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MEASURING SUSTAINABLE DEVELOPMENT LEVEL IN VIETNAM BY USING A COMPREHENSIVE INDEX

Pomiar poziomu rozwoju zrównoważonego w Wietnamie za pomocą wskaźnika syntetycznego

Abstract: Development of evaluation relevant indicators and a method for assessing the level of sustainable development is one of the effective ways to monitor and measure the progress toward sustainability. The author developed a system of 20 core indicators of sustainable development in Vietnam and a concept of comprehensive index which allow a quick of recognition of sustainable development level in different spatial units. The results of research indicate that the comprehensive index of sustainable development of Vietnam was still at the low-medium level, but getting better over period of time. There are spatial differences between components of sustainable development and the level of sustainable development is the highest in South East and Red River Delta and the lowest in the north-eastern periphery of the country.

Zarys treści: Stosowanie odpowiednich wskaźników oraz metod pomiaru poziomu zrównoważonego rozwoju jest jednym ze skutecznych sposobów monitorowania i mierzenia postępu w kierunku zrównoważonego rozwoju. Autor opracował system 20 podstawowych wskaźników zrównoważonego rozwoju w Wietnamie i koncepcję syntetycznego wskaźnika, który pozwala na szybkie rozpoznanie poziomu zrównoważonego rozwoju w różnych jednostkach przestrzennych. Wyniki badań wskazują, że wszechstronny wskaźnik rozwoju zrównoważonego Wietnamu nadal znajduje się na niskim-średnim poziomie, ale ulega poprawie. Występują różnice przestrzenne między komponentami zrównoważonego rozwoju, a poziom zrównoważonego rozwoju jest najwyższy w regionie południo-wschodnim i regionie Deltę Rzeki Czerwonej, a najniższy na krańcach północno-wschodnich kraju.

Key words: Sustainable Development, Measurement, Comprehensive Index, Vietnam

Słowa kluczowe: rozwój zrównoważony, pomiar, wskaźnik syntetyczny, Wietnam

INTRODUCTION

Every human being wishes that he and the members of his community can live in a good, healthy and happy environment and the quality of life continues to be improved (Vietnam Agenda 21 Office, 2008). Present generations now live better than earlier generations because we have inherited benefiting from their decisions, discoveries, and achievements. But we are now also facing a lot of challenges which threaten our outcomes such as climate change, poverty, pollution, *etc.*... To ensure that

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our children and grandchildren can maintain a good quality of life and have a higher standard of living, we must leave future generations a good social, economic and environmental foundation (Australian Government, 2013). To do this, our progress must be made in ways that are sustainable.

One of the most critical problems is knowing how to measure and evaluate sustainable development, means “How do I know the levels of sustainable development” or “How might I know objectively whether things are getting better or getting worse” (Bell and Morse 2008). To be able to measure the present level of sustainability and indicate how far removed we are from complete sustainability, a clear definition of sustainability is required at first (Lawn 2004) to create a platform for developing a corresponding set of core and relevant indicators and a comprehensive index.

Vietnam, the official name is the Socialist Republic of Vietnam, covers a total area of approximately 330,966 km², is the eastern country on the Indochina Peninsula in Southeast Asia. With an estimated 91.7 million inhabitants as of 2015, it is the world's 14th-most-populous country, and the ninth-most-populous Asian country (GSO, 2016). Vietnam is divided into 63 administrative units including 58 provinces and five municipalities, which are administratively on the same level as provinces. Vietnam is a developing country and experiencing fast urbanization and industrialization period, accompanied by increasing Gross Domestic Product (GDP), expanding infrastructures, and changing in the quality of life. Even though there are many severe problems, and shortcoming has to be dealt, Vietnam has recorded remarkable achievements in economic, social and environmental sectors, all three pillars of sustainable development (Vietnam Agenda 21 Office, 2008). Generally speaking, people already realized the significance of sustainable development and had carried out some research. But there are no useful indicators, evaluation method and a comprehensive index for assessment of sustainable development of Vietnam.

The aim of the research is to determine a new set of indicators and a comprehensive index based on the understanding sustainable development, criteria for selecting indicators and taking into account the circumstances of Vietnam to identify change of level of sustainability for entire country by the time (with dynamic comparison from 2004 to 2016) and the spatial differentiation of level of sustainability between 63 provinces (with the temporal scope of data in 2014-2016). For the next sections of this paper, I will define the term sustainable development. The components of sustainability will also be revealed to be able to understand better the concept of this notion. The author then released a new set of core indicators which is considered to be suitable for Vietnam, and illustrate the methodology of calculating a comprehensive sustainability index. The results for indicators are aggregated into components and then into one comprehensive index for the entire country and 63 Vietnamese provinces. The last section gives the main results for whole country, for all 63 administrative units, shown on charts, and maps.

THE DEFINITION OF SUSTAINABLE DEVELOPMENT

The concept of sustainability originated in the context of renewable resources such as forests or fisheries for a long time ago. But the definition of the concept of sustainable development appeared for the first time in 1987 with the publication of the Brundtland Report. The brief definition of sustainable development in the report as the “ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987) is undoubtedly the typical definition when judged by its ubiquitous use and frequency of citation (Kates *et al.* 2005). The term “sustainable development” has been defined

in a lot of ways and interpreted in more than two hundred ways (Rogers *et al.* 2008; Van De Kerk and Manuel 2008). The enormous numbers of books, articles, reports and policy papers offered many proper definitions of the term (Gibson *et al.* 2005). Even some people suggested that sustainable development is an “oxymoron”, “contradiction in the term”, “self-contradictory” (Daly and Townsend 1993), when we engage two terms which are impossible to reconcile in one word. Because considering about terminology, “development” means progress to get better, to become more advanced, stronger; meanwhile “to sustain” means to maintain, to preserve, to keep.

For many people, the basic idea of sustainable development focuses mainly on the depletion of resources. Others consider that sustainability also covers pollution, conservation of nature and other environmental and ecological aspects (Van De Kerk and Manuel 2008). Some people see sustainable development as primarily about the environment, and indeed sustainable development has its roots in conservation and the desire to protect the planet’s ecosystems from the ravages of human civilization (Blewitt 2018).

However, sustainable development does not mean the sustainable development of any single economic, social, or environmental subsystem. Today sustainable development is broadly understood as a three-pillar approach (Ivanov and Peleah 2017). It attempts to balance economic growth, environmental protection, and social progress (Li *et al.* 2009). As an intellectual pursuit, sustainable development tries to make sense of the interactions of three complex systems: the world economy, the global society, and the Earth’s physical environment (Sachs 2015). Sustainability requires an understanding of the relationship, integration and balance between the capacity of the natural environment and the human social world (Rogers *et al.* 2008). It is a process that requires us to view our lives as elements of a larger entity. It requires an understanding that the world is multifaceted, fragmented and complete (Blewitt 2018).

From all of the perspectives, as far as I am concerned that sustainable development is the development that guarantees the balance between economic growth, social well-being and environmental component, satisfies the needs of the present without compromising the ability of future generations to meet their own needs. In order to perceive sustainability and to be able to measure the extent of sustainability I have elaborated the definition into three main pillars which are the economic, social and environmental aspect.

- Economic sustainability focuses on sustained and productive economic growth. It is also a competitive and prosperous economy that can also lead to new and better employment opportunities and generates wealth for all, without harming the environment.
- Social sustainability fosters the development of people, communities, and cultures to help achieve reasonable and fairly-distributed quality of life, healthcare and education.
- Environmental sustainability prevents nature from being used as an infinite source of resources and ensures its protection and rational use.

(ACCIONA, no date)

The research question is now shifted to ask for a set of indicators available to measure these elements adequately.

DEVELOPMENT OF AN INDICATOR SYSTEM FOR VIETNAM

There is no way we can know that the path we are on is heading towards sustainable development or away from it unless we know what it is we are trying to achieve and unless we have indicators

that tell us whether we are on or off a sustainable development path (OECD, 1999). The United Nations Conference on Environment and Development in 1992 recognized the important role that indicators could play in helping countries make informed decisions concerning sustainable development. The first two sets of indicators of sustainable development were developed by the United Nations between 1994 and 2001 and the third edition was released in 2007. They have been extensively tested, applied and used in many countries as the basis for the development of national indicators of sustainable development (United Nations, 2007).

Moreover, we have many comprehensive indexes and sets of indicators concerning sustainability on a national level for whole world, such as: Human Development Index (HDI) developed by the UNDP; Environmental Performance Index developed by Columbia University and Yale University, USA; Ecological Footprint published every two years by the WWF; Millennium Development Indicators set up by the UN in 2000; Sustainable Development Goals indicators set up by UN in 2015, *etc.*... In Vietnam, the Prime Minister of the Government of Vietnam signed the decision to release the strategy for sustainable development of Vietnam in period 2011 – 2020 with indicators to monitor and evaluate sustainable development for whole country (Government of Vietnam, 2012).

One of the hardest methodological choices one would face in construction of an index that would be both meaningfully relevant and statistically powerful is the selection of adequate indicators (Ivanov and Peleah 2017). On the one hand, very often we don't have indicators to measure things we are interested in. For example, in the case of environment component, we need indicators to measure for water quality, waste recycling, biodiversity protection, *etc.*..., but we are still lacking data for such indicators for particular territory in country. On the other hand, indicators, which are available, sometime measure things only partially or measure only certain aspects of broader phenomenon (Ivanov and Peleah 2017) or are only available for national, international level and lack data for provincial level.

Table 1. New set of indicators for measuring sustainability in Vietnam

Tabela 1. Nowy zbiór wskaźników do pomiaru rozwoju zrównoważonego w Wietnamie

<i>Component</i>		<i>Indicator</i>	<i>Rationale</i>
Economic	1	GDP per capita (PPP current USD)	Prosperity
	2	Urban population rate (%)	Intensive economic activity
	3	Incremental capital-output ratio (ICOR)	Efficiency
	4	Unemployment rate (% labor force)	Unemployment
	5	Percentage of advanced trained employed workers at 15 years of age and above (%)	Quality of labor
	6	Competitiveness Index	Good governance
Social	7	Adult literacy rate (%)	Education
	8	Proportion of household own permanent house (%)	Housing condition
	9	Poverty rate (%) - national poverty line	Poverty
	10	Gini index	Equality
	11	Female labor force participation rate (% male labor force participation rate)	Gender equality
	12	Proportion of malnutrition of children under 5 (underweight) - %	Sufficient food
	13	Average life expectancy at birth	Health
	14	Proportion of death due to traffic accident per 100.000 population	Safety

Table 1. Continued from page 10**Tabela 1.** Ciąg dalszy ze strony 10

Environmental	15	Forest cover (%)	Resource
	16	Agricultural land per person (ha)	Land use
	17	Proportion of household with access to improved sanitation (%)	Safe sanitation
	18	Percentage of household access potable water (%)	Sufficient to drink
	19	Proportion of rural households using wood for cooking (%)	Indoor air quality
	20	Annual mean concentration of Particulate Matter 2.5 ($\mu\text{g}/\text{m}^3$)	Outdoor air quality

Source: author's own elaboration.

Źródło: opracowanie własne.

An indicator has to be chosen carefully, meeting SMART (Specific, Measurable, Available, Relevant, Time-related) criteria as following (Van De Kerk and Manuel 2008; Bell and Morse 2003; Lynch *et al.* 2011):

- **Specific** - Indicators have to be independent from each other and must have no overlap. Essentially, avoid using indicators which have really high correlation in the same component of sustainable development;
- **Measurable** - An indicator must be measurable (implies that it must be a quantitative indicator and we can set upper and lower threshold for it);
- **Available** - Data for the indicators must be available, reliable from public sources, scientific or official institutional sources and also available for all administrative units of the research;
- **Relevant** - An indicator must be relevant for an issue according to the definition used;
- **Time-related** - Data must be recent and be regularly updated.

Following the interpretation of definition of sustainable development with three main components, taking into account the criteria for the indicators, considering for Vietnamese provinces, the new set of indicators including 20 indicators can be defined (Table 1). These indicators are clustered in 3 components, following the rationale by giving the element of sustainability¹.

¹ The research has used most of raw data from the official sources which are released by Vietnamese government:

- Statistical Yearbook of Viet Nam 2004-2016
- Statistical Yearbook of Provinces 2015
- Result of the Vietnam household living standards survey 2004, 2006, 2008, 2010, 2012, 2014, 2016
- Viet Nam mid-term population and housing survey 2004-2016
- Vietnam Population and Housing census 2009
- Report on labor force survey 2004-2016
- Vietnam rural, agriculture and fishery census 2011, 2016

Only data for Annual mean concentration of Particulate Matter 2.5 ($\mu\text{g}/\text{m}^3$) by provinces the author synthesized from the satellite data of air quality for Environmental Performance Index of Yale University, USA (available at <http://visuals.datadriven.yale.edu/airmap/>) and retrieved from remote sensing data provided by Aaron Van Donkelaar Professor of the Department of Physics and Atmospheric Science, Dalhousie University in Canada (available at http://fizz.phys.dal.ca/~atmos/martin/?page_id=140).

METHOD FOR CONSTRUCTING A COMPREHENSIVE INDEX

The research started by rescaling each variable from 0 to 1 with 0 representing worst performance and 1 describing the optimum. This procedure is necessary to make the data comparable across indicators after having raw data. The author always bear in mind that some variables the high numerical value is negative (e.g. infant mortality rate) while for other indicators the high numerical value is positive (e.g. life expectancy at birth) (Ranasinghe *et al.* 2016). To have rescaled variables we need to define thresholds, the upper and lower bounds, for each indicator as a first step for rescaling. The thresholds for each indicator were set up by looking for the best and worst performances of almost countries in the world to be able to compare the achievement of Vietnam on the road of sustainable development with other countries and entire world. Essentially bear in mind that the threshold values cannot always be constant values over time (Van De Kerk and Manuel 2008).

In most of cases the absolute thresholds can be defined as natural optimum values to mark the upper bound for variable. These are derived from maximum values that must be met to achieve sustainable development. For example, in the case of poverty or undernourishment, zero percent is optimum and in the some cases such as adult literacy rate or households using electricity, one hundred percent are optimum.

For some variables no absolute upper bounds can be identified in this way as it may be impossible to achieve certain absolute limits. For instance, it is impossible and utopian to achieve zero Gini index, zero child mortality rate, zero deaths from road accidents. In these cases the research will take the average of the five best performers among countries in the world as the upper threshold (Sachs *et al.* 2016). To determine the lower threshold I truncated the data by removing the bottom 2.5 percentiles from the distribution in order to remove outliers and the effect of extreme values at the bottom end of the distribution, which can change the results of a composite index (OECD, 2008).

The same weight was used for each indicator. Meaning within each component every indicator is equally weighted. The approach reflects that we should treat all indicators equally and another advantage of this approach is that as more and better sustainability indicators data become available, new variables can be added easily to comprehensive index without changing the relative weighting of the components (Sachs *et al.* 2016).

After establishing the upper and lower bounds, variables are transformed linearly to a scale between 0 (minimum value) and 1 (maximum value). In other words, each indicator, component and synthetic index is always between in the worst state (0) and an optimum state (1) (Liu *et al.* 2018). The equation below is applied to calculate value for all of indicators:

$$I_n = \frac{x_a - x_{min}}{x_{max} - x_{min}}$$

Where I_n is adjusted value of each indicator; x_a is raw value; x_{min} (the worst performance) and x_{max} (the best performance). Logarithm base on 10 will be applied to this equation when the author count value for GDP per capita as the same way we are using for Human Development Index. Any resulting values above 1 are set equal to 1, and negative values are set equal to 0. This formula ensures that higher values will denote better performance and all rescaled variables are expressed as ascending variables.

The total value for each component can be done by calculating.

$$S_i = \frac{\sum_1^n I_n}{n}$$

Where S_i is value of each component which is formed by indicators (I_n) and n is the number of indicators in each pillar.

