Contents List available at VOLKSON PRESS Economics & Management Innovations(EMI)

DOI : <http://doi.org/10.26480/icemi.01.2017.404.405>

Evaluation of UN Sustainable Development Goal 9 in Thailand*

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ARTICLE DETAILS

Article History:

Received 02 october 2017
Accepted 06 october 2017
Available online 11 october 2017

Keywords:

Sustainable Development Goal 9,
sustainable industry, Thailand.

ABSTRACT

Sustainable Development Goal 9 (SDG 9) encompasses three important aspects of sustainable development: infrastructure, industrialization and innovation. Infrastructure provides the basic physical systems and structures essential to the operation of a society or enterprise. Industrialization drives economic growth, creates job opportunities and thereby reduces income poverty. Innovation advances the technological capabilities of industrial sectors and prompts the development of new skills. This paper adds some new insights to sustainable industry studies by evaluating SDG 9 in the context of Thailand.

1. Introduction

The development of a country is often synonymous with its industrialization. As an economic engine, industry touches all of our lives in direct and indirect ways. As the conversation about sustainable development spreads, the demand for industrial sustainability standard grows steadily. Although Thailand is already taking steps to meet these standards, this is the bare minimum required for the nation's industry to stay competitive. The real test will lie in making long-term plans for innovation and infrastructure that support growing trade and ensuring economic stability that inspires confidence (United Nations, 2016).

In the last century, Thailand was the region's brightest development success story. The nation shot to its leading position among the Newly Industrialized Countries in the 1980s and 1990s. Manufacturing currently accounts for 27 percent of Thailand's US 395 billion GDP. Thailand is now number 17 in the list of the world's top 20 manufacturing countries.

Green and sustainable industry is the main target of SDG 9. Thailand is in the early stages of moving toward a sustainable industry. The SDG index for Goal 9 of Thailand was the second lowest for any of the Goals.

Little work has been conducted on SDG 9 because of its relatively new issue. The objective of the paper is to evaluate SDG 9 in context of Thailand. The paper adds some new insights to sustainable industry studies by evaluating SDG 9 in the context of Thailand.

2. Methodology

To assess SDG Goal 9 indicators, we use the Analytic Hierarchy Process (AHP) (Saaty, 2008). The AHP is one of multi-criteria decision making methods through pairwise comparison, and relies on the judgment of experts to derive priority scales. The structure of the hierarchy decision making is follows:

- 1) State the objective or goal which is the readiness of indicators to achieve Goal 9.
- 2) Define the criteria for readiness assessment that are known by respondents, law enforcement including rules and regulations, resource including human resource and budget,

perception of stakeholders, and social recognition.

- 3) Define a set of alternatives, which are the 12 indicators of Goal 9 as follows:

Indicator 9.1.1 Proportion of the rural population who live within 2 km of an all-season road, Indicator 9.1.2 Passenger and freight volumes, by mode of transport,

Indicator 9.2.1 Manufacturing value added as a proportion of GDP and per capita, Indicator 9.2.2 Manufacturing employment as a proportion of total employment,

* The authors wish to acknowledge the helpful comments and suggestions of Chia-Lin Chang and Michael McAleer.

Indicator 9.3.1 Proportion of small-scale industries in total industry value added, Indicator 9.3.2 Proportion of small-scale industries with a loan or line of credit, Indicator 9.4.1 CO2 emission per unit of value added,

Indicator 9.5.1 Research and development expenditure as a proportion of GDP, Indicator 9.5.2 Researchers (in full-time equivalent) per million inhabitants,

Indicator 9.a.1 Total official international support (official development assistance plus other official flows) to infrastructure,

Indicator 9.b.1 Proportion of medium and high-tech industry value added in total value added, Indicator 9.c.1 Proportion of population covered by a mobile network, by technology.

The decision hierarchy starts from the top, with the goal of the decision, then the criteria goes through the intermediate level to a set of the alternatives at the lowest level (see Figure 1).

Figure 1 Decision making procedure of indicator readiness using AHP

4) Construct pairwise comparison matrices; five criteria and 12 alternatives are compared each time to find which is more important. Comparing two criteria, C1 and C2. If an expert gives a judgment that C1 is more important than C2, put scale between number 1 and 9¹, while if their advocacy C2 more than C1, then mark the reciprocal into an element of the matrix. The number of comparisons depends on the number of criteria (alternatives); that is, number of comparison = $n(n-1)/2$. The comparison matrix of criteria has size 5 by 5, and 12 by 12 for the comparison matrix of indicators.

