A REVIEW OF PROJECT RANKING AND CLASSIFICATION SCHEME IN CLIMATE CHANGE RESEARCH, STRIVING TOWARDS A SYSTEMATIC RESEARCH IMPACT ASSESSMENT IN VIET NAM

Nguyen Tuan Quang[(1)], Huynh Thi Lan Huong[(2)], Nguyen Xuan Hien[(2)], Tran Van Tra[(2)], Cung Hong Viet[(2)]

[(1)]Department of Climate Change, Viet Nam Ministry of Natural Resources and Environment

[(2)]Viet Nam Institute of Meteorology, Hydrology and Climate Change, Viet Nam Ministry of Natural Resources and Environment

Received: 2 July 2020; Accepted: 7 August

Abstract: *Climate change is expected to have negative impacts on earth environmental systems. Given the impacts, there has been a tremendous amount of research on the topic of climate change. From the research, a large volume of information has been provided, yet, lack a systematic organization. Therefore, research project ranking and classification form an important part for project transfer and dissemination. Research in the past attempted to create frameworks grading outputs, effectiveness, and efficiencies of research projects. Specifically, these frameworks are used to analyze organizations, studies, topics, projects, programs with their process of reaching its objectives; how their outputs interact with related factors and achieving the final goal; or how are they supposed to be applied into practical problems effectively, etc. This has been adopted in Viet Nam, however, the frameworks are still limited in its complexity and opted for more simplicity. In light of the National Research Program on Climate Change, Natural Resources and Environmental Management (NRPCRE) for the period 2011-2015 and 2016-2020, research projects on the topic of climate change has been conducted. Although information has been sorted, there is still a lack of collection and classification through a synchronic process. Hence, a comprehensive framework has been adopted in this study, based on the fundamental theory of efficiency, effectiveness. In this specific case study, 48 projects of NRPCRE 2011-2015 are ranked and classified, 04 of them are chosen for their outstanding results presented in the final total points (FTPs). This framework in our study might be uncomplicated, though, it is assumed as the most suitable version compare to recent available sources of information.*

Keywords: *Climate change, project classification, project ranking, framework.*

1. Introduction

"Climate change" (CC) is defined as the changes of the climate. It is worthwhile mentioning that the climate itself is in a stable state of changing. Therefore, climate change in this context refers to the changes in the composition of the global atmosphere that amplify natural climate fluctuations in comparable time periods due to anthropogenic activities [19]. Along with global climate change, adverse impacts are foreseeable. Viet Nam is among the nations expected to be severely impacted by CC, especially in the Mekong Delta region. Given both the scale of the impact in the future and the damaged currently exhibiting, there has been a large volume of research on climate change in Viet Nam [5,18,9,11,21].

Scientific and technological research activities supporting response efforts to CC are among the most viable solution. In particular, scientific and technological research activities play a crucial role since they provide not only information for decision makers but the outcomes of research also involve practical

Corresponding author: Nguyen Tuan Quang
E-mail: nguyentuanquang7@yahoo.com

solutions for the purpose of adaptation and mitigation. Yet too much information and too many technical solutions can be overwhelming for the user of such information. For such a reason, there is a strong incentive to better manage the information provided by researches. This provides a need for research project ranking and classification so that most useful outcomes could be easily detected and transferred where applicable.

Project ranking and classification is not in itself new. Rather, it has been done ubiquitously in the past. Most previous works relied on a ranking and classification framework with grades given to different aspects of the projects. There have been a whole host of frameworks adopted, such as the England Research Excellence Framework - a peer assessment of the quality of UK universities' research in all disciplines; Excellence in Research for Australia - Australia's national research evaluation framework, The Payback Framework of the Canada National Institute of Canadian Academy of Health Sciences Panel on Return on Investment in Health Research, etc [2,3,4].

