CONSTRUCTION OF THE RURAL DEVELOPMENT INDEX: THE CASE OF VIETNAM*

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Keywords

rural development, Rural Development Index, rural development in Vietnam, agriculture in Vietnam

Abstract

The objective of this research is to analyze the current status and process of Vietnam's rural development to draw lessons for improving the quality of rural life and achieving sustainable rural development in Vietnam. The research was carried out by the following methods. First, the paper reviews previous studies on concepts and theoretical perspectives on rural development and comes up with a concrete definition of the term 'rural development' for this research to build a Rural Development Index (RDI). Second, the RDI is developed as a tool to evaluate the current status and process of rural development. Third, the paper examines the current status and development process of Vietnam's rural development using the RDI. The scope of this study covered 63 regions (58 provinces and 5 municipalities) in Vietnam. This research can be used to establish mid- and long-term visions and strategies of rural development policies in Vietnam.

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I. Introduction

Vietnam's economy has experienced an annual growth rate of about 7-8 percent since the launch of the national reform program called Doi Moi[1], or "Economic Renovation." The rapid economic growth has allowed the GDP to continuously increase, attaining US$170.5 billion in 2013. Despite the economic progress, however, Vietnam is facing serious social and economic development imbalances across different regions. Rural regions lag behind urban areas in terms of living conditions and income, and the growing economic and social disparities between urban and rural areas are posing a serious social challenge. Rural development is of greater importance in a country like Vietnam where 70.4 percent of the total population resides in rural areas.

The government of Vietnam, especially the Ministry of Agriculture and Rural Development (MARD), is implementing new rural development programs at a national level with an objective to improve socio-economic infrastructure and quality of life in rural areas. More specifically, the goal of such programs is that 60 percent of townships achieve satisfactory scores in all of the nineteen selected indicators in the domains of transportation, irrigation, electricity, education, sanitation, and income.

Despite such efforts, however, evaluators criticize that the existing programs lack in capacity to comprehensively implement Vietnam's rural development policies and also fail to present a long-term vision. Moreover, it is widely pointed out that the implementation methods are not entirely relevant nor carried out efficiently.

A rural development strategy suitable for Vietnam should be established after systematically examining various conditions and development status of Vietnam's rural areas in a multi-dimensional manner, taking the regional differences in rural areas into account. Furthermore, the rural development strategy should be based on an elaborate forecast of the rural development direction through a thorough analysis of the process of changes in various sectors of the society. For this end, this paper presents a Rural Development Index that can be utilized to analyze the process of rural development and to measure the current level of development.

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[1] Doi Moi is a formal title of the economic reforms initiated in Vietnam in 1986 with the goal of creating a "socialist-oriented market economy."

II. Definition of Rural Development

1. Definitions and Theories in Previous Studies

In order to construct a Rural Development Index (RDI), this study attempts to define the term "Rural Development" based on a review of previous studies. There are many different theoretical perspectives on the definition of rural development.

Moseley (2003) defines rural development as "the process of improving the quality of life and economic well-being of people living in relatively isolated and sparsely populated areas." Similarly, Lee et al. (2012) also define rural development as "the process of improving the quality of life of people living in rural areas." Moreover, Lee et al. emphasize that a rural development policy addresses much broader issues related not only to local industry and economy but also to a variety of sectors including transportation, medical care, culture, welfare and environment.

Jeong (1997) defines rural development as a chain of processes that brings improvement in the living conditions for people in local communities through people's participation and commitment as a group. Jeong continues that such rural development programs pursue the goals through projects supported by the government, NGOs, or enterprises, and involve project planning, implementation, and evaluation that are necessary to achieving common economic, social, and psychological goals of local communities or to solving common challenges.

According to Rowley (1996), rural development arises from the need of rural communities to approach development from a wider perspective focusing on a broad range of development goals rather than merely providing incentives for agriculture or resource based businesses. From this perspective, education, entrepreneurship, physical infrastructure, and social infrastructure all play an important role in developing rural regions.

Rudengren et al. (2012) also define rural development as a process of improving the quality of life and economic wellbeing of people living in a relatively isolated and sparsely populated area. Rudengren et al. point out that traditionally, rural development had focused on the exploitation of natural resources through land intensive activities such as agriculture and forestry. In the current era, however, rural development takes a spatial rather than thematic approach reflecting a cross-sector outlook involving social, economic, demographic, legal, financial, governance, and administrative aspects.

2. Definition of Rural Development in this Research

The review on previous studies with regard to the definition of rural development highlights three common factors that are the most essential for rural development. First, the main agents of rural development are local people and the government. Second, the key objectives of rural development are to improve the quality of life of the people and to achieve sustainable development in rural areas. Third, the principal domains of analysis are: Economy, Education, Health and Welfare, Environment, Culture and Leisure.

Reflecting the three key factors, this study defines rural development as: *the process of improving the quality of life for people living in rural areas and achieving sustainable development in rural areas by solving challenges faced by local communities in various domains such as economy, education, health and environment, with the involvement of local people and government as the main agents of change.*

III. Construction of the Rural Development Index

1. Literature Review

There are two broad types of previous studies related to the rural development index, out of which one is related to an evaluation of the extent or level of regional development and the other is related to measuring the quality of life. Previous studies on regional development evaluation index include Song et al. (2012), Kim and Byun (2006), Lee and Park (2002), etc.

Song et al. (2012) developed the 2012 Regional Development Index aimed at improving the policy-making processes and strategies for rural development. The scope of this study covered 161 cities and counties throughout South Korea excluding districts in Seoul and the other six metropolitan cities. The Regional Development Index, which is a comprehensive index, is composed of four sectoral indices: 'Living Service Index', 'Regional Economy Index', 'Space for Relaxation Index', and 'Resident Vitality Index'. This study utilized the Analytic Hierarchy Program (AHP) for judging each index's weighted values.

Kim and Byun (2006) developed a Regional Development Index for com-

prehensive evaluation on the level of regional development and residents' quality of life. Their study attempts to analyze development status by region and gap in development status across regions based on the index system. The Regional Development Index developed by Kim and Byun comprises two sectoral indices: 'Regional Economic Power Index', and 'Resident Vitality Index'. The target of this study were 16 cities and provinces in South Korea.

Lee and Park (2002) categorized all regions across South Korea into four types of standards based on the evaluation of development status, to come up with a supporting mechanism that can differentiate regions by type. Aimed at promoting balanced development through differentiated policy measures considering the level of underdevelopment by region, it compares and evaluates the regional development status of 232 cities and districts and 16 metropolitical councils throughout the country. Based on the results, regions are categorized into four types of standards according to the level of regional development.

Some limitations of the presently available information and directions for further research are as follows. First, there is a shortage of indices to comprehensively evaluate the level of development and the development process in rural areas. Each study evaluates the status and level of development through comparison of regions and sectors for different purposes. Results of these studies can be used to review which sectors need to be fortified and what kind of policies are needed in each region. Studies by Song et al. (2012) present the Regional Development Index targeting rural areas, but economic and social indicators that are unique to rural areas are not thoroughly reflected in these studies. It is therefore necessary to develop an evaluation index composed of indicators that meticulously consider the unique economic and social characteristics of rural areas.

Second, the basic principles for index construction and indicator selection are not presented in the previous studies. It is necessary to present clear and basic principles for index construction.

Third, result indicators and cause indicators that compose an index have been indiscriminately put together in previous studies. For example, indicators like the number of doctors per population and the number of patient beds per population are cause indicators that facilitate the process of improving residents' health status whereas indicators like life expectancy rate, infant mortality rate, and under-five mortality rate are result indicators reflecting the current status of residents' health. It is necessary to separate cause indicators and result indicators and develop an evaluation index that reflects a logical causal between 'Cause' and 'Result.'

