

**РЕКРЕАЦІЙНА ГЕОГРАФІЯ**

UDC:338.32:914/919

DOI:https://doi.org/10.15407/ugz2020.01.051

**Nguyen Thu Nhung<sup>1</sup>, Pham Hoang Hai<sup>1</sup>, Nguyen Manh Ha<sup>1</sup>, Nguyen Khanh Van<sup>2</sup>, Hoang Bac<sup>1</sup>**<sup>1</sup> Institute of Geography, Vietnam Academy of Science and Technology, Ha Noi, Viet Nam<sup>2</sup> Vietnam Association of Geography, Ha Noi, Viet Nam**SUSTAINABLE TOURISM INDICATORS FOR CO TO - VAN DON ISLANDS**

Island districts Co To (including 400 islands) and Van Don (including 600 islands) have a favourable geographic location, situated in the semi-direct economic impact of the tourist centre of the Gulf of Tonkin. The area has unique tourism resources to create conditions for the formation and organization of various special forms of tourism and making Co To and Van Don became a major tourist resort in Vietnam northeast tourist region. But such research areas as waste increasing, untreated sewage into the natural environment releasing and the social evils with the management are still restricted. Clearly, to develop this place into a big attraction the country needs to ensure the quality of travel, to meet the goal of sustainable tourism development in the near future. An indicator system of sustainable development can help the managers, and decision-makers to deal with the problem. Delphi is one of the appropriate research methods to develop the indicators for the study area. Using the Delphi method, 24 indicators were selected by experts, including 14 of natural resources, 4 of economic, 3 of environmental and 3 of cultural and social aspects.

**Keywords:** Indicator; Sustainable Tourism, Delphi method, Co To island, Van Don island, Viet Nam.**Нгуен Ту Нхун<sup>1</sup>, Фам Хоанг Хай<sup>1</sup>, Нгуен Мань Ха<sup>1</sup>, Нгуен Хань Ван<sup>2</sup>, Хоанг Бак<sup>1</sup>**<sup>1</sup> Інститут географії, Академія науки і технологій В'єтнаму, Ханой, В'єтнам<sup>2</sup> Асоціація географії В'єтнаму, Ханой, В'єтнам**ІНДИКАТОРИ СТАЛОГО ТУРИЗМУ ДЛЯ ОСТРОВІВ КО ТО ТА ВАН ДОН**

У статті опрацьовані індикатори сталого розвитку туризму для островів Ко То (близько 400 островів) та Ван Дон (близько 600 островів). Ці острови мають сприятливе географічне положення, оскільки розташовані в межах опосередкованого економічного впливу центру розвитку туризму в затоці Тонкін. У районі є унікальні туристичні ресурси. Це є передумовою для формування та організації різноманітних напрямків туризму та перетворення островів на головний туристично-рекреаційний центр північного туристичного регіону В'єтнаму. Визначено чинники, що обмежують можливості розвитку туризму в регіоні (збільшення обсягу відходів, скидання неочищених стічних вод у природне середовище, проблеми менеджменту тощо). Для того, щоб перетворити регіон на велику визначну дестинацію та досягти найближчим часом цілей сталого розвитку туризму необхідно забезпечити належну якість турпродукту в регіоні. Вирішенню цієї проблеми та наданню допомогти керівникам і особам, які приймають рішення, сприятиме запропонована система індикаторів сталого розвитку. Одним із інструментів для розроблення такої системи показників є метод Дельфі. За його допомогою експертами було обрано 24 показники, у тому числі 14 таких, що стосуються природних ресурсів, 4 – економічних аспектів, 3 – екологічних, 3 – культурних та соціальних аспектів сталого розвитку туризму.

**Ключові слова:** показник; сталий туризм; метод Дельфі; острови Ко То; острови Ван Дон; В'єтнам.**Introduction**

Co To and Van Don, Vietnam are two island districts with favourable geographic conditions, located in diameter affected directly by tourist centre of Gulf of Tonkin, being a halt – transit of inter-district, inter-

province, and international sea tours. This areas are closely linked to tourist sites such as Cat Ba - Ha Long - Co To - Mong Cai, or more widely Vietnam - China international tours through Mong Cai - Co To - Bai Tu Long - Ha Long - Cat Ba - Do Son, or this will be a halt in Transnational tour of Quang Ninh - Hue - Ho Chi Minh City. This archipelago is located in region with climate very favourable to human

© **Nguyen Thu Nhung, Pham Hoang Hai, Nguyen Manh Ha, Nguyen Khanh Van, Hoang Bac, 2020**

health, characteristics and marine hydrology suitable to develop sea tourism. Moreover, nature endow it many precious and original tourism resources, creating favourable conditions for forming and organizing many distinctive tourism types, turning Co To, Van Don into a valuable convalescent resort on the North East of Vietnam.

With abovementioned advantages, over the past years, tourism resources here have been exploited maximally and showed that tourism in the researched area becomes a key economic factor, a source of income, which increase employment rate. In fact, it is an impetus for developing social, cultural, commercial sectors. However, tourism development is closely connected to the increase in wastes and sewages discharged into natural environment, and changes in social condition in the researched area. Here are some examples: according to the report of Institute of Natural Resources and Sea Environment Department of Aquatic Resources Exploitation and Preservation, coral reefs in Co To Island District (including 15 islands and isles) are dead to 80 – 85%, due to main cause of water environment being seriously polluted due to economic development activities such as fishermen using explosive, toxic substance Xyanua. Moreover, in recent years tourism-service activities in Bai Tu Long Bay concentrated mainly in Minh Chau - Quan Lan and some resort in Cai Bau isle. Although there isn't a high volume of tourists, some service activities caused distortion in domestic waterway safety. Especially in coastal area close to Cai Rong port, houseboats living and selling goods directly discharge solid waste and sewage into natural environment destroying natural landscape. It can be seen that in Van Don, Co To, the rate of tourism revenue is multiplying and it impacts the environment, especially influencing forest ecology, coral ecology, deterioration in genetic sources such as seaweed, bottom creatures and fish resources. It is obvious that in the future in order for this site to be developed into a place attracting high number of tourists, it is required to ensure tourism quality, meeting sustainable tourism development goal. For that purpose, it is necessary to select sustainable tourism development indices and calculate them; evaluation results need to be submitted to scientists, managers for expressing opinions. In fact, in Vietnam, with different methods, this work has been implemented in rather diversification in many studies about sea tourism by many scientist such as Hai [1] (general study on islands and sea in Quang Ninh and Kien Giang Seas, An(1993) (Issues about

methodology and research methods to assess general natural condition, natural resources and socio-economic condition of coastal islands in Vietnam in marine socio-economic development strategy) etc. In spite of such reality, such studies are only limited to selecting general criteria for the large territory, while for highly sensitive area such as Van Don, Co To, specific criteria are necessary, meeting requirements for the time being and long term.

Based on studying main criteria of sustainable tourism development of WTO and others, stated in the works of abovementioned authors in combination with reality of tourism development in localities, criteria were selected to submit to experts having experience in relevant fields. Delphi approaches allow to determine work of general assessment of natural resources, socio-economic condition for sustainable tourism development in the locality.

### Research Methods

The triangle matrix method is used in the first step to select the necessary criteria for the sustainable tourism development of Co To Island based on the criteria for tourism sustainable development that have been studied by the authors in the world. However, the method of triangle matrix has not shown objectivity while selecting those criteria. Therefore, to ensure high reliability, the Delphi method was chosen. In fact, the Delphi method has been used in many fields of science, health, education, etc. as a forecasting method or plays a very important role in selecting the initial criteria for development purposes, such as Hai et al. [2], Lang [3].

Delphi is a useful method to establish an effective process of exchanging information among groups to allow team members to solve a complex problem (Linstone and Turoff [4], Louise Twining Phuong Ward [5]). Delphi is a research methodology for qualitative identification that is fairly accurate and can address issues that contribute to decision-making in order to gain consensus within the group within different ranges (Cochran [6]; Uhl [7]).