Similarly, a lot of Vietnamese scientific institutes have already introduced their own frameworks with the main intention of evaluating the results of scientific research projects. Basically, these frameworks perform as an assessment tool, determining the benefits and disadvantages, potential opportunity of real-life implementation, and knowledge transferring for national management purposes.

This article summarizes the aforementioned frameworks with the intention of sorting out the advantages and drawbacks of the different framework. Based on this, an example for an Assessment Framework for Viet Nam National Science and Technology Program on CC will be introduced.

2. State-of-the-art on research project assessment

2.1. Definitions

Project ranking and classification is a multidimensional concept that can be conceptualizedand operationalized in several ways. According to the study of Bartuševičienė & Šakalytė (2013), the two main concepts that were used to assess studies, topics, projects, programs, or organizations are Efficiency and Effectiveness (Figure 1).

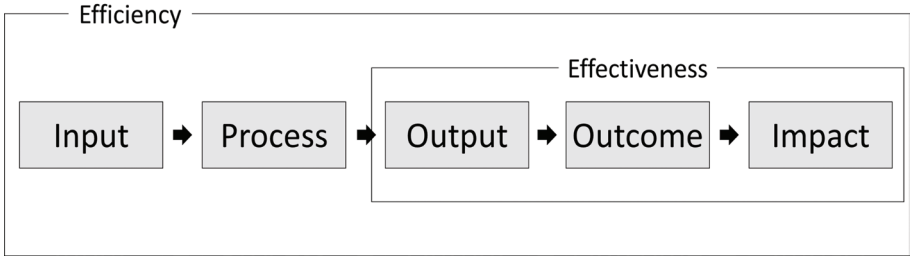

Figure 1. Efficiency, Effectiveness, and Impact Assessment [6]

In particular, efficiency measures the relationship between inputs and outputs or how successfully the inputs have been transformed into outputs [10]. Effectiveness assessment is concerned with output, quality, creation of added value, innovation, and cost reduction. It measures the degree to which a project achieves its objectives or the way outputs interact with other factors, usually has something to do with reaching final goals [22].

With regards to effectiveness assessment, the stage of impact is considered as the effects, changes, or benefits on the economy, society, culture, community policies and services, health, environment, or quality of life [16]. Meanwhile, according to [13], the impact of a project is understood as changes in perceptions, knowledge, understanding, ideas, attitudes, receptions, policies, practices straight from the project results.

Effectiveness assessment or project impact evaluation plays an important role in government's strategies determination [6]. Effectiveness assessment, especially impact evaluation is an important part. It is conducted focus on analyzing the outputs of the projects,

then the decisions will be made whether those projects have potential benefits to realistic implementation or not, in lieu of they are belonging to different sectors. This is a stage where projects are ranked and sorted out into different categories, then, the most outstanding ones will be chosen to transfer and apply in suitable purposes.

By applying those ranking and classifying process above (Figure 1) the project assessors can consider all sides of the projects fully under control, then they can be aware of both benefits and drawbacks, followed with immediate actions such as modifications (if needed). In addition, they can also estimate the expected outputs and dealing with anticipated impacts as soon as possible.

2.2. Approaches

Evaluating the efficiency and effectiveness of projects have been conducted as early as 1990 [15]. Notable work includes the England Research Excellence Framework, Excellence in Research for Australia, The Australian Research Quality Framework, The Payback Framework of the Canada National Institute of Health Research, etc.

The England Research Excellence Framework (REF) is a tool used to assess scientific researches in English universities. However, it has also been widely adopted in other nations such as Finland, Norway, Denmark, Holland, Italia, Australia, Hong Kong, etc [20]. Effectiveness and impact are evaluated and given score based on the study manager. The evaluation process consists of 6 stages (Figure 2) below:

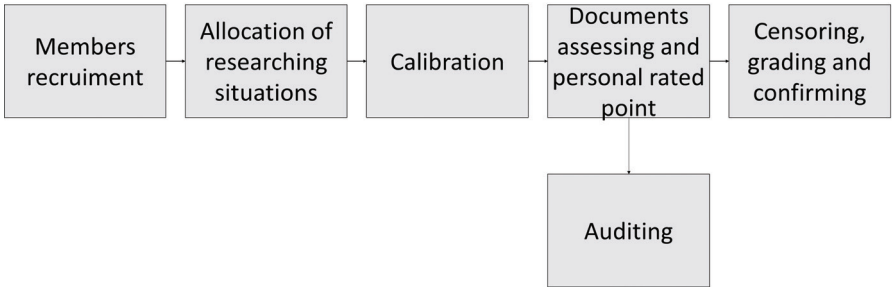

Figure 2. Assessing stages

The impact assessment results are developed into impact profiles based on a combination of case studies and model studies [12]. In 2009-2010, this framework was implemented to evaluate specific studies in five sectors of health, physics, earth science - environment, society, and literature - English language) at 29 institutions [16].

This framework was built on 03 theoretical basics, which are also 03 main factors: (i) Output quality of the study; (ii) Impact research and (iii) Research environment. The studies were evaluated by a group of qualified experts. In detail, the first factor accounted for 65% of the final assessment. The second and the last constituted of 25% and 15%, correspondingly.

The Excellence in Research for Australia (ERA) is developed to measure the effectiveness of pieces of researches and projects in Australia for the purpose of reporting the results implementation and used as references for expanding those researches. This framework was first used in 2010, after 3 years of consultation, evaluation and completion. It aims to provide the research quality, which was conducted in university and research institutions of higher education in Australia. The right of using this framework belongs to the Australian Research Council (ARC) - an Australian government unit.

Evaluation indicators of the framework include (i) Indicators on research quality; (ii) Indicators on volume and research activities; (iii) Indicators on research application; and (iv) Indicators on achievement.

The Australian Research Quality Framework (RQF) is a comprehensive assessing tool. In detail, it was built with a set of indicators, focused on the benefits of 04 main pillars (i) Economic benefits; (ii) Social benefits; (iii) Environmental benefits; and (iv) Cultural benefits. In this framework, researchers are required to demonstrate and also prove whether

their study includes the four aforementioned benefits. It then is to be verified by a panel of experts for identification and conclusion [7].

The flow of RQF (Figure 3) follows:

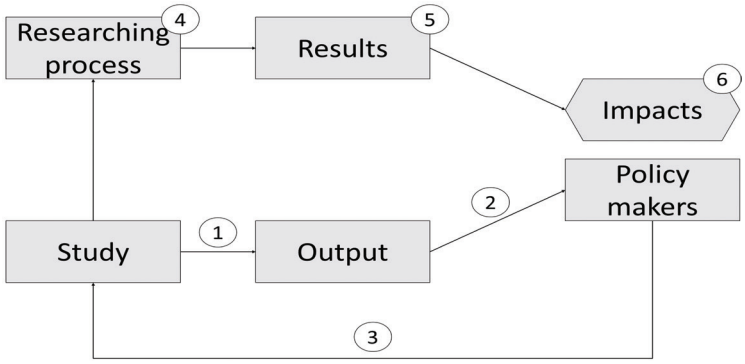

Figure 3. Data connection structure

where,

(1) The findings of the study, output included (for instance published papers or scientific articles);

(2) Communication and interaction with related-parties and the public (emails, visits, seminars, public promotion);

(3) Feedbacks of related-parties;

(4) Research development (based on input and discussion of related-parties);

(5) Results (e.g. commercial, culture, references);

(6) Impacts (changes in behavior and economy).

The Payback Framework of the Canada National Institute of Health Research (NIHR) uses an investment return approach for research in the medical system based on analyzing indicators in order to provide consistency and comparison between users and investors. Especially, this framework was designed to evaluate the effectiveness and impact of scientific researches in the medical system on end-users.

