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Accounting the Value of National Resources to Sustainable Development: Applied for Thanh Hoa Province

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Abstract: In more recent times, sustainable development has become the common development goal for countries, regions. If so, to assess the level of economic development based on criteria such as GNP or GDP is not enough. The reason the criteria only represent the level of economic development, but not the level of sustainable development of the countries is that there is not calculating the cost of environmental protection, the degree of degradation and depletion of natural resources. Natural resources not being calculated correctly in most cases has led to economic growth based on the overexploitation of natural resources. The natural resource accounting is to provide environmental damage in economic analysis, and correct GDP according to the value of environmental resources. By dividing resources into components as follows: intangible assets, produced assets and natural assets and then calculating the values, the method showed a picture of the contribution of intangible assets, natural capital in the economic development. Since then, Economic policy makers advance reasonable adjustments to the goal of sustainable development, help to increase the percentage of intangible assets and reduce natural resources capital. Findings and initial resource accounting in Thanh Hoa Province showed that the economic development of the province in 2013 remain heavily dependent on natural resources.

Key words: accounting, economic, sustainable development, national resources

1. Introduction

According to WHO, the natural resource accounting is economically analyzing natural resources to investigate annually national natural resources capital.

1.1 Objectives

GDP and GNP are effective took to reveal level of economical development. These index show level of economical development and annual mobilization, comparing the level of economical development between nations. However, the indexes cannot reveal sustainable income of the nation due to: cost of environment and the percentage of depression and exhausted of the natural resources.

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Economical development and no care environment is not sustainable development. Therefore, aims of natural resources accounting are:

- Economical analysis of environmental cost: accounting natural resources and environment is considered as economical analysis of value of resources for statistical and monitoring natural resources. This provided quality, quantity and value of resources at the beginning of exploitation and exchange of resources in the different period of time.

- Accounting the value of natural resources and environment also transform GDP based on value of natural resources. The exchange of natural resources is estimated based on correction GDP.

Accounting the value of natural resources implemented in the developed countries. The “Where is the wealth of nations?” of the Word Bank in 2006 is

considered as completely report of capital accounting in more than 100 nations [1].

1.2 Methods

Method 1: separate natural resources to 2 groups: commercial natural resources and non-commercial natural resources

- *Accounting the value of commercial natural resources* [4]: To account value of these natural resources, some methods are listed:

- Exchage methods: The method depends on demand of productions in the market to exchange non-commercial natural resources to commercial natural resources.
- Direct change: costed-productions are used instead of non-costed productions via another service.
- Indirect change: The methods change natural resources by comparing the value of natural resources and a third sector.
- Index change: The method considers lost of environmental risk or restore of the natural resources.
- Opportunity cost: The method calculated benefits thanks to weeding out a natural resources and invest another natural resources. It provides benefits but value of ecology and environment has not considered.
- Enjoy assessment: The methods assess an environmental service which impacts on the other environmental service.
- Travel cost: The method measure value of tourism scenery via benefit of travellers' tourism cost.
- Randomize investigation: The method considered community comments. The method setted up questionnaires which investigated how much compensation they get to agree with the environment as well as how much they can afford to have the environment. Therefore, value of affordability and agreement of community is value of the resources.

- *Accounting the value of commercial natural resources:* The method based on benefit-cost extended analysis. The method is assessed as economically effective method.

If the method is used for projects, the benefit-costs such as the beginning benefit-cost, fixed cost and working capital, production expense, revenue, etc. are calculated every year during the project. In the method of benefits-cost, they calculated discount of the money. This means the money spending in the future has discount as the money spending at the present. The present is considered as the beginning of the projects.

The benefit cost had been calculated before the project. The method provides the managers decision: the project should be issued or not. The method compared effectiveness of economical projects

The method compares effectiveness of economical projects or different options to implement the projects. The aim of that is choosing the best effective project.

Net profit value is calculated by the equation:

$$\mathrm{NPV} = \sum_{t=1}^{n} \frac{Bt}{(1+r)^t} - [Co + \sum_{t=1}^{n} \frac{Ct}{(1+r)^t}] \quad (1)$$

In which: B_t: The profit of the t year; C_t: The cost of the t year; C_0: The first cost; r: coeffition of discount; t: time; n: the project duration.

So, Net Profit Value (NPV) is accumulated net profit which depends on coefficient of discount and time. In the beginning of the project, net profit value has negative value. The cost is higher than the profits. After that, the cost is higher than the profit and the NPV is zero and has positive value.