2. Concept of the Rural Development Index

This research develops a Rural Development Index that can be used to comprehensively evaluate the level of development and the progress of development projects in rural areas. This research presents the basic components of the Rural Development Index as below.

First, the Index is composed of five domains of analysis: (1) economy, (2) education, (3) health and welfare, (4) environment, and (5) culture and leisure. It is necessary to consider not only the regional economy but also domains that are closely related to the living territory of rural residents in order to accurately evaluate the level of rural development. The five domains that comprise the index are drawn from the areas that are mutually presented in previous studies. In this paper, a general index is constructed by organizing an indicator system in a way that covers all the core parts related to the living territory of rural residents including economy, education, health·welfare, natural environment, and culture·leisure to ensure that the index reflects the most common characteristics of rural residents' lives in their entirety.

Second, the Index is composed of a 'Result Index' and a 'Cause Index.' This paper distinguishes result indicators and cause indicators to form a separate index for each in order to overcome the limitations of previous studies that failed to distinguish cause indicators and result indicators. The paper examines the result index to measure the current level of rural development and the cause index to evaluate the process of rural development.

3. Principles for Constructing the Rural Development Index

This paper suggests five principles for constructing a Rural Development Index. First, an index should be located within the range ($0 \leq RDI \leq 1$) and satisfy boundness so that it can be clearly analyzed and compared. This will ensure that the index is easy to understand for policy makers and the general public (Boundedness). Second, an index should be composed of data that has credibility and quality. In other words, the index should be constructed using credible data, avoiding use of internal data that is available only to a certain group of people (Reliability). Third, the process to calculate an index should be clear so that anyone using the same data can attain the same results (Replicability). Fourth, representative indicators that fully reflect certain characteristics of each domain have to be meticulously selected

to construct the index (Completeness). Fifth, the indicators should be independent and not be duplicated (Independence).

4. Calculation of the Rural Development Index

Satisfying the third principle that anyone using the same data should be able to obtain the same results, the calculation of average, which could lead to different results depending on artificially selected weighted value (applying equal weighting), should be avoided. Calculation of specific evaluation indicators follow the Agricultural Competitiveness Index calculation method introduced by Yang et al. (2014). We apply the following methods for each type of specific indicator obtained as a result of the calculation.

① Type I: When specific indicator X, a continuous variable, satisfies the condition of boundness as $0 \leq X \leq 1$, then use a relevant indicator as the evaluation indicator.

② Type Ⅱ: When specific indicator X, a continuous variable, fails to satisfy boundness, and absolute evaluation indicator is applied, calculate the maximum and minimum values of X, $\hat{X}_{\max}$ and $\hat{X}_{\min}$, using the methods applied in (Equation 1-1) and (Equation 1-2) targeting certain countries and duration of time assuming certain distribution of specific indicators. Assume a normal distribution if there is no lowest or highest limit, and assume a log normal distribution if the value is a positive number greater than 0. The maximum value $\hat{X}_{\max}$ and the minimum value $\hat{X}_{\min}$ refer to the maximum and minimum values of X that could occur under the assumption of specific distribution.

$$(\text{Equation 1-1}) \quad \hat{X}_{\max} = \overline{X} + 3\sigma_X$$

$$(\text{Equation 1-2}) \quad \hat{X}_{\min} = \overline{X} - 3\sigma_X$$

$\overline{X}$: Mean value of X , σ_X : Standard deviation of value X

For calculation of XI^k, an evaluation indicator of kth evaluation target of which the specific indicator value is X^k, use (Equation 2-1) if the bigger value

of the evaluation indicator represents superior condition, and use (Equation 2-2) if the smaller value of the evaluation indicator represents superior condition.

$$(\text{Equation 2-1}) \quad XI^k = \frac{X^k - \hat{X}_{\min}}{\hat{X}_{\max} - \hat{X}_{\min}}$$

$$(\text{Equation 2-2}) \quad XI^k = 1 - \frac{X^k - \hat{X}_{\min}}{\hat{X}_{\max} - \hat{X}_{\min}}$$

③ Type Ⅲ: When applying relative evaluation indicators to specific indicator X which is a continuous variable that does not satisfy the condition of boundness, for calculation of XI^k, an evaluation indicator of kth evaluation target of which the specific indicator value is X^k, use (Equation 3-1) if the bigger value of the evaluation indicator represents superior condition and use (Equation 3-2) if the smaller value of the evaluation indicator represents superior condition. Evaluation indicator XI^k which is calculated using the (Equation 3-1) and (Equation 3-2) should satisfy the condition of $0 \le XI^k \le 1$.[2]

$$(\text{Equation 3-1}) \quad XI^k = \frac{X^k - X_{\min}}{X_{\max} - X_{\min}}$$

$$(\text{Equation 3-2}) \quad XI^k = 1 - \frac{X^k - X_{\min}}{X_{\max} - X_{\min}}$$

5. Structure of Indicators of the Rural Development Index

The Rural Development Index is composed of five domains that are closely related to the quality of life of people living in rural areas. The domains are (1) economy, (2) health·welfare, (3) education, (4) environment (residential and natural environment), and (5) culture·leisure.

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[2] This formula is developed by the UNDP to calculate specific evaluation indicators for the Human Development Index as mentioned in ″Measuring Human Development : A PRIMER, Guidelines and Tools for Statistical Research, Analysis and Advocacy (2007).″

The Rural Development Index comprises the result index and the cause index following the logical structure of 'Cause-Result'. The result index is a system of indicators constructed to analyze and evaluate the development status of rural regions by selecting indicators for each domain.

A comprehensive result index is computed by applying the same weighted value to the five domains, and the development status of each region is evaluated using the comprehensive result index.

(Equation 4-1) $CRI^r = \dfrac{1}{5}(ERI^r + HWRI^r + EDRI^r + ENRI^r + CLRI^r)$

Where CRI^r is the Composite Result Index for region r, ERI^r is Economy Result Index for region r, $HWRI^r$ is Health·Welfare Result Index for region r, $EDRI^r$ is Education Result Index for region r, $ERNI^r$ is Environment Result Index for region r, and $CLRI^r$ is Culture·Leisure Result Index for region r.

The cause index is a system of indicators constructed to evaluate the process of rural development and to establish development strategies using data collected on various activities that affect rural development. A comprehensive cause index is computed by applying the same weighted value to the five domains, and the development process of each region is evaluated by using the comprehensive cause index.

(Equation 4-2) $CCI^r = \dfrac{1}{5}(ECI^r + EDCI^r + HWCI^r + ECI^r + CLCI^r)$

Where CCI^r is the Composite Cause Index for region r, ECI^r is Economy Cause Index for region r, $HWCI^r$ is Health·Welfare Cause Index for region r, $EDCI^r$ is Education Cause Index for region r, $ENCI^r$ is Environment Cause Index for region r, and $CLCI^r$ is Culture·Leisure Cause Index for region r.

FIGURE 1.   Structure of the Rural Development Index
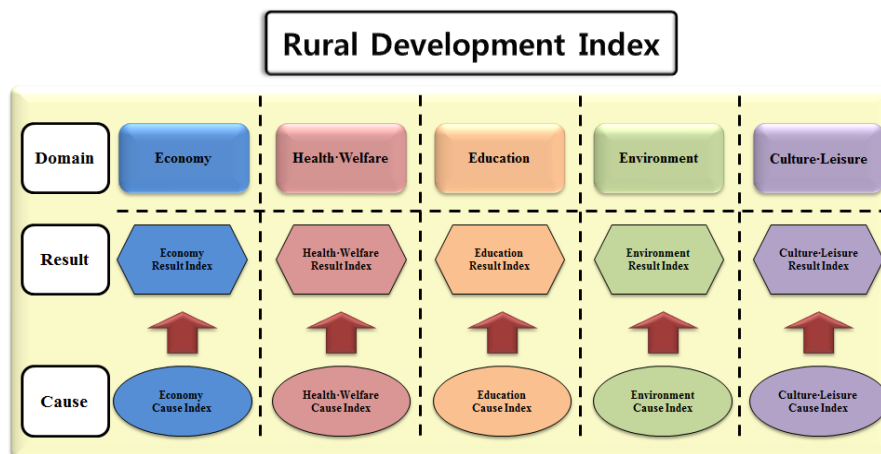
5.1. Economy Domain

The Economy Result Index is composed of indicators that can measure the income level of rural residents. Considering the unique features of rural economy, a rural household's income can be divided into farm income and non-farm income. Average annual farm income is used as an indicator of agricultural income level. Average annual non-farm income is used as an indicator of non-farm income level.