5) Use the priorities obtained from the comparisons to weigh the priorities of criteria, the indicators with respect to each criterion, and the overall composite weight, which are normalized principal Eigen vectors or priority vectors.

6) Check the consistency of respondent answers.

3. Result

The results of the Analytic Hierarchy Process (AHP) in Tables 1 and 2.

Table 1 weight of the criteria

Expert No. Criteria	1	2	3	4	5	6	7	8	Mean	Criteria Ranking
Perception of Stakeholders	0.12 2 3	0.3 7 6	0.3 7 6	0.3 7 6	0.4 1 9	0.1 2 5	0.2 5 0	0.3 0 6	0.288	1
Social Recognition	0.5 6 1	0.0 7 4	0.0 7 4	0.0 7 4	0.1 6 5	0.2 5 0	0.2 5 0	0.3 0 6	0.198	2
Knowledge of Respondents	0.0 6 9	0.2 1 5	0.2 1 5	0.2 1 5	0.0 6 2	0.2 5 0	0.1 2 5	0.0 5 1	0.191	3
Law Enforcement	0.1 2	0.2 1	0.2 1	0.2 1	0.2 6	0.2 5	0.2 5	0.1 6	0.180	4

¹Scale of pairwise comparison: 1= equal importance, 2=weak or slight, 3=moderate important, 4=moderate plus, 5=strong importance, 6=strong plus, 7=very strong, 8=very, very strong, 9=extreme importance.

Table 1.cont	3	5	5	5	3	0	0	8		
Resource	0.12 3	0.12 1	0.12 1	0.12 1	0.09 7	0.12 5	0.12 5	0.16 8	0.143	5
Inconsistency	0.00 7	0.00 7	0.00 7	0.00 7	0.02 0	0.00 0	0.00 0	0.00 8		

The inconsistency indexes of all experts are below 0.10, which shows that the data are consistent.

The criterion ranking shows that the perception of stakeholders is the first rank, with mean equal to 0.288. For other criteria, the results show that social recognition, knowledge of respondent, law enforcement and resource have higher rank.

Table 2 Overall composite weights of the alternatives

No. Indicator	1	2	3	4	5	6	7	8	Mean	Indicator Ranking	Readiness
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9.2.2	0.084	0.195	0.097	0.168	0.112	0.081	0.067	0.094	0.112	1
9.1.2	0.082	0.126	0.116	0.123	0.109	0.068	0.068	0.072	0.096	2
9.5.1	0.111	0.090	0.073	0.094	0.117	0.077	0.095	0.068	0.091	3
9.5.2	0.111	0.112	0.038	0.094	0.117	0.102	0.086	0.060	0.090	4
9.c.1	0.035	0.039	0.126	0.072	0.124	0.068	0.093	0.121	0.085	5
9.2.1	0.063	0.094	0.130	0.062	0.033	0.102	0.093	0.101	0.085	6
9.3.1	0.050	0.113	0.084	0.057	0.028	0.111	0.102	0.126	0.084	7
9.3.2	0.082	0.099	0.094	0.066	0.091	0.069	0.094	0.070	0.083	8
9.a.1	0.163	0.042	0.046	0.090	0.042	0.110	0.062	0.082	0.080	9
9.1.1	0.052	0.026	0.085	0.095	0.091	0.068	0.064	0.064	0.068	10
9.b.1	0.092	0.030	0.050	0.055	0.050	0.077	0.094	0.075	0.065	11
9.4.1	0.076	0.033	0.061	0.024	0.085	0.068	0.082	0.067	0.062	12

Overall Inconsistency	0.01	0.02	0.01	0.03	0.02	0.00	0.00	0.02	1.000
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sustainable production. In 2009, the company launched an environmentally friendly product label called "SCG Eco Value". In 2014, SCG's Eco Value products generated 31 percent of the company's revenue.

Financial institutions have also a key role to play. Some Thai banks, such as KASIKORNBANK, already offer green loans to businesses that are planning environmental or energy reduction retrofits. This can be expanded to include infrastructure projects to help make logistics more sustainable, while low-interest loans for R&D projects can help incentivize innovation efforts.

Finally, the government must recognize that far more than well-meaning policies are required to foster competitive industries. The bedrock for sustainable growth is economic stability.

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