The comprehensive index is constructed by taking average of the component values.

$$CI = \frac{S_1 + S_2 + S_3}{3}$$

Where CI is Comprehensive Index, S_1 is sustainability index for economy, S_2 is sustainability index for society and S_3 is sustainability index for environment.

The adjusted value of each indicator, each component and comprehensive index will be evaluated through six levels to determine the strength of capacity for sustainable development (see Table 2).

Table 2. Classification of sustainable development level of in Vietnamese provinces

Tabela 2. Klasyfikacja poziomu rozwoju zrównoważonego w prowincjach Wietnamu

Level	Value	Qualitative level
I	0.8 – 1.0	Very high
II	0.7 - 0.8	High
III	0.6 - 0.7	High-medium
IV	0.5 – 0.6	Low-medium
V	0.4 – 0.5	Low
VI	0.0 - 0.4	Very low

Source: author's own elaboration.

Źródło: opracowanie własne.

EVALUATION OF SUSTAINABLE DEVELOPMENT LEVEL IN VIETNAM

The author at first evaluated the sustainable development level for entire country with three components using the method for constructing index: economic, social and environmental based on the data for indicators from the sources described in section above. The author then synthesized the results to provide a single comprehensive index. The results for whole country in 2004, 2008, 2012 and 2016 are shown in Figure 1.

This graph illustrates information about the sustainability in Vietnam over the period of time. Generally, Vietnam was still at a low-medium level and moving slowly toward higher level of sustainability. The comprehensive index for sustainable development for Vietnam shows that the level increased gradually from 0.464 in 2004, 0.492 in 2008 which represents a poor status with low level, to low-medium level with 0.530 in 2012 and 0.572 in 2016. It also provides the significant differences level of sustainable development between components. In three component of sustainability, Vietnam got the highest level for social, following by environmental and economic component.

Viet Nam has made the transition from a centrally planned economy to a market-oriented system with unprecedented success and in 2010, the country achieved low middle-income status (Asian Development Bank, 2013). But when we measure the distance to sustainability for economic component, we suppose that Vietnam is being trapped at low rungs of a ladder. Based on the 2004 data, the synthetic indicator for the economic component in Vietnam was low (0.431), and ranks as level V. It increased gradually to 0.447 in 2008, 0.472 in 2012 but still be stuck in the level V. The situation was going better when Vietnam got level IV (low-medium) with 0.508 in 2016 (Fig.1). The major reasons for this problem are the low per capita GDP, proportion of GDP generated by service, urban

population rate, level of competitiveness of the economy, especially low percentage of advanced trained employed workers. Moreover, ICOR, an indicator using to determine a country's level of production efficiency, was still high and going to increase. It makes the score for ICOR was going to decrease. The bright spot in economic component is keeping a low level of the unemployment rate.

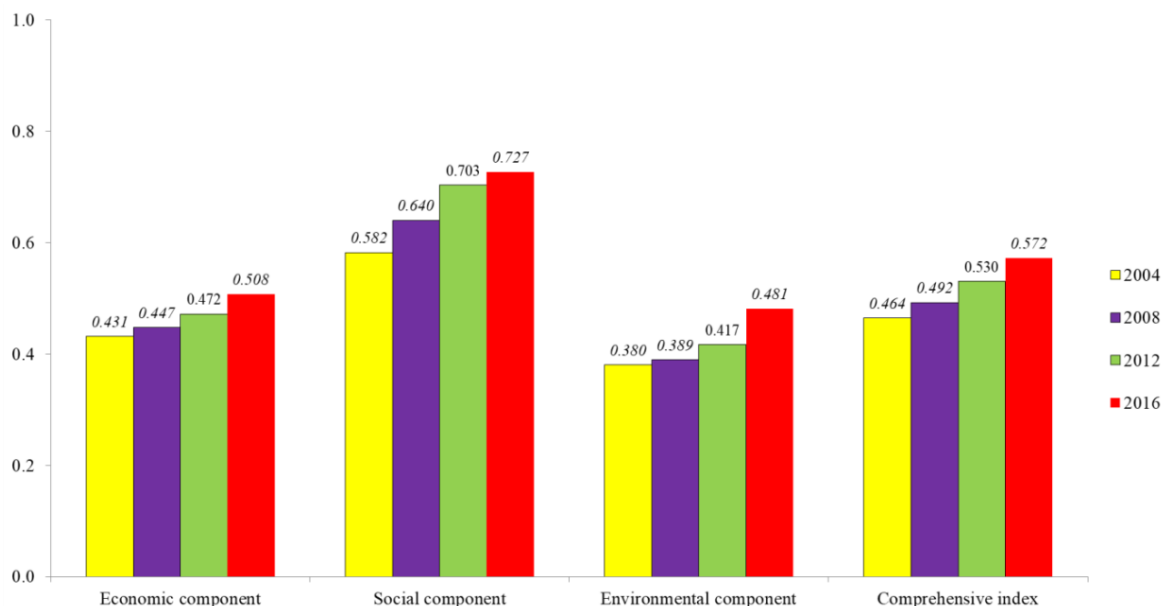


Fig. 1. Comprehensive evaluation of sustainable development level of Vietnam
Ryc. 1. Syntetyczny wskaźnik poziomu rozwoju zrównoważonego w Wietnamie

Source: author's own elaboration.
 Źródło: opracowanie własne.

The Vietnamese government has a lot of policies to take care for human-wellbeing such as education, living condition, health care, equality, *etc...* That is the main reason to explain why social component in the sustainable development of Vietnam is at a good level and higher than the others. In 2004 comprehensive indicator for the social component was 0.582 in the level IV (low-medium), then it increased significantly to level III (high-medium) with 0.640 in 2008, and level II (high level) with 0.703 and 0.727 in 2012 and in 2016 respectively (Fig.1).

The analysis of research showed that the environmental component in Vietnam is at the lowest level compared with others. Due to the low indicator values for forest cover, agricultural land per person and high level of the proportion of rural households using wood for cooking, the annual mean concentration of Particulate Matter 2.5, the synthetic indicator for the environmental component was bad with 0.380 (very low level) in 2004 to 0.481 (low level) in 2016. One of key challenges for Viet Nam is to manage its rapid economic growth in a sustainable way and to prevent adverse impacts of environmental degradation and climate change (Asian Development Bank, 2013).

COMPREHENSIVE INDEX FOR SUSTAINABLE DEVELOPMENT LEVEL OF VIETNAMESE PROVINCES

The research takes available data for all of 63 administrative units in the time 2014-2016 for assessing sustainable development at the provincial level in Vietnam in recent times. The results then are presented on the maps for synthetic index and for 3 main components of sustainability.

Figure 2 shows at a glance the comprehensive index for sustainable development level of 63 Vietnamese provinces. Danang is the only one province with comprehensive sustainable index gets score over 0.7 (level II - high), leave all of the other provinces in low (9 out of 63 provinces) and moderate (53 out of 63 provinces) level. With a 0.746, Danang, the largest city in the central of Vietnam, is number 1 on the ranking list, followed by Quang Ninh (0.676), Ho Chi Minh City (0.676), Dong Nai (0.665), Khanh Hoa (0.659), Ba Ria – Vung Tau (0.658), Hanoi (0.656), and Binh Duong (0.651). In Vietnam circumstance, economic indicators play an important role for the comprehensive index of sustainability. The clue is that provinces at the top of the ranking list are thanks to the high level of the economic component. All of them are the leader of economic development of regions and nation. 31 out of 63 provinces (47.6%) at the level from 0.5 to 0.6 are found in Highland, Mekong Delta, and North Central Coast region. Meanwhile, most of the provinces in Southeast and Red River Delta have sustainable development values of more than 0.65. Seven out of nine provinces take last place with the level below 0.5 belong to the Northern Midlands and Mountain region.

The sustainability index of economic development of Vietnamese provinces is illustrated in figure 3. It is so clearly to determine 3 key economic regions of Vietnam (one in the North, one in the Central, and one in the South) on the map due to the high-level value of economic development (roughly more than 0.6). Almost all of provinces in Vietnam are at low level for economic sustainability with 42 out of 63 provinces values range from 0.4 to 0.5. There are no provinces score more than 0.8. Some provinces (9 out of 63 provinces) are at very low level (below 0.4). There are only two cites score more than 0.7. They are Ho Chi Minh City with 0.720 and Danang with 0.708.

The level of sustainable development of Vietnam gets better when we look at figure 4 for the sustainability index of social component: only 3 out of 63 provinces score lower than 0.6, meanwhile 35 out of 63 provinces score higher than 0.7. At the top of the list out of 13 provinces with the highest scores (higher than 0.8), no less than 10 are found in Red River Delta, even though some provinces in this region still get lower scores for the economic component. The lower scores (between 0.5 – 0.6) are for provinces in Northern Midlands and Mountain, as well Highland region.

Figure 5 illustrates the sustainability index of environment. Due to the low level of forest cover and agricultural land per person, plus high level of the annual mean concentration of Particulate Matter 2.5 and the proportion of rural households using wood for cooking, 36 out 63 the lowest score provinces (lower than 0.5) are founded in Northern Midlands and Mountain, Red River Delta and Mekong Delta region. The best performances of environmental component (higher than 0.7) can be found in provinces in Central Coastal areas.