When NPV is used to compare the projects, the input capital should be considered. Because the NPV of two different projects are the same but the input capitals are different. If the projects focus on the economical profit, the project with low input capitals should be considered.

Method 2: The method calculates total resources value according to WHO. In which, resources including: invisible property capital; manufacture

capital (machines, devices, urban land); natural property (energy sources such as gas and coal, mineral resources, forest resources such as timber and non timber), cultivation land, breed land and conservation zones.

* Process of general calculation:

Process of general calculation in the Figure 1:

- Stage 1: Total wealth measured by: NPV
- Stage 2: Produced capital
- Stage 3: Natural capital
- Stage 4: Intangible capital

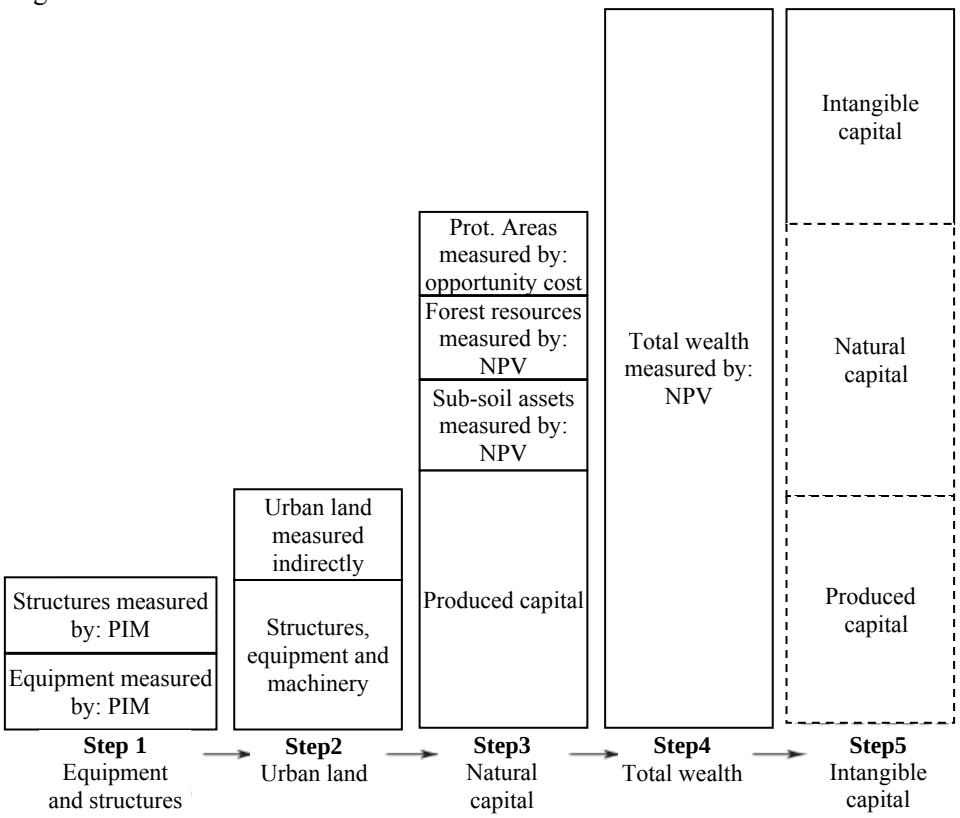

Fig. 1 Estimating the components of wealth.

In which:

- Produced capital: including: value of urban land, works, machines and devices.

+ *Capital of machines, devices and buildings:* In the paper, Perpetual Inventory Method (PIM) to calculate manufactory capital. It is the most common method to calculate manufactory capital because the method requires not so much database. Equation to calculate manufacture capital (urban land) in the period of time t showed below:

$$K_t = \sum_{i=0}^{19} I_{t-1} (1-\alpha)^i \qquad (2)$$

In which: K_t: total investment of machines, devices and works; I: total investment in the year t; α: discount, α = 5%. Default duration: 20 years. The default duration is 20 years for works, machines and devices although works last longer than machines and duration of machines and devices. Applying the research for 62 countries, Larson and his collages conclude that 20-year is suitable period of time for investment.

+ *Capital from urban land:* According to Kunte (1998), urban land account for some percentages of investment. In the ideal circumstance, the percentage is defined for countries. However, due to lack of database, the paper applied Kunte's estimation as 24%.

