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Human Development and Environmental Sustainability in Oil Exporting Countries[1]

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Abstract:
Sustainability consists of fulfilling the needs of current generations without compromising the needs of future generations, while ensuring a balance between economic growth, environmental care and social well-being. Sustainability[2] includes three environmental, economic and social dimensions; whose environmental dimension has a decisive weight in sustainability. Many empirical sustainability-related researches have been carried out in the 2000s and 2010s, and the empirical model used in these studies was based on the Environmental Kuznets Curve (EKC)[3]. Also, the two concepts of human development and sustainability have been widely used in development literature in the past years, and humans have been considered as an important factor in the development of different societies in various studies. Composite index of human

[1] This article is extracted from a doctoral dissertation
[2] Sustainable development can be applied to corporate policy in the business world as it encompasses three key areas: economic, environmental and social. Sustainable development requires that a company must contribute to economic growth, social progress and promote environmental sustainability.
[3] The Environmental Kuznets Curve (EKC) is often used to describe the relationship between economic growth and environmental quality. It refers to the hypothesis of an inverted U-shaped relationship between economic output per capita and some measures of environmental quality.

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development includes various dimensions that can affect sustainability and especially environmental sustainability. Also, the influence of large oil revenues in the oil-owning and exporting countries on human development in these countries has played a prominent role, and has categorized the countries into three groups: oil-producing countries with high human development, oil-producing countries with medium human development, and oil-producing countries with low human development. This study has used the panel data method and the Kuznets function in the period of 2010-2019 to investigate the effect of the human development index in 35 major oil exporting countries in the world. According to the result of model estimation by econometric method, environmental sustainability in these countries increases with the increase in the human development index (HDI)[1].

1. Introduction

Global attention was focused on the issue of sustainability from the Brundtland Commission[2], which initiated the discussion on sustainable development. The World Commission on Environment and Development under the title of Brundtland Commission of the United Nations provided a general and practical definition for sustainability. This commission with the publication of the "Our Common Future" report, this commission introduced the discussion of sustainability in international policies in 1987 (Keeble, 1988)(1, 2)[3]. According to this report, it is necessary to ensure that the needs of today's generation are met, without harming the needs of future generations. It is necessary to achieve all basic needs in sustainable development, and to create and extend opportunities in such a way that we can realize the aspirations of people to achieve a better life (World Commission on Environment and Development (WCED, 1987). Sustainability and sustainable development include three environmental, economic and social dimensions. Sustainable development has become one of the most important political goals in recent years, and many empirical studies have been conducted to determine the relationship between economic growth and environmental quality. The empirical model used in these studies is known as Environmental Kuznets Curve (EKC)(3). Also, the two concepts of human development and sustainability have been widely used in development literature in the 2010s and 2020s. Attention to the human role in economic development historically goes back to the views of Adam Smith and the thoughts of classical economists. In various studies in recent years, humans have been considered as an important factor in the development of societies. Therefore, this current research investigates the role of human development index on sustainability.

[1] The Human Development Index is a statistic composite index of life expectancy, education, and per capita income indicators, which is used to rank countries into four tiers of human development.
[2] The Brundtland Commission, formerly the World Commission on Environment and Development, was a sub-organization of the United Nations that aimed to unite countries in pursuit of sustainable development.
[6] Keeble, Brian R

Human is considered as the most precious and greatest wealth of any society. Education of educated manpower as human capital is a must for sustainable and balanced development in any society. Any kind of development first requires the presence of developed and civilized humans, and human development is considered as the foundation of any other form of development. In general, human capital is the only factor that is able to change or adjust other factors of production simultaneously with its change. Therefore, human development can provide a basis for innovation and lead to economic development and growth on a large scale. The human development refers to the process of development of people's choices, the most important of which are the development of a healthy and long life, education and enjoyment of living standards. Literature and discussion on human development on one hand and sustainability on the other hand show many common aspects. Many proponents of sustainability seek to achieve human development. The goal of human development is that every person in the society can fulfill his wishes and desires, own capital and be the person he wants, which this goal is actually at the heart of economic development. (Amartya Sen, Martha Nussbaum 2006)(4). According to the human development literature, people should clearly have freedom and the right to choose to meet their needs; this definition is comparable to a common definition of sustainable development in which it is stated that sustainable development is the non-decreasing capacity to provide non-decreasing per capita utility from each unit of capital for eternity and shows the common features in the literature of these two indicators (Eric Neumayer, 2001)(5).

In fact, the insistence of different definitions of sustainable development and human development on capabilities, capacity and ability, suggests the view that people, in addition to income, gain utility from other factors such as health, education, agency and freedom, which all these things have contributed to human development and are considered indicators of human development (Richard Layard, 2005)(6).

The Human Development Index (HDI) is a statistic composite index of life expectancy, education and per capita income indicators, which HDI score is always between zero and one. The impact of large oil revenues in oil-owning and oil-exporting countries on human development in these countries has played a prominent role and categorized the countries into three groups: oil countries with high human development (human development index above 0.8), oil countries with medium human development (human development index in the range of 0.5 to 0.8) and oil countries with low human development (human development index below 0.5) (United Nations Development Programme, 2000, p. 249)(7).

Although it is expected that countries with higher oil revenues have a higher human development index, according to the results of inter-country comparison, many of them with higher incomes from oil exports are at lower levels of the

human development index (Behboudi, Beheshti, Mousavi, 2010)(8). In fact, according to the results of the comparison of the per capita income ranking of the oil countries and the ranking of the human development index, it is possible to determine to what extent the oil wealth and revenues from oil exports of these countries have been spent on improving the quality of life of people in these countries. Energy is mentioned as one of the important production factors along with other factors in recent decades. Therefore, energy along with other production factors such as capital, labor and raw materials, plays a decisive role in the growth, development and economic sustainability of countries. Therefore, one of the important solutions in achieving the development goals of countries is the use of energy resources optimally and efficiently to improve human development indicators. Abundant sources of energy and oil as one of the most important types of energy in oil exporting countries has led to more focus on the use of natural resources and more pressure to achieve economic growth. Therefore, the main topic of this study is to investigate the role of human development index affected by energy in oil exporting countries as an important source of energy, on environmental sustainability. The current study was conducted with the aim of investigating the impact of the human development index on the environmental dimensions of sustainability in the major oil exporting countries of the world and testing the hypothesis that "The human development index (HDI) has a positive and significant effect on environmental sustainability".

In this regard, the Panel Data Regression method is used to estimate the model in this study for the time period of 2010-2020 (according to the maximum available data). The countries investigated in this research are 35 countries, which are selected from Brics Countries, selected Mena Countries (Middle East and north Africa), Opec (The Organization of the Petroleum Exporting Countries), OECD (Organization for Economic Co-operation and Development), Non Opec Countries, and Oil exporting countries from the group of 7 (G7).

This study is compiled in five parts: the introduction is presented in the first part, and the second part is dedicated to the subject literature. The third part deals with the research methodology, and the fourth part deals with model estimation and estimation of findings. Conclusions and policy suggestions are presented in the fifth section.

2. Literature review

1.2. Theoretical Foundations

The root of the sustainability movement can be found in the thoughts of radical economists that began in the late 1960s. A definition of sustainability that is agreed upon by many people includes three economic, social and environmental dimensions. Sustainability should provide social growth in which the needs of different human generations are met, consumption of natural resources and

effective protection of the environment should be done carefully and bring sustainable economic growth and economic prosperity as well. In these goals, the prominent role of human and human capital can be seen. Man is the goal and axis of development. Human capital is the most sustainable and renewable form of capital. Human capital is a collection of knowledge, innovation and creativity that people choose to invest in their work. The human development index includes various aspects of education, health and economy. Human resources exploit natural resources, build social, economic and political organizations and promote national development. The two concepts of human development and sustainable development have been widely used in sustainability literature in recent years. The Human Development Index (HDI) is a composite measure of health, education and income, the first result of which was published by the United Nations Development Program (UNDP), in the first Human Development Report in 1990. A team of experts from the United Nations Development Program has been publishing this index annually since 1990. In this annual report, by calculating the human development index, the concept of development is emphasized beyond the mere emphasis on the economic growth category, and other aspects of the quality of human life are considered as development criteria. Furthermore, in each of the annual reports, by raising the main issue and the challenge facing humanity, issues related to the state of human welfare and development have been raised in a specific field and this field has been discussed (World Development Report, 2003)(9).

The United Nation Development Program defines human development as the development of the selection process of people. This index enables citizens and governments to evaluate progress over time and determine priorities for political intervention. The concept of human development means that the main purpose of development is to benefit people or to improve the quality of life of people. The basis of this index is that in addition to having a higher income, developing human talents and capacities are necessary to achieve a better life. The human development index aims to measure the average achievement of a country in three dimensions of human development, including: a long and healthy life, being knowledgeable and have a decent standard of living. Each of these dimensions can explain the level of welfare of a society in social and economic life. The life expectancy indicates the level of people's enjoyment of social opportunities and their level of satisfaction with the life situation in various economic, social and political dimensions, and the high level of this index increases the ability of people to raise the level of their quality of life in the economic and social dimension (Momeni and Milani Amini, 2011)(10).