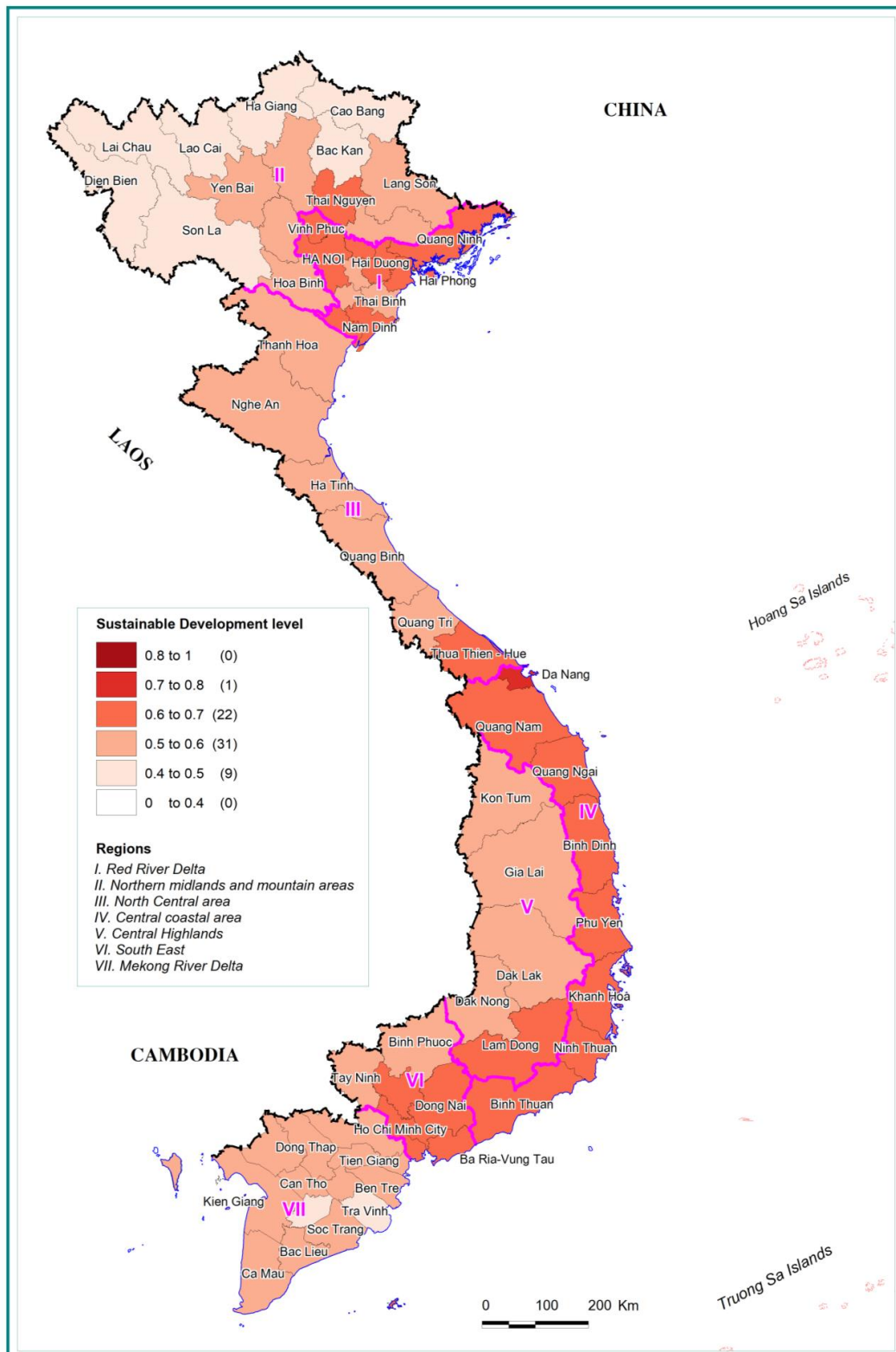


Fig. 2. Comprehensive index for sustainable development of Vietnamese provinces
Ryc. 2. Syntetyczny wskaźnik rozwoju zrównoważonego w prowincjach Wietnamu

Source: author's own elaboration.
 Źródło: opracowanie własne.