The Delphi method has the following advantages: (1) The review does not need the full presence of experts; (2) Anonymity: This eliminates the form of direct discussion and disclosure, eliminating psychological factors. The referendum is conducted through an anonymous self-declaration and the opinion is informed to experts. (3) Use positive inverse relationships to adjust the answer, this shows that the referendum was conducted in several stages, the results of the previous referendum

were announced at the later stages. Based on the information that has shown that the reviewers adjust their answers. Opposite connections are used to eliminate useless information and reduce dispersion in responses, limiting the impact from outside the collective.

However, this method has some disadvantages such as: (1) Often criticized at points related to the consent of expert groups, questionnaire setting, anonymity and interaction among members of participating groups (Penelope (2003); (2) The quality of the criteria selected by the Delphi method depends heavily on how the method is applied.

To limit the above disadvantages, the authors followed the recommendations of Parente, Anderson, Myers and OeBrien [8] according to the following procedure:

#### A- Preparation Step

The questionnaire was established based on a workshop held at the Institute of Geography, the Vietnam Academy of Science and Technology (Table 1) and based on the research documents on sustainable tourism development index. In the World (WTO: 11 indices; Yianna Farsari, Poulicos Prastacos: 53 indices divided into 7 categories; Yianna Farsari: 52 indices and Ted Manning: 23 indices divided into 4 categories). Choosing principles for Van

Don's sustainable tourism development criteria, Co To island is not outside of the 10 principles of sustainable tourism development and is divided into 4 categories.

Selecting a team of experts: A group of 10 selected experts, who are qualified and experienced in the field of tourism, with a deep command of the research area.

A list of indicators being send to experts in tourism and the environment. In this research, 2 rounds were performed by individual experts. Each participant completed a questionnaire and then provided feedback on all the answers. This process can be repeated if necessary.

#### B-Round 1

Experts are required to indicate the extent to which they agree with a statement regarding specific indicator on 4 aspects such as Natural Resources, Economy, Environment and Socio-Cultural on a scale of 1- 5 (Table 2). In this scale, it means that:

- 1: the indicator is very unrelated;
- 2: the indicator is likely not relevant;
- 3: that the index is more or less relevant;
- 4: that the index is likely to be related;
- 5: that the index is highly relevant.

This method is explained in Table 3, shows the main procedures.

Table 1.

Analysis of the methods

	Literature review	Round 1	Round 2
Date mailed out	01 June 2010	02 August 2010	06 September 2010
Date due back	30 July 2010	06 September 2010	04 October 2010
Instrument	Literature and discussion	Questionnaire	Questionnaire
Data collected	Indicator check lists from different sources; Identification of key characteristics of core indicator	Ranking the order of importance (1-5) of each indicator	Ranking the order of importance (1-5) of each indicator
Data analysis	Compile list of indicators; Prepare Round 2 using complied lists	Prepare Round 2	Compute frequency of responses and range of responses of the degree of importance of each indicator

Table 2.

An example of questionnaire for experts

Nr.	Degree of relevance Indicators	Highly inclined to be irrelevant (1)	Inclined to be irrelevant (2)	More or less relevant (3)	Inclined to be relevant (4)	Highly inclined to be relevant (5)
1	SDI <sub>1</sub>					
...	...					

Table 3.

**Rules to analyze the ratings from multiple experts using a Delphi approach**  
(Chu and Hwang, 2007)

Round t	Round t+1	Round t+2
Rating mean $(rm_i) \geq 3.5$	If the rating mean $(rm_i) \geq 3.5$ and quartile deviation $(Q) \leq 0.5$ and the rating variance $(rv_i) < 15\%$ , then indicator i is accepted, and no further discussion concerning indicator i, is needed.	If $rm_i \geq 3.5$ and $Q \leq 0.5$ and $rv_i \leq 15\%$ then indicator i is accepted, and no further discussion concerning indicator i, is needed.
$rm_i < 3.5$	$rm_i \geq 3.5$ or $rv_i > 15\%$ .  If $rm_i < 3.5$ and $Q \leq 0.5$ and $rv_i \leq 15\%$ , then indicator i is rejected, and no further discussion concerning indicator i, is needed.	

Note:  $rm_i$ : the mean of the ratings for questionnaire item indicator i and  $rv_i$ : the ratio of experts who change their ratings for indicator i and Q is the quartile.

