Performance of Iran's Sustainability Index as Compared to the Global Average

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Abstract

The present study seeks to investigate Iran's performance in terms of indexes of development sustainability among some countries during 2004-2009. In this study, in order to construct a sustainability index, three different dimensions have been taken into account including: economic aspect, social aspect, and environmental aspect; for each aspect variables has been defined for constructing each of the sustainability dimensions. 6 variables for the economic aspect of sustainability index, 7 variables for the social aspect, and 6 variables for the environmental aspect have been taken into consideration. Each aspect is given an equal weight in constructing the sustainability index. For constructing sustainability index, the standardized value of each aspect was initially computed using "Standard Deviation" method; and then using a formula, we obtained the value of these variables in such a way that the value of each one of them is between "zero and one" in which the closer this value is to "one", it shows the direction toward sustainability, and the closer this value is to "zero", it is indicative of distancing from sustainability. After computing index number, Iran's performance at world level and among selected countries has been compared. Considering the results for each of the index aspects, Iran's performance has not been successful in the economic aspect of the sustainability index, and we have been observing distance from sustainability. Regarding the social aspect of the sustainability index, Iran's performance has been satisfactory and this country has moved toward sustainability. Concerning the environmental aspect of the sustainability index, Iran's performance has not had the necessary sustainability and there has been no achievement in this regard.

Keywords: Development, Sustainability, Performance, Index, Standardized Value, Triple Aspects

Introduction

Sustainable development is one of the new phenomena in the modern world, stated in the 21st century as one the main challenges and the focal point for debate regarding existing issues in the modern era of disorder in the world. Speed in expansion of "sustainable development" in international debates and discussions are a further emphasis on the centrality of this concept in the 21st century.

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The most common definition of sustainable development is the one stated by the World Commission on Environment and Development: "a development that meets the requirements of the modern generation without harming next generations in meeting its own need". Realization of sustainability of environment and natural resources such as water, soil, pasture, and jungle calls for multiple factors and doing various planning. Development with the adjective of sustainable includes "economic", "social", and "environmental" aspects which are related to each other along with all related-subsets, and understanding the relationship between them has a unique importance in codifying and implementing plans.

Aspects of sustainable development can be defined as follows:

Economic aspect: economic development doesn't necessarily refer to economic growth. The quality of growth and the way of wealth sharing are taken into consideration in this aspect.

Human-social aspect: in this dimension, sustainable development means achieving a fixed population and comprehensive and fundamental development in rural areas in such a way that it slows down migration to cities. It also refers to applying policies and using technologies that guarantee literacy and hygiene for the whole society, whether rural and urban population, and create the pillars of sustainable development.

Environmental Aspect: Maintaining and protecting natural resources for food production, useful use of earth and water, and improvement of agriculture methods are necessary to sustainable development.

Sustainable development is the ideal of all societies. However, it should be noted that bridging the existing gap between developed and developing worlds is impossible without sustainability of development. Sustainable development covers all aspects and dimensions of human life. Accordingly, it should not be expected that this issue can be easily defined and readily measured. In recent years, that Iran's progress in indexes related to sustainable or unsustainable development and also its status in this regard among countries with the greatest success in these matters have been the concerns of many development economists, one can correct unsuccessful methods by determining sustainability indexes. It is obvious that a country is able to correct or reconsider existing policies and make right and planned decisions regarding improvement of development indexes only when first it is fully aware of its own performance in this aspect and obtained results, and second it knows in what stage and status it is. Conducting this study can be accompanied by the question in what level can Iran be in comparing sustainable and unsustainable development indexes to selected countries?

Next, research history, theoretical fundamentals of research, and research methodology are reviewed. In the end, conclusion is presented by analyzing results.

Review of Literature

Concerning non-Persian language articles and books, there have been valuable and sobering works in many countries, among which one can mention Daniel Moran et al.'s article "Measuring Sustainable Development—Nation by Nation" which studies human development indexes "HDI" as the index of sustainable development. It was shown in the conclusion of this study that for development, "HDI" creates a high per capita demand for environmental resources, which is distant from sustainability.

In a study titled "Assessing sustainable Development: A Case Study of Southwestern Australia", Anne M.Wallis et al have investigated three pillars of sustainability with social, economic, and environmental indexes.

It is thought that by measuring each of the factors, one can make a remark on the sustainability of the whole system. This study was conducted in southwestern Australia, which attributes sustainability mainly to environmental issues.

In a study titled "Economic Variety, Development Capacity, and Sustainable Development in China", Jung Ming et al. stated that economic growth in China in the past few decades has been in its highest rate, and with increase of energy consumption for development, its negative feedback will be inevitable. In this article, it has been attempted to investigate sustainable development in China's provinces, and signs of sustainable development in 1985 to 1998 due to increased energy consumption have been observed in conclusion.

In their article titled "Knowledge Economy of India (a Model for Sustainable Development in Iran), Hamid Nazemiyan et al. stated that in the sense of qualitative change and a transition from a period to another, development calls for comprehensive change in economic, political, cultural, social,... dimensions. In this article, while explaining the status and importance of basic knowledge of economy and its role in achievement of sustainable development, they have discussed India's improving process and going toward development, and state that it can be considered as a valuable and applicable model for achieving development.

In their article titled "Content Analysis of Conformity of policies of post-Revolution social, economic and cultural development plans with sustainable development model", Karim Naderi et al. attempted to determine the amount of development plans policies conformity with sustainable development model as the dominant model in the recent decades.

Farshad Mo'meni and Minoo Amini Milani investigated how to achieve sustainable development, emphasizing the concept of capability and life quality, "age" in Iran's development plans and determining its level in the third and fourth development plans and its distance to desired level as well as identifying the factors influencing sustainable development in Iran's current situation. The result of this study suggested that in Iran's current situation, socioeconomic factor is the most influential factor for stepping into the path of sustainable development and, its related variables, although some of which having a social and environmental nature, must be strengthened so that by achieving an acceptable level of development, social and environmental promotion can be possible and promotion of life quality can be the center of programs.

In an article titled "Emerging Models in Measuring Development Sustainability", while introducing emerging models in development concepts, Seyyed Kiyanoosh Kalantar et al. reviewed fundamentals and the necessity of attention to development sustainability (by nations and states).

Several studies have been conducted in the field of sustainable development and its related indexes, in each of which a particular aspect has been addressed. But in most studies in this regard, more attention has been paid to the meaning, the nature, and the quality of sustainable development and less attention to indexes showing move toward sustainability or distance from sustainability.

Theoretical Fundamentals of the Research

Sustainable development is not a completely new concept. Since pre-historic times, people have been aware of environmental restrictions and some strategies of successful and long-term evolution of survival such as optimal management and suitable measures.

From 1960s on, multiple seminars and conferences were held for getting rid of this situation, examples of which include biosphere conference in Paris (1968), ecological characteristics of international ecology in Washington (1968), human environment conference in Stockholm (1972), and finally in the same year, growth restrictions introduced in the world of science by Rom Club.

In the middle of 1970s, Barbara Ward gave scientific credit to the word of sustainable development. In 1980, this word was used with its widest form in the sense of "the strategy of protecting the world". It means that from that time on, it was regarded as one the factors of progress and promotion of human welfare and support for resources and environment. The strategy of protecting the world criticized the theory of inability of integrity of environment and economy as well as less attention to social conditions. In 1987, report of World Commission on Environment and Development placed the concept of sustainable development in the political and economic territory in which unlike in 1970, economic growth and environmental protection joined hands with each other.

Sustainable development has multiple dimensions. Accordingly, common definition of sustainable development can't be reached. That is why some consider the concept of sustainable development as navigating in achieving economic, social, and environmental targets. "Whether sustainable development is of a value and useful concept for planners or not has been so far answered with different responses.... Some environmentalists believe that if sustainable development is a necessary thing, therefore there must be the means to realizing it" (Cambell, 1996).

Generally speaking, sustainability is a dynamic concept including increasing needs of the world population, a population which is increasing in number. Considering this, the concept of sustainability and sustainable development implies sustained growth. Moreover, this concept contains new knowledge, knowledge of capacity and restriction of the spaceship called earth, and knowledge of the fact that the environmental balance of the world is in danger. "The concept of development observes an approach in socioeconomic development, which requires correction and recognizes the fundamental role of cultural independence. This concept has a dual function: determining direction and providing criteria for evaluating personal actions" (Sachs, 1990).

From among the multiple definitions made so far regarding sustainable development, several definitions are mentioned:

Robert Allen in "How to Save The World" in 1980 gives this definition for the sustainable development: a development in which the basic needs are constantly provided through the increase in the quality of life.

J. Commer in "In Search of a Sustainable Society" in 1979 provides the following as the definition of sustainable development: the expression of sustainable development is a set of comments which can be discussed in ecology courses and should be considered in economic processes.

The conclusion is that the new idea of sustainable development is to consider everything in the environment with a systematic and structured thinking and in connection with one another. Therefore it is necessary to consider any developmental phenomenon in economic, social, and environmental dimensions in connection with each other. Sustainable development is the management of optimal operation and protection of rare resources through application of technological advancements in all productive, administrative, and human aspects in such a way to both provide for the present generation and the requirements of the future generation in a sustainable and desirable manner.

The Definition of Index

The indexes are used for measuring the situation and process of economic, social, policy-making changes and determining the progress and evaluating the programs, indicating economic, social, and environmental problems and plights, identifying lagging districts, and measuring inequalities of districts. In general, the indexes are a set of summarized data in regards to the inventories and currents which are necessary for measuring the proposed economic, social, and environmental aspects for analysis and decisions about policymaking and planning.

Using the indexes for measuring development faces some problems such as lacking unanimity about indexes, the problem of determining the significance level for each separate index, determining the value of each one, the interdependence and correlation, and being connected to the present well-being of the society, etc.

Economic Development Index

In preliminary discussions on development during 1950s, "economic growth" and "economic development" were considered to be the same thing and the scholars believed that when the countries acquire the economic growth, their production capacity increases and they reach economic development. The economic growth is the constant increase in production or the national income per capita through a connection with the increase in workforce, consumption, capital, and the trade volume³. Therefore in the mentioned perspective about the index of the gross national product⁴ is more unanimously agreed upon⁵. The other indices of development are formed around the index of gross national product, such as gross domestic product⁶, net domestic product⁷, net national product⁸, and the national income.

The Economic Development Perspective

In this perspective no fundamental change can be observe despite of the fundamental change in the concept of development and numerous flaws in in the indices of macroeconomic development —or the economic growth. What actually happened was that a set of indices about the quality of life were added to the economic indices. These new indices showed whether some other non-economic dimensions were changed or not? This means that the indices of the previous perspective were still pivotal and the new indices played a minor role. To be more explicit, even now when the international organizations "rate" countries based on their economic growth they still consider the indices of economic growth such as gross domestic product; and the indices of the quality of life are only a part of "the reports of these organizations" on the economic development of the countries without being considered in "rating". The most explicit reason is the minor role of the new indices; that is why the discussion on the sustainable development perspective is based on the given critiques of one of the most important aspects of life, which is the environment.

The Sustainable Development Perspective

The Human Development Perspective

In the 1980s and most years of the 1990s most of the developmental attempts in financial organizations and major helping countries were based on the belief that forces of the market enter all poor countries in the path for economic development. The globalization was regarded as a new engine for the economic development of the world, it was imagined that poor countries can reach the economic growth by promoting suitable economic governance, based on the concepts of the sustainability of macroeconomics, privatization, and economic activity. At first a Pakistani scientist "MahbubulHaq" proposed the concept of human development theoretically and then the aforementioned concept gained interest and acceptance of experts and politicians around the world. The capabilities of MahbubulHaq in merging all theories of development made this a global index.

The followers of the mentioned perspective believe that the human development is to develop the process of choosing individuals and the main purpose of development is for human to gain the benefit; this means to increase the quality of human lives is the center of the patterns for development rather than in the margin. There are also some deep issues discussed in it on the features of the economic growth and its distribution methods. The basis for choosing fundamental dimensions and the indicators of the human development index are formed by the primary capacities of people for making a contribution and playing a role in the society.

These capacities and capabilities include: the ability to enjoy a long and healthy life, the ability to gain knowledge and acquire science, and the ability to access the required resources and facilities for having a good life.⁹

Methodology and the results of the study

All indices and statistics that are presented in this paper are according to the documents of the World Bank and are accepted and applied in Iran by Expediency Discernment Council. Since the statistics and data for all used variables in making the sustainability index didn't exist for many developing countries or they are not declared annually and also because of the belief that the selected countries for this study had a better performance in development indices, in this paper we compare the performance of Iran with the performance of Australia, Germany, Japan, Norway, and the United States.

The Process of Developing the Sustainability Index

The simplification of the amount of each index

In order to simplify the amount of the various dimensions of sustainability index, firstly we calculate the standardized amount for each index so that this simplification process can exhibit the sustainability of each unique index using simple and exact numbers and statistics; since each index has various features and units, the unification of the amounts for each of these indices is the first step in making them comparable and being able to analyze the indices. That is the reason why this paper we will use the "Standard Deviation" method as the basis for forming the sustainability method.

Forming Standardized Amounts for each Index

The process of simplification of indices firstly involves the standardized amounts for each index during a period for which the statistics of 6 years, that is 2004 to 2009, were used. If the standardized amount is positive the gained amount of the variable is more than the average amount during the period, and if the standardized amount is negative, the gained amount of the variable is less that the average amount during the 6-year period.

The standardizing method for each index

$$z_i = \frac{(x_i - \mu_i)}{\sigma_i} \tag{1}$$

z_i. Standardized amount for each index.

 $\sigma_i \hbox{: Standrard deviaiton of the whole period for each index}.$

 x_i . The affective factors for each of the three dimensions of sustainability index.

 μ_i : TheaverageofthewholeperiodforeachXi.

The conversion of the standardized amounts into variables of sustainability index

In order to calculate sustainability indices and also to better understand these indices in the present paper, we used a method for converting standardized amounts in such a way that the amount of each index is between "zero and one" which also facilitates the weight of each variable. Since moving towards "one" does not necessarily mean advancement and movement towards sustainability, some certain indices, which will be discussed as followed, should be used to solve the problem.

The method for converting each standardized amount

$$Y_{i} = \frac{(z_{i} - a)}{(e - a)} \tag{2}$$

 z_i the amounts between a toe.

a: The gained minimum for z_i .

e: The gained maximum for z_i .

 Y_i . The amount between 0 and 1.

The reverse index

For some variables a decrease in the amount of the variable is an advancement and movement towards sustainability, therefore for calculating the amount of such variables we use the following "reverse index" formula:

$$Y^* = 1 - Y \tag{3}$$

Therefore as the amounts of the indices approach 1, they indicate advancement and movement towards sustainability, and as they approach zero or in other words move away from "1" they show the deviation from sustainability.

Calculating Each Dimension of Sustainability Index

The economic dimension of sustainability index:

 X_1 : the rate of male participation in the labor force.

 X_2 : the rate of female participation in the labor force.

 X_3 : the Unemployment rate.

X₄: the rate of gross domestic product growth.

 X_5 : tax income (a percent of gross domestic product).

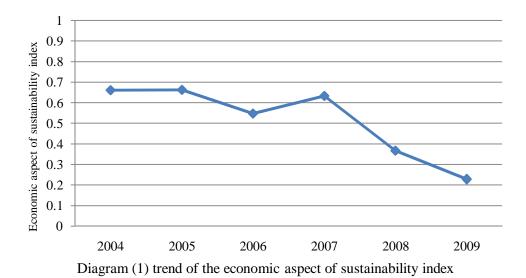
X₆: the direct foreign investment, net current (a percent of gross domestic product).

With regards to the presence of the unemployment variable in economic dimension and the fact that the changes in this variable inversely affect the process of sustainability, we should convert the amount of this variable using the reverse index "Y*=1-Y" in such a way that moving towards "one" indicates advancement and movement towards sustainability.

The total economic dimension of sustainability index

$$\frac{Y_{ij} + Y_{ij} + Y^*_{ij} + Y_{ij} + Y_{ij} + Y_{ij}}{6}$$
 (4)

In Diagram (1), the change trend of the economic aspect of sustainability index in Iran has been shown



As seen, in most years except for 2004-2005 in which it has remained relatively stable and for 2007 in which it has increased, the economic aspect of sustainability index for Iran has declined and we have been observing a move away from sustainability and progress conditions.

Now in order to see Iran's economic dimension in comparison to other countries in the world, we compare the sustainability index of Iran with some selected countries. In table (2)shows Iran's situation and the place among some selected countries.

As you can observe, in table (2) the changes in the economic dimension of sustainability index of Iran and other countries, as the table shows the amount of the index for Iran in 2004 and 2005 was higher than most selected countries and since 2005 as Iran's sustainability index decreased, in other words since 2005 as Iran deviated from sustainability, its rate and position of declined among different selected countries until in 2007 and 2007 Iran's sustainability index was lower than all these countries

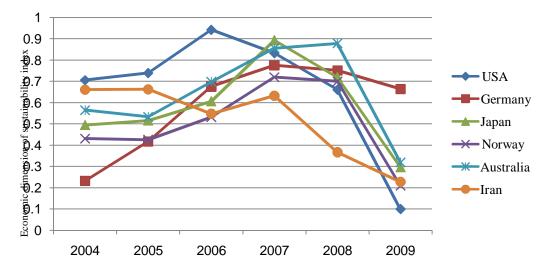


Figure (2) the comparison of changes in economic dimension of sustainability in Iran and selected countries

Source: the Calculations of the study

In diagram (3), the change trend of economic aspect of Iran's sustainability index as compared to trend of this index in the world.

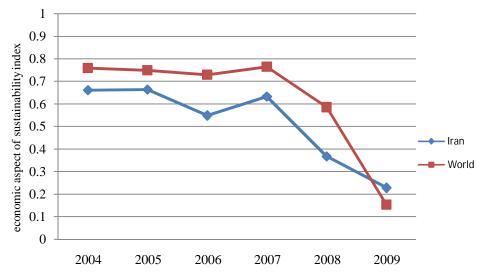


Diagram (3). Comparison of change trend of economic aspect of Iran and te world's sustainability index

In this diagram in which the performance of economic aspect of Iran's sustainability index has been compared to the performance of this index in the world, Iran's sustainability index has not enjoyed a suitable status as compared to global average and except for 2009, the value of this index for Iran has been less than its global value, which is indicative of Iran's poor performance in these years.

The social dimension of sustainability index

X₁: Human development index

X₂: The general costs in education (a percent of gross domestic product)

X₃: Total health expenditures (per each 100 persons)

X₄: Internet users (per each 100 persons)

X₅: Telephone Lines (per each 100 persons)

X₆: Scientific and technical articles and magazines

 X_7 : Population growth rate (annual percent)

Due to the presence of the population growth rate variable in social dimension and this fact that the changes in this variable inversely affects the sustainability process, the amount of this variable should be converted using the reverse index " $Y^*=1-Y$ ", so that a move towards "one" is an indicator of development and moving towards sustainability.

The totalsocial dimension of sustainability index

$$\frac{Y_{ij} + Y_{ij} + Y_{ij} + Y_{ij} + Y_{ij} + Y_{ij} + Y^*_{ij}}{7}$$
(5)

In diagram (4), change trend of social aspect of Iran's sustainability index has been shown.

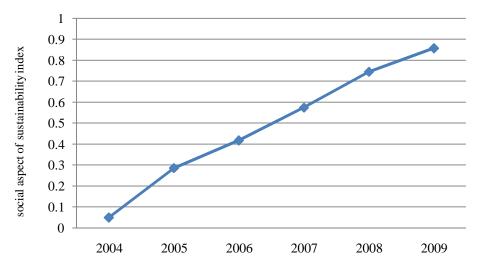


Diagram (4). change trend of social aspect of sustainability index

As it has been shown in this diagram, Iran has observed a sustainable status and a promising performance in the social aspect of sustainability index. As you can see, the value for index in 2004 has been in its lowest amount and Iran has had a poor performance in this year. But gradually, Iran's performance in this regard has improved and sustainability index has increased, which is suggestive of appropriate management in this regard and moving forward in achieving a sustainable development.