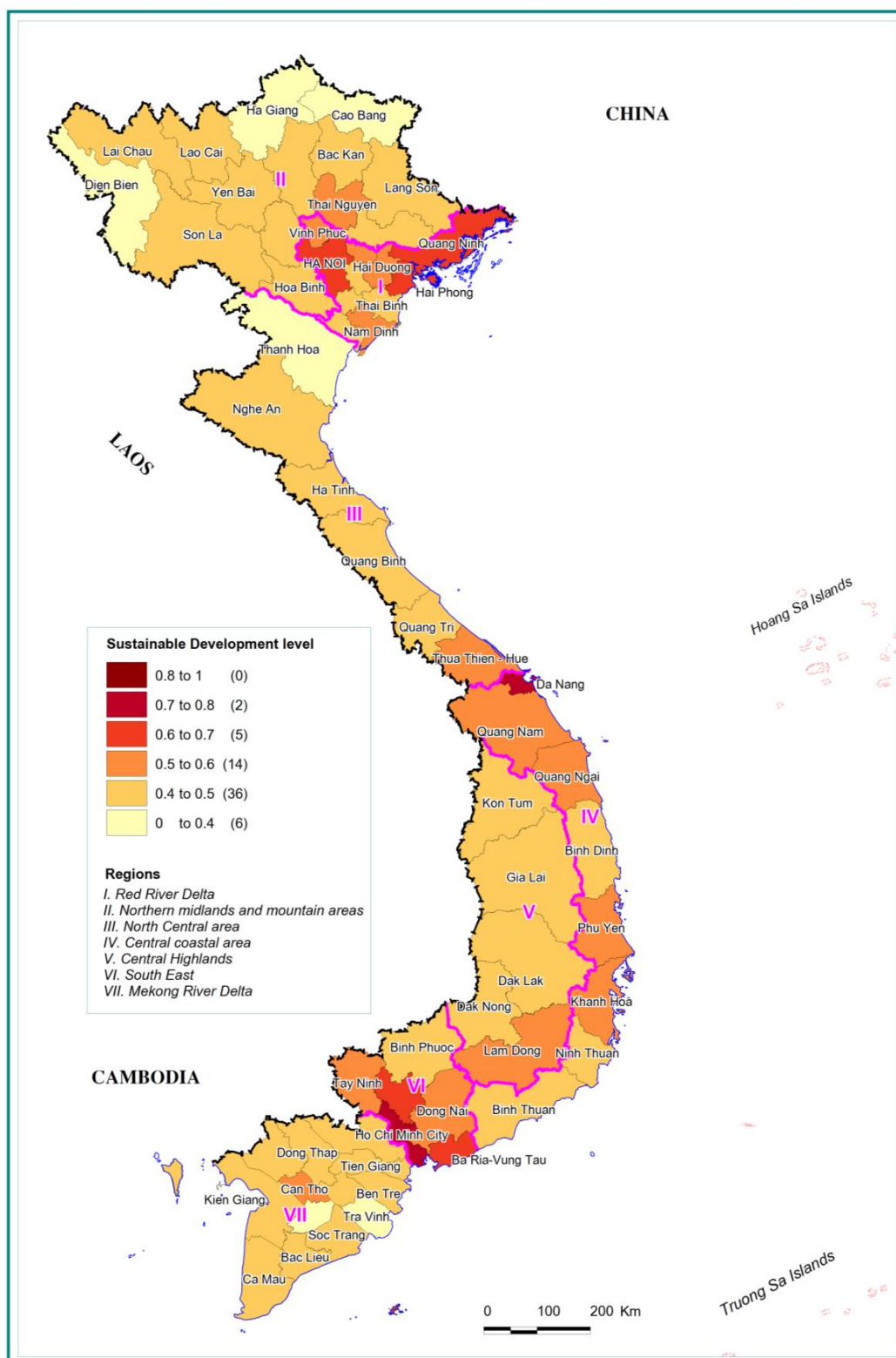


Fig. 3. The Sustainability Index of Economic component of Vietnamese provinces

Ryc. 3. Wskaźnik rozwoju zrównoważonego dla komponentu ekonomicznego w prowincjach Wietnamu

Source: author's own elaboration.

Źródło: opracowanie własne.

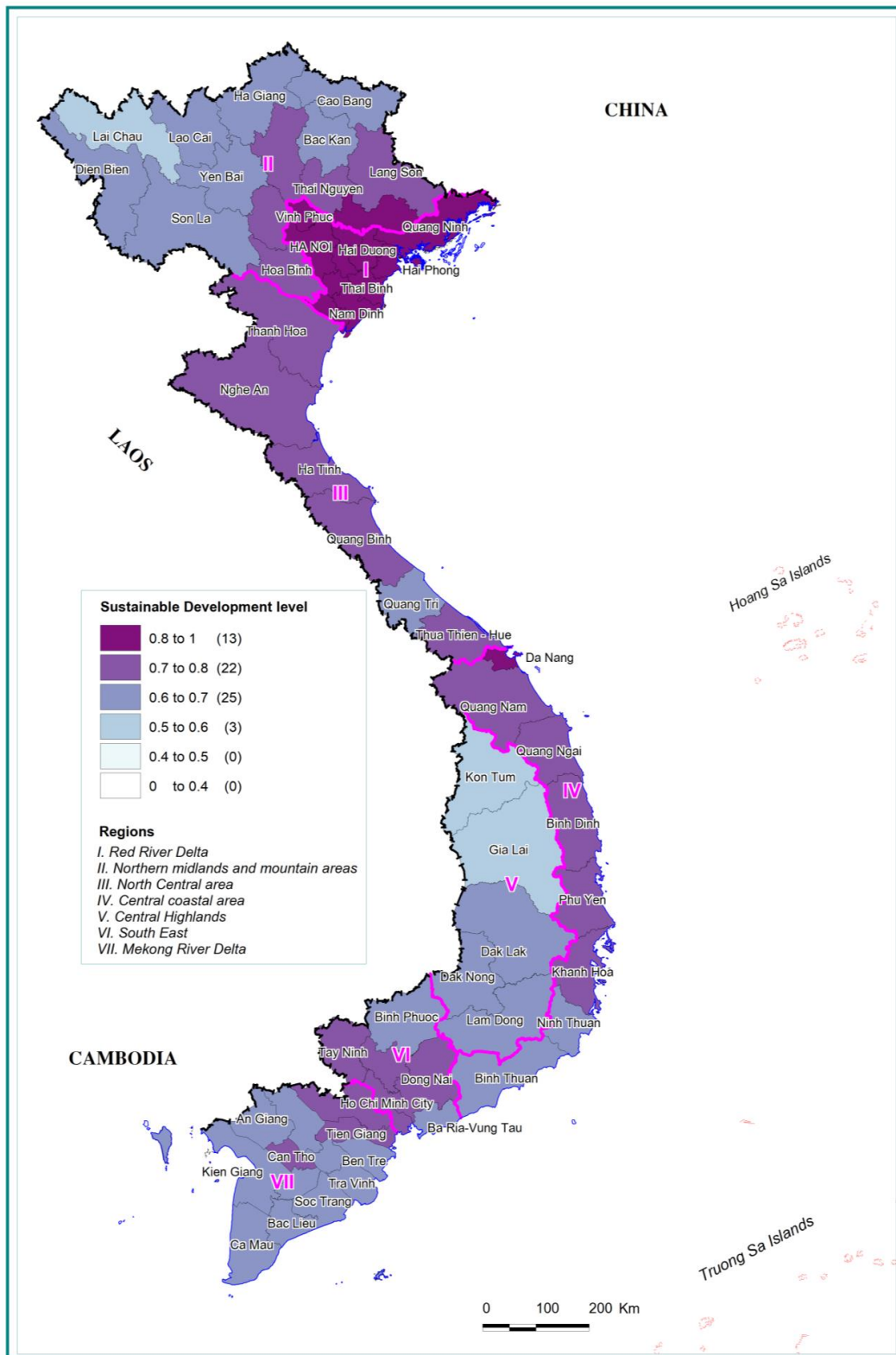


Fig. 4. The Sustainability Index of Social component of Vietnamese provinces
Ryc. 4. Wskaźnik rozwoju zrównoważonego dla komponentu społecznego w prowincjach Wietnamu

Source: author's own elaboration.