The group of experts selected the indicators that focus on the key aspects of sustainable ecotourism: the economic, social and environmental aspects. The experts were asked to assess the relevance of the indicators of sustainable ecotourism development on five different scales mentioned above. Based on the assessment of experts, they will calculate the values such as rating median (rmd), Q, and rm to determine the consensus among experts.

#### C – Round 2

The results from round 1 will be sent to the experts. They will be offered evaluate the same indicators on a scale like Round 1. After the completion of Round 2, rmd, Q, and rm of each indicator will be calculated.

### Results and discussion

Based on the documents used to establish the indicators for sustainable tourism development in Van Don, Co To Islands, 30 indicators were chosen (Tables 4, 5) including 16 indicators of natural resources, 5 – economic, 4 – environment, 5 – culture and society.

#### Round 1

In this round,  $rm_i$  of 25 indicators are above 3.5, and 30 indicators with  $rv_i$  are less than 15%. This means there are 5 indicators of  $RI_6$ ,  $EcIs_3$ ,  $EnIs_3$ ,  $CSIs_1$ , and  $CSIs_5$  with the rating means is below 3.5. Therefore, these indicators are not much considered to be relevant for the case study.

#### Round 2

Continuing in round 2, the results from round one are re-sent to the experts They are proposed continuous to evaluate of indicators under the point scales as in round 1. After analyzing the feedback

results of the second round (Tables 4, 5) showed that 24 indicators have  $rm_2 \geq 3.5$ ,  $Q \leq 0.5$ , and  $rv_2 < 15\%$ . Six indicators have  $rm_2 < 3.5$ ,  $Q \leq 0.5$ , and  $rv_2 \leq 15\%$ .

Based on Chu and Hwang's rules [9], 24 indicators were selected as shown in Table 4, including 14 indicators of natural resources, 4 economy, 3 environment, and 3 culture - society.

Based on 30 initial indicators, only 24 indicators are selected after the two rounds of evaluation. The choice that Van Don and Co To are the island districts with the specific characteristics can be explained. It can be seen very clearly that the basic difference compared to the districts in the continent, which characterized distribution, is usually adjacent to each other; boundaries are determined quite specifically and therefore the characteristics of natural conditions, natural resources, and features of the socio-economic conditions, etc. have relationships and interactions. Meanwhile in the island districts are normally distributed independently on the sea and are surrounded by vast territorial waters (Hai P.H. [1]). Therefore, its natural, social, and environmental conditions are usually the independent system, which has many characteristics and comparative advantages as well as inherent limitations. Furthermore, because the characteristics so the selection of indicators are also influenced and directly extremely affected by the marine regulations (Hai P.H. [1]). The properties and characteristics of the most of natural components, the natural resources, and the socio-economic as well as environmental factors have significant characteristics and a direct relationship to the sea.

Attractiveness has highly integrated properties and is usually determined by the beauty of landscapes, the relevance of climate and marine factors, the special and unique of natural and human tourism resources. It is expressed in the number and quality

Table 4:

## Results of the scoring for the indicators in 2round

Round 1	$rm_1 \geq 3.5$	$rm_1 < 3.5$
Resource indicators (RIs)	Beach (RI <sub>1</sub> ), Terrain diversify (RI <sub>2</sub> ); Temperature (RI <sub>3</sub> ), Salinity (RI <sub>4</sub> ); Wave height (RI <sub>5</sub> ); Sunshine hours (RI <sub>7</sub> ); Average annual temperature (RI <sub>8</sub> ), Amplitude of temperature (RI <sub>9</sub> ), Average annual rainfall (RI <sub>10</sub> ), Humidity (RI <sub>11</sub> ), Average wind speed (RI <sub>12</sub> ), Forest cover (RI <sub>13</sub> ), Genetic diversity (RI <sub>14</sub> ), Special products to exploit (RI <sub>15</sub> ), Mineral water sources (RI <sub>16</sub> )	Flow rate (RI <sub>6</sub> )
Economic indicators (EcIs)	Ability to link (EcIs <sub>1</sub> ), Location and accessibility (EcIs <sub>2</sub> ), Infrastructure and technical material facilities (EcIs <sub>2</sub> ), Time travel activities (EcIs <sub>3</sub> ),	Investment promotion (EcIs <sub>3</sub> )
Environmental indicators (EnIs)	Capacity of tourist (EnIs <sub>1</sub> ), Environmental sustainability (land, water, air, creatures) (EnIs <sub>2</sub> ), Waste management (EnIs <sub>4</sub> )	Efficiency of energy (EnIs <sub>3</sub> )
Cultural – Social indicators (CSIs)	Relic density (CSIs <sub>2</sub> ), Number of ranked relics (CSIs <sub>3</sub> ), Significant relics (CSIs <sub>4</sub> )	Number of relics (CSIs <sub>1</sub> ), Population size (CSIs <sub>5</sub> )
Round 2	$rm_2 \geq 3.5, Q \leq 0.5, rv_2 < 15\%$	$rm_2 < 3.5, Q \leq 0.5, rv_2 \leq 15\%$
RIs	RI <sub>1</sub> , RI <sub>2</sub> , RI <sub>3</sub> , RI <sub>4</sub> , RI <sub>5</sub> , RI <sub>7</sub> , RI <sub>8</sub> , RI <sub>9</sub> , RI <sub>10</sub> , RI <sub>11</sub> , RI <sub>12</sub> , RI <sub>13</sub> , RI <sub>14</sub> , RI <sub>16</sub>	RI <sub>6</sub> and RI <sub>15</sub>
EcIs	EcIs <sub>1</sub> , EcIs <sub>2</sub> , EcIs <sub>4</sub> , EcIs <sub>5</sub>	EcIs <sub>3</sub>
EnIs	EnIs <sub>1</sub> , EnIs <sub>2</sub> , EnIs <sub>4</sub>	EnIs <sub>3</sub>
CSIs	CSIs <sub>2</sub> , CSIs <sub>3</sub> , CSIs <sub>4</sub>	CSIs <sub>1</sub> and CSIs <sub>5</sub>

of resources, the ability to meet the many tourism forms. Indeed, the attraction of Quang Ninh province with more than 3,000 small islands covers Ha Long Bay in the Gulf of Tonkin with some 1,600 islands and islets and the study area forming a spectacular seascape of limestone pillars and having the type of unique terrain and terrain beach. At the same time, visitors are fascinated by the diversity of biological resources.

- Beach factor: the beach is an important resource that nature gives for the islands, exploitable beach with many different travel purposes including bathing was a special preferred type.
- Marine factors: sea is beneficial environment to conduct many different types of tourism; seawater is evaluated according to the characteristics that affect human health and tourist activities such as water temperature, waves height, salinity, and the indicators of climate change.
- Biological factors: factors re evaluated according to indicators in service type of sightseeing, picnicking, and scuba diving. For all of that type, the factors on species composition and characteristics of marine species are evaluated; the selected indicators are coverage and often assessed in combination with the terrain characteristics of vegetation.
- Climate factors: climate factors serve effectively

for the conduction of various types as well as tourism activities. They are determined by all of combination of factors such as sunshine hours, temperature (meaning annual temperature), amplitude of temperature rainfall, humidity and wind speed.

- Human factors: they are evaluated by including the quantity and quality of the historical cultural relics and modern works, the archaeological sites and cultural festivals, etc.

#### Economic aspects

The ability to link with other tourist centers and tourist routes is an important indicator to evaluate the possibility of attraction by destination. Co To and Van Don Island districts have an extremely important positions in the strategy to protect national security and economic development in the Northwest of Tonkin (especially tourism development). The area have been linked closely to the points and inland tourist routes such as Cat Ba - Ha Long - Co -Mong Cai, cross-country routes as Vietnam - China, or it will rest stop at the tourist route through Vietnam as Quang Ninh - Hue - Ho Chi Minh City, etc.

Infrastructure and technical material directly influence tourist's requirements, the tourism product structure and the quality of tourism products. Infrastructure has special significant importance for the promotion of tourism activities. It also affects

Table 5.

