SDG9 – INDUSTRY, INNOVATION AND INFRASTRUCTURE

CONCISE GUIDES TO THE UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS

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BY

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INVESTOR IN PEOPLE

This book is dedicated to my professors, colleagues, former students, family, and friends, all my fellow adventurers on my tireless quest for sustainability. Moreover, I also dedicate it to those students worldwide who will become the agents of change needed to achieve inclusive and sustainable industrialisation and a better world.

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Luis Velazquez, PhD, is a Sustainability Senior Sustainability Researcher with over 30 years of experience as an Industrial Engineer. He holds a Doctoral degree in Engineering Science with a major in Cleaner Production and Pollution Prevention from the University of Massachusetts Lowell. He has been a Sustainability Research Intern at several higher education institutions, such as the Center for Health and the Global Environment of the Harvard School of Public Health, Boston, USA; the Paulista University, Sao Paulo, Brazil; Erasmus University, Rotterdam, Holland; and the University of Applied Sciences in Zittau/Görlitz, Germany. Since 1993, he has served as a Project Manager in several sustainability initiatives in different countries. In addition, he has conducted several investigations in the Sustainability, Cleaner Production, and Pollution Prevention fields and the study of sustainable universities.

DISCLAIMER

The views expressed in this book do not reflect the opinions or views of any organisation, agency, or program of the United Nations or any other international agency.

PREFACE

Although *SDG9: Industry, Innovation and Infrastructure* targets students and professors in the field of Engineering Management, it is also intended for those students, professors, researchers, and practitioners in related fields. It has been almost 30 years since I graduated as an industrial engineer from the University of Sonora in Mexico and practically the same time since Sustainable Development captivated me.

My quest for sustainability in the industry has been fascinating and challenging, as I have had successes and disappointments. During these three decades, I have had the opportunity to study sustainability at prestigious universities worldwide. Everything I have experienced has been valuable, but if I had to select the most valuable thing, without a doubt, it is the experiences shared with my colleagues and with students. I have collaborated with sustainability experts in North America, South America, Europe, Asia, Africa, and Arabia; everyone taught me so much about sustainability.

The invitation to write this book came from a researcher in Germany whom I consider an icon of Sustainability Science; however, my most significant spiritual motivation has always been the students. For them, I accepted the invitation, hoping that they will find inspiration to be agents of change and soon help achieve inclusive and sustainable industrialisation. The students have been an injection of enthusiasm and optimism at a most challenging moment of my career; therefore, a reason

not to give up. While I do not consider myself a sustainability expert, writing about inclusive and sustainable industrialisation initially did not seem as challenging as it turned out.

The most challenging phase was gathering information about SDG9 because there appears to be a lack of reliable SDG9 information available and what exists is hard to find. The searching for information lasted months and sometimes was frustrating and futile. This fact is likely because progress towards SDG9 has not been as positive as it might be. It is not that the current SDG9 published literature is wrong, but the evidence is not conclusive. In general, though, information sources often offer qualitative information, and quantitative data are scarce. Moreover, there is no trustworthy or go-to source of information that indicates with certainty the progress towards the 2030 Agenda; therefore, generating insights about assessing progress towards the achievement of SDG9 was somewhat difficult; it was like piecing together a puzzle. This situation is not exclusive to SDG9; thus, several of the arguments expressed in the book might apply to multiple SDGs.

In the end, I have managed to present a comprehensive framework within which complex SDG9 issues can be understood to be adapted and applied effectively and efficiently in particular situations. Therefore, I hope that this book helps build qualified human resources to accelerate progress towards SDG9 by increasing awareness and knowledge towards a low-carbon and inclusive industrialisation.

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I am entirely indebted to my colleague Krystal Perkins, from the Department of Psychology, School of Natural and Social Sciences, Purchase College, SUNY, USA, for her support, inspiration, and guidance during the writing process. I would also like to acknowledge my colleagues in the Sustainability Graduate Program of the University of Sonora, who had helped me tune up the book's content.

Finally, yet importantly, I would like to thank my lovely family and friends for their patient and understanding during the months I spent writing the book.