Therefore, equation to calculate capital from urban land is:

$$U_t = 0.24 * K_t \qquad (3)$$

Natural resources capital:

According to economic theory, the value of property was calculated based on net current value which

included discount of benefit from the property. The theory applied not only finance properties and manufactory properties but also natural resources. However, finance properties and manufactory properties have market but natural resources have not. Natural resources managed by the government. Value of natural resources depends on current economical conditions. When technology and current rate exchanges, some kind of resources having no enough attractive in the past contributes benefit if they are exploited.

To estimate the value of particular resource in period t, the author applied model based onThe Work Bank (2006) [1]:

$$V_t = \sum_{i=t}^{t+T-1} \pi_i q_i /(1+r)^{i-t} \quad (4)$$

In which:

π_i: benefit unit of the natural resources in the time *i* và q_i is the output, therefore, $\pi_i q_i$ is economical benefit or total output in the time *i*.

r: social discount percentage.

T: duration of exploitation. It is difficult to estimate benefit of resources in each period of time from the beginning to time *T*. So, equation is simpler. Calculating future benefit based on current benefit. To assume that benefit unit π rised with speed *g*:

$$\pi^*/\pi = g = r/(1+(\varepsilon-1)(1+r)^T) \quad (5)$$

where ε is the curvature of the cost function, assumed to be isoelastic (as in Vincent 1996). Then, the effective discount rate is r*,

$$r^* = (r-g)/(1+g) \quad (6)$$

The value of the sources stock can be expressed as:

$$V_t = \pi_t q_t (1+1/r^*)/(1-1/(1+r^*)^T) \quad (7)$$

To assume that resources increases with a stable rate, the equation (7) was used to estimate value of mineral resources. However, depend on kind of natural resources, theory involved in resources in the future may expand or shrink.

Duration time (T) of resources exploitation is a important parameter. In the case of non-renewable resources, duration time to completely exploit should be investigated. Economical reserve of a kind of natural resources depends on not only materials but also economical conditions. Estimating duration time to completely exploitated is more difficult than estimating rate of reserve and exploitation productivity. In the paper, applying the method of The Work Bank, 25-year duration time is used for all kind of resources. The reasons why the duration time was chosen were: (1) many non-renewable resources. The rate of reserve and exploitation productivity is from 20 to 30 years; (2) the duration is estimately a circle life, thus, it was used for decision of scheme.

**** Method to estimate total value of resources***

In the paper, total value resources or properties was calculated via equation of The Work Bank (2006):

$$W_t = \int_t^{\infty} C_{(s)} e^{-r(s-t)} ds$$

In which: W_t: total value resources, it is also capital in the time t; C(s): consumption in the year s; r: social benefit coefficient from the investment, r = 0.04; t:Duration time of the source.

2. General Information of Thanh Hoa Province

Thanh Hoa is located in north point of Center of Vietnam. It has coordination from 19°23' to 20°30' Northern latitude, from 104°23' to 106°30' Eastern lonngtitude. The province has border with Son La province, Hoa Binh province and Ninh Binh province in the North; Nghe An province in the South, Lao PRD in the West and Guil Tonkin in the East. The area is 1.112.948 ha, account for 3.37% total area of the nation. The geology is higher in the West and lower in the East. The geology separated to 4 clear areas: coast, delta, midland and mountainous areas. Thanh Hoa province connect North Area with Center Area and South Area. Thanh Hoa located in suitable area for transportation on land, on the sea and on the air.

Thanh Hoa province has variety resources including land, water, mineral, forest. It has 296 mineral mines and point of mines on the area of 13.547ha. Total

reserve is 10 billions tons, separating to 4 groups: fuel mines, metal mines, non-metal mines and mineral for fertilizer and chemicals. Forest area increases in the recent years. Thanh Hoa province has long coastal area, Nghi Son deep-water seaport, many river mouths and other various resources. The sea contributed not only seafood but also salt or conditions for mangrove forest. Territoral water in the province has high economical value seafood with large reserve. Thanh Hoa has long history, various culture, historical monuments. All of them is advantage to develop travel and other services.

3. Applied for Thanh Hoa Province

In this paper, Method 2 of The Word Bank was applied: The method calculates total resources value according to WHO.

Value of natural resources in the Thanh Hoa province was estimated based on benefit from mineral resources, forest resources (timber, non-timber and conservation zone) and soil resources (cultivation land, breeding land and aquacultural land). Database of the resources was collected from the Annual abstract of statistics in 2013[3] and the local reports.

Almost natural resources used price based on database of FAOSTAT. Some kind of natural resources used national or local average price. Database of natural resources manufactory cost is national database. In the case of there is no database for manufactory cost of some kind of resources, database of research in the same conditions countries will be applied.