Those impacts that needed to be assessed in the framework are (i) Enhancing knowledge including new inventions and breakthroughs from medical research and contributions to the scientific database; (ii) Building capacity including developing and improving research skills for both individuals and organizations; (iii) Providing information for decision making including the impact of research in the field of science, publicity, clinical, and management; (iv) Medical effects including advances in prevention, diagnosis, treatment and mitigation, and (v) Others socio-economy impacts.

This framework is implemented nationwide and worldwide, for instance in Canada Health Research Institute, Dutch Public Health Agency, Australian National Health Research and Medical Council, and Hong Kong Welfare Office [4,15,17].

Meanwhile, in Viet Nam, the evaluation of scientific and technological activities at research institutions is mainly through works published in specialized scientific journals or the proceedings of domestic and foreign conferences, public transfer contracts. Research organizations arrange annual scientific evaluation activities individually in order to assess their research performances, as well as setting up scientific and technological strategic orientations. Otherwise, these activities are done with in-house assessing indicators, which are adopted from foreign frameworks and with the intention of improving the quality of scientific research application, and transferring either knowledge or technology.

Some of the popular in-use frameworks in Viet Nam can be listed as Framework for the evaluation of the scientific and technological performance of the Viet Nam Academy of Agricultural Sciences, Framework of evaluating the scientific and technological performance of the Vietnamese Institute of Forest Sciences, Framework of evaluating the scientific and technological performance of The Viet Nam Institute for Water Resources Research, etc. [15]. They share a similar structure of 06 main

criteria: (i) Numbers of scientific studies; (ii) Numbers of researchers; (iii) Educational effectiveness; (iv) Information effectiveness on scientific research; (v) Effectiveness on science and technology; and (vi) Economic effectiveness.

Nevertheless, these frameworks have only been considered in a narrow scope, which is assumed inapplicable to organizations and institutes of different sizes and research fields. Hence, a revolution is needed to help the process of evaluating results as well as selecting outputs from research projects more systematically, effectively and efficiently.

3. An example assessment for the National Research Program on Climate Change, and Natural Resources and Environmental Management

Given the importance of ranking and classification of projects, the case study here proposed a framework to assess projects within the Viet Nam National Research Program on Climate Change, and Natural Resources and Environmental Management for the 2011-2015 period. In overall, the evaluation of these projects within the program is to go through 03 main steps. The first step involves collecting all relevant documents, general reports, and detailed results. The second step comprises of proposing and establishing an assessing framework. Finally, the assessment is performed to quantify the total final point that each project achieves. Eventually, in light of those definitions and worldwide-implemented frameworks mentioned above, a comprehensive assessing product quality framework (APQF) has been proposed. It goes with 02 main criteria Efficiency and Effectiveness which are described specifically as a list of indicators and grading methodology below (Table 1 and Table 2).

The foundation of the framework in this study is conducted based on previous frameworks which are shown in Table 2 - "References"). The framework is built up simply with 02 major criteria. Each indicator is chosen carefully based on the availability data provided in each project's final report. The main purpose of using this framework is to find out how well each project have done with educating for researchers, and completing objectives.

Table 1. List of indicators

No.	Indicators	Units
Indicators of Efficiency		
1	The success rate of PhDs candidates	%
2	The success rate of MScs students	%
3	The success rate of bachelor/engineers students	%
4	The percentage of completed tasks compared to the original research objectives	%
5	The percentage of completed tasks compared to the original research design	%
6	The percentage of finished products compared to the original request	%
Indicators of Effectiveness		
7	Numbers of PhDs successfully defended	Person(s)
8	Numbers of MScs successfully defended	Person(s)
9	Number of bachelors/engineers successfully defended	Person(s)
10	Numbers of articles published in international journals	Articles
11	Number of articles published in national journals	Articles
12	Number of articles published at international scientific conferences	Articles
13	Number of articles published at national scientific conferences	Articles
14	Practical applicability after the transfer	Insignificant-Medium-High