**Overview of appropriate indicators for each sustainability aspect.  
Analysis of the ratings in the rounds 1 and 2**

Nr.	Indicators	Round	Rating given by each expert										rmd	Q	rm	rv (%)	Selection	
			1	2	3	4	5	6	7	8	9	10						
<b>Resources Sub-total</b>																	<b>14</b>	
	Beach	1	5	5	5	5	5	5	5	5	5	5	5	5	0	5.0	0	✓
		2	5	5	5	5	5	5	5	5	5	5	5	5	0	5.0		
	Terrain diversify	1	4	4	4	3	4	4	5	4	4	4	4	0	4.0	10	✓	
		2	4	4	4	3	4	4	5	4	3	4	4	0.375	3.9			
	Temperature	1	5	4	5	4	4	5	4	4	4	4	4	0.375	4.3	10	✓	
		2	4	4	5	4	4	5	4	4	4	4	4	0	4.2			
	Salinity	1	4	4	5	4	5	4	5	4	4	4	4	0.5	4.3	10	✓	
		2	4	4	4	4	5	4	5	4	4	4	4	0.5	4.2			
	Wave height	1	3	4	3	4	5	4	4	4	4	4	4	0.375	3.9	10	✓	
		2	3	3	3	4	5	4	4	4	4	4	4	0.5	3.8			
	Flow rate	1	3	3	4	3	4	4	3	3	3	4	3	0.5	3.4	10		
		2	3	3	4	3	3	4	3	3	3	4	3	0.5	3.3			
	Sunshine hours	1	5	5	5	5	5	5	5	5	5	5	5	0	5.0	0	✓	
		2	5	5	5	5	5	5	5	5	5	5	5	0	5.0			
	Average annual temperature	1	4	4	5	5	5	4	4	3	4	4	4	0.5	4.2	14	✓	
		2	4	4	4	4	5	4	4	4	4	4	4	0	4.1			
	Amplitude of temperature	1	4	3	4	3	4	3	4	4	3	4	4	0.5	3.6	10	✓	
		2	4	3	4	3	4	3	4	3	3	4	3.5	0.5	3.5			
	Average annual rainfall	1	4	4	3	4	4	4	4	4	4	4	4	0	3.9	10	✓	
		2	4	4	3	4	4	5	4	4	4	4	4	0	4.0			
	Humidity	1	4	3	4	3	4	3	5	4	3	4	4	0.5	3.7	10	✓	
		2	4	3	4	4	4	3	5	4	3	4	4	0.5	3.8			
	Average wind speed	1	4	4	4	4	4	4	3	3	4	4	4	0.375	3.8	10	✓	
		2	4	4	4	4	4	4	4	3	4	4	4	0	3.9			
	Forest cover	1	4	4	4	4	3	4	5	4	4	4	4	0	4.0	10	✓	
		2	4	4	4	4	3	4	5	3	4	4	4	0.375	3.9			
	Genetic diversity	1	4	4	4	4	4	5	5	4	4	4	4	0.375	4.2	10	✓	
		2	5	4	4	4	4	5	5	4	4	4	4	0.5	4.3			
	Special	1	3	4	4	3	5	3	4	3	3	3	3	0	3.5	10		
		2	3	4	4	3	3	3	4	3	3	3	3	0.5	3.3			
	Mineral water sources	1	3	3	4	3	4	3	4	3	3	5	3	0.5	3.5	0	✓	
		2	3	3	4	3	4	3	4	3	3	5	3	0.5	3.5			
<b>Economy Sub-total</b>																	<b>4</b>	
	Ability to link	1	5	4	5	4	5	5	4	5	4	5	5	0.5	4.6	10	✓	
		2	5	4	5	4	5	5	4	5	4	4	4.5	0.5	4.5			
	Location and accessibility	1	5	5	5	5	4	5	3	4	5	4	5	0.5	4.5	10	✓	
		2	5	5	5	4	4	5	3	4	5	4	4.5	0.5	4.4			
	Infrastructure and technical material facilities	1	3	4	4	4	3	4	3	4	4	4	4	0.5	3.7	10	✓	
		2	3	4	4	4	4	4	3	4	4	4	4	0.375	3.8			

Continuation of Table 5.