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INTRODUCTION

There is nothing more attractive for students committed to sustainability than becoming agents of change for their community, country, or, why not, the world. To achieve that dream, the sacrifices that have to be made, the hours of study, sleeplessness, and even disappointments do not matter. To enhance their learning experience, the purpose of this book is twofold: to present and debate the relevant body of SDG9 literature with a particular focus on U.N. documents and explore the fascinating and cross-cutting aspects that jeopardise achieving SDG9 Industry, innovation, and infrastructure.

This book is addressed to talented bachelor and postgraduate students and professors in the field of Engineering Management or closely related academic programs. For them, contributing to the consolidation of inclusive and sustainable industrialisation should be the highest aspiration in their professional life.

The U.N. 2030 Agenda aims to meet 17 sustainability goals by 2030. Still, SDG9 is the most significant for all industry sectors because it seeks new steps towards inclusive and sustainable industrialisation. For the U.N., visioning, inclusive, and sustainable industrialisation had been a recurrent ambition since, the World Summit on Sustainable Development, better known as the Earth Summit, was held in Rio de Janeiro almost thirty years ago.

However, the U.N.'s insistence on fostering inclusive and sustainable industrialisation has not rendered the expected results. Outcomes so far are, to say at least, disappointing. Worse, the COVID-19 pandemic has exacerbated conditions in almost all sectors, especially in industrial settings, which has further complicated the future achievements towards SDG9.

The first chapter starts with an overview of the fundamental concepts to better understand SDG9 and its targets. Then, the importance of issues like resilient infrastructure, technological innovation, information and communications technology, inclusive and sustainable industrialisation, and financial services are debated to gain valuable insights on SDG9.

The second chapter presents a detailed analysis to understand how member states' delegations report the progress made in implementing the Sustainable Development Goals (SDGs) and targets as mandated in the A/RES/70/1 Resolution. In this chapter, students will have the opportunity to review U.N. landmark events from which the 2030 Agenda emerged. Then, students will be able to delve into the guidance documents issued by the U.N. High-level Political Forum on Sustainable Development (HLPF) for reviewing individual countries' progress. The most controversial issue covered in this chapter undoubtedly concerns information gathering. The chapter also covers the guidelines of two independent external organisations, such as the Global Compact Initiative and Global Reporting Initiative used by firms to legitimate sustainability reporting content and increase reliability. The chapter concludes with a brief description of required procedures to submit and present Voluntary National Reviews (VNRs).

The purpose of the third chapter is to examine factors involved in reporting and other critical issues necessary to understand the progress and how we are progressing towards SDG9. From this point on, data for our debate comes mainly from U.N. sources such as the 2017 High-level Political Forum

on Sustainable Development and the Sustainable Development Goals Report 2020. The official information is complemented with independent assessments of 2020 VNRs, other SDGs reports, and scientific literature.

The last chapter covers the Decade of Action to improve actual efforts to accomplish the 2030 Agenda. The industry would undoubtedly play an essential role in supporting this call; however, for this to be possible, it will first have recover from the effects of the pandemic. This chapter illustrates the adverse impacts that the construction, manufacturing, and hospitality industries have suffered since the beginning of the COVID-19 pandemic and how they gradually have returned to the new normal. The chapter also shows the case of the industry that could be considered the 'champion in the COVID era', the high-tech industry. Finally, the book is closed with an invitation to *Build Back Better Together,* reflecting on the fundamental principle of SDG9, which is sustainable industrialisation, but above all, inclusivity. The SDG9 cannot be considered achieved until its benefits are transferred to the countries in the global south.

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THE FUNDAMENTAL CONCEPTS OF SDG9

ABSTRACT

The 2030 United Nations Agenda has framed Sustainable Development Goal 9 around eight targets outlined in Resolution A/RES/71/313 (U.N. General Assembly, 2017). The purpose of this chapter is that the lectors, without much previous knowledge on SDG9, understand the fundamental concepts involved in each of the eight targets. Multiple discussion points emerge when reflecting on the nature of these concepts and others emerge when reflecting on them in the industry settings. The first section of this chapter covers issues concerning resilient infrastructure. Resilient infrastructure is related to targets 9.1, 9.4, and 9.a. This concept needs to cope with extreme natural events potentially associated with global warming and climate change. The second section focusses on the importance of technological innovation in the context of targets 9.5 and 9.b. In a business domain, innovation allows to strengthen industrial competitiveness and increases corporate sustainability. The third concept covered in this chapter is the Information and

Communication Technology that is a key to understand target 9.c. Last but not the least, two essential ideas are discussed: Inclusive and sustainable industrialisation and financial services, which are fundamental elements in target 9.2 and target 9.3. In a certain way, it is possible to conclude that both concepts integrate all previous conceptions.