No.	Indicators	Units
15	The urgency of the project in dealing with urgent practical issues related to climate change adaptation	Insignificant-Medium-High

Table 2. Grading methodology

No.	Indicators	Process					References
I	**Indicators of Efficiency**						
1	The success rate of PhDs candidates	<50	60-70	70-80	80-90	100	Framework of evaluating scientific and technological performance of Viet Nam Institute of Forest Science
2	The success rate of MScs students	<50	60-70	70-80	80-90	100	
3	The success rate of bachelor/ engineers students	<50	60-70	70-80	80-90	100	
4	The percentage of completed tasks compared to the original research objectives	<50	60-70	70-80	80-90	100	The Australian Research Quality Framework (RQF)
5	The percentage of completed tasks compared to the original research design	<50	60-70	70-80	80-90	100	
6	The percentage of finished products compared to the original request	<50	60-70	70-80	80-90	100	The Excellence in Research for Australia (ERA)
	Point levels	**0**	**25**	**50**	**75**	**100**	
II	**Indicators of Effectiveness**						
7	Numbers of PhDs successfully defended	0	1	2	3	≥4	Framework of evaluating scientific and technological performance of Viet Nam Institute of Forest Science
8	Numbers of MScs successfully defended	0	1-3	4-6	7-9	>9	
9	Number of bacelors/engineers successfully defended	0	1-3	4-6	7-9	>9	
10	Numbers of articles published in international specialized journals	0	1	2	3	≥4	
11	Number of articles published in domestic specialized journals	0	1-4	5-9	9-13	>13	
12	Number of articles published at international scientific conferences	0	1-2	3-4	5-6	>6	
13	Number of articles published at domestic scientific conferences	0	1-4	5-9	9-13	>13	
	Point levels	**0**	**25**	**50**	**75**	**100**	
14**	Practical applicability after the transfer	Insignificant		Medium		High	

No.	Indicators	Process			References
15**	The urgency of the project in dealing with urgent practical issues related to climate change adaptation	Insignificant	Medium	High	The England Research Excellence Framework (REF)
	Point levels	**25**	**50**	**75**	
	Final total point*				

(*) The final total point (FTP) of each particular project will be converted into of 100 scale point. In detail, there are 04 point-stages for assessing the FTP, which are divided into the following levels: (i) FTP≤40: Not achieved; (ii) FTP from 41-60: Good; (iii) FTP from 61-80: Very good; (iv) FTP from 81-100: Excellence.

(**) Projects after being assessed are compared with each other by the FTP that they achieved (converted into a scale point of 100). In the consequence of equal FTP, the comparison and selection will be based on the consideration of 2 indicators (14) and (15) (extra round of classification).

All of 48 projects belong to the NRPCRE program period of 2011-2015 have been evaluated using the APQF. In order to transfer the outstanding projects, it is a necessity tocarry out the evaluation, and at the time, selecting and refining the evaluated results in an integrated and consistent manner. Therefore, specific evaluating points of 48 projects will be demonstrated in this section, specifically:

Table 3. Detail indicators points of 48 projects

No.	Project name	Indicators															FTP*
		1	2	3	4	5	6	7	8	9	10	11	12	13	**14****	**15****	
Group of the first research content																	
1	BĐKH.03	100	100	100	100	100	100	25	25	00	00	25	00	00	**100**	**100**	**58.3**
2	BĐKH.04	100	100	100	100	100	100	25	50	00	00	50	00	00	**100**	**50**	**58.3**
3	BĐKH.38	100	100	100	100	100	100	25	25	00	25	25	00	00	**100**	**100**	**60**
4	BĐKH.39	100	100	100	100	100	100	25	25	00	00	25	00	00	**50**	**50**	**51.7**
5	BĐKH.50	100	100	100	100	100	100	00	00	25	00	25	00	00	**100**	**50**	**53.3**
6	BĐKH.61	100	100	100	100	100	100	25	25	00	00	25	50	25	**50**	**50**	**56.7**
Group of the second research content																	
7	BĐKH.01	100	100	100	100	100	100	00	25	50	25	25	25	00	**50**	**50**	**56.7**
8	BĐKH.02	100	100	100	100	100	100	00	25	00	00	50	00	00	**100**	**50**	**55**
9	BĐKH.15	100	100	100	100	100	100	00	25	00	00	25	00	00	**50**	**100**	**53.3**
10	BĐKH.17	100	100	100	100	100	100	25	25	00	00	25	00	00	**100**	**100**	**58.3**
11	BĐKH.43	100	100	100	100	100	100	50	25	00	25	25	25	25	**100**	**50**	**61.7**
Group of the third research content																	
12	BĐKH.05	100	100	100	100	100	100	50	25	00	00	25	00	00	**50**	**100**	**56.7**
13	BĐKH.06	100	100	100	100	100	100	00	25	00	00	50	00	00	**50**	**100**	**55**
14	BĐKH.07	100	100	100	100	100	100	50	25	00	00	25	00	25	**50**	**100**	**58.3**
15	BĐKH.08	100	100	100	100	100	100	100	25	00	00	25	25	50	**50**	**100**	**65**

No.	Project name	Indicators															FTP*
		1	2	3	4	5	6	7	8	9	10	11	12	13	**14****	**15****	
Group of the third research content																	
16	BĐKH.11	100	100	100	100	100	100	00	25	00	00	25	00	00	**50**	**100**	**53.3**
17	BĐKH.13	100	100	100	100	100	100	00	25	00	00	25	00	00	**100**	**100**	**56.7**
18	BĐKH.16	100	100	100	100	100	100	50	25	00	00	50	25	00	**100**	**100**	**63.3**
19	BĐKH.18	100	100	100	100	100	100	00	00	00	00	25	25	00	**50**	**100**	**53.3**
20	BĐKH.19	100	100	100	100	100	100	100	75	00	00	75	25	00	**50**	**50**	**65**
21	BĐKH.20	100	100	100	100	100	100	25	25	00	00	50	00	25	**50**	**50**	**55**
22	BĐKH.21	100	100	100	100	100	100	25	25	00	00	25	00	50	**100**	**50**	**58.3**
23	BĐKH.22	100	100	100	100	100	100	25	25	00	00	25	00	00	**50**	**100**	**55**
24	BĐKH.23	100	100	100	100	100	100	25	25	25	00	25	00	00	**50**	**50**	**53.3**
25	BĐKH.24	100	100	100	100	100	100	00	25	25	25	25	00	25	**50**	**50**	**55**
26	BĐKH.25	100	100	100	100	100	100	00	25	00	25	50	00	00	**50**	**100**	**56.7**
27	BĐKH.28	100	100	100	100	100	100	25	25	00	00	50	00	00	**50**	**100**	**56.7**
28	BĐKH.30	100	100	100	100	100	100	50	25	00	00	25	00	25	**50**	**100**	**58.3**
29	BĐKH.32	100	100	100	100	100	100	25	25	25	25	25	50	00	**50**	**50**	**58.3**
30	BĐKH.36	100	100	100	100	100	100	25	25	00	00	25	00	00	**50**	**100**	**55**
31	BĐKH.40	100	100	100	100	100	100	25	25	00	00	50	00	00	**50**	**100**	**56.7**
32	BĐKH.42	100	100	100	100	100	100	50	25	25	25	50	50	00	**50**	**50**	**61.7**
33	BĐKH.44	100	100	100	100	100	100	25	25	00	25	25	00	00	**50**	**100**	**56.7**
34	BĐKH.45	100	100	100	100	100	100	00	25	00	00	25	00	00	**50**	**100**	**53.3**
35	BĐKH.48	100	100	100	100	100	100	25	25	25	00	25	00	00	**50**	**100**	**56.7**
36	BĐKH.49	100	100	100	100	100	100	00	00	25	25	25	00	00	**50**	**100**	**55**
Group of the fourth research content																	
37	BĐKH.12	100	100	100	100	100	100	25	00	00	00	25	00	00	**50**	**100**	**53.3**
38	BĐKH.14	100	100	100	100	100	100	00	00	00	00	25	00	25	**100**	**50**	**53.3**
39	BĐKH.29	100	100	100	100	100	100	50	00	00	00	25	00	00	**50**	**100**	**55**
40	BĐKH.34	100	100	100	100	100	100	25	25	00	25	25	00	00	**50**	**100**	**56.7**
41	BĐKH.35	100	100	100	100	100	100	00	25	00	25	25	25	00	**50**	**100**	**56.7**
42	BĐKH.52	100	100	100	100	100	100	00	25	00	00	25	00	00	**100**	**100**	**56.7**
43	BĐKH.59	100	100	100	100	100	100	50	25	00	00	25	00	00	**50**	**100**	**56.7**
Group of the fifth research content																	
44	BĐKH.09	100	100	100	100	100	100	25	25	00	00	25	00	00	**50**	**100**	**55**
45	BĐKH.10	100	100	100	100	100	100	25	25	00	25	25	25	00	**50**	**100**	**58.3**
46	BĐKH.27	100	100	100	100	100	100	25	25	25	00	25	00	00	**100**	**100**	**60**
47	BĐKH.56	100	100	100	100	100	100	25	25	00	00	75	00	00	**50**	**100**	**58.3**
48	BĐKH.57	100	100	100	100	100	100	25	75	00	25	25	00	25	**50**	**50**	**58.3**

