Preface to Transitioning to Sustainable Industry, Innovation and Infrastructure

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1. Introduction

Each of us intends to implement transformation in a sustainable manner. We are aware of our role for the environment and, in striving to be a leader in sustainable transformation, we know what a great responsibility we have to preserve the environment for ourselves and for future generations. The concept of sustainability, since its introduction (Our Common Future, Brundtland Report), has constantly been evolving. Sustainability is about intergenerational solidarity in finding solutions to ensure continued growth that allow organizations, companies and each of us to be proactive. Sustainability is an important part of economic systems and global law.

We believe that this volume is a systemic issue, taking into account the contexts of social ecology and the environment (Cynarski 2014; Eiglad 2015). New urban and industrial infrastructure and innovation in this area should take into account new urban plans for the creation of human-friendly spaces and smart cities (Azkuna 2012), as well as the impact of the development of tourism on the changes in this space and great sporting and cultural events (Sieber and Cynarski 2010; Edizel and Ward 2016). Facilities for people with disabilities are included in the infrastructure that is being built. Innovations are being made regarding the materials used and savings, including waste management, energy savings (preference for green energy) and other resources used in economies and industries (Gajdzik and Sroka 2021; Gajdzik et al. 2023).

2. Sustainability in a World of Modern Technology

In the past, sustainability was the doctrine of economics, which assumes a quality of life at the level allowed by the current development of civilization. The idea of sustainable development is summarized in the first sentence of the WCED—Our Common Future report: "At the current level of civilization, sustainable development is possible, that is, a development in which the needs of the present generation can be met without diminishing the chances of future generations meeting them" (Brundtland 1987). A sustainable economy (including industry) should balance economic growth, environmental protection, quality of life and human health. It is not only about the natural environment, but also the artificial, i.e., man-made

(as in Chicago School's work on human ecology), environment. The doctrine of sustainable development strives for social justice by using environmental projects for higher efficiency. It is important to work and life now, but needs to factor in future generations and their heritage, both cultural and natural (cf. Kozłowski 2000, 2007; Caradonna 2014; Alhaddi 2015). The priority is to set ecological standards for preserving the homeostasis of the ecosystem.

In a world of modern technology (the fourth industrial revolution), the popularized concept of Industry 4.0 and rapid business development, the impact of industry, transport, cities, etc., on climate change and caring for the ecosystem as a whole are becoming increasingly important. Taking care of the needs of the present generation in a sustainable manner, as well as taking into account the environment and the future of future generations, is the strategic goal of modern civilization.

Modern business is becoming more and more digital and intelligent. Enterprises implement new technologies of the fourth industrial revolution in the sustainable environment. They use their own paths to Industry 4.0 (Gajdzik et al. 2021). Sustainable Industry 4.0 is a new concept for discussion by scientists and businesses (Gajdzik et al. 2020). This concept has been gaining more and more interest among scientists and practitioners in recent years because there is more and more information regarding Industry 4.0 (Kagermann 2013). Factories are becoming smarter, more efficient, safer and more environmentally friendly by linking and integrating production technologies and devices, information and communication systems and data and services into network infrastructures (Saniuk et al. 2020). New business models with cyber-physical systems (CPSs) are being built (Lee et al. 2015; Gajdzik 2020, chap. 3), but sustainability must not be forgotten in these models. In a new concept called Industry 5.0, sustainability has been given even more prominence. In the European document titled Industry 5.0: Towards more sustainable, resilient and human-centric industry (7 January 2021), we read (citation from Research and Innovation, European Commission) that "the common environmental goals can only be achieved by incorporating new technologies and rethinking the production processes with respect to the environmental impacts. Industry must lead by example in the Green transition".

3. Contents of the Book

3.1. Towards Smart Steel Manufacturing

This book consists of five chapters. In the first chapter, the author of the chapter, B. Gajdzik, presents the path of transformation of the steel sector in Poland to Industry 4.0. Since 2011, when it was presented at the Hannover fair, the concept of Industry