The Economy Cause Index is composed of indicators reflecting factors that directly affect the level of income. Cause indicators that affect farm income include (1) agricultural production, (2) agricultural distribution, and (3) agriculture infrastructure. Cause indicators that affect non-farm income can be represented by industrial development, assuming that the level of industrial development of a region is closely related to the level of non-farm income.

(1) Agricultural productivity: Farm income is positively related to agricultural productivity; farm income improves when agricultural productivity increases. Agricultural productivity is positively related to the size of farm, crop cultivation, agricultural mechanization, number of producer organizations, and access of residents to agricultural technology centers. Land productivity is used as an indicator of agricultural productivity, and average cultivated land area is used as an indicator of farm size. Ratio of cash crop farm households in a region is used as an indicator of cash crop cultivation. Since indicators reflecting agricultural mechanization and producer organization are not currently available, it would be necessary to develop

dataset on the rate of agricultural mechanization and the number of producers' organizations in the future.

(2) Agricultural distribution: Farm income is positively related to agricultural distribution; agricultural distribution improves as it becomes easier to share information on the price of agricultural produces among farmers and transportation conditions for delivery of agricultural produces to the distributors are facilitated. Landline phone penetration rate, computer penetration rate, radio penetration rate, and TV penetration rate are effective indicators of ease of access to price information, assuming that farmers acquire price information on agricultural produces by means of telecommunications and media. Motorbike penetration rate is used as an indicator of agricultural produce transportation status considering the fact that most Vietnamese farmers use motorbikes as a means of transportation to carry agricultural produces.

(3) Agricultural infrastructure: Farm income and agricultural infrastructure for both production and distribution are positively related; farm income will increase as conditions of agricultural infrastructure for production and distribution improve. Rate of road pavement is used as an indicator of agricultural infrastructure for distribution. More indicators are needed in order to assess the level of expansion for agricultural infrastructure such as agricultural irrigation canal and agricultural pumping stations.

Various industries need to be developed in order for the non-farm income to increase. Non-farm income is positively related to industrial development, and the level of industrial development is closely related to the number of enterprises in manufacturing and agro-technical industry that processes and commercializes agricultural produces, presence of regional tourism industry, development of industrial complex, and availability of vocational training programs for job seekers. Thus, the number of enterprises and employment in non-farm sector are used as indicators of the development level of enterprises.

In order to capture a better picture, it is necessary to develop a dataset on the proportion of people engaged in agro-processing for an indicator of the development level of agro-technical industry. Likewise, the number of tourists and number of people engaged in tourism business can be effective indicators of development level of tourism business. Also, further data such as the number of agricultural and industrial complexes as an indicator of agricultural and industrial complex, and the number of people attending vocational schools and number of vocational schools, are needed as indicators of conditions of accessibility to vocational training.

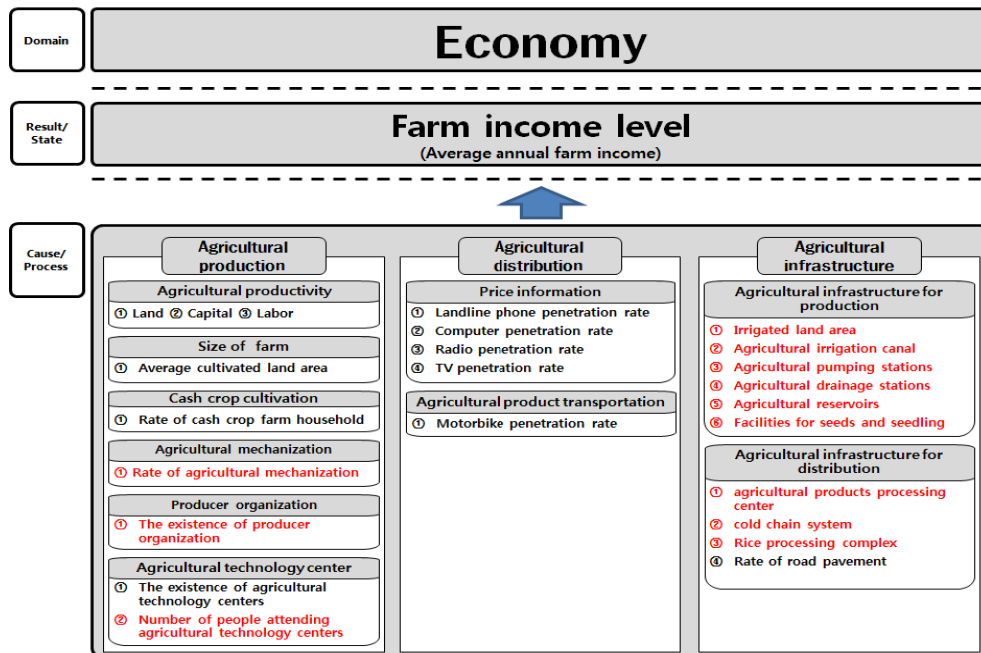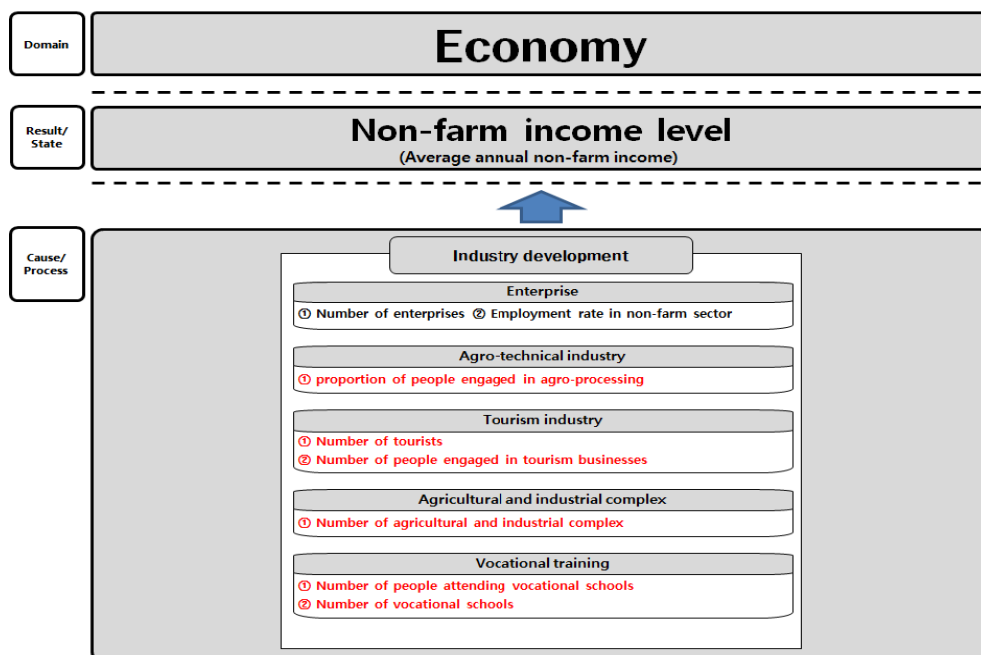FIGURE 2. Structure of the Economy Domain (Farm income)

FIGURE 3. Structure of the Economy Domain (Non-farm income)

5.2. Health·Welfare Domain

The Health and Welfare Result Index is composed of indicators that can measure the level of health and welfare. Life expectancy rate at birth is used as an indicator of rural residents' health and welfare status.