The performance of each dimension of human development is expressed by an index as a value between zero and one. In an ideal country, the aggregate index would be 1, and this would be made up of three dimensions, each of which would

equal 0.333. In a country where there is severe human and social poverty, this figure reaches a very low percentage, but it does not become zero, because anyway, people live for a certain period of time and have a minimum income. The United Nations uses this index in order to rank 130 countries of the world in a program called “National Development Programme (NDP)” in terms of human resources development. This organization in this model, which has the ability to expand and replace; has used three indicators: "life expectancy", "education" and "per capita income". The value of this index is variable between zero and one, the higher this index is for a country, the higher the country is in terms of human development. Therefore, the countries of the world are divided into four categories according to this index: countries with very high human development, countries with high human development, countries with medium human development and countries with low human development. In fact, sustainability refers to an effort to achieve the best results in human and natural environment programs that are carried out for the present and indefinitely for the future (Shia, 2008, 199). The goal of sustainable development is to guide human society towards a good, ecological and sustainable world through economic development, social progress and environmental responsibility. Sustainable development is realized if there is an overlap between ecological, economic and social systems, and this means that each of the ecological, economic and social systems and subsystems should achieve a desirable level of sustainability to be able to talk about sustainability; which, the role of man is very prominent and key. Man is considered as the most valuable and the greatest wealth of the society. The balanced and sustainable development of any society requires the training of educated human resources as human capital. The participation of the people who own the development is necessary to achieve success in sustainable development. Therefore, sustainable development and environmental sustainability or any other type of sustainability requires the presence of human development index and developed humans. In 1992, the United Nations Conference on Environment and Development in Rio Declaration mentioned sustainable development as one of the global goals. In a short time, various definitions of sustainable development were proposed and its theoretical foundations were completed (United Nations, 1996)(11).

Currently, sustainable development emphasizes the necessity of social and ecological balance. On the other hand, it is necessary to manage resources and ecosystems and take care of them as the basic condition of humans (University of Dortmund, 2001). Environmental sustainability refers to material and non-material measures that provide key information on environmental effects, compliance with regulations, stakeholder relations and organizational systems, and indicate definitions of the effectiveness and efficiency of measures taken in the environment (Henry and Journeault, 2008, 166)(12).

Undoubtedly, human activities during the past decades are associated with many negative environmental effects and the lack of awareness of the society about the activities around them has caused the intensification of these negative effects (Salehi and Moradi, 2019: 37)(13). In recent years, much attention has been paid to the role of natural resources and the environment, as the main aspects of human health and quality of life, and looking at the environment from a limitation for economic growth to its active role in reducing poverty, achieving higher standards and raising the human development level (Behboudi et al., 2009). One of the most fundamental issues in today's world is environmental problems, which are the result of their conflict and confrontation with the natural environment; the result of this process will be the imbalance and incompatibility between man and nature and the destruction of ecosystem relationships. With the expansion of cities, the manifestations and values of the natural environment have been exposed to further destruction and erosion, and the city dwellers have been deprived of natural attractions. The issue of environmental sustainability has been of particular interest to many people, especially researchers and governments, during the last three decades of the 20th century. Since any activity to improve the quality of life and human development is realized in the environment, therefore the state of the environment and its resources in terms of sustainability or unsustainability will have a significant effect on the development process. Based on this, any discussion about development without considering the concept of environmental sustainability is considered incomplete. With these words, if sustainable development is considered as our ultimate goal, environmental sustainability is a necessary condition for realizing sustainable development (Brimani, 2010:127). Environmental sustainability is the desired evolution and transformation that does not disrupt the sustainability and sustainability of the society, but rather helps in its sustainable growth and elevation. Sustainability is rooted in ecological sustainability. This theory emphasizes on the fact that nature provides certain limits and opportunities to human life (Mujtahedzadeh, 2018, 40)(14). Consequently, sustainability embraces development that makes the best use of resources without harming them in any way. This study has used a measure called environmental performance index to evaluate the environmental sustainability index. Environmental Performance Index (EPI)[1] is a measure to check how a country's environmental policies work and determine its numerical value. This index was proposed in line with the third millennium development goals of the United Nations in 2002. The Environmental Performance Index is superior to the Environmental Sustainability Index (ESI), which was published and used between 1995 and 2005. Both indicators are measured and proposed by Yale

[1] The Environmental Performance Index (EPI) is a method of quantifying and numerically marking the environmental performance of a state's policies.