Eight projects were ranked with the highest grades, which are listed as (i) BĐKH.08; (ii) BĐKH.16; (iii) BĐKH.17; (iv) BĐKH.19; (v) BĐKH.27; (vi) BĐKH.38; (vi) BĐKH.42 and (vii) BĐKH.43.

The extra round of classification was conducted by comparing each specific scores of indicators number (14) and number (15). In the consequence, these 04 projects below are the final which have met all of the requirements:

- Project BĐKH.16;
- Project BĐKH.17;
- Project BĐKH.27;
- Project BĐKH.38.

4. Conclusion

Research on project ranking and classification forms an important task. This allows the assessment of the results and provides information for decision makers not only to obtain research results but to rationalize which projects to transfer. Due to its importance, a large volume of research in the past has proposed a large number of ranking and classification framework. The frameworks relied heavily on the concept of effectiveness and efficiency of a project to determine its ranking. Frameworks in the past provided a grading scheme where each criteria are given maximum amount of points. Each project is thus graded according to how well they meet each criterion.

Ranking and classification of projects in Viet Nam, however, are fairly new. It is not to say that there has been no effort in developing a ranking and classification of research projects in Viet Nam. Rather there has been limited success in developing a generic framework where research projects could be properly assessed. This study seeks to establish a framework for project ranking and classification with a case study using the NRPCRE of Viet Nam.

Ranking and classification of projects under the 2011-2015 NRPCRE as a case study not only serves the purpose of an example but also a necessary operation. Only on the basis of evaluation and classification, outstanding results from those projects can be delivered and applied properly in the most effective and efficient way. The study has indicated a systematic evaluating method for scientific projects, which was built on the foundation of other profound assessing frameworks around the world.

All 48 projects have been classified, the output comes out that all of them resulted in "Good" and "Very good". Initially, 04 outstanding projects have been selected - which are all proved their urgency and importance in the field of climate change adaptation, natural resources and environmental management.