The Health and Welfare Cause Index is composed of indicators related to factors that lead to positive effects on health and welfare status. The Health and Welfare Cause Index is composed of conditions of medical facilities available to rural residents, number of medical manpower providing health services, etc. The level of health or general health status is positively related to conditions of the medical facilities. Health status of people living in rural areas gets improved as conditions of medical facilities are improved. The number of patient beds per 1,000 people is used as an indicator of the condition of medical facilities. An increase in the number of doctors, physicians, nurses, midwives, and pharmacists improves the health status of people living in rural areas through its positive effects on health and welfare. Number of doctors per 1,000 people, number of physicians per 1,000 people, number of nurses per 1,000 people, number of midwives per 1,000 people, and number of pharmacists per 1,000 people are used as indicators of the availability of health and medical manpower.

Health and welfare status also improves as the health insurance system, cost of which is jointly shared by members of a community, is developed and expanded as part of the efforts to minimize risks of heavy medical cost and loss in income caused by various types of unexpected accidents and diseases. Furthermore, data on the rate of medical insurance, which is not yet available, may be used as an indicator of the reach of health insurance coverage when it becomes available.

Health and welfare status of people in rural areas improves with health education as basic health-related knowledge, through which people can learn about transmitted diseases, vaccinations, medical check-ups, and practices to improve health conditions, is disseminated. Further data such as rate of vaccination as an indicator of the reach of vaccinations, rate of medical check-ups as an indicator of the reach of medical check-ups, and number of patients attending health education seminars as an indicator of the reach of health education are needed to capture a whole picture.

FIGURE 4. Structure of the Health·Welfare Domain
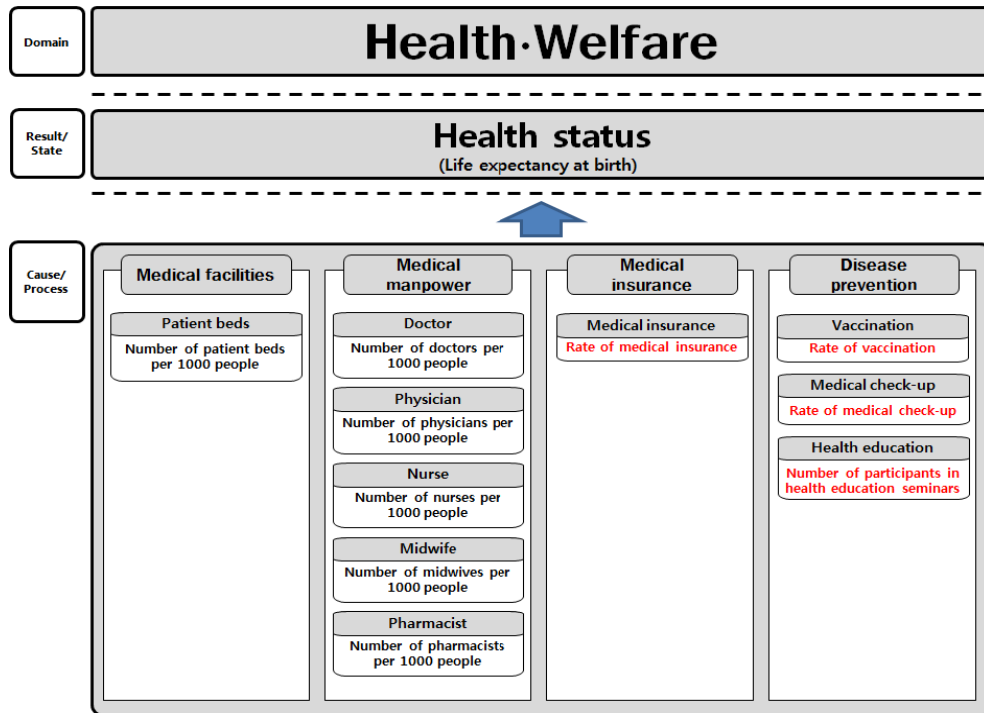
5.3. Education Domain

The Education Result Index is composed of indicators that measure the level of education among people living in rural areas. Literacy rate of population aged 15 and older is used as an indicator of the level of basic education. Primary school net enrollment rate, lower secondary net enrollment rate, and upper secondary net enrollment rate are used as indicators of the level of elementary and secondary school education.

The Education Cause Index is composed of indicators related to factors that lead to positive effects on the educational level of rural residents. The Education Cause Index is calculated based on the numbers of educational facilities, education manpower, and illiteracy eradication campaigns. Rural residents' educational level improves when educational facilities are improved. The numbers of pupils per class in primary, lower secondary, and upper secondary schools are used as indicators of the condition of educational facilities. Rural residents' educational

level improves when the number of teachers is increased. The numbers of pupils per teacher in primary, lower secondary, and upper secondary schools are used as indicators of the availability of teachers.

Further data on the number of teachers participating in capacity building related seminars is needed as an indicator of activities to enhance the capacity of teachers. Rural residents' educational level improves as the number of illiteracy eradication campaigns grows, since such campaigns lead to an increase in the number of people who can read and write. Thus, as indicators of efforts to promote illiteracy eradication campaigns, further data on the number of literacy trainers and the number of class participants are needed.

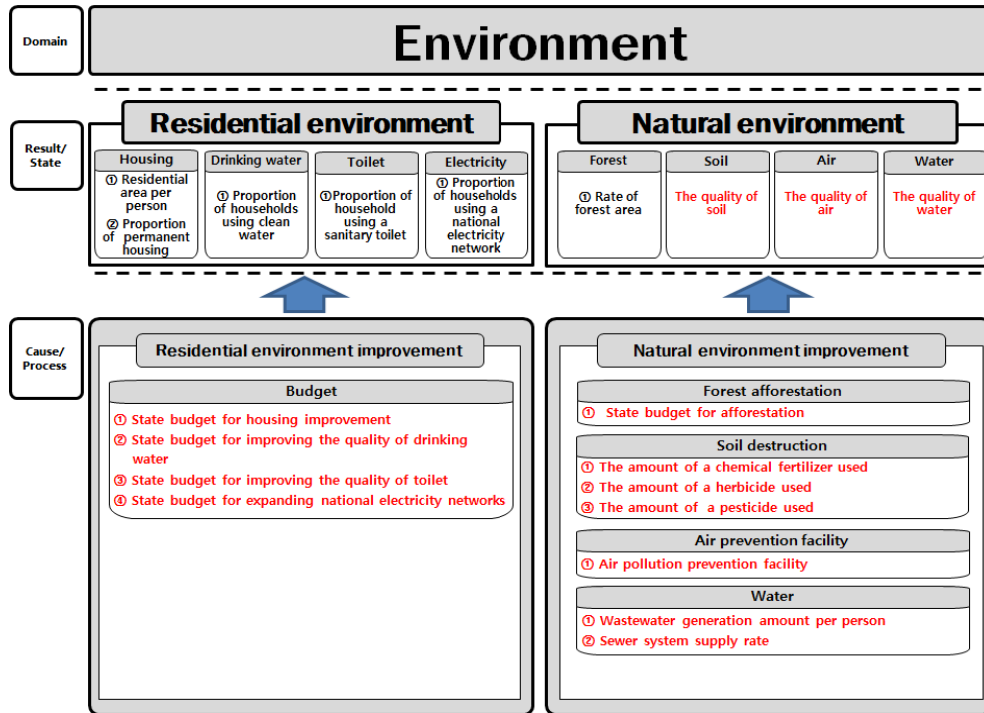FIGURE 5. Structure of the Education Domain
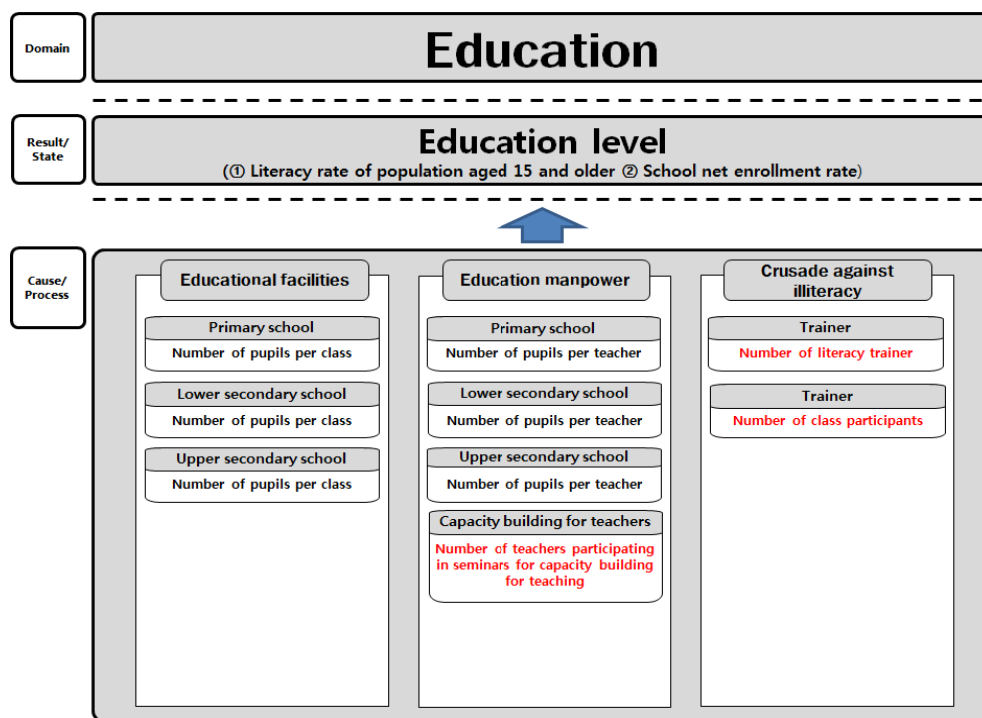
5.4. Environment Domain

