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Policy analysis in Romania regarding the transition to an industry with low carbon emissions

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Abstract. This paper aims to perform a policy analysis and determine improve pathways for the Romanian industrial field in terms of the low carbon industry transition. In order to obtain the expected results, the Hoshin Kanri methodology has been applied upon the existing strategic framework in order to determine possible concrete actions to be undertaken by the companies. The Romanian manufacturing industry must become more competitive and at the same time align with the goals of carbon neutrality assumed at European and national level. Since the programmatic documents are rather general, the authors believe that firms could benefit from more direct support and assistance, in a collaboration between the public and private sectors.

Keywords. low carbon, carbon emissions, manufacturing, Hoshin Kanri

1. Introduction

Following the Kyoto Protocol, Romania adopted the National strategy on climate change and economic growth based on low carbon emissions (Romanian Goverment, World Bank, 2015, pg. 25-26). This took place at Romania's initiative to stimulate economic growth through proposals to reduce the carbon emissions. The strategic objectives were proposed by the Government of Romania and the World Bank within a project developed through the Operational Programme for Technical Assistance 2007-2013. This document establishes a series of operational objectives whose deadline ends in 2020 and it is divided into two categories; the first category relates to "reducing greenhouse gas emissions and to increasing the environment capacity to absorb CO_2 from the atmosphere", while the second category proposes measures regarding "climate change mitigation" (Romanian Goverment, World Bank, 2015, pg. 29, 65). The main purpose of climate and emissions related measures is to improve the quality of life of the people and to bring added value to products and processes in the industrial field in Romania.

This analysis is based on the application of the Hoshin Kanri approach which is underpinned by the X matrix tool which helps to deploy the strategic goals into workable objectives and projects. The methodology is effective because it allows to pursue long-term changes, as well as improvements on a daily basis. With this method, objectives must be clearly defined and well structured (Lean Factories, n.d.). At the end, after determining the four categories of the matrix, the dependencies between them are established (Kanbanize, 2020) using three different correlation modes: strong correlation, medium correlation, and weak correlation.

2. Literature review

A fast transition to a low-carbon economy is needed, and the topic is pressing in the face of climate change. Due to this reason, there is a considerable body od knowledge and research being published in the present. In order to connect our study to the larger picture in this field, we present below some recent findings connected to the same goal.

Scientific content	Source
In this paper, the author highlights the need to make key industry players aware of the transition to an ecological form of manufacturing relying on clean energy, which is associated with reduced carbon emissions.	(Xiangsheng Dou, 2017)
The authors present a long-term study, covering 19 years starting in 1991, which analyzes the changes in carbon emissions of the cement producing sector, in relation to the rapid development of infrastructure in China. Possible improvement measures are presented in the context of the accelerating economic growth.	(Lin & Zhang, 2016)
In this article the researchers perform a detailed analysis of two power related and two transportation related transition scenarios that can be included in the low carbon economy. The results classify the 128 associated benefits into several categories, including technical, economic, and social.	(Sovacool, Martiskainen, Hook, & Baker, 2020)
The paper recognizes the importance of regional level planning in deploying national low carbon innovation policies into local measures and initiatives and it investigates the drawbacks manifested in the UK. Based on 35 interviews with SME managers, the authors propose improvements to the policy mix.	(Uyarra, Shapira, & Harding, 2016)
In this work, the authors use a significant body of literature to identify a diverse framework of intrinsic and extrinsic factors that play an important role in the manufacturing sector's journey towards low carbon emissions, either supporting or hindering it.	(Olatunji, et al., 2019)
The standard ISO 14067:2018 was published to help companies determine and reduce their carbon footprint, establishing the principles, the requirements, and the guidelines to be followed in the process.	(ISO, 2018)

3. Results analysis

X-Matrix begins with the clear establishment of long-term goals. In this paper we assume three fundamental objectives based on the strategic documents, which are then elaborated into the other three categories. First comes the proposal of annual objectives, which should contribute to the achievement of the fundamental objectives for reducing emissions and climate change effects. The next category (step) is dedicated to improvements opportunities or projects which are established to fulfil the annual objectives. The last category (step) is represented by the concrete improvement targets, which are designed around specific values of key indicators

following the contents of the previously established projects. In our study, the work team has used the policy study to generate categories two and three and stakeholder consultation, as well as its own industrial experience, to generate step four.

Legend: ● strong relationship, ◎ medium relationship, ○ weak relationship

Annual Objectives (left columns, order as shown 5→1):
- AO5. Implementing circular economy policies
- AO4. Implementing incentives in Climate Change Mitigation
- AO3. Implementing the environmental management system and continuous improvement projects
- AO2. Investing in equipments to reduce CO2 emissions
- AO1. Reducing CO2 emissions by replacing / minimizing raw materials

Target to Improve (right columns, 1→8):
- TI1. Adopting models and solutions by over 5% of the manufacturing companies
- TI2. Implementing ISO 14067 into 20% of manufacturing firms
- TI3. Reaching at least 19% of energy efficiency compared to the current situation
- TI4. Increasing by 20% the number of installations conforming to IED
- TI5. Reducing the number of certificates by 1.74%
- TI6. Increasing of public investment by over 10% until 2030
- TI7. Deductible insurance for industrial losses caused by climate change
- TI8. Funding research and innovation projects through Horizon Europe and national programs