The proposed framework utilized the best available information from research projects for the purpose of ranking and classifying. It should be noted though, more useful information could be incorporated into the framework. This includes but is not limited to economic impacts of research, societal impacts, etc. This type of second order impact however, is harder to measure and record and may take years after the completion of the project. For this reason, these impacts have been omitted within the framework. More advanced method to address second order impacts of the projects could be incorporated in the future should there be more readily available information.

Acknowledgements*: The authors wish to acknowledge the support of the "Scientific and practical basis for evaluating and transferring results of national science and technology programs on climate change response, natural resources and environmental management, proposing researching orientations for the period of 2021-2025" research project (project number: BĐKH.43/16-20), the National Research Program on Climate Change, Natural Resources, and Environmental Management for the period 2011-2015, and 2016-2020, the Viet Nam Institute of Meteorology, Hydrology and Climate Change, and the Department of Climate Change. Without this support, the research would not have seen the light of day, and for this, the authors are deeply grateful.*

References

1. Australian Research Council (2010), *Excellence in Research for Australia (ERA)*. Available at: https://www.arc.gov.au/excellence-research-australia.
2. Bartuševičienė and Šakalytė, E. (2013), *Organizational assessment: effectiveness vs. efficiency*, Social Transformations in Contemporary Society, 1, pp. 45–53.
3. Bernstein, A. et al. (2006), *A Framework to Measure the Impact of Investments in Health Research*.
4. CAHS (2009), *Making an Impact: A Preferred Framework and Indicators to Measure Returns on Investment in Health Research*.
5. Cuong, T. T. (2013), *Creating a scientific and pratical basis to establish a monitoring system for the impacts of climate change and sea level rise on the quality of the continental surface water environment.*
6. Donovan, C. and S., H. (2011), *The "Payback Framework" explained*, Research Evaluation, 20, p. 181.
7. Duryea, M., Hochman, M. and Parfitt, A. (2007), *Measuring the Impact of Research*, Research Global, 27, pp. 8–9.
8. Frey, K. and Widmer, T. (2009), *The Role of Efficiency Analysis in Legislative Reforms in Switzerland*, 5th ECPR General Conference, Potsdam, Germany.
9. Huong, H. T. L. (2015), *Researching and developing climate change adaptation indexes to serve the state management of climate change*.
10. J. Low (2000), "The value creation index", *Journal of Intellectual Capital*, 1(3), pp. 252–262.
11. Khiem, M. Van (2015), *Researching to develop a set of Atlas related to climate and climate change in Viet Nam.*
12. Manville, C. et al. (2014), *Assessing impact submissions for REF 2014: An evaluation*. RAND, Prepared for HEFCE, SFC, HEFCW and DEL.
13. Morton, S. (2015), *Progressing research impact assessment: A contributions approach*, Research Evaluation, 24, pp. 405–419.
14. Nason, E. et al. (2007), *Policy and practice impacts of research funded by the Economic and Social Research Council. A case study of the Future of Work programme, supporting data*. Technical report. Rand Europe.
15. Quang, N. T. (2019), *Topic Explanation of "Studying scientific and practical basis for evaluating and transferring results of national science and technology programs on climate change response, natural resources and environmental management, proposing orientations research f*.
16. REF2014 (2011), *Decisions on Assessing Research Impact*.
17. SIAMPI (Social Impact Assessment Methods through Productive Interactions) (2011), *SIAMPI Final Report*.
18. Thai, T. H. (2013), *Studying on the effects of climate change on water resources change in the Mekong Delta.*
19. Thang, N. V. et al. (2010), *Climate change and its impacts in Viet Nam*.
20. The 2014 Research Excellence Framework (REF) (2014). Available at: https://www.ref.ac.uk/2014/results/intro/.
21. Thuc, T. and Neefjes, K. (2015), *Viet Nam Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX Viet Nam)*.
22. W., Z., B., Y. and G, M. (2010), "Linking organizational culture, structure, strategy, and organizational effectiveness: Mediating role of knowledge management", *Journal of Business Research*, 63(7), pp. 763–771.