The domain of environment is composed of the residential environment and natural environment that include all factors surrounding human life. Permanent housing, safe drinking water, sanitary toilets, and sustainable electricity are the specific com-

ponents of residental environment. Afforestation level, air condition, and soil and water quality are the specific components of natural environment.

A combination of residential area per person and proportion of permanent housing is used as indicators of the occupation level of permanent housing and quality of housing. Proportion of households using clear water is used as an indicator of access to safe drinking water. Proportion of households using sanitary toilets is used as an indicator of the usage level of sanitary toilets. Proportion of households using a national electricity network is used as an indicator of access to sustainable electricity. Afforestation level, condition of air, soil and water quality should be used as indicators to measure the level of natural environment. In Vietnam, however, there is no indicator measuring the level of natural environment that can be distinguished by region except for the rate of afforestation. Thus, it is necessary to have indicators related to natural environment that can measure the quality of air, soil and water by region.

In order to compose the cause index for residental environment, indicators related to the state budget for improving residental environment are needed. Examples of such indicators can be the state budget allocated for housing improvement or state budget allocated for improving the quality of drinking water. However, Vietnam is not developing such indicators, and therefore, it is advisable to develop indicators related to projects on improving residental environment. Also, it is suggested that environment cause indicators such as state budget for afforestation and sewer system supply rate by region be developed.

FIGURE 6.   Structure of the Environment Domain

Domain	**Environment**							

Residential environment

	Housing	Drinking water	Toilet	Electricity
Result/State	① Residential area per person ② Proportion of permanent housing	① Proportion of households using clean water	①Proportion of household using a sanitary toilet	① Proportion of households using a national electricity network

Natural environment

Forest	Soil	Air	Water
① Rate of forest area	The quality of soil	The quality of air	The quality of water

Cause/Process

Residential environment improvement

Budget
① State budget for housing improvement
② State budget for improving the quality of drinking water
③ State budget for improving the quality of toilet
④ State budget for expanding national electricity networks

Natural environment improvement

Forest afforestation
① State budget for afforestation

Soil destruction
① The amount of a chemical fertilizer used
② The amount of a herbicide used
③ The amount of a pesticide used

Air prevention facility
① Air pollution prevention facility

Water
① Wastewater generation amount per person
② Sewer system supply rate

5.5. Culture·Leisure Domain

The average annual expenditure for culture and leisure per household is used as an indicator to measure the dynamism level of cultural and leisure activities. Adding more regional facilities for cultural activities, tourism, and sports invigorates the level of cultural and leisure activities. It is composed of indicators related to the availability of facilities for cultural and leisure activities such as cultural, tourist, and sport facilities. Number of libraries per 100,000 people, number of movie theaters per 100,000 people, and number of playhouses per 100,000 people are used as indicators of access to cultural facilities. Further data on the number of local festivals, number of provincial parks, number of amusement parks, and number of tourist attractions are needed as indicators of the condition of tourist facilities. Also, the number of stadiums per 100,000 people and the number of swimming pools per 100,000 people are needed as indicators of the condition of sports facilities.

FIGURE 7.   Structure of the Culture and Leisure Domain
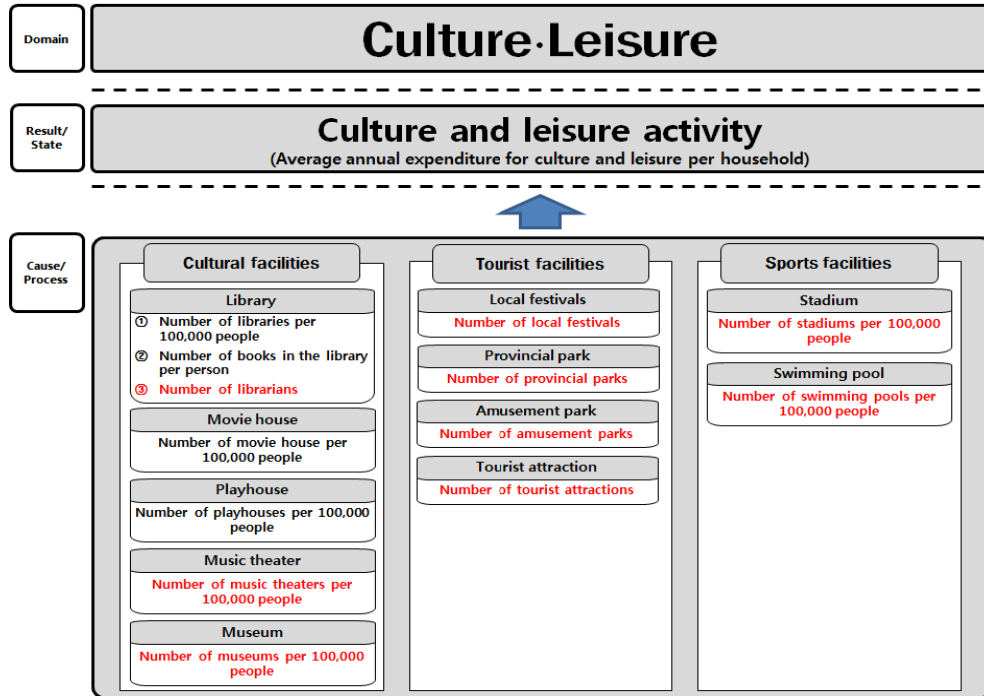
IV. Analysis of the Rural Development Index in Vietnam

1. Scope of Analysis

The Vietnamese government groups various provinces of the country into six regions: the Northern Midlands and Mountainous Areas, the Red River Delta, the North Central and Central Coastal Areas, the Central Highlands, the South East Area, and the Mekong River Delta.[3] Vietnam consists of 58 provinces and 5 centrally-controlled municipalities that include Ha Noi, Ho Chi Minh City, Can Tho, Da Nang and Hai Phong that have the same status as the provinces. The scope of analysis in this research covers all of the 63 regions.