Źródło: opracowanie własne.

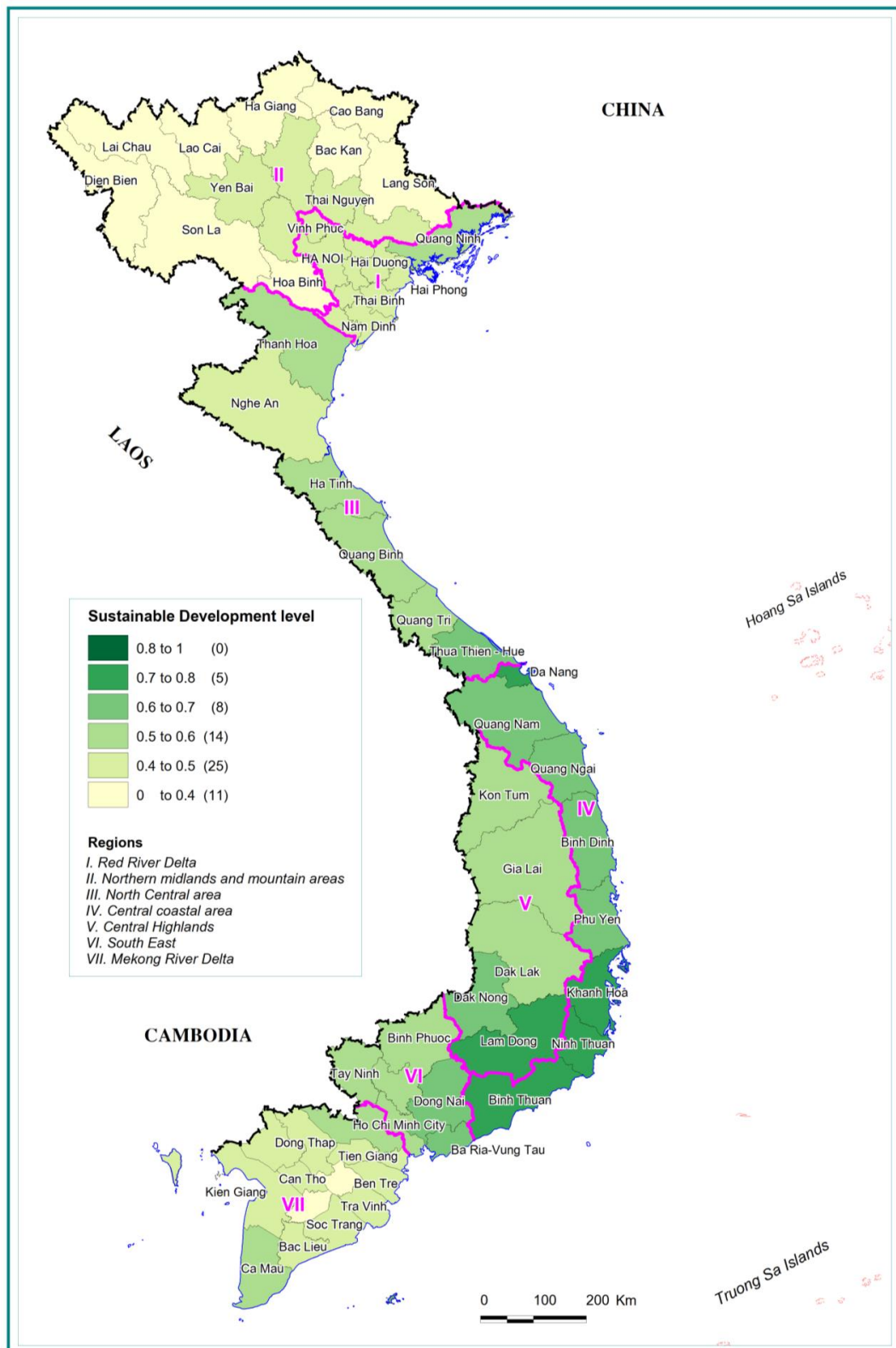


Fig. 5. The Sustainability Index of Environmental component of Vietnamese provinces
Ryc. 5. Wskaźnik rozwoju zrównoważonego dla komponentu środowiskowego w prowincjach Wietnamu

Source: author's own elaboration.

Źródło: opracowanie własne.

CONCLUSIONS

It has been demonstrated that the comprehensive index is a simple instrument for assessing and a quick of recognition of relatively level of sustainability. The comprehensive index offers a practical tool for defining targets on its way to sustainability and for monitoring the progress over time. Based on the definition of sustainable development, criteria for indicators and available data for Vietnam, the author developed a system of 20 core indicators that address three aspects of sustainable development: economic development, social and environmental. This article also describes the calculation method provides a suite of individual indicators that can be combined into a sustainability index for each component and a comprehensive index. The research uses the most recent available data for each indicator for provinces and considers historical data to study the changing of the entire country over time series. The main results of research, the change of level of sustainable development for the entire country from 2004 to 2016 and the spatial differentiation for provinces in 2014-2016, indicate that Vietnam was still at the low-medium level of sustainable development and getting better over a period of time; there is a significant difference of the level of sustainability between components and provinces.

However, due to lacking available statistical data for local level, the objective limitation is that the research has been missing indicators for some essential aspects, such as public debt, investment in education, investment in R&D and especially for the environmental component such as land quality, environmental conservation, preservation of biodiversity, renewable energies..... So, updating indicators with relevant available data is necessary to improve the quality of the research in the future.

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