Investment promotion	1	3	4	3	4	3	4	2	3	4	3	3	0.5	3.3	10	
	2	3	4	3	4	3	4	2	4	4	3	3.5	0.5	3.4		
Time of tourist activities	1	4	4	5	4	4	4	3	3	4	3	4	0.5	3.8	10	✓
	2	4	4	5	4	4	4	4	3	4	3	4	0.375	3.9		
<b>Environment Sub-total</b>															<b>3</b>	
Capacity of tourist	1	5	5	5	5	5	5	5	5	5	5	5	0	5.0	0	✓
	2	5	5	5	5	5	5	5	5	5	5	5	0	5.0		
Environmental sustainability	1	5	5	5	5	5	5	5	5	5	5	5	0	5.0	0	✓
	2	5	5	5	5	5	5	5	5	5	5	5	0	5.0		
Waste management	1	5	5	5	5	5	5	5	5	5	5	5	0	5.0	0	✓
	2	5	5	5	5	5	5	5	5	5	5	5	0	5.0		
Efficiency of energy	1	4	3	3	3	3	3	4	4	3	3	3	0.5	3.3	10	
	2	3	3	3	3	3	4	3	4	3	3	3	0.375	3.2		
<b>Culture – Society Sub-total</b>															<b>3</b>	
Number of relics	1	3	4	3	4	3	4	2	3	4	3	3	0.5	3.3	10	
	2	3	4	3	4	3	4	2	4	4	3	3.5	0.5	3.4		
Relic density	1	5	4	5	4	4	3	4	4	4	4	4	0.375	4.1	10	✓
	2	5	4	5	4	4	3	4	4	5	4	4	0.5	4.2		
Number of ranked relics	1	5	4	4	4	4	5	4	5	4	4	4	0.5	4.3	0	✓
	2	5	4	4	4	4	4	4	5	4	4	4	0.375	4.2		
Significant relics	1	5	3	4	3	4	4	4	3	4	3	4	0.5	3.7	10	✓
	2	5	3	4	3	4	4	4	4	4	3	4	0.5	3.8		
Population size	1	4	3	3	3	3	3	4	4	3	3	3	0.5	3.3	10	
	2	4	3	3	3	3	4	4	4	3	3	3	0.5	3.4		
<b>Total</b>															<b>24</b>	

tourism activities including systems of transportation, telecommunications and providing daily demands such as electricity, water, etc.

Time tourism activities are influenced by climatic factors. In other words, operating time of travel determines regular or seasonal tourist activities from which relevant to the orientation of investment in management organizations, business in travel service.

#### *Environmental aspect*

In general, carrying capacity is the capacity of an ecosystem to support healthy organisms while maintaining its productivity, adaptability and capability for renewal (IUCN, WWF, UNEP, [10]). Capacity of tourist is understood simply as the maximum number of tourists that can be serve (Luong, P.T [11]). Capacity is based on four aspects: physical space, biological space, psychological and social space. The tourism capacity of the islands has crucial role for the orientation and size of the sustainable tourism development, the arranged ranges of the technical facilities and social infrastructure.

Environmental sustainability: this indicator shows

the protection and restoration of natural components from pressure of tourism activities, natural disasters and others. These pressures are less when the nature has higher ability to recover and vice versa (Hai, P.H 2005). On the islands, these factors are considered one of the prerequisite indicators for SD especially in the environmental sustainability of land and water (Hai, P.H 2005) because it is decisive factor to the development of the island. Currently, even on the mainland, many areas, regions, cities and countries (both developed and developing ones) are faced with lack of natural resources to meet the basic needs of fast population and economic growth, particularly to ensure adequate availability of water and land for domestic, industrial and other purposes (Hai et al., [12]).

Waste management: waste often has a large rate of hazardous component and difficulty to treatment (Luong, P.T. [13]). Many forms of tourism are developed on the island districts then the waste will increase, while this area does not have adequate infrastructure and machinery for waste treatment.

If the problem is not handled timely, especially in tourist places, it will lead to a serious decline in tourist numbers, losing the attractiveness of tourist destinations because of the environmental unsanitary and affecting to water quality, to the structural surface, and to beauty of landscape and human health. Furthermore, for sustainable tourism, the environmental problems need to set very stringent, requiring the full participation, active and responsibilities of concerned parties.