3.1 Total Value of Resources

Total value of resources are calculated based on the value in Statistical Yearbook 2013 and the reports of Thanh Hoa Province. The result of total value of resources are shown in Table 1.

3.2 Value of Manufactory Capital

Value of manufactory capital includes value of urban land, works, machines and devices.

Applying Eqs. (2) and (3) for total value of manufactory capital in Table 2.

3.3 Value of Natural Resources

Value of natural resources includes mineral resources, land resources and forest resources.

3.3.1 Value of Mineral Resources

Due to limited database, value of mineral resources was calculated with 25-years duration time, 5% social discount. Scenarios for rate of rent cost and annual rate of increase were shown in the Table 3. Based on equation of natural resources (4), value of mineral resources was shown in the Table 3.

3.3.2 Value of Land Resources

Value of land resources includes agricultural land, aquacultural land and forest.

Value of agricultural land was estimated based on current value which has discount. It means the difference between commercial of crops productivity and manufactory cost. Agricultural productions were calculated based on the price on the world and cultivation cost was calculated based on national cost.

Table 1 Total value of resources.

Consumption in 2013	212.643.590 (USD)
Total value of resources in Thanh Hoa province	16.750 (USD/person)

(Current rate 2013: 1USD = 21.000 VND)

Table 2 Manufactory capital.

Capital of machines, devices and works (USD/person)	4.638
Value of urban land (USD/person)	1.132
Total value of manufactory capital (USD/person)	5.770

Table 3 Value of mineral resources.

	Basicscenario	Otherscenario
Total average manufacture value (USD)	89.023.810	89.023.810
Rate of rent cost (%)	50%	50%
Annual rate of rise (%)	15%	20%
Value of mineral resources (USD/person)	1.172	2.435

Crops are high value ones and they contributed in all area in the province.

Therefore, average benefit from land per ha in the 2013 is 494.55 USD. Based on annual rate of development of agriculture in the "Summary report of agricultural development planning Thanh Hoa Province", value soil resources in the Table 4.

3.3.3 Value from Breed Land and Aquacultural Land

Value of breed land was estimated the same method with estimating the cultivation land. The resources investigated potential of land for breed such as cows, chickens, pigs, buffalos, etc and other aquacultural such as oyster, arca and squid, etc.. Due to limited database, breed cost was estimated based on the method of The World Bank, account for 55% benefit and rate of benefit is 45%. Speed of development of breeding and aquaculture based on the "Summary report of agricultural development planning Thanh Hoa Province". Applying Eq. (4) with current value, benefit from breeding and aquaculture in 25-years discounts with 4% discount rate. Manufactory value of aquaculture and breeding in 2013 is shown in the Table 5.

3.3.4 Value of Forest Resources

(1) Timber resources

To estimate value of timber resources, database of timber input in all kind of forest should be contributed. Timber resources was investigated based on forest area which available in the forest and quantity of timber.

Table 4 Value of cultivation land resources.

Rate of development 2011-2020	Rate of development 2021-2032	Value of cultivation land resources(USD/person)
1.1%	0.9%	1.676

Table 5 Value of breeding and aquaculture land.

Rate of development 2011-2015	9.1%
Rate of development2016-2020	6.2%
Rate of development2021-2025	4%
Rate of development2026-2032	1.6%
Rate of development2033-2037	0.6%
Value of breeding and aquacultural land (USD/person)	**3.481**

According to "Global forest resources assessment 2005" (FRA, 2005), productivity of Vietnam forest is estimately 66 m^3/ha. According to that, productivity of timber is calculated by available forest area (ha) multiply average forest productivity (ha). Of course, timber supply increase when forest area rise. At present, forest productivity in Vietnam is quite low, 4 m^3/ha/year.

Value of timber was estimated based on net current benefit from timber productivity. In the ideal cases, the benefits were estimated based on cost to buy rights to exploit timber. The cost was paid owner of the forest. The cost includes plantation cost.

However, the database of that is limited. Therefore, price in market and manufactory cost was used to calculate benefits based on equation:

Rate of benefits = (price in the market – exploitation cost)/price in the market

Due to exploitation database was limited, the database of The World Bank was used, estimately 50% in the Southeast area. Rate of the benefit multibly price of manufactory timber and fule timber (Weight based on rate of exploitation). Price of manufactory timber and fuel timber was used from database of FAO. To assume that exploitation is stable, duration to completely exploit was 20 years.