4.0 has become more and more popular. Technologies described as the pillars of the concept are modern determinants of industrial development (Kagermann 2013; Schwab 2017). More and more companies in different industries are implementing these pillars because they want to create smart manufacturing strategies. One of these industries which is actively transforming towards smart is steelworks. Large capital groups of the global steel industry are investing in the latest generation of solutions to achieve smart steel manufacturing (Gajdzik 2022; Gajdzik and Wolniak 2021). One of the large capital groups also has plants in Poland. The transition of smelters in Poland to the use of smart requirements was preceded by a profound restructuring in the 1990s, and after that, when foreign capital entered the Polish market, the process of market transformation of Polish steelwork was initiated. The path of Polish steelwork to being competitive on the market was long (Gajdzik 2013). Currently, steel companies in Poland wish to become more and more smart. Changes to Industry 4.0 are implemented at the operational level (process optimization), and human reorganization occurs (Gajdzik and Wolniak 2022). If the demand for steel in consumer markets continues to grow, smelters can expect to co-create intelligent processes with consumers in 2030 (based on the results of filed research: see Gajdzik 2022, Monograph).

3.2. RPL Protocol and Internet of Things (IoT)

The second chapter of our book is about enhancing the RPL protocol using an artificial neural network to create sustainable IoT infrastructure. IoT is one of the pillars of Industry 4.0, a pillar that will play a telling role in sustainable development in the near future. The authors of the chapter, S. Kuwelkar and H. Virani, presented the protocol RPL. The protocol has been proven to be efficient in tackling major communication issues. The efficiency of the network largely depends on the design of the protocol at the network layer of the communication stack. Over the years, RPL has attracted many researchers who have contributed to improving this protocol in order to meet the requirements of energy efficiency, real-time implementation, scalability and reliability. The authors of the chapter present several methods by which to improve the protocol, and, in the final part of the section, point out the key prospect, neural networks. The authors stress the importance of an improved protocol in terms of improving energy efficiency.

3.3. Urban Planning in Sustainability

The author, W. Vaz, present the historical reasons for the current state of suburban development in the US. Vaz explains some of the key features of urbanism,

such as automobile design and single-family zones, as well as the problems they cause, namely, rising home prices, pollution and municipal insolvency. Examples of recent infrastructure failures were cited. Changes in historical trends caused by the COVID-19 pandemic are highlighted: migration from cities, the resulting effects on various industries, and changes in public transportation. Finally, upcoming policy and industry changes are discussed, along with suggestions for addressing the described problems. These primarily include redesigning urban planning, making cities more pedestrian-friendly, investing in public transportation and relaxing restrictive zoning regulations to allow for denser building.

3.4. Innovation in Urban Infrastructure and Development of Physical Culture

In the fourth chapter, the authors, W. J. Cynarski and Leszek Woźniak, present the positive impact of improving sports infrastructure (physical culture) in urban spaces on the living conditions of residents. The city of Strzyżów (Podkarpackie voivodeship, Poland) was used as a case study. Recreational physical activity in the open air (cycling, horseback riding, other open-air sports) simultaneously serves social health, the development of physical culture and the sustainable development of the city and municipality. Residents of cities and towns want urban space for themselves, and they want that space to enable them to live active and healthy lifestyles. In modern cities and towns, sports and tourism infrastructure are being developed for everyone, including people with disabilities.

3.5. Corporate Social Responsibility Reporting

The chapter focuses largely on the principles of corporate social responsibility. The authors present the most common methods and areas of SCR reporting, focusing on non-financial data. The authors, B. Orzeł and R. Wolniak, presented statistical data on corporate social responsibility in various European countries. In 1987, the Bruntland Report defined sustainability as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Since that year, everyone has participated in building sustainable economies and industries. Sustainability has become the key to many "doors." One does not open a business door without a sustainable production strategy. One does not become a conscious citizen of the globe without waste segregation. We are all learning to conserve environmental resources. In the era of Industry 4.0, we expect the latest generation of technology to help us in this continuous transformation.

4. Conclusions

The principles of sustainable development have many addressees; thus, our book is not homogeneous. There are chapters on the impact of industry on sustainability (especially environmentally disruptive industries, e.g., the steel industry), chapters describing (presenting) scientific methods for measuring various aspects of sustainability, a chapter on urban planning (e.g., United States) as well as urban infrastructure (case study, Poland) and a chapter on corporate social responsibility.

The authors of the individual chapters have contributed to promoting the idea of sustainability. The content in the book follows a holistic approach, giving all people, regardless of economic or social factors, the opportunity to acquire the skills necessary to achieve sustainable personal development.

The authors of the book thank everyone for making their scientific work available for the promotion of sustainable development. As the title of the book, "Transitioning to Sustainable Industry, Innovation and Infrastructure," indicates, sustainability is an ongoing process for our benefit and that of future generations.

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