#### *Cultural and social aspects*

The historical and cultural relics are attractive points for the spiritual tourism activities, sightseeing tour, etc. They express cultural characteristics of the region. However, directly or indirectly, the tourism activities along with time have impacts on quality of these projects, which have affected to the attractions of tourism landscape.

#### **Conclusions**

Delphi method is a proper technique for selection of indicators for integrated assessment of natural resources, economic and social for sustainable tourism development in Van Don-Co To Island.

30 indicators were listed and evaluated by the multi-experts in which 16 indicator of natural resources, five of economic development, 4 of environment, and 5 of culture – society. Through the

two rounds of the Delphi method, 6 indicators were excluded because of unsuitable conditions based on the given rules and the remaining 24 indicators were selected. In other words, most of the indicators that were selected have large or very large impact to sustainable tourism development in Van Don and Co To Islands. This means that the rating mean of these indicators are always oscillates of about 4-5.

This is one of the first studies using the Delphi method for the selection of indicators for sustainable tourism development on the coast island districts of Vietnam, so it needs to be improved. Moreover, the results are good tools for managers, planners and public because it proposes effective strategic development for tourism on the Islands of Van Don and Co To in particular in ecotourism and in Ha Long Bay where the site's outstanding scenic beauty is complemented by its great biological interest.

#### **Acknowledgements**

This research is funded by Vietnam National Foundation for Science and Technology (NAFOSTED) under grant number 105.06.85.09.

We would like to thank the Independent National Project (2008 G/04) allowed to collect the relevant information and National Foundation for Science and Technology Development has helped fund completion of this article.

#### *References*

- Hai, P.H. (ed.). (2005) *Integrated assessment of potential natural and economic - social setting science-based solutions and economic development - a sustainable society for some island districts*. The National Project, December 29
- Hai L.T., Hai P.H., Khoa N.T., Hens L. (2009). Indicators set for SD indicators: A case study in the province of Quang Tri, Vietnam. *International Journal of Human Ecology*, 27(3), 17-227.
- Lang T.T (2007). Development indicators to assess quality and manage water quality in Dong Nai river system. URL: [http://www.imh.ac.vn/b\\_tintuc.../34%20Tonthatlang-WQI262.pdf](http://www.imh.ac.vn/b_tintuc.../34%20Tonthatlang-WQI262.pdf).
- Linstone, H. A. and Turoff, M. (eds., 1975). *The Delphi Method - Techniques and Applications*. Reading, Addison-Wesley.
- Louise Twining – Ward. (2002). *Indicator handbook, a guide to the development and use of Samoa's sustainable tourism indicators*. South Pacific Regional Environment.
- Cochran S.W. (1983). The Delphi method: Formulation and refining group judgements. *Journal of Human Sciences*, 2(2), 111-117.
- Uhl N.P. (1983). Using the Delphi technology in institutional planning. *New directions for Institutional Research*, 37, 81-94.
- Parente F. J., Anderson J. K., Myers P., O'Brien T. (1994). An examination of factors contributing to Delphi accuracy. *Journal of Forecasting*, 3(1), 173 - 183.
- Chu H.C, Hwang, G.J. (2007). A Delphi-based approach to developing experts system with the cooperation of multiple experts. *Experts system with application*. DOI:10.1016/j.eswa.2007.05.034.
- IUCN, WWF, UNEP (1991). *Caring for the Earth: a Strategy for Sustainable Living*. Gland: Suica.
- Luong P.T. (2002). Sustainable tourism development in the relationship with the community. *The Conference on Sustainable tourism development in Vietnam*. Hanoi, Vietnam.
- Hai L.T., Hai P.H., Giang D.T.H., Hens L. (2009). Land, water uses and carrying capacity on Ly Son island, Quang Ngai province, Vietnam. *Advances in Natural Science*. ISSN 1895-221X).
- Luong P.T. (2000). *Natural resources and environment of Vietnam's tourism*. Publishing of Education, Hanoi, Vietnam.

**The article was received 25.06.2019**