Based on that, value of timber resources in the present was calculated with 4% rate of social discount and 4.9% rate of average increase. Applying Eq. (3), value of timber resources is 83.33 USD/person.

(2) Non timber resources

Based on database of General Statistics of Vietnam, benefits from non timber resources is estimately 9.4 USD/year.person. In which, 3USD is from timber exploitation and 6.4USD is from non timber exploitation. Non timber resources in Thanh Hoa province is various and profuse and it contributed high economical value.

Applying the equation (4) with 20-year exploitation duration time, 4% social discount and 4.9% rate of

increase per month, 50% rate of rent cost, value of non timber resources was calculated is 177.77 USD/person.

(3) Value of conservation zone

Value of conservation zone was calculated based on affordability for benefits from the zone. However, in the study: "Accounting value of Vietnam resources: Functions of natural resources", value of conservation was estimated based on method of "benefits and cost". Based on the method, value of conservation was calculated by benefits from not conservation and from other aims. The method concerned just minimum benefit and cost of conservation. Value of conservation zone includes direct and indirect benefits which were quite difficult to apply. Therefore, the method should be applied and all values of the conservation were calculated.

Based on that, value of resources in the conservation zone is 196 USD/ person. Conservation zones were considered as property for the future generations. The consecation zones support developing industrials such as ecological tourism, conservation and biodiversity development, absorb and reduce CO_2 gas in the air. Consevation zone have area around 2.5 million ha and population 86.210.800 people. Value of resources of the conservation zone is around 6.759 USD/ha [4].

According to statistics database in conservation zone in Thanh Hoa province, conservation zone in Thanh Hoa province has area of 64.309 ha and population of 3.476.592 people. Value of resources of the conservation zone is around 117 USD/person.

Generally, total forest resource was 378.1 USD/person.

(4) General information of value of resources in Thanh Hoa province

Based on above results, contribution of investment to development of Thanh Hoa province is:

- Total value of resources is 16.750 USD/person, in which:

+ Total value of natural resources is 6.706 USD/person, account for 40%;

+ Total value of manufacture capital is 5.770 USD/person, account for 34%;

+ Total value of invisible capital is 4.244 USD/person, account for 26%.

Percentage of value of resources in Thanh Hoa province in 2013 and 2008 was shown in the Fig. 2 and Fig. 3, respectively.

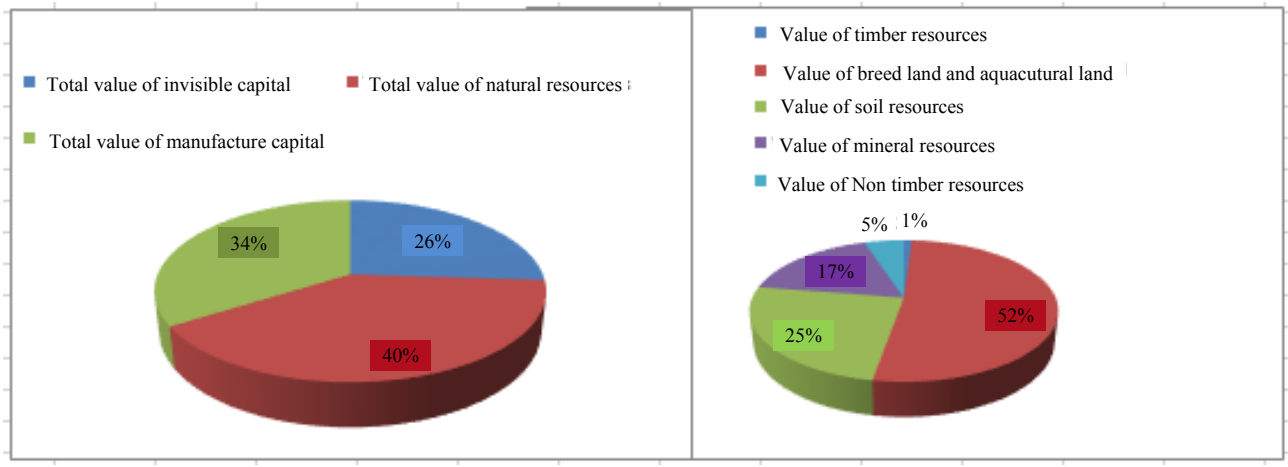

Fig. 2 Percentage of value of resources in 2013.

