begun, several ancillary tools need to be adopted in order to obtain improvements in achieving the SDGs. The organization's strategy enhances its business value, improve business risk management and ensure its acceptance by the societies in which it operates. In order to avoid increased inequality and unemployment in the future, smart and planned actions should be undertaken by governments today in order to establish a workforce that will possess the required skills for a changed world. The way is neither obvious nor easy but, as has been high lightened by many official surveys, is the key strategy to the overall success of the venture, which is none other than the exit from the recession in a sustainable way.

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