University (The Yale Center for Environmental Law & Policy[1]) and Columbia University (The Center for International Earth Science Information Network (CIESIN)[2] in collaboration with the World Economic Forum and the Joint Research Center of the European Commission. The Environmental Sustainability Index (ESI) was first proposed in 2000, but was revised due to its weaknesses in 2002. The said index was calculated and published with slight changes in 2005 for 146 countries. The Environmental Sustainability Index (ESI) assesses the ability and capabilities of nations to protect the environment over the next several decades. This index is extracted from 76 statistical data groups that are integrated in the form of 21 environmental sustainability indicators. The results of this report show that by increasing a country's environmental sustainability index (ESI), there will be better environmental conditions in the future. In fact, the environmental sustainability index is a general score that wants to show the rank and state of a country's environment compared to other countries in order to create a constructive competition (Pourasghar Sangachin, Salehi and Masnavi, 2014)(15). But since this index was used more to examine environmental sustainability in developed countries, the need for a more comprehensive index was raised that can be easily used by policy makers, environmental scientists, supporters and the general public. In 2006, Yale University and the World Economic Forum proposed the environmental performance index as a supplement to the environmental sustainability index, which emphasizes the dimensions of environmental sustainability and measures and evaluates the performance of countries' policies and programs in the field of reducing environmental problems, protecting the environment and managing natural resources. The Environmental Performance Index (EPI) report of 2008 has proposed two major goals, including 1- reducing environmental stress and pressures that threaten human health (environmental health goal) and 2- protecting ecosystems and natural resources (sustainability goal environment) consisting of 25 sub-indices, which is a composite environmental performance index (EPI) for different countries, using appropriate statistical methods. In order to make this index, first, the performance of countries in the field of 25 indicators is determined from reliable sources and expert estimates and they are categorized using cluster analysis, and the final value of each of the sub-indicators is estimated and finally It can be done by using the appropriate technique of Environmental Performance Composite Index (EPI) for different countries of the world (Pourasghar Sangachin, Salehi and Masnavi, 2010)(16). The value of this index fluctuates between zero and 100, like the Environmental Sustainability

[1] The Yale Center for Environmental Law & Policy is a joint initiative between the Yale School of Forestry & Environmental Studies and the Yale Law School.

[2] The Center for International Earth Science Information Network (CIESIN) was established in 1989 as an independent non-governmental organization to provide information that would help scientists, decision-makers, and the public better understand the changing relationship between human beings and the environment.

Index (ESI). Higher numbers of this index for a country indicate a better environmental performance of that country, and the lower this number, it indicates a more unfavorable performance in the field of environment.

2.2. Experimental studies

1.2.2. Foreign empirical studies

Few foreign studies have been conducted in line with the research topic of this study in recent years:

Neumayer (2012) (17)conducted a research titled human development and sustainability index. In this study, Neumayer states that there are many commonalities in the literature of human development and sustainability, and the human development index is related to sustainability criteria (weak and strong). Weak sustainability is based on the assumption that different forms of capital are substitutable, while strong sustainability rejects the concept of substitutability for some important forms of natural capital. This research, which is more focused on the close relationship between the concept of sustainability and the sustainable human development index, states that empirical results during the period of 1980-2006 show that many countries are facing low human development and the problem of weak unsustainability that is measured by negative real savings. On the other hand, countries with high to very high HDI performance generally appear to be highly environmentally unstable, mainly due to high carbon dioxide emissions. On the one hand, breaking the relationship between high human development and severe damage to natural resources, and on the other hand, the need for very significant and rapid decarburization of countries with high human development are two of the biggest challenges facing humanity in this century.

Valeria Costantini, Chiara Martini (2010)(18) during a study entitled "Adjusted Kuznets curve for evaluating sustainability using composite data" have proposed that until now, articles have investigated the relationship between economic growth and environmental pollution using the Kuznets curve. They have also suggested that these studies have shortcomings and are not complete. They used the adjusted Kuznets curve to examine all dimensions of sustainability in order to complete the investigation of this issue. They have investigated the higher levels of well-being and consumption of natural resources and confirmed the sustainability of human development by using the World Bank's gross net savings measure and the Human Development Index as the United Nations' the Measure of Happiness. In this review, the time period of 1990-2000 is considered for a large number of developed and developing countries. According to the results of their review, human development should be the first goal for global sustainable development policies and an increase in the level of human development to increase sustainability.

Norma Maccari has conducted a study entitled "Environmental Sustainability and Human Development: With a Green Human Development Index Approach", in 2010(18). This study achieved three main results: 1) providing a global picture of the relationship between human development and Environment, with a U-shaped relationship between human development and environmental sustainability. 2) A new measurement criterion for the environmental human development index that introduces the concept of balancing human development in the framework of the environment. Also, it examines the different contexts of the scenario between human development and environmental sustainability. 3) It raises a debate for EHDI (Environmental Human Development Index) in line with the agreement of the Kyoto Protocol[1].

2.2.2. Domestic empirical studies

The analysis of sustainable development indicators in the world's major oil exporting countries is an article published by Nazmfar, Hamidi, Hosseini and Janbzi (2017)(19) This research has been conducted with the aim of analyzing sustainable development indicators in 30 major oil exporting countries of the world using 23 environmental, economic and social indicators. The type of applied research and its method is descriptive-comparative. Promethee method (multiple decision-making methods) has been used to analyze the information. According to the results of the research conducted in 2006, the countries of Norway, Canada and the United States of America, respectively, with the highest Q coefficients, are in a favorable situation in terms of development indicators; And in 2012, the countries of Australia, Norway and Canada respectively have the highest number of parameters. The country of Iraq is the most undesirable country, which is in the last rank of these countries in these two years. Among these countries, Iran was ranked 27th in 2006 and 22nd in 2012 among 30 oil exporting countries.