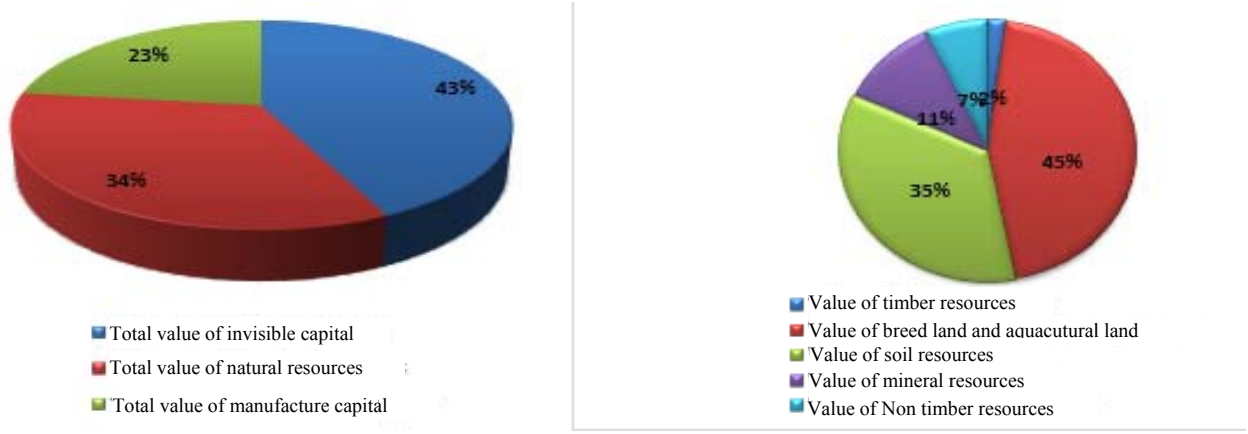

Fig. 3 Percentage of value of resources in 2008.

Based on above results, from 2008 to 2013, rate between value of resources and value of aquacultural and mineral improve clearly. Value of cultivation land and timber resources reduce significantly.

- Comparing value of resources of Thanh Hoa province with account of the other provinces (2008) was shown in the Figure 4:

+ Quang Tri province (2008):

According to above findings, value of resources in Thanh Hoa province contributed to economy as the same as value of resources in Quang Tri province but smaller than the value of Hanoi. Nevertheless, at the present, the development of Thanh Hoa province is not real sustainable development and the development depend on natural resources. In the recent years, the province should be improved infrastructure for economical development.

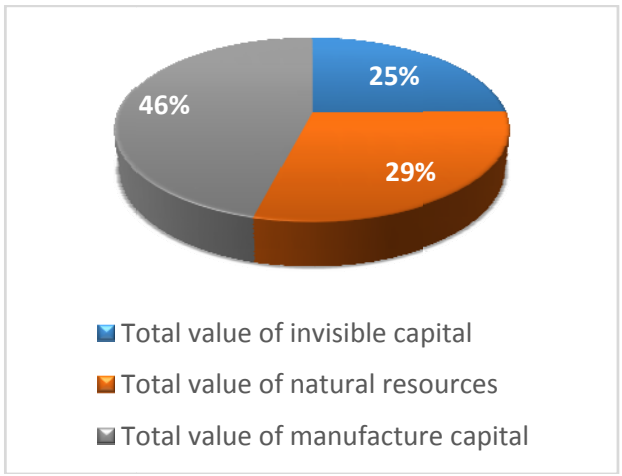

Fig. 4 Percentage of resources in 2008 [2].

4. Conclusion and Recommendation

4.1 Conclusions

Accounting the value of natural resources is economical analyzing value of them to investigate annually national natural resources reserve. It contributed quantity, quality and value of resources in different time. Therefore, contribution of natural resources to economy was shown clearly instead of GDP or GNP when estimating development of the provinces. Moreover, based on that, managers have clear plants and manage resources for sustainable development.

Study results revealed that economical development of Thanh Hoa province in 2013 depended on natural resources. Value of natural resouces account for 33% of natural resouces value in Thanh Hoa province. Infrastructure and human force had not been invested agreeably.

Infrastructure and human force should be invested more to improve value of natural resources and reduce proportion of the natural resources. It aims to sustainable development. In addition, non timber forest productions and conservation area should be protected and developed. Mineral resources and area for breed and cultivation should be exploited effectively.

4.2 Recommendation

At present, accounting the value of natural resources

in Thanh Hoa, Vietnam had faced to troubles. First, database is limited. Second, accounting the value of natural resources is the new method. So, detail method and experience are so limited. It is difficult to account the value of some natural resources. The issue should be studied in the recently future.

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