Technical Letter

An Analysis of Sustainable Development in Dong Ha Town, Quang Tri Province, Vietnam

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Abstract

For each country, region or area, sustainable development (SD) planning is of paramount importance. Defining SD has both global and local aspects. SD is a core concept at the moment and also in the future. Development is largely dependent upon the natural resource base. The main point of view of SD is the integration of environmental, economic, societal and institutional aspects.

In Vietnam, there is insufficient scientific basis to define SD and even inadequate basis to define it at the provincial and local level. Decision making for SD using Geographical Information System (GIS) systems is poorly implemented.

In view of the above, if SD is to be achieved, it will help and support SD and decision making process will be speedy and appropriate based on spatial and temporal information. This study discusses the case study of a GIS based Sustainable Development Indication (SDI) system for Dong Ha town in Quang Tri province.

1. Introduction

Sustainable development (SD) is very importance for each area, region, or country. It has to be analyzed and valued basically on a general evaluation of environmental and socio-economic components.

Vietnam has achieved significant successes in socio - economic development since the *"Doi moi"* (re-newal) policy, which was initiated in 1986. Vietnam is still in the process of transition from a centrally planned to a market economy. It faces many unsustainable factors, such as fast population growth, dramatic environmental degradation and complex social-economic development issues. SD is a unique social choice and as such extremely important.

Quang Tri province is located in central Vietnam. It is one of the poorest provinces. The province has 2 towns (Dong Ha town and Quang Tri town) and 7 districts. Quang Tri province and also Vietnam as a country have been heavily affected by two wars, not only disrupting peace but also destroying the socio - economic, environment and natural resources base in some of the fiercest ground fighting of the war, especially from 1966 to the end of the war in 1975.

Dong Ha is the provincial capital of Quang Tri province; It contains 9 precincts, with 73.59 km^2 and 72,191 people as of the year 2000 (Quang Tri Statistical Office, 2001). Dong Ha's economy is more developed than other districts of Quang Tri province, but less developed than other towns and districts of Vietnam. Sustainable economic re-construction is required for economic development, and environmental prevention. On the other hand environmental

resources have to be protected. How can this be achieved in a sustainable way? One of these best ways to measure SD is to rely on indicators or sustainable development indicators (SDIs). SDI provides various statistical values that collectively measure the capacity to meet present and future needs (NASA, 2003). SDI will provide information crucial to decisions of national policy and to the general public. In fact, many indicators are applied and used into practice as well as SD. As SD is a wide area, many issues need to be concerned; so how and which best indicators will be selected, established and applied for this case study basic on Vietnam's (in general) and Dong Ha's conditions, status and potential into economic, social, cultural and environmental aspects.

The case study and the establishment of indicators will be approached by reversing the top down approach, since the local initiative model empowers people in a community to discuss and derive actions and policies at the community level involving business, government, neighbourhoods and villages in a way, which is interconnected with community functions (Nath, Hens and Devuyst, 1998).

2. SDIs Application for the Case Study

Based on guidelines and methodologies for SDI proposed by the United Nation (UN), the SDIs belong to 4 major aspects: socio, economic, environmental, and institutional. Establishing indicators systems for SD are mostly based on the analysis characteristics, actual conditions and data availability in the case study area. Each SDI is constructed in the concepts of definition (brief definition), unit of measurement, type of indicator, policy relevance (purpose, relevance to SD, linkages to other indicators), and methodological description. In addition, other studies have considered, for example, the People's Committee of Quang Tri province (2000) and Phuc Tuan (2000). Application of the SDI system for Dong Ha town contains following indicators:

Environmental aspects
- Integrated approach to the planning and management of land resources: *changes in land conditions, land use changing;*
- Promotion of sustainable agriculture and rural development: *arable land per capita;*
- Quality of water resources: *BOD in water bodies, concentration of faecal coliforms in freshwater.*

Social aspects
- Combating poverty: *poverty gap index, unemployment rate;*
- Demographic dynamics: *population density, population growth rate, total fertility rate;*
- Promotion of education, public awareness and training: *primary school and secondary school enrolment ratio-gross, women per 100 men in the labour force;*
- Promoting sustainable human settlement development: *flood area per person;*
- Protection and promotion of human health: *access safe water, immunization against infectious childhood diseases, and life expectancy at birth.*

Economic aspects
- Changing consumption patterns: *share of economic sectors in GDP;*
- International cooperation to accelerate SD in countries and related domestic policies: *GDP per capita.*

Institutional aspects
- Information for decision-making: *main telephone lines per 100 inhabitants; programmes for local environmental statistics;*
- Integration environment and development in decision-making: *mandated environmental impact assessment, program of integrated environmental and economic accounting, sustainable development strategies.*

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3. Creating a SD Map by using GIS

In order to create a SD map, it needs to establish different thematic maps. Totally, six thematic maps were established from correlative indicator, including:

1. Map of arable land per capita;
2. Map of distance of health care center;
3. Map of distance of schools;
4. Map of flood area per person;
5. Map of population density;
6. Map of soil erosion from correlative indicators.

And then, 6 sustainable sector maps were created from these above maps. Finally, a SD map was built from these sustainable sector maps by using GIS overlay analysis. The study gives an example of the application of a new method to SD based on SDIs. The SD map (Figure 1) shows the spatial distribution SD areas, which presents different areas in between sustainable grades (from very low sustainable - grade I to very high sustainable - grade VIII) as following:

- 1st grade: very low sustainable;
- 2nd grade: low sustainable;
- 3rd grade: very low moderate;
- 4th grade: low moderate;
- 5th grade: moderate;
- 6th grade: high moderate;
- 7th grade: high sustainable;
- 8th grade: very high sustainable.

Table 1 shows the total area in different grades of SD map in Dong Ha town in 1998. The total area (the 2nd column) and percentage (the 3rd column) in different grades of SD are shown. The illustration and justification of grades is following:

1st **grade:** very low sustainable, distributed at Trieu Luong precinct (68.17%), Phuong 1 precinct (18.19%) and Phuong 2 precinct (9.45%). From point of view of SD they could not get high result of productivity of agriculture and plants and others. Because, at Trieu Luong precinct was heavily affected by flood at near Thach Han River place. But some of them were good option for commerce, service and tourism, for in stance, at Phuong 1 and Phuong 2 places.
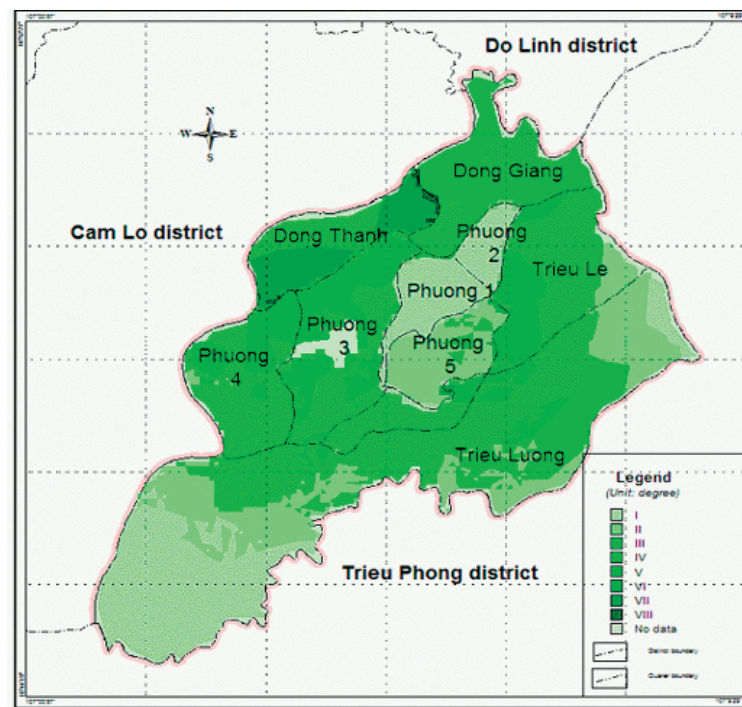

Figure 1: Map of sustainable development - 1998 (Dong Ha Town, Quang Tri Province)

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2nd grade: low sustainable and was high percentage (about 16.89%). The highest area as at Trieu Luong precinct (67.22%) and Phuong 5 precinct (23.23%). In Phuong 5, almost area was the grade II (78.36%). Also, one of main reason at Dong Giang and Trieu Luong precincts were heavily affected by Thach Han river place.

3rd grade: very low moderate sustainable, which was better than grade I and II situations about access to school, health care center, and more available agricultural land, less affected by flood and soil erosion issues. Trieu Luong and Dong Giang precincts were occupied the largest area about 43.65% and 37.96%.

4th grade: low moderate sustainable. This grade was highest area of the case study 2,040.01ha (29.04%). Combining with all of these; the grade from I to IV was very lager area about 5793.97ha (82.48%) in the total.