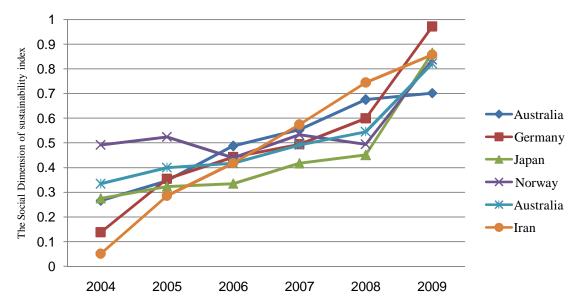
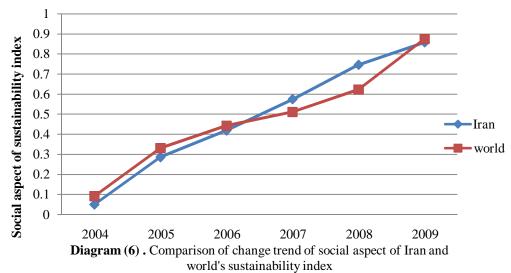


Diagram (5): The changes in social dimension of sustainability index

Source: the Calculations of the study

In this figure which shows the changes in social dimension of the sustainability index in Iran along with the changes in this index for selected countries, the amount of sustainability index for Iran in 2004 was lower than all countries, and all of these countries are in a higher and better situation comparing to Iran; however the sustainability index has grown for Iran and in 2005 the index amount of this country was almost equal to this amount for Japan; and in the year after that, which means in 2006, the amount of this index for Iran was higher than Japan and was equal to Australia which was in a much better and higher situation in 2004-2005; this development and success in moving towards sustainability continued so that in 2009 exceeded most countries and the only country which was in a better position than us was Germany. This shows that the performance of Iran in social dimension of sustainability index has been suitable and we should do our best in order to keep it this way.

In diagram (6), the change trend of social aspect of Iran's sustainability index as compared to trend of this index in the world has been presented.



In diagram (6) shown above, the change trend of social aspect of Iran's sustainability index along with change trend of global average have been shown. As you can see, the value for this index in Iran in 2004-2006 has been less than global average. Since the beginning of 2006, the value for the index in our country has come close to the global value; it has been above the global value in later years, but declined in 2009 toward less than global average.

The environmental dimension of sustainability index

X₁: Carbon Dioxide emission per capita.

X₂: The emission of CO₂ from transportation (the percent from total fuel combustion).

 X_3 : The consumption of fossil fuel consumption (the percent from total).

 X_4 : The consumption of chemical fertilizer (a percent from the production of chemical fertilizer).

 X_5 : The power generation form oil, gas, and coal resources (the percent from total).

 X_6 : The emission of CO_2 gases form residential, commercial, and public service buildings (the percent from total fuel combustion).

In environmental dimensions, the sustainability index of all variables has an inverse relationship with sustainability index, that means the changes in these variables are in such a way that the more the amount of these variables leans toward zero, the more sustainability is indicated in this field, therefore, we replace the converted amount, i.e. " $Y^*=1-Y$ ", instead of all variables in calculation of the sustainability index.

The total environmental dimension of sustainability index:

$$\frac{Y^*_{ij} + Y^*_{ij} + Y^*_{ij} + Y^*_{ij} + Y^*_{ij} + Y^*_{ij}}{6}$$
 (6)

In diagram (7), the change trend of social aspect of Iran's sustainability index has been shown.

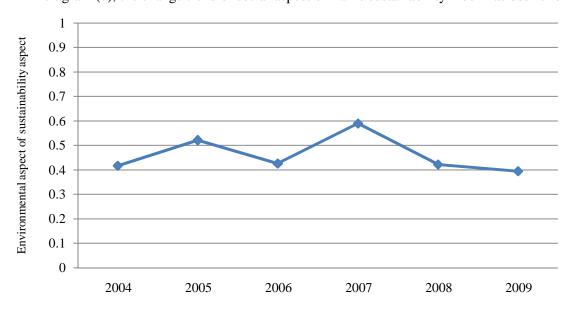


Diagram (7): Change trend of environmental aspect of sustainability index

As it can be seen in diagram (7), Iran's performance in the environmental aspect of sustainability index has not been successful and had fluctuated during 2004-2009. The change trend of the index has not been stable in these years and if there has been some success in 2005 and 2007, they have not been sustainable.

