
The Relationship Between Quality of Life and Sustainable Human Development

[Algeria 2016-2023]

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Received: 01/03/2025

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Published: 04/06/2025

Accepted: 08/04/2025

Abstract:

This study tries to prove whether there is a relationship between quality of life and sustainable human development in Algeria for the period 2016-2023 or not. It found that there is a relationship between them theoretically, which was not validated by the analytical aspect, and was validated by the linear trends of both variables, but proved that the linearity of sustainable human development is higher than the linearity of quality of life, which is the desired result in the reality of their relationship, as quality of life is intended to raise the efficiency and development of the human element, although the results of the linearity of both variables are statistically unacceptable, and finally result of the spread of data and correlation metrics confirmed that there is no relationship between QoL and SHD, whether linear or nonlinear.

Keywords: Quality of Life; Sustainable Human Development; Index; Relationship; Linear; Nonlinear, Correlation.

Jel Classification Codes : D63.

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1. Introduction:

For decades, materialism has dominated the perceptions of thinkers about economic components, factors, and goals, from Adam Smith and his focus on the causes of wealth to Milton Freeman and his focus on money, but this tendency did not last long as thinkers and theorists realised that these materials are only means, not ends, and that the first purpose should be the human being himself. Thinkers and theorists realised that these materials are only means and not ends, the first purpose of which should be the human being himself, and perhaps this view was initially purely materialistic, as the focus on human development is only a path to economic growth, but this view has changed, as what is the use of economic growth if it is not? After the Second World War, new concepts such as human development and subsequent sustainability frameworks emerged, without which sustainable development cannot be achieved, and this human being cannot be developed in unprepared conditions, and from that point of view, the vision of a decent and happy life for all members of society, across races and regions, which has evolved to create another new concept, which is the quality of life.

1.1. The Problem of the study

On what we said above we pose the research problem:

Is there a relationship between quality of life and sustainable human development?

1.2. The sub-questions of the study

In order to address this issue, we decided to answer the following sub-questions:

- If the relationship between quality of life and sustainable human development exists, what is its nature?
- What is its behavior?

1.3. The hypotheses of the study

In light of this, we hypothesize the following two hypotheses:

- There is a linear relationship between quality of life and SHD.
- The higher the value of quality of life, the higher the value of sustainable human development and vice versa.

1.4. Importance and objectives of the study

The importance of the topic is evident in the fact that quality of life is no longer viewed from a purely psychological perspective, especially after the initiative launched by the United Nations in this regard, which is itself the official sponsor of the Sustainable Development Goals. Perhaps this late interest in this framework stems from the understanding that the Sustainable Development Goals cannot be reached without individuals as an inevitable necessity, and individuals who do not live a quality life cannot achieve these goals and may even be an obstacle to their realization.

This study aims to address the topic of quality of life by taking it out of the purely psychological perspective in which most studies sail to an economic study perspective that links it to the concept of human development in the context of sustainability, by criticizing some concepts that focus on certain aspects to reach deeper and more comprehensive concepts.

1.5. The Previous studies

With regard to previous studies, the overwhelming majority of them, if not all, studied the two variables separately, except for the excessive focus on the psychological aspect of quality of life, and the latter was linked to sustainable development and its goals in some studies that are counted on the fingers, and perhaps the most important and closest study to our study is:

2018: The Arabic article “Quality of Life from a Human Development Perspective - An Evaluation Study of Human Development Policies and Indicators in Algeria during the period 1990-2015” by Bendjeloul Khaled and Djeddi Abdelhalim from the University of Guelma 8 May 1945, Algeria, who used the numbers of the Human Development Index mainly, and reