



Development of conceptual framework and indicators for assessment of power development fund in Thailand

Pongpoj Putarungsi

Graduate School of Environmental Development Administration, National Institute of Development Administration, Bangkok 10240, Thailand

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Abstract

This study developed a conceptual framework and indicators for evaluating the Power Development Fund (the Fund) in Thailand by collecting information and data from interviews with key informants such as the Energy Regulatory Commission, the Fund Committee, and employees of the Fund. The funds were characterized into two groups namely three Funds in category A and three Funds in category B. The Sustainability Balanced Scorecard concept was selected as a framework and used to produce indicators to evaluate the management of the Fund. The conceptual framework contained six perspectives and each perspective had indicators as follow: 1) Learning and Development (2 indicators); 2) Management Process (5 indicators); 3) Overall Efficiency of operation and management (5 indicators); 4) Stakeholders (3 indicators); 5) Environmental (5 indicators); and 6) Social (4 indicators). There were 23 indicators in total.

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Introduction

Energy has become one of the most important factors in our daily lives. Everyone uses energy; therefore, the demand for energy has increased. Subsequently, increasing the number of power plants in the country is one of the solutions to meet the energy demand. However, the establishment of power plants in Thailand has impacted the environment, society, and the economy. Social impact includes affecting communities and the social life of residents. After the construction of power plants, pollution will occur causing the local people to abandon their settlement. The economic impact involves changes to the economic situation around power plants as the resources around the areas can generate revenue for the communities nearby. However, the resources will be destroyed by the

construction and establishment of power plants. The environmental impact may result from destruction of the environment by the operation of power plants. The raw materials, fuel, and other resources used to produce electricity in power plants will release pollution to the atmosphere.

To address these impacts, the Power Development Fund (the Fund) has been set up under the Office of the Energy Regulatory Commission (OERC) pursuant to the Energy Industry Act B.E. 2550 (2007), with the following objectives: to be used as capital to enhance extensive electrification to various localities; to decentralize the development to provincial areas; to develop or rehabilitate localities affected by power plant operation; to promote the use of renewable energy and technologies for electricity industry operation that have minimal impact on the environment, with due consideration to the balance of natural resources; to create fairness for power consumers (Office of the Energy Regulatory Commission, 2016).

E-mail address: pongpojputarungsi@gmail.com.

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Operations pertaining to the Fund will be regulated by the Energy Regulatory Commission (ERC) in compliance with the policy framework prescribed by the National Energy Policy Council (NEPC). The OERC is responsible for the receipt, disbursement, safeguarding, and management of the Fund in conformity with the regulations set forth by the ERC, by separating the Fund account from the OERC budget. Sources of the Fund comprise the following: 1) contributions from electricity industry licensees in accordance with the announcements issued by the ERC under the policy framework of the NEPC; 2) fines collected from electricity industry licensees who violate or fail to comply with the ERC orders; 3) donated money or assets; and 4) interest or any benefit incurred from the money or assets of the Fund. Presently, the ERC has issued an announcement pursuant to the policy framework of the NEPC, requiring electricity generation licensees to send contributions to the Fund, which can be divided into two cases: 1) during the plant construction, at a rate of THB 50,000/MW/year; and 2) during the plant commission, at a rate classified by fuel type used for power generation, ranging from 1 to 2 satangs/kilowatt-hour (kWh) (or satangs/unit) (100 Satangs = 1 Thai Baht; approximately 35 Baht = 1 USD) (Office of the Energy Regulatory Commission, 2016).

The Fund has been decentralized and the budget has been allocated to residents for community project proposals in order to develop the social, economic, and environmental sectors. However, nowadays, the operation and management of the Fund in Thailand is faced with some problems. For example, the budget distributed by the Fund in each category is not appropriate because people or residents living near or receiving impacts from the power plant do not get any benefit from the Fund. Therefore, this study aimed to set up the conceptual framework and indicators to evaluate and assess the Fund in Thailand. This task is required to improve on the operation and management of the Fund. It will also improve the performance of the Fund toward all stakeholders. This study used the Sustainability Balanced Scorecard theory (SBSC) to evaluate and assess the operation and management of the Fund in Thailand. SBSC was developed from the Balanced Scorecard theory which focuses more on social and environmental perspectives. SBSC theory will help to evaluate the performance of an organization or any system which focus on the external process such as environmental and social perspectives with the goal of sustainability in the organization or system. Researchers have applied SBSC theory to create a framework to measure the performance of environmental projects through the corporate sustainability management of the organization and system. For example the SBSC theory was used as the conceptual framework to improve the quality of sustainability management goals, especially environmental issues (Johnson, 1998).

Literature Review

The Balanced Scorecard (BSC) was first introduced in the early 1990s by Kaplan and Norton to develop a business performance evaluation system. This methodology was introduced due to some weaknesses in traditional performance evaluation, by which the then current system

overemphasized financial parameters while other perspectives were neglected. The BSC technique is used to evaluate an organization from four perspectives, namely financial, customer, internal process, and learning and growth.

In general, BSC is considered an effective tool to facilitate firms in achieving their strategic management goals and providing quantitative results in relation to their financial and management performance (Kaplan & Norton, 1996). A series of benefits of the BSC for the measurement of corporate sustainability have also been presented in the current literature, which can be classified as follows: "(a) provide complete performance measures and perspectives (b) offer tighter and effective management system and tool (c) take care of internal/external, financial/non-financial, driving/outcome KPI in a 'balanced' way and (d) implement BSC and generate synergy with other corporate strategy management" (Hsu & Liu, 2010, p. 601).

Recently in Thailand, Panya, Poboon, Phoochinda, and Teungfung (2018) applied BSC for evaluation; for example, the performance of the environmental management of local governments in Thailand. They used BSC theory to evaluate the performance of environmental management in local government in Thailand by focusing on the four perspectives of BSC theory. However, the BSC technique did not cover the environmental and social aspects as essential pillars of a sustainable business. So, new methods were developed for curing the problem. Figge, Hahn, Schaltegger, and Wagner (2002) believed that BSC could help by taking all relevant aspects into account simultaneously to achieve sustainability and in a balanced manner. Since BSC has high potential to integrate environmental and social aspects into the general management system, BSC has been combined with sustainable parameters, called the sustainability BSC (SBSC), to provide a meaningful instrument for sustainability management (Chai, 2009).

Johnson (1998) stated that SBSC is an essential context to bring together environmental issues and corporate strategic management goals regardless of the approach that would be followed for its development. SBSC has lately been considered an essential tool to design and achieve the key objectives of corporate sustainability management. It could also constitute a suitable context for recording necessary information in relation to corporate sustainability performance by combining financial and non-financial information (Lansiluoto & Jarvenpaa, 2010). Epstein and Wisner (2001) recognized that a well-organized SBSC could assist firms to implement an efficient sustainability strategy. The suitability of SBSC for preparing and designing corporate sustainability management strategies is mainly associated with its capability to recognize relations between long-term environmental and social goals and the short-term financial benefits of firms (Moller & Schaltegger, 2005). SBSC is also considered a suitable means for disclosing corporate sustainability performance information (Lansiluoto & Jarvenpaa, 2008).

There has been international research using the SBSC methodology to evaluate the performance of an organization or company; for example the proposal for a new integrated model based on the SBSC and multi criteria

decision making (MCDM) approaches by using linguistic variables for the performance evaluation of oil-producing companies (Rabbani, Zamani, Yazdani-Chamzini, & Kazimieras Zavadskas, 2014). The purpose of that study was to propose a model to evaluate performance by using a combination of the MCDM methods and the SBSC approach to help authorities achieve a competitive advantage. Another research project considered managing sustainability with the support of business intelligence by integrating socio-environmental indicators and organizational context, with the main contribution of the study being to propose a conceptual model that seeks to support the process of integration of socio-environmental indicators into organizational strategy for sustainability (Maira & Marlei, 2009). Those studies aimed to create models to evaluate the performance of organization and system using SBSC as a tool, which is what the current study aimed to do to evaluate the performance of the operation and management of the Fund in Thailand.

SBSC is useful for evaluating the performance of the Fund in Thailand because the Fund has to manage and operate the internal process regarding its performance and needs to focus on its performance toward environmental and social outcomes. Therefore, SBSC is suitable to be used as a tool to evaluate the Fund's internal and external processes.

Methods

This research collected information and data from interviews with key informants such as the Energy Regulatory Commission (which has a role in and responsibility to manage the operation and management of the Fund in Thailand), the Power Development Fund Department (which monitors the operation of all power development funds in Thailand), officers who work in the Power Development Fund Department, the Director of the Office of the Energy Regulatory Commission Regional office, the manager of the Fund in designated areas (category A and B), employees who work at the Fund in designated areas (category A and B), and the sub-district headmen and

village-headmen (who are leaders of the communities around power plants). The key informants totaled 48. Tables 1 and 2.

The Fund in Thailand is operated by the Energy Regulatory Commission (ERC). The ERC gives authority to the Office Energy Regulatory Commission (OERC) which is located in each designated area to manage and control the Fund in Thailand. The Fund is separated into three categories (A, B, and C).

The purposes of the methodology were to understand the operation and management of the Fund and its performance toward all stakeholders as well as toward society and the environment. The information and collected data with key informants will lead to understanding of those purposes and help to find solutions to improve on the operation and management of the Fund. The author used the content validity process Index of Item-Objective Congruence (IOC) on the questions that were used in the interviews with key informants. In data analysis, triangulation was applied to provide diverse ways to look at the same phenomenon which included interviews, observations, and secondary data. The author used content analysis theory in this study as a qualitative analysis method.

Results

The interviews with key informants revealed that the Funds have been facing many problems. The community projects which residents proposed for using renewable energy and technologies are still fewer than expected and also community projects related to supporting extensive electrification to distant areas are still undeveloped because the residents have been told that when they propose a community project to extend electrification, they need to contact Provincial Electricity Authority (PEA) to get the approval documents and to then bring the documents to the Fund. However, sometimes the process of getting approval document from the PEA takes a long time which affects the residents in their effort to formulate community projects.

Table 1
Key informants

Location of key informant	Type of key informant	Number of key informants
The Energy Regulatory Commission	The energy regulatory Committee	1
The Power Development Fund Department	The Director of the Department	1
	Employees of the Fund Department who are in specialist positions in each section of the Department	4
The OERC regional office	The director of the OERC regional office	6
The power Development Fund in designated area selected by the type of fuel mostly used for electricity generation in the power plants, including natural gas, lignite, fuel oil and diesel and the power plants operated by the Electricity Generating Authority of Thailand (EGAT).	The manager of the Fund in designated area in six areas of the fund in categories A and B	6
	Employees of the Fund in designated areas of the fund (A and B)	12
The residents in the area where a Power Development Fund is located, selected by the sub-district headmen and village headmen who are people in charge of and who manage the communities	The sub-district headmen, the assistant sub-district headmen and village headmen who are representatives of residents in community areas and sub-district headmen and village headmen living in areas affected by the operation of a power plant	18
	Total	48

The researcher collected data from all 48 interviewees.

Table 2
Example of indicators and evaluation criteria

Perspective dimensions	Issue	Indicator	Evaluation criteria
Overall efficiency of operation and management	1. Social development affected by the operation of power plant	1.1 Society has been developed with support of the Fund (Collect data from interviews with manager of the Fund, employees of the Fund (in each category), interviews with sub-district headmen and village headmen who live around the operations of the Fund)	The Fund helps communities to benefit by the operation of power plants (3 points) The Fund never helps communities to benefit by the operation of power plants (1 point)
Stakeholders	1.The participation of stakeholder toward the operation and management of power development fund for example the attending of public forum, the opportunity for propose community project	1.1 The stakeholders participate in the operation and management of the Fund (Collect data from interviews with sub-district headmen and village headmen who live around the operations of the Fund)	The stakeholders participate in the operation of the Fund, for example, attending public forums and participating in proposing community projects (3 points) The stakeholders do not participate in the operation of the Fund, for example, attending public forums and participating in proposing community projects (1 point)
Management process	1. The coordinating and participating with related organization The coordinating and participating with related organization	1.1 Coordinating and participating with related organizations on providing information about the operation and management of the Fund (Collect data from interviews with manager of the Fund and employees of the Fund in each category)	The Fund coordinates with related organizations for example, ERC, and OERC regional office (3 points) The Fund never coordinates with related organizations for example ERC and OERC regional office (1 point)
Learning and Development	1.The supporting on knowledge and training for employee of power development fund	1.1 The amount of organizing activities/ knowledge for providing knowledge of employee at power development fund (Collect data from interview with manager of power development fund and the employee of power development fund in each categories)	The Fund organizes activities/ provides knowledge that supports and improves Fund employees more than 3 times a year (3 point) The Fund does not organize activities/ provide knowledge that supports and improves Fund employees more than 3 times a year (1 point)
Environmental	1.The significance of the environment	1.1 Significance of the environment considered in the operation and management of the Fund (Collect data from interviews with Fund manager, Fund employees (in each category, interviews with sub-district headmen and village headmen who live around the Fund's operations.)	The Fund supports any activities which provide significant environmental benefits through supporting community projects (3 point) The Fund does not support any activities that provide significant environmental benefits through supporting community projects (1 point)
Social	1. The rehabilitation of social that have effect from the operation of power plant	1.1 Have a rehabilitation of social that have effect from the operation of power plant (Collect data from interview with manager of power development fund, the employee of power development fund in each categories, the sub-district headmen and village headmen who live around the operation of power development fund)	The Fund rehabilitates social impacts from the operation of power plants (3 point) The Fund does not rehabilitate social impacts from the operation of power plants (1 point)

There are problems with reporting the progress of the performance and results of the operation and management of the Fund to stakeholders (for example residents who live around the operation of power plant). Interviewees commented that the Fund in the designated area was not providing adequate reporting of progress on the performance results of the operation and management of the Fund to inform related organization and residents.

There is a motivation problem for residents to participate in the public forums which are organized by the Fund. The residents were less interested in participating in public forums that are organized by the Fund.

The amount of training and supporting knowledge that employees who work at the Fund receive was considered insufficient and employees want it to be increased.

Power development fund provides opportunity for residents to propose community projects to improve their community and the environment. However, according to the interviewees, the community projects proposed are not sufficiently diversified and consider only some problems that impact on their community.

These problems have led to the setting up of the conceptual framework and indicators which help to evaluate and assess the operation and management of the Fund

under the sustainability balanced scorecard concept and help to improve the operational and management performance of the Fund as shown in Figures 1 and 2.

Focusing the operation and management of the Fund using the Sustainability Balanced Scorecard concept includes the following.

The overall efficiency of the operation and management of the Fund focuses on the benefit that the community receives through budget allocation by the Fund for residents to propose the formulation of community projects, for example, job creation, decentralized development to provinces for increased income, and the efficiency of the Fund to enhance extensive electrification. Therefore, the SBSC concept was used to evaluate the overall efficiency of the fund toward the community.

The stakeholder perspective of the SBSC concept is related to all stakeholders, directly or indirectly affected by the operation of a power plant. The conceptual framework focuses on the Fund's treatment and remedial management to all stakeholders affected by the operation of a power plant as well as the Fund's environmental management. The stakeholders are the sub-district headmen, village headmen who are leaders of communities and residents who live in community areas around the power plant.

The learning and development perspective of the SBSC concept is related to learning and development of the Fund's employees. The conceptual framework focuses on the support of their knowledge and training, the setting up of evaluation performance for employees, and support to create the technology or systems for internal use.

The management process perspective of the SBSC concept is related to the management process of the Fund which focuses on the its performance toward the following: policy and budget planning and allocation that support the formulation of community projects; organizational structure; management; reporting on the progress of the Fund; formulating the Fund's direction; coordination of the Fund among all stakeholders; accountability and transparency in the management of the Fund.

The social perspective specifies support and budget allocation of the Fund to residents for community project proposals which can improve the quality of life, for example, if the community project contributes to job creation and increased income. Moreover, the social perspective also measures the Fund's creation of a Social Corporation and support for health care and medical services to the community.

The environmental perspective specifies the attention paid by the Fund to the environment through budget allocation to community project proposals. It also specifies the support of the fund to solve pollution problems derived from the operation of the power plant.

The conceptual framework leads to the creation of indicators to evaluate and assess the performance of the Fund under the SBSC concept. From the overall efficiency of the operational and management perspective, it focuses on social development as affected by the operation of the power plant, the support of the use of renewable energy and technologies, decentralized development of job creation and increased income, and enhanced extension of the electricity grid. From the stakeholders perspective, it

focuses on their participation toward the operation and management of the Fund, for example, attending the public forums for proposing community projects, the examination and scrutiny by stakeholders of the operation and management of the Fund, and understanding how to write and propose community projects. From the management perspective, it focuses on coordination and participation with related organizations, reporting on the progress of operation and management, resident participation in the operation and management of the Fund and accountability and transparency of the Fund's operation and management. From the learning and development perspective, it focuses on supporting expanding the knowledge and training for employees of the Fund. From the environmental perspective, it focuses on the significance of the environment which is supported by the Fund, treatments and remedies for areas affected by the operation of the power plant under the support of the Fund, problem solving on pollution resulting from the operations or activities of the Fund, and saving and protecting natural resources. From the social perspective, it focuses on the rehabilitation of social issues that have been affected by the operation of power plants under the support of the Fund, job creation under the support of the Fund, social co-operation from the support of the Fund, and the development of health care and medical services under the support of the Fund.

Discussion

Using the sustainability balanced scorecard as a conceptual framework to produce indicators to evaluate and

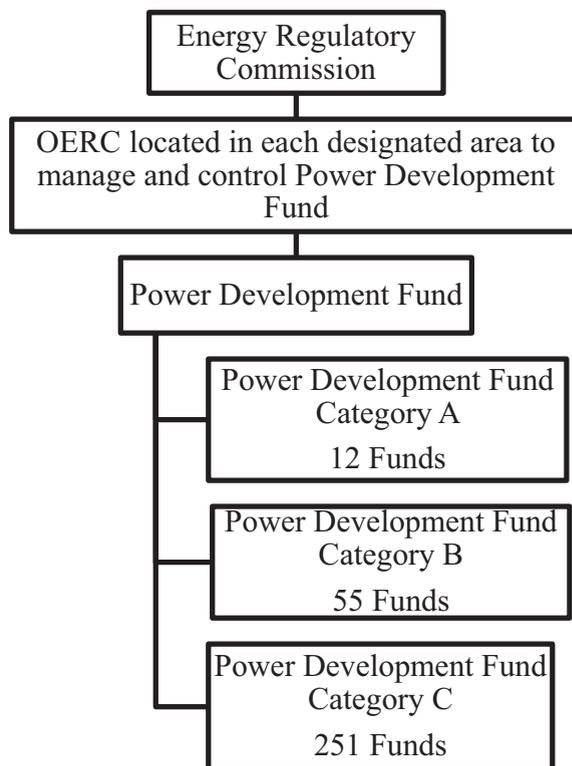


Figure 1 Management structure of power development fund



Figure 2 Conceptual framework of power development fund under sustainable balance scorecard theory

assess the operation and management of the Fund provides benefits to improve the efficiency of the operation and management and to stakeholders, for example, for residents who live in communities in affected areas and related organizations by providing the opportunity for them to participate in the operation and management of the Fund.

From the perspective of the overall efficiency of the Fund's operation and management, using SBSC theory for evaluation and assessment will help to development from the effects of the operation of power plants, it will support proposing renewable energy projects, help to create income and jobs for communities through supporting of community projects, and also support extensive electrification.

From the perspective of the management process, the evaluation and assessment of the Fund will help to improve the coordination and participation with related organizations on providing information, increase the ability and efficiency of reporting the progress of the operation and management of the Fund, increase the participation of related organizations and residents in the operation and management of the Fund and the evaluation and assessment will improve the opportunity for all stakeholders to examine and scrutinize the operation and management of the Fund.

From the stakeholder perspective, the evaluation and assessment of the Fund will help to improve and increase opportunities for stakeholders to participate in public forums which are organized by the Fund to propose community projects and the evaluation and assessment will improve the ability of residents to propose community projects and receive approval from the authorities.

From the learning and development perspective, the evaluation and assessment of the operation and management will help to improve the training and knowledge on the activities which can help to improve the ability and efficiency of the employees who work for the Fund in Thailand.

From the environmental perspective, the evaluation and assessment of the operation and management will help to improve the quality of the environment, provide suitable treatments and remedies for environmental issues, reduce problems of pollution and help to save and protect natural resource through supporting the Fund to allocate budget for residents to implement community projects.

From the social perspective, the evaluation and assessment of the operation and management will help the rehabilitation of social issues from the operation of power plants; will encourage community projects related to social issues and help to provide benefit to communities by creating jobs and income for resident in the communities, by creating Social Cooperation in the communities and supporting health care for community residents.

The sustainability balanced scorecard is suitable for evaluation of the performance of the operation and management of the Fund in Thailand because SBSC is theory which helps to evaluate the performance of the internal and external processes that provide benefits to society and the environment. Therefore, applying SBSC theory for evaluating the performance of the Fund in Thailand will help to improve the operational and management efficiency and provide benefits to all related organizations and stakeholders.

There has been research on the evaluation of the operation and management of the Fund on environmental

community projects proposed by stakeholders which used sustainability analysis by focusing on the effects of the environmental project toward economics, society, environment and good governance around the area (Winya & Phoochinda, 2016). However, the current study focused on the evaluation of the operation and management of the Fund from the perspective of SBSC theory which helped to evaluate the performance of the Fund more holistically, which will help to improve the operation and management of the Fund in Thailand.

Conclusion and Recommendation

The conceptual framework under the sustainability balanced scorecard theory can be used as a tool to evaluate the operation and management of the Fund in Thailand. The conceptual framework provided a set of indicators and evaluation criteria.

The SBSC indicators and evaluation criteria can be used to evaluate the overall efficiency of operation and management under the objectives of the Fund, for example, social development support by the Fund, support on using renewable energy that has minimal impact on the environment, the performance of the Fund in supporting job creation and creating income for residents through propose community projects, and extensive electrification to various localities through the support of the fund.

The SBSC indicators and evaluation criteria can be used to evaluate the performance of the stakeholders, for example, evaluation of stakeholder participation in the operation of the Fund, the opportunity for stakeholders to examine and scrutinize the operation and management of the Fund and to increase their ability to write and propose community projects that will be approved by the authorities.

The SBSC indicators and evaluation criteria will help the Fund in terms of improving coordination and participation with related organizations on providing information on the operation and management, increasing the efficiency of reporting the progress of the Fund's operation and management, finding solutions to increase residents' participation in the operation and management of the Fund, increasing the transparency and good governance of the Fund.

The SBSC indicators and evaluation criteria will help the Fund to improve the learning and development perspective of the Fund's employees. The indicator and evaluation criteria will help to evaluate performance and increase the amount of organized activities by the Fund.

The SBSC indicators and evaluation criteria of the Fund will help to support any activities which make significant environmental improvements through community projects proposed by residents, and support treatments and remedies for environmental problems, by solving pollution problems and protecting natural resources.

The SBSC indicators and evaluation criteria will help and support residents to propose community projects which can rehabilitate society from the effects of the operation of

power plants, and to propose community projects which create jobs and income, lead to Social Cooperation and develop healthcare and medical services for communities.

Further study could consider adjustments to the indicator and evaluation criteria and propose to Energy Regulatory Commission to be guidelines for all power development fund activities in Thailand. The SBSC indicators and evaluation criteria can also be apply to other organizations who seek to their operation and management. As there are a lot of theories and concepts that can be applied to evaluate the operation and management of an organization, study and focus on the theory should be conducted before using the theory, to ensure that it is suitable and provides the maximum benefit to the organization.

Conflict of Interest

The authors declare no potential conflicts of interest with respect to the research, authorship, and publication of this article.

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