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[3] Decree No. 92/2006/ND-CP dated September 7th, 2006 of the Government on the Formulation, Approval and Management of the Master Plan for Socio-economic Development

Households located in rural (following the administrative definition of the Vietnamese government) areas, and households located in urban areas but engaged in agricultural, forestry, and fishery activities as the main source of income are sampled as the target of the analysis.

2. Data Source

This research uses four types of data sets obtained from surveys conducted by the General Statistic Office of Vietnam (GSO). The applied data sets are as follows: (1) the 2009 Vietnam Population and Housing Census 2009, (2) Vietnam Household Living Standards Survey 2010, (3) Statistical Yearbook of Vietnam 2010, and (4) Rural, Agricultural and Fishery Census 2011.

3. Grading Scheme

In order to correctly understand the comprehensive development level of each region, the calculated results of the Composite Result Index are categorized into four grades. Development goals and directions for each region can be established based on these results. The calculated results of the Result Index for each domain are categorized into four grades to identify domains that are outstanding or inadequate. Development policies customized for each region can be established based on these results.

As for the grading methodologies, two methods are available: one using absolute values and another using relative values. This research paper applies the method using absolute values. Such an attempt was made not to simply distinguish different regions and compare their development levels in relative terms, but rather, it was intended to set the specific development goals to be promoted and to establish relevant development strategies based on the grading results that effectively capture the current level of development within each region. For this reason, the Rural Development Index cut-off points for classification were set in terms of absolute values. The cut-off points in <Table 1> were set based on the overall development level of the rural areas in Vietnam.

TABLE 1.　Grading Scheme of the Rural Development Index

Classification	Range of Rural Development Index
Grade A	$0.900 \leq RDI \leq 1$
Grade B	$0.800 \leq RDI < 0.900$
Grade C	$0.500 \leq RDI < 0.800$
Grade D	$0 < RDI < 0.500$

4. Calculated Results of the Rural Development Index

1.1. Calculated Results of the RDI for the Economy Domain

The top 5 regions are Ho Chi Minh City, Binh Duong, Dong Nai, Binh Phuoc, and Ba Ria - Vung Tau, listed in the ranking order. The bottom 5 are Lai Chau, Ha Tinh, Hoa Binh, Quang Binh, and Quang Ngai, listed in the ranking order. Statistics result of the Economy Result Index shows a maximum value of 0.919, minimum value of 0.274, mean value of 0.500, and standard deviation of 0.126.

Among the top 10 regions, five regions belong to the sphere of South East that has the most advanced industrial sector centered around Ho Chi Minh City. The bottom 10 regions are the regions that are recognized as the most under-developed regions in Vietnam. These regions are mostly mountainous areas, which are isolated from other regions by poor infrastructure.

1.2. Calculated Results of the RDI for the Health·Welfare Domain

The top 5 regions are Ho Chi Minh City, Can Tho, Binh Duong, Dong Nai, and Ba Ria - Vung Tau, listed in the ranking order. The bottom 5 regions are Lai Chau, Dien Bien, Quang Tri, Kon Tum, and Ha Giang, listed in the ranking order. Statistics result of the Health·Welfare Result Index shows a maximum value of 0.734, minimum value of 0.000, mean value of 0.500, and standard deviation of 0.166.

Among the bottom 10 regions, six regions belong to the sphere of the Northern Midlands and Mountainous Area. These regions are mostly mountainous areas that are isolated from other regions by poor infrastructure and inadequate transportation conditions.
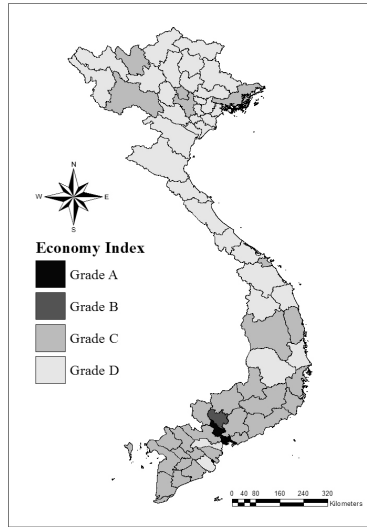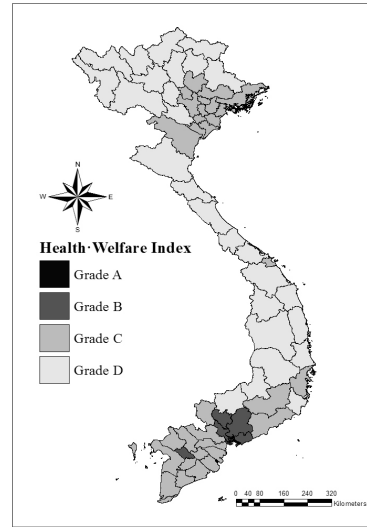
FIGURE 8. Calculated RDI for the Economy Domain

FIGURE 9. Calculated RDI for the Health·Welfare Domain

1.3. *Calculated Results of the RDI for the Education Domain*

The top 5 regions are Thai Binh, Ha Noi, Hai Phong, Bac Ninh, and Hai Duong, listed in the ranking order. The bottom 5 regions are Lai Chau, Ha Giang, Dien Bien, Son La, and Soc Trang, listed in the ranking order. Among the top 10 regions, eight regions belong to the sphere of the Red River Delta. Statistics result of the Education Result Index shows a maximum value of 0.923, minimum value of 0.525, mean value of 0.801, and standard deviation of 0.092.

The Education Index shows a higher average value and lower standard deviation value in comparison to the results in other domains. The significance of such a result is that the difference in terms of educational level are comparatively low among different regions . Vietnam has implemented an educational policy that makes six years of education compulsory. Primary education is provided to all children without tuition fees. It is considered to be one of the most important and effective policies to enhance educational level of rural residents.

1.4. Calculated Results of the RDI for the Environment Domain

The Environment Result Index is only composed of the residential environment since there are currently no indicators to measure the level of natural environment. The top 5 regions are Ho Chi Minh City, Da Nang, Ba Ria Vung Tau, Binh Duong, and Ha Noi, listed in the ranking order. The bottom 5 regions are Lai Chau, Dien Bien, Ha Giang, Son La, and Lao Cai, listed in the ranking order. Statistics result of the Environment Result Index shows a maximum value of 0.978, minimum value of 0.303, mean value of 0.711, and standard deviation of 0.138.

FIGURE 10. Calculated RDI for   FIGURE 11. Calculated RDI for
the Education Domain   the Environment Domain

1.5. Calculated Results of the RDI for the Culture·Leisure Domain

The Culture·Leisure Result Index is an index that measures rural residents' level of participation in cultural and leisure activities. The top 5 regions are Binh Phuoc, Binh Duong, Ho Chi Minh City, Lam Dong, and Bac Ninh, listed in the ranking order. The bottom 5 regions are Ha Giang, Dien Bien, Thua Thien Hue, Da Nang, and Hung Yen, listed in the ranking order. Statistics result of the Culture·Leisure Result Index shows a maximum value of 0.933, minimum value of 0.000, mean value of 0.500, and   standard deviation of 0.167.