Jafari Samimi and Raeisi (2018)(20) in a study entitled "Nonlinear impact of human development index on economic stability in developed countries" have used the human development index and the new composite and macroeconomic stability index provided by the Fondazione Eni Enrico Mattei (FEEM) Foundation according to the maximum available information for the time period 2007-2014. According to the results obtained from the model estimation using the combined data method for developed countries, there is a non-linear and threshold relationship. That means, before the turning point, the relationship becomes negative and after that, the relationship becomes positive. Also, with an increase in the human development index, economic stability increases in these countries.

[1]The Kyoto Protocol was an international treaty which extended the 1992 United Nations Framework Convention on Climate Change that commits state parties to reduce greenhouse gas emissions, based on the scientific consensus that global warming is occurring and that human-made CO_2 emissions are driving it.

Jafari Samimi and Gholami (2015)(21), during the research entitled "Effect of globalization of economy on environmental sustainability, comparison of developing and developed countries using mixed data method to compare the effect of globalization on environmental sustainability developed and developing countries in the time period of 2005-2011, and uses the new (KOF Globalization Index) KOF index for globalization and the new FEEM environmental sustainability index as an environmental index. According to the results of this research, globalization Economy has a negative and significant effect on the environmental sustainability of developing and developed countries.

Behboudi, Beheshti and Mousavi (2009)(8) in their study entitled "Human Development and Sustainable Development in Selected Oil Exporting Countries", have addressed the purpose of estimating the modified Kuznets curve model. In this model, development and sustainability criteria are used instead of the concepts of economic growth and environment; in such a way that the criterion of instability is the negative value of the adjusted net savings index and the criterion of development is the human development index. The investigated period is 1990-2006 and for 20 oil exporting countries. They used the combined data method of the estimation results and confirmed the existence of an inverted U-shaped relationship between human development and resource instability in these countries.

3. Research Methodology

In this study, testing the regression model has been investigated after collecting data through the review of documents (library) from internet sources and reliable sites and the review and publication of the results related to the measurement and status of the human capital index in the territory of the countries in question. Eviews12 software has been used by the panel data panel regression during the period of 2010-2019 for 35 major oil exporting countries in the world to check the stationarity, collinearity and other tests, estimation of the explicit model and inference in this study. The present study has used the Kuznets model to estimate the effect of the human development index on environmental sustainability based on the model. The Kuznets curve has sought to investigate the relationship between economic growth and environmental sustainability, and in this study, the human development index is also included in the model by adjusting the classical Kuznets function. The proposed model for the classical Kuznets function is generally as follows:

$$E_i = \beta_0 + \beta_1 X_i + \beta_2 X_i^2 + \beta_3 X_i^3 + \beta_4 CONT_i + e_i \quad (1)$$

Where, Ei indicates environmental pollution, Xi is the independent variable and CONTi is the control variable, which is a variable or different variables in each model that are entered in the model with the aim of neutralizing the effect of other variables on the relationship between dependent and independent variables,

namely Xi and Ei. The concept of the environmental Kuznets curve was first mentioned in the 1990s at the same time as the study of the potential environmental effects of the conclusion of the North American Free Trade Agreement (NAFTA) by Grossman & Krueger (1991) (22), as well as the study by Shafik & Bandyopadhyay published in the World Development Report (1992)(1): If technology, tastes and investment in the environment are considered constant, the increase in economic activities will undoubtedly lead to the destruction and damage of the environment. Also, the demand for increasing the quality level of the environment and investment in the environment increases with the increase of economic activities and subsequently with the increase of per capita income. Therefore, it cannot be said; that economic growth and development will definitely lead to the destruction of the environment (International Review of Bipolar Disorders (IRDB) 1992 pp. 38-39). Bekerman (1992), presenting the argument that: there is clear evidence that economic growth leads to the destruction of the environment in its initial stages, but in the end, getting rich is the best and perhaps the only way to maintain and improve the quality of the environment in the countries of the world, which caused the fame and expansion of the environmental hypothesis of Kuznets (Bekerman, 1992, 482). According to the supporters of Kuznets environmental hypothesis; the economic structure is moving towards information industries and services at high levels of development. Furthermore, the awareness about the environment has increased in the higher stages of development, more effective environmental laws have been established and implemented, and the expenses spent to preserve and improve the environment have increased. The proposed model of this study is defined as the following relationship, using the Kuznets environmental curve literature, and of course with a more specialized perspective on the issue of environmental sustainability:

$$EPI_{it} = \alpha_0 + \alpha_1 HDI_{it} + \alpha_2 GDP + \alpha_3 (GDP_{it})^2 + \alpha_4 RL_{it} + \varepsilon_{it} \qquad (2)$$

The above equation estimates the relationship between human development index and environmental sustainability, as well as the relationship between economic growth and environmental sustainability. Dependent variables in this equation are: HDI_{it}human development index, GDP index of gross domestic product per capita at the price of 2017, $(GDP_{it})^2$ square of the index of gross domestic product per capita (GDP per capita)[1], RL_{it}index of rule of law and also EPI is the dependent variable of this regression model, which is considered as an environmental sustainability index.