As you can see in the Diagram (8), the performance of Iran in the environmental dimension of sustainability index is shown along with the process of this index for some selected countries. In 2004, Japan was in the lowest level with sustainability index of 0.32, and Norway with a sustainability index of 0.79 was higher than other countries and amount of sustainability index for Iran was 0.42 which is higher than Japan, the United Sates, and Germany; in 2005 this process went on and the amount for Iran was higher than these countries and lower than Australia and Norway, but the difference between Iran and three aforementioned countries increased during this year and despite the fact that most selected countries declined, Iran inclined and in 2006 that most countries inclined the amount of sustainability index declined for our country; however in 2007 the performance of our country was so much better than other years that the amount of index for Iran was not very different from the countries which were at the highest level during this year and it was so close to the amount of index for these countries i.e. Australia and Norway. And in 2008 and 2009 the performance of Iran declined among the selected countries.

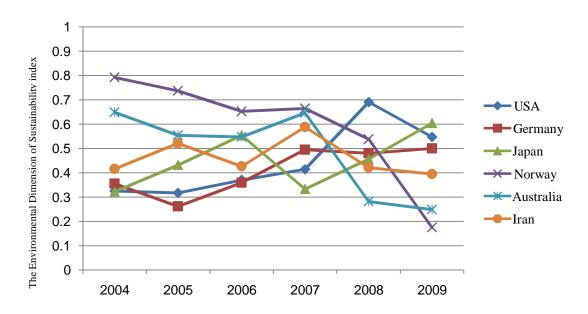


Diagram (8): the comparison of changes in environmental dimension and sustainability in Iran and selected countries

Source: the Calculations of the study

In diagram (9), trend of environmental aspect of Iran's sustainability index as compared to trend of this index in the world has been shown

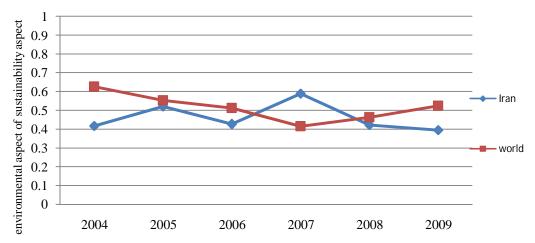


Diagram (9) : Comparison of change trend of environmental aspect of Iran and the world's sustainability inde.

In diagram (9) shown above, the change trend of environmental aspect of Iran's sustainability index along with change trend of global average have been presented. As it can be seen, the value for this index for Iran has been less than that for global average in 2004-2006. The year 2007 in which Iran's index value has reached its highest level is the only year in which Iran's index value has been above global level, and it has been lower than its global level in other years, which is indicative of Iran's bad status in the world.

Conclusion

Due to the results gained from the sustainability index, the situation of Iran in the economic dimension of the index was not desirable, and as we observed the economic dimension of Iran in the investigated period, which means 2004-2009, has declined and the country has moved towards a direction to move away from sustainability in a gradual manner and the position of Iran was not a suitable one among the selected countries from 2006 to 2009. And in comparison to the global average the position of the country is in a place lower than the global average as well, which is an indicator of the undesirable conditions of Iran and the poor performance in this regard and it requires more attention.

In the social dimension as we indicated before, the country has inclined and has moved towards sustainability year by year, despite being at the lowest level among the selected countries in 2004-2005, the performance of Iran gradually inclined in this field and the amount of index for our country has exceeded most of the countries in this matter. And in comparison to the global average the conditions of Iran has gradually inclined and it have achieved a desirable performance in this regards. In general, in social dimension the index of our country shows a desirable performance and the direction of its movement has been in such a way that it has gone through a sustainable and constant process which indicates that if we manage properly, we can move towards advancement and sustainability of development.

The situation of Iran has been very fluctuating in this dimension and Iran has not been sustainable in this regard. The performance of Iran in environmental dimension moved towards sustainability in some years and in some other years it has moved away from sustainability. Among selected countries, Iran was in a desirable position in some years and in some other years that the country moved in the direction away from sustainability, it was placed in a position lower than these countries, this matter needs to be investigated because the performance was desirable in some years and some other years it was totally the opposite. Therefore, we should adopt some policies which have the required stability, and if some policy is successful, we should try to do.

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