5th grade: moderate sustainable. SD was an acceptable for some aspects (e.g. access to school, health care system, available cultivation land, and less more soil erosion, flood effecting and among them). In Phuong 3 precinct was the highest percentage rate (41.75%) in Dong Ha town. Unfortunately, in Dong Giang, Dong Than, Phuong 1, Phuong 2, and Phuong 5 precincts were almost zero percentage rates.

6th grade: high moderate sustainable. The same situation with the grade V, 7 precincts left of Dong Ha town were almost or zero percentage rate, because only Phuong 5 and Trieu Le precincts distributed 59.15% and 40.85% of the total area. Unfortunately, it was the smallest area about 5.56ha (0.08%) in the total area of Dong Ha town. This grade was more sustainable than the grade V.

7th grade: high sustainable. The same situation with the grade VI, it belonged to Dong Thanh precinct (96.93%). In point of SD view in aspects such as access to school, health care system, available cultivation land were good situation and development; beside that softly effected from soil erosion, flood, and population growth.

8th grade: very high sustainable. It was the highest grade of SD issue in Dong Ha town. Unfortunately, this grade had very small area; It was about 19.66 ha (0.28%). Even, if combining the grade from V to VIII, the area is very small, about 1230.99 ha (17.52%) in the total.

4. Conclusions

1. GIS have been widely applied as tools in detecting, analyzing, and creating a SD map. GIS technology provides a flexible environment to store, analyze, and display digital data on SD. Recently, in Vietnam, GIS have been used increasingly to examine the spatial and temporal issues of SD. In view of the foregoing discussions on the situation in Dong Ha town,

Table 1: Total area and percentage in different grades of SD in Dong Ha town in 1998

The grades of SD	Area (ha)	Percentage (%)	
I.	1,372.92	19.54	
II.	1,186.86	16.89	
III.	1,194.18	17.00	
IV.	2,040.01	29.04	
V.	937.05	13.34	
VI.	5.56	0.08	
VII.	268.73	3.83	
VIII.	19.66	0.28	
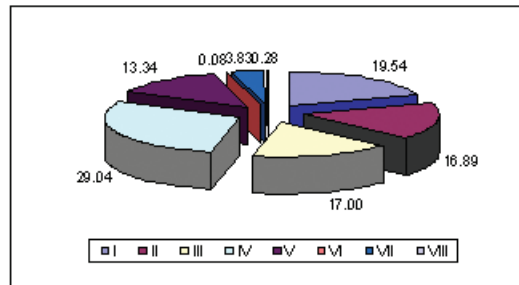
it is necessary to establish specific measures like GIS to manage progress toward SD through a SDI's system.

2. The setting of SDI indicators and visualization of the thematic maps and the SD map shown the *'picture'* of the present situation and the tendency of changing over time, in particular during the year 1996, 1998, 1999 and/or 2000, in which:

Aspects of sustainability (because the intensity of the target problems was reducing over time) included: land use change (forest area, scrub, grass, and other land), poverty gap index, population growth rate, total fertility rate, primary school and secondary school enrolment ratio - gross, women per 100 men in the labour force, access safe water, immunization against infectious childhood diseases, life expectancy at birth, share of economic sector in GDP, GDP per capita, and main telephone lines per 100 inhabitants.

Aspects of un-sustainability (because the intensity of the target problems was increasing over time) included: high soil erosion grade rate, arable land per capita, BOD5 in water bodies, concentration of faecal coliforms in freshwater, unemployment rate, population density, and flood area per person.

Almost all institutional situations of this case study were weak, such as programmes for local environmental statistics, programme of integrated environmental and economic accounting, mandated environmental impact assessment, and sustainable development strategies.

As the recommendation, the aspects of sustainability have to be encouraged to develop; other side the aspects of un-sustainability have to reduced and reject eradication.

And last, but by no means least, through establishment of SDIs, situations and tendency movement were shown and indicated, that is right issue for planning, policy and decision-makers to follow SD point of view by put regulation and development forces. That means they always must consider socio - economic, environmental and institutional interrelationship.

References

NASA Headquaters website, 2003, *Sustainable Development Indicators,* http://www.hq.nasa.gov/iwgsdi/Welcome.html.

Nath, B., Hens, L., and Devuyst, D., 1998, *Sustainable development,* 2nd Edition, (Brussels: VUB Press, Belgium).

Phuc Tuan, T., 2000, *Sustainable development indicators system for Thanh Lan Island,* Human Ecology Department, Free University Brussels, Belgium.

Quang Tri Statistical Office, 2001, *Statistic yearbook in 2000,* Quang Tri province, Vietnam.

The People's Committee of Quang Tri province, 2000, *Establish the environmental indicators of Quang Tri province,* Quang Tri, Vietnam.