In the above model: $\alpha_0$is the intercept, $\alpha_1$is the coefficient of human development index, $\alpha_2$is the coefficient of GDP index, $\alpha_3$is the coefficient of GDP index to the power two, $\alpha_4$is the coefficient of the rule of law and $\varepsilon_{it}$are

[1] GDP per capita is the sum of gross value added by all resident producers in the economy plus any product taxes (less subsidies) not included in the valuation of output, divided by mid-year population.

among the disturbances of this regression relationship. Data related to these variables were obtained from WDI (2021) and UNDP (2021) databases. HDI is the human development index that the United Nations Development Program measures and presents annually. The United Nations has conducted this index for 130 countries with the aim of ranking countries in terms of human development. This index varies between zero and one, the larger this index is for a country; it means that country has a higher level of human development. GDP is the Gross Domestic Product index and the most important variable used in macroeconomic analyzes and evaluations. The data related to GDP in this research study is taken from UNDP (2021) in the form of per capita based on purchasing power and in 2017 dollars. Rule of Law (RL) is considered as a rule of law index as a general rule in public law by which government decisions are made based on recognized legal principles or natural rights. The rule of law index is a subset of government indices that includes the quality of law enforcement, justice and governance; whose data is extracted from WDI (2021).

4. Model estimation and analysis of findings

Before the model is estimated, first, the stationarity of the variables is determined by using The Levin–Lin–Chu's stationarity test, which has more testing power than using the unit root test for sections separately. The results of this test show that the probability value of the variables of GDP and its square are 0.1385 and 1.0000 respectively. Therefore, these two variables are not stationary at the level because their probability value is higher than 0.05, which after taking the difference once and performing the stationarity test again, it was determined that these variables are stationary in the first difference with a 100% probability. In the following, the Kao cointegration test has been performed to ensure the absence of false regression, the result of which showed with a probability of 0.0000 and a statistical value of -7.917002 that the null hypothesis that there is no cointegration between the variables has been rejected, and there is a long-term relationship between the dependent variable and explanatory variables of the model. The model can be estimated using the panel data method and making sure that the regression is not spurious. Then, the collinearity test has been done, and after performing the collinearity test between two variables and multiple collinearity, the results indicate the absence of linearity between the independent variables of the model. In the following, the Chow test has been used to choose between the panel and pooled methods. The result of the test shows that since the probability value of the F statistic is less than 0.05; Therefore, the null hypothesis based on the existence of cumulative regression (regression without fixed or random effects) has been rejected, and the appropriate model for estimating the studied model is a panel form that has fixed effects or random effects. Then, by applying the Hausman test on the use of fixed effects or random effects, it was

determined that the probability value of the $\chi 2$ statistic is greater than 0.1, so the random effects method is the optimal method for estimating the model of this study. The time dimension is considered in the random effects method, unlike the fixed effects method, and the individual effects of sections are entered into the model separately during the time period under investigation. Also, in situations where samples from the entire statistical population are randomly selected, random effects will be more effective.

Table 1: HAUSMAN test

The statistic type	The value of the Chi-square statistic	Probability value
Cross-section Random	5.580766	0.2327

Source: research findings

First, variance heterogeneity has been examined and tested before estimating the model. Variance heterogeneity can be checked in panel data such as time series data. If the number of studied periods is more than the number of years studied, it can be expected that the disorder sentences have variance heterogeneity. White's test was used to check the existence of heterogeneity of variances, which is based on the result obtained because the probability of the F statistic is not less than 0.05 (1.207588), so the null hypothesis based on the homogeneity of variances is not rejected; So there is no problem of heterogeneity of variance. In the following, the estimation of the model has been discussed, and the results of the estimation of the model using the random effects method are listed in table two:

Table 2: Model estimation for 35 countries in the period of 2010-2019

Probability value	The value of the statistic	Coefficients	The explanatory variables
0.0091	2.625134	25.32037	Intercept (C)
0.0008	3.402057	42.69877	Human Development Index (HDI)
0.0486	2.165014	0.000149	Gross domestic product index (GDP)
0.0430	-2.790002	-3.60E-08	Gross domestic product index to the power of two D(GDP)2
0.0233	2.279438	3.553145	rule of law (RL)
0.431682			R^2
14.24676			F statistic
0.000000			F statistic prob
Random effects			Estimation method
0.840819			Watson camera statistics
35			Sample size
350			Number of observations