1.6. Calculated Results of the Composite Index

The top 10 regions are Ho Chi Minh City, Binh Duong, Ba Ria-VungTau, Dong Nai, Ha Noi, Binh Phuoc, Bac Ninh, Quang Ninh, Lam Dong, and Hai Phong, listed in the ranking order. Among the top 10 regions, 5 regions belong to the South East centered around Ho Chi Minh City. Ho Chi Minh City is the commercial center of Vietnam and accounts for a large share of the national economy, contributing to over 20 percent of the country's GDP and over 26 percent of total industrial production. The result was similar for the Economy Result Index; the South East region which has the highest level of industrial development centered around Ho Chi Minh City ranked the highest. Hanoi, the capital city of Vietnam, and Hai Phong, the traffic hub of the major economic regions and the strategic region for economic and social development, ranked 5 and 10, respectively.

The bottom 10 regions are Lai Chau, Dien Bien, Ha Giang, Kon Tum, Lao Cai, Cao Bang, Yen Bai, Bac Kan, Son La, and Quang Tri, listed in the ranking order. Among the bottom 10 regions, 8 regions belong to the Northern Midlands and Mountainous Areas. Most of regions in Northern Midlands and Mountainous Areas have low connectivity with other regions due to poor conditions of infrastructure and transportation. Such regions are largely recognized as the most underdeveloped regions in Vietnam. Statistics result of the Composite Result Index shows a maximum value of 0.853, minimum value of 0.278, mean value of 0.602, and standard deviation of 0.107.

FIGURE 12. Calculated RDI for the Culture and Leisure Domain
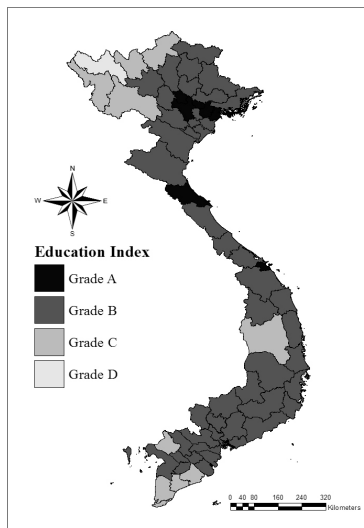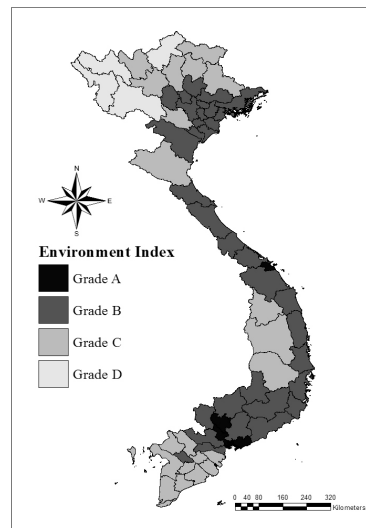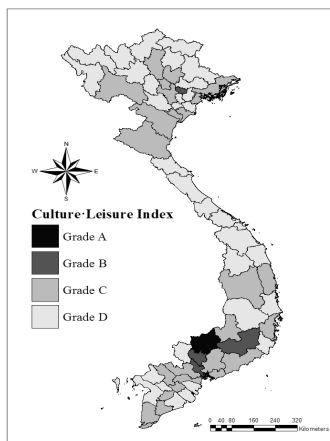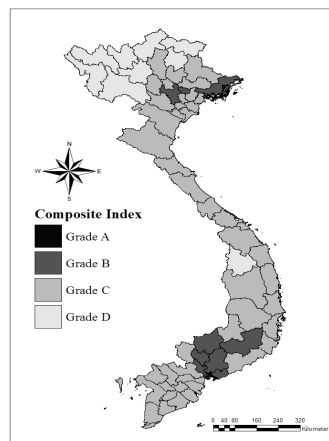
FIGURE 13. Calculated Results of the Composite Index

Ⅴ. Conclusions

The purpose of this research was to analyze the current status and process of Vietnam's rural development to draw lessons for improving the quality of rural life and achieving sustainable rural development in Vietnam. This research attempted to construct a Rural Development Index that measures development status and process in rural areas. First, the paper reviewed previous studies to analyze concepts and theoretical perspectives on rural development, and came up with a concrete definition of rural development to set up a Rural Development Index. Second, the paper suggested five principles for constructing the Rural Development Index: Boundedness, Reliability, Replicability, Completeness, and Independence. Third, the Rural Development Index was constructed as a tool to evaluate the current status and process of rural development as applied to the case of Vietnam.

According to the calculated results of the RDI, among the top 10 regions with the highest scores, five regions belong to the South East region centered around Ho Chi Minh City, which is the commercial center of Vietnam. Among the bottom 10 regions, eight regions belong to the Northern Midlands and Mountain Areas. Most of the regions in the Northern Midlands and Mountainous Areas have low connectivity to other regions due to poor conditions of infrastructure and transportation. Such regions are widely recognized as the most underdeveloped regions in Vietnam. As indicated by the calculated results, the level of rural development and development status of each domain that closely affect rural development vary significantly across different regions in Vietnam.

In order to maximize the effects of utilizing limited rural development resources, specific rural development strategies relevant for Vietnam should be established. Various conditions and development status of Vietnam's rural areas need to be examined by a multi-dimensional aspect and differences in rural areas across regions must be taken into account.

The significance of this research lies in its attempt to evaluate the status of rural development and development process by constructing a Rural Development Index.

A limitation of this research is that although a comprehensive Cause Index system was constructed to evaluate the process of rural development and establish strategies accordingly, the Cause Index was composed of limited indicators due to

the lack of accessible data. For this reason, this paper is constrained to present only results of the Result Index that shows the progress status of rural areas.

Therefore, it is necessary to establish a rural development strategy reflecting the essential characteristics of rural areas based on in-depth analysis of development status and development progress in Vietnam, applying an elaborate Rural Development Index with more diverse indicators included within the Cause Index.

This paper makes the following recommendations for developing countries with limited statistical data to be able to utilize the Rural Development Index in formulating rural development strategies. First, it is necessary to develop specific indicators to build a comprehensive Cause Index at the government level. A regular survey on various indicators that make up the five domains can lead to a thorough analysis of the rural development process and development impacts along the passage of time. Secondly, even when it is difficult to compose a Cause Index because of limited statistical data, the RDI can still be effectively utilized in selecting priority regions for development using the calculated results from the Result Index. Moreover, the RDI can also be utilized by policy makers when establishing rural development strategies by region, particularly in identifying domains in need of development and the appropriate sectors and level of development using the gradings from the Result Index.

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APPENDIX

Appendix Table 1. The Calculated Results of RDI (Result Index)

Ranking	Regions	City/Province	Composite Result Index		Economy Result Index		Health Welfare Result Index		Education Result Index		Environment Result Index		Culture Leisure Result Index	
			score	grade	score	grade	score	grade	score	grade	score	grade	score	grade
1	SE	Ho Chi Minh City	0.853	B	0.919	A	0.734	C	0.852	B	0.978	A	0.783	C
2	SE	Binh Duong	0.828	B	0.892	B	0.709	C	0.756	C	0.918	A	0.865	B
3	SE	BaRia-Vung Tau	0.749	C	0.669	C	0.703	C	0.837	B	0.921	A	0.615	C
4	SE	Dong Nai	0.746	C	0.694	C	0.709	C	0.835	B	0.879	B	0.611	C
5	RRD	Hanoi	0.735	C	0.639	C	0.677	C	0.919	A	0.894	B	0.546	C
6	SE	Binh Phuoc	0.729	C	0.675	C	0.484	D	0.821	B	0.731	C	0.933	A
7	RRD	Bac Ninh	0.706	C	0.432	D	0.615	C	0.916	A	0.836	B	0.733	C
8	RRD	Quang Ninh	0.702	C	0.597	C	0.546	C	0.883	B	0.808	B	0.677	C
9	CH	Lam Dong	0.701	C	0.581	C	0.584	C	0.830	B	0.769	C	0.743	C
10	RRD	Hai Phong	0.699	C	0.476	D	0.652	C	0.918	A	0.853	B	0.595	C
11	NCCCA	Khanh Hoa	0.682	C	0.534	C	0.534	C	0.819	B	0.839	B	0.684	C
12	RRD	Vinh Phuc	0.677	C	0.532	C	0.621	C	0.902	A	0.779	C	0.550	C
13	NCCCA	Da Nang	0.673	C	0.570	C	0.671	C	0.912	A	0.969	A	0.242	D
14	RRD	Nam Dinh	0.670	C	0.405	D	0.609	C	0.900	B	0.831	B	0.605	C
15	NCCCA	Binh Thuan	0.668	C	0.597	C	0.571	C	0.783	C	0.789	C	0.598	C