Keywords: Resilient infrastructure; innovation; information and communication technology; inclusive and sustainable industrialisation; financial services; SDG9

Within the 2030 Agenda, SDG9 is one of the most important, if not the most important, for the industry and, therefore, for a country's inclusive and sustainable development and growth. In the following sections, each of the fundamental concepts and terms is broken down to understand this objective.

1.1. RESILIENT INFRASTRUCTURE

Resilient infrastructure is one of the most complicated ideas for students to understand. This concept involves a significant amount of subjectivity when deciding upon the level of resilience. The idea of resilient infrastructure relates to the following SDG9's targets:

> *TARGET 9.1: Develop quality, reliable, sustainable, and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all. (U.N. General Assembly, 2017)*
>
> *TARGET 9.4: By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action*

> *in accordance with their respective capabilities. (U.N. General Assembly, 2017)*
>
> *TARGET 9.a: Facilitate sustainable and resilient infrastructure development in developing countries through enhanced financial, technological, and technical support to African countries, least developed countries, landlocked developing countries and small island developing States. (U.N. General Assembly, 2017)*

There are many factors to be considered in understanding what resilient infrastructure is; for instance, infrastructure can be climate-resilient but fragile to fire, earthquakes, or floods. Let us start with the basics; infrastructure refers to an entity's physical structure such as firm, city, region, or country. On the other hand, resilience is the capability to recover from or adjust to change, whatever the cause, in the shortest period possible. While no standard definition of the term resilient infrastructure exists across various disciplines, in sustainability, the term strongly relates to the system's capacity to return to its original sustainability level before a natural disaster (Chatterjee & Layton, 2020).

Concerning this approach, Helmrich et al. (2020) conceptualise a resilient infrastructure system as resilient to numerous potential disturbances, not only natural disasters, by adopting 'Life's Principles' associated with the resilience in ecological systems. On the other hand, from an engineering approach, resilience is understood as the structural integrity of systems and physical infrastructure, essential to ensure continued operational performance during extreme loading (EOD Resilience Resources, 2016). Therefore, other anthropogenic potential disturbances can be caused by human error, such as fires, explosions, etc. The essential rationality of integrating ecological principles in industrial settings is not new; it gained popularity by the mid-nineties with the emergence of industrial ecology.

For Industrial Ecology scholars, natural and industrial systems are intrinsically interconnected and mutually reinforcing, particularly regarding resources and industrial growth where competition and cooperation are present in a balanced way (Ehrenfeld, 2000; Tilley, 2003).

Similarly, the relationship between sustainability and resilient infrastructure has to be found in both directions. That is to say; sustainability can influence the infrastructure's resilience and vice versa; a resilient infrastructure can determine the sustainability of a system (Gromek & Sobolewski, 2020). During extreme weather conditions, accidents, and natural disasters, infrastructure systems are highly vulnerable. This situation is particularly critical in climate change-related events because it is a matter of life and death in many of the emerging countries of the Global South (Chirisa, Bandauko, Mazhindu, Kwangwama, & Chikowore, 2016).

Building resilient infrastructure is not enough to warrant the resilience of systems. The governance of resilient infrastructure is another vital component to strengthening countries' productivity and competitiveness (Huck, Monstadt, Driessen, & Rudolph-Cleff, 2021). At least, private participation in building infrastructure and its governance has always been controversial (Baker, Khater, & Haddad, 2019). The debate heats up for critical infrastructures such as those related to electricity, gas, and water (MacArthur, Hoicka, Castleden, Das, & Lieu, 2020; Spencer & Meng, 2019). On the other hand, middle-income and lower-income countries currently spend many funds to procure and administer COVID-19 vaccines that they might have no choice but support the crowding-in of private investment. However, it can no longer be taken for granted. According to a novel World Bank Infrastructure report, the worldwide private investment in infrastructure decreased by 56% during the first months of the COVID-19 pandemic compared to investment levels in the first half-year of 2019 (The World Bank, 2020).