Source: research findings

As seen in table 3, there is a positive and significant relationship between human development indicators and environmental sustainability. Therefore, in countries that have huge oil resources; an increase the level of the human development index leads to the improvement of the level of environmental sustainability. The obtained result is consistent with the results of studies that have previously investigated the relationship between human development index and

environmental sustainability. Also, the obtained results show that the GDP per capita index has a positive and significant effect on environmental sustainability, and its square has a negative and significant effect on environmental sustainability, which indicates the existence of a non-linear and threshold relationship of the GDP index. It has gross domestic production (economic growth) and environmental sustainability. According to the knowledge of mathematics, it is possible to find the turning point and reach a level of gross production per capita, where the upward trend of the curve turns into a downward trend. This level, which is called as the turning point, is obtained by setting the first order derivative of the tested model to zero based on the GDP per capita index.

$$\frac{\partial EPI}{\partial DGDP} = 0.000149 - 7.2E\text{-}08GDP \quad (4)$$

Set the above equation to zero to reach the turning point:

$$0.000149 - 7.2E\text{-}08GDP = 0$$

$$GDP = 2069.4444$$

The turning point is equal to 2069.4444 and then the second order derivative of the model is calculated:

$$\frac{\partial^2 EPI}{\partial^2 DGDP} = -7.2E\text{-}08 \quad (5)$$

Considering that the amount of the second derivative is a negative number, so the curve has a maximum at this point. The obtained results show that at levels lower than 2069.4444, an increase in GDP per capita index or economic growth causes an increase in environmental sustainability, and an increase in GDP per capita index causes a decrease in environmental sustainability at levels lower than this amount. It can be concluded that environmental sustainability requires the existence of gross domestic product (economic growth) with a maximum value of 2069.4444. The results listed in the table above show that there is a significant and positive relationship between the rule of law index as a representative of government indicators and environmental sustainability.

5. Conclusions and recommendations

According to the agenda of the Rio Conference, known as Agenda 21 in 1992, governments were required to consider development and environmental goals in an integrated manner in their policies. In addition to this, the United Nations has listed the correlation of human development with the environment and, more broadly, sustainable development as one of the development goals of the third millennium. Since the 21st century, sustainability has become the basis of countries' environmental policies, which include programs to prevent air pollution, water pollution, reduce the use of toxic substances, slowing down the exploitation and consumption of non-renewable resources. Rational use of natural resources is one of the key principles of sustainable development, which

means exploiting non-renewable resources to the extent of renewables and observing efficiency in the consumption of non-renewable resources. The efficiency of resource consumption means increasing the amount of product production per unit of resource consumption, or reducing its consumption in exchange for obtaining a certain level of product, leaving more resources for future generations, and producing less pollution and waste. The role of energy among all factors affecting sustainability is very decisive, either directly or by affecting the human development index.

In oil-exporting countries, the limitation of fossil resources and the increasing growth of per capita energy consumption will lead to the depletion of oil resources in a not-so-distant time and the cessation of income from oil exports; which will seriously affect the development of countries. Therefore, it is of particular importance to investigate the impact of the important and influential factor of human development on sustainability, which can reduce oil consumption and environmental pollution and increase people's contributions in improving energy consumption and saving oil revenues for future generations. Economic, social and environmental policies of countries. Some of the most important challenges in the field of sustainability include population growth, poverty, increased consumption of natural resources, pollution, political instability, countries' debt, and becoming a slogan of sustainable development. This study examines the impact of the human development index on the environmental dimension of sustainability in the exporting countries, with the main goal of world oil for the time period of 2010-2020 (according to the maximum available data); In this regard, the panel data regression method has been used to estimate the model in this study. The results obtained from the estimation of the model of this research show that, with the increase in the level of human development in the major oil exporting countries of the world, the environmental sustainability of these countries has also increased; Therefore, the higher a country's ranking in the human development index, the more successful it will be in terms of environmental sustainability. Therefore, it can be acknowledged that higher levels of sustainability can be achieved in these countries by investing and focusing more on the human development index in oil-exporting countries, with the aim of increasing the level of sustainability in the environmental dimension; furthermore, by considering this relationship, oil importing countries can prevent the reduction of environmental sustainability and environmental pollution caused by oil consumption in their countries, and use this model to improve the quality of the environment and increase the level of environmental development with the aim of developing human abilities.