Top Level Improvement (rows):

AO5	AO4	AO3	AO2	AO1	Top Level Improvement	TI1	TI2	TI3	TI4	TI5	TI6	TI7	TI8
●		◎	○		8. Promoting measures and benefits of circular economy implementation								●
○	●	◎			7. Supporting the use of insurance for industrial losses caused by climate change	○						●	
	●	◎	●	◎	6. Increasing public investment in decarbonisation and climate change				○	○	●		○
○		●	●	●	5. Applying / implementing emissions trading certificates	◎	○			●		○	
		●	◎		4. Transiting to IED Directive		○	○	●				
		●	●		3. Achieving a high level of energy efficiency	◎	◎	●	○	◎	○	○	
		●	◎		2. Adopting and implementing the ISO 14067 standard	◎	●						
			○	●	1. Adopting models and solutions to calculate the carbon footprint	●	◎		○				

Center diagonal labels: Top Level Improvement · Annual Objectives · Target to Improve · Breakthrough Objectives

Breakthrough Objectives (rows):

AO5	AO4	AO3	AO2	AO1	Breakthrough Objectives
○		◎	●	●	1. Reducing the intensity of CO2 emissions
○	◎	◎	●	●	2. Reducing the quantity of CO2 emissions
◎		●			3. Emphasizing voluntary managerial approaches

Figure 1 X-Matrix of policy analysis and deployment for the manufacturing industry

In figure 1, we present the overview of analytical elements deduced when establishing priorities for the Romanian manufacturing sector and their interconnections. In the list below, we present the source strategic documents for the examined measures:

Analysis element	Source	Analysis element	Source
Breakthrough objectives: 1-3	National strategy (Romanian Goverment, World Bank, 2015)	Top level improvement: 4	Conformation plan to Industrial Emissions Directive - IED (Agenția Națională pentru Protecția Mediului, 2014)
Annual objectives: 1-5	Own proposals (the level is missing from current documents)	Top level improvement: 5 & Target to improve: 5	HG 780/2006 (Guvernul României, 2016)
Top level improvement: 1, 2, 8	Own proposals	Target to improve: 1, 2, 4, 7, 8	Own proposals

Top level improvement: 3, 6, 7	National strategy (Romanian Goverment, World Bank, 2015)	Target to improve: 3, 6	National strategy (Romanian Goverment, World Bank, 2015)

The first fundamental goal that appears in the X matrix is to reduce the intensity of carbon emissions as proposed in the national strategy (Romanian Goverment, World Bank, 2015, p. 46), out of which one correlation sequence is analysed in detail to demonstrate the way in which we have used the approach. In order for the goal to be accomplished, one of the possible annual objectives is to foster the replacement of the raw materials used in the production system with emission friendly ones. As can be seen in the matrix, the correlation between the first fundamental goal and the first annual objective is a strong one. Adopting models and solutions for carbon footprint calculation is the improvement priority based on which this objective can be achieved, and, in turn, it can be verified in implementation by a short-term target of 5% diffusion in the manufacturing sector, for the first year of monitoring. As we can see in Figure 1, between the improvement target and the project opportunity there is also a strong correlation. Another demonstration comes from the long-term strategic goal of capitalizing on voluntary managerial approaches also proposed by the national strategy. In order to achieve a certain performance in terms of the emission of industrial processes, Romania must seek to adopt, in addition to the measures imposed by law, best practices regarding voluntary management instruments (Romanian Goverment, World Bank, 2015, p. 46). As a consequence, the implementation of environmental management systems and tools, and continuous improvement projects related to them was set as an annual objective. This objective correlates to an opportunity for improvement, namely, the adoption and implementation of the ISO 14067:2018 standard on the carbon footprint of products (ISO, 2018). The goal proposed by our team for the practical implementation in companies is the adoption of this standard in 20% of the Romanian industrial companies in the first year, as it can be operationalized through online training and platforms. The correlations between the goal, the objective, the opportunity, and the target mentioned above are all strong.

Of course, in the above paragraphs we have insisted on the measures mostly related to our team's own proposals, but similar logical chains can be established for the other elements which are already connected by their source strategic documents. Due to a lack of space, such descriptions have not been included here.

4. Conclusion

There is a strong need for Romania to become a country concerned with the environment, especially the carbon emissions it generates. Approaching an environmentally friendly attitude increases the performance level of companies, implicitly of the country.

Although Romania does not have prepared evaluation reports of the proposals indicated in the national strategy on climate change, the adoption and implementation of the goals proposed by it in the manner demonstrated above, ensures a good development plan for companies in the industrial field.

This matrix is constrained to the concrete strategic objectives set for the Romanian manufacturing industry regarding the transition to a low carbon industry. Companies should take such measures to reduce carbon emissions, because addressing such concerns can bring added value to the company's products and bottom line.

In the future, we intend to expand this analysis to include more strategic documents and plans at various levels of government (European, national, regional, local), more industries with a significant carbon footprint (e.g., energy production, agriculture, transport etc.) and other

strategic goals related to sustainable development (e.g., waste management and recyclability, resource depletion, air pollution).

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