Appendix TABLE 2. The Calculated Results of RDI (Result Index)

Ranking	Regions	City/ Province	Composite Result Index		Economy Result Index		Health Welfare Result Index		Education Result Index		Environment Result Index		Culture Leisure Result Index	
			score	grade	score	grade	score	grade	score	grade	score	grade	score	grade
16	MRD	Long An	0.667	C	0.551	C	0.671	C	0.809	B	0.776	C	0.525	C
17	MRD	Vinh Long	0.659	C	0.513	C	0.646	C	0.845	B	0.622	C	0.670	C
18	MRD	Can Tho	0.655	C	0.628	C	0.715	C	0.771	C	0.732	C	0.429	D
19	RRD	Thai Binh	0.655	C	0.426	D	0.652	C	0.923	A	0.785	C	0.486	D
20	MRD	Tien Giang	0.653	C	0.481	D	0.646	C	0.814	B	0.796	C	0.526	C
21	MRD	Bac Lieu	0.651	C	0.656	C	0.596	C	0.686	C	0.678	C	0.637	C
22	NCCCA	Binh Dinh	0.650	C	0.521	C	0.490	D	0.869	B	0.799	C	0.572	C
23	RRD	Hai Duong	0.642	C	0.440	D	0.621	C	0.915	A	0.788	C	0.444	D
24	RRD	Ninh Binh	0.641	C	0.404	D	0.552	C	0.890	B	0.788	C	0.573	C
25	MRD	Ben Tre	0.632	C	0.511	C	0.621	C	0.837	B	0.694	C	0.498	D
26	RRD	Ha Nam	0.630	C	0.426	D	0.552	C	0.896	B	0.789	C	0.486	D
27	SE	Tay Ninh	0.629	C	0.517	C	0.596	C	0.763	C	0.803	B	0.465	D
28	MRD	Hau Giang	0.625	C	0.510	C	0.646	C	0.726	C	0.580	C	0.663	C
29	CH	Dak Lak	0.624	C	0.543	C	0.415	D	0.796	C	0.723	C	0.645	C
30	MRD	Ca Mau	0.623	C	0.638	C	0.571	C	0.683	C	0.683	C	0.541	C
31	NMMA	Thai Nguyen	0.623	C	0.367	D	0.577	C	0.872	B	0.738	C	0.560	C
32	MRD	Dong Thap	0.613	C	0.567	C	0.546	C	0.758	C	0.558	C	0.634	C

Appendix TABLE 3. The Calculated Results of RDI (Result Index)

Ranking	Regions	City/ Province	Composite Result Index		Economy Result Index		Health Welfare Result Index		Education Result Index		Environment Result Index		Culture Leisure Result Index	
			score	grade	score	grade	score	grade	score	grade	score	grade	score	grade
33	NMMA	Bac Giang	0.612	C	0.463	D	0.521	C	0.874	B	0.720	C	0.480	D
34	RRD	Hung Yen	0.612	C	0.459	D	0.615	C	0.892	B	0.804	B	0.287	D
35	MRD	An Giang	0.604	C	0.666	C	0.527	C	0.695	C	0.640	C	0.493	D
36	MRD	Kien Giang	0.602	C	0.597	C	0.571	C	0.703	C	0.650	C	0.487	D
37	NCCCA	Thanh Hoa	0.601	C	0.360	D	0.527	C	0.854	B	0.711	C	0.553	C
38	NCCCA	Phu Yen	0.590	C	0.482	D	0.440	D	0.819	B	0.755	C	0.454	D
39	NCCCA	Nghe An	0.588	C	0.382	D	0.490	D	0.848	B	0.700	C	0.520	C
40	NCCCA	Ninh Thuan	0.583	C	0.579	C	0.408	D	0.727	C	0.726	C	0.475	D
41	NCCCA	Ha Tinh	0.579	C	0.313	D	0.496	D	0.907	A	0.727	C	0.450	D
42	MRD	Soc Trang	0.576	C	0.598	C	0.527	C	0.657	C	0.650	C	0.448	D
43	NCCCA	Quang Nam	0.574	C	0.409	D	0.440	D	0.875	B	0.801	B	0.345	D
44	MRD	Tra Vinh	0.574	C	0.472	D	0.527	C	0.726	C	0.649	C	0.494	D
45	NCCCA	Quang Ngai	0.574	C	0.342	D	0.458	D	0.851	B	0.783	C	0.433	D
46	NMMA	Phu Tho	0.560	C	0.363	D	0.484	D	0.866	B	0.706	C	0.379	D
47	NCCCA	Quang Binh	0.559	C	0.339	D	0.440	D	0.851	B	0.741	C	0.424	D
48	NMMA	Tuyen Quang	0.555	C	0.359	D	0.465	D	0.807	B	0.593	C	0.552	C
49	CH	Gia Lai	0.551	C	0.515	C	0.346	D	0.674	C	0.649	C	0.570	C

Appendix TABLE 4. The Calculated Results of RDI (Result Index)

Ranking	Regions	City/ Province	Composite Result Index		Economy Result Index		Health Welfare Result Index		Education Result Index		Environment Result Index		Culture Leisure Result Index	
			score	grade	score	grade	score	grade	score	grade	score	grade	score	grade
50	NCCCA	Thua Thien Hue	0.548	C	0.444	D	0.402	D	0.829	B	0.837	B	0.225	D
51	NMMA	Lang Son	0.543	C	0.469	D	0.465	D	0.814	B	0.574	C	0.393	D
52	NMMA	Hoa Binh	0.540	C	0.335	D	0.465	D	0.818	B	0.593	C	0.492	D
53	CH	Dak Nong	0.537	C	0.491	D	0.327	D	0.750	C	0.635	C	0.481	D
54	NCCCA	Quang Tri	0.503	C	0.412	D	0.133	D	0.851	B	0.727	C	0.392	D
55	NMMA	Son La	0.496	D	0.526	C	0.315	D	0.642	C	0.440	D	0.557	C
56	NMMA	Bac Kan	0.494	D	0.365	D	0.465	D	0.783	C	0.520	C	0.337	D
57	NMMA	Yen Bai	0.461	D	0.366	D	0.290	D	0.746	C	0.571	C	0.331	D
58	NMMA	Cao Bang	0.459	D	0.439	D	0.290	D	0.735	C	0.515	C	0.318	D
59	NMMA	Lao Cai	0.451	D	0.528	C	0.171	D	0.688	C	0.505	C	0.362	D
60	CH	Kon Tum	0.442	D	0.428	D	0.133	D	0.726	C	0.606	C	0.316	D
61	NMMA	Ha Giang	0.309	D	0.425	D	0.139	D	0.567	C	0.414	D	0.000	D
62	NMMA	Dien Bien	0.304	D	0.384	D	0.108	D	0.609	C	0.388	D	0.029	D
63	NMMA	Lai Chau	0.278	D	0.274	D	0.000	D	0.525	C	0.303	D	0.289	D

* RRD: the Red River Delta Region, NMMA: the Northern Midlands and Mountainous Areas, NCCCA: the North Central and Central Coastal Areas, CH: the Central Highlands, SE: the South East, MRD: the Mekong River Delta