References

1. Shafik N, Bandyopadhyay S. Economic growth and environmental quality: time-series and cross-country evidence: World Bank Publications; 1992.
2. Keeble BR. The Brundtland report:'Our common future'. Medicine and war. 1988;4(1):17-25.
3. COLE M, RAYNER, A., & BATES, J. (1997). The environmental Kuznets curve: An empirical analysis. Environment and Development Economics, 2(4), 401-416. doi:10.1017/S1355770X97000211.
4. Nussbaum ACSoASaM. The concept of human development: a comparative study of Amartya Sen and Martha Nussbaum.
5.Neumayer E. The human development index and sustainability—a constructive proposal. Ecological Economics. 2001;39(1):101-14.
6. Layard R, Happiness: Lessons from a New Science, London: Allen.
7. United Nations Development Programme, (2000).
8. D Behboudi MB, S Mousavi Human Development and Sustainable Development in Selected Oil Exporting Countries.
9. Bank W. World Development Report 2003, Sustainable Development in a Dynamic World: Transforming Institutions, Growth, and Quality of Life. 2003.
10. momeni F AM. Capability and Sustainable Development in the Third and Forth Development Plans of Iran Considering "Amartia Sen"'s Approach. refahj. 2011; 11 (42) :37-66
11. nations U. The Rio Declaration on Environment and Development (1992).
12. Henri J-F, Journeault M. Environmental performance indicators: An empirical study of Canadian manufacturing firms. Journal of environmental management. 2008;87(1):165-76.
13. Javad Salehi HM. Fuzzy logic and its application in environmental impact assessment 2019.
14. Mojtahedzadeh G. Urban planning in Iran (geography major): Payam Noor University 2018.
15. farzam pourasghar Sangachin es, morteza dinarvand Comparing Sustainable Development Evaluation Methods Using Composite Indicators (Case Study of Iran's Provinces).
16. SF POURASGHAR ES, MR Masnavi. An Analytical-Comparative Study on Measurement Methods of Sustainable Development. 2010.
17. Neumayer E. Human development and sustainability. Journal of Human Development and Capabilities. 2012;13(4):561-79.
18. Costantini V, Martini C. The causality between energy consumption and economic growth: A multi-sectoral analysis using non-stationary cointegrated panel data. Energy Economics. 2010;32(3):591-603.

19. Hosein Nazmfar SM, Seyyed mostafa Hoseini , Farzaneh sadat Hosieni. Analysis of sustainable development indices in the major oil exporting Countries of the World. 2019.
20. Ahmad Jafari Samimi zr. The Nonlinear Impact of Human Development Index on Economic Sustainability in developed countries. 2018.
21. Ahmad Jafari Samimi ZG. Economic Globalization and Environmental Sustainability: A Comparison between Developing and Developed Countries. 2015;Volume:19(Issue: 75, 2015).
22. Grossman GM, Krueger AB. Environmental impacts of a North American free trade agreement. National Bureau of economic research Cambridge, Mass., USA; 1991.

تأثیر توسعه انسانی بر پایداری زیست محیطی در کشورهای منتخب صادر کننده نفت[1]

چکیده

پایداری به معنای تداوم در امور، مانند فعالیت و موازنه پویا، میان عوامل مؤثر فراوان مانند عوامل طبیعی، اجتماعی و اقتصادی مورد نیاز بشر تفسیر شده است. در پایداری و توسعه پایدار یک جامعه باید مطمئن شویم نیازهای نسل امروز، بدون این که به برآورده شدن نیازهای نسل های آینده آسیبی بزند؛ برآورده شود. پایداری دارای سه بعد زیست محیطی، اقتصادی و اجتماعی است؛ که بعد زیست محیطی آن وزن تعیین کننده ای در پایداری دارد. در دهه های ۲۰۰۰ و ۲۰۱۰ تحقیقات تجربی بسیاری پیرامون موضوع پایداری به انجام رسیده است که الگوی تجربی مورد استفاده در این مطالعه ها بر پایه منحنی کوزنتس بوده است. همچنین در سال های گذشته دو مفهوم توسعه انسانی و پایداری به شکل گسترده ای در ادبیات توسعه به کار بسته شده اند و در مطالعات گوناکونی انسان به عنوان عاملی مهم در توسعه جوامع مختلف در نظر گرفته شده است. شاخص مرکب توسعه انسانی ابعاد گوناگونی دارد که می تواند روی پایداری و به ویژه پایداری زیست محیطی اثرگذار باشد. همچنین تأثیرگذاری درآمدهای کلان نفتی در کشورهای صاحب و صادر کننده نفت بر توسعه انسانی در این کشورها نقش پررنگی را بازی نموده و کشورها را به سه گروه کشورهای نفتی با توسعه انسانی بالا، کشورهای نفتی با توسعه انسانی متوسط و کشورهای نفتی با توسعه انسانی پایین دسته بندی کرده است. در این مطالعه برای بررسی تأثیر شاخص توسعه انسانی در ۳۵ کشور صادرکننده عمده نفت جهان از روش داده های تابلویی و تابع کوزنتس در دوره زمانی ۲۰۱۹-۲۰۱۰ استفاده شده است. نتیجه برآورد الگو به روش اقتصاد سنجی نشان داده که با افزایش در شاخص توسعه انسانی، پایداری زیست محیطی در این کشورها افزایش می یابد.

واژه های کلیدی: پایداری، پایداری زیست محیطی، توسعه انسانی، توسعه پایدار، داده های تابلویی، منحنی زیست محیطی کوزنتس، کشورهای صادر کننده نفت

طبقه بندی JEL: Q01, 015, C23, O50.

[1]. این مقاله برگرفته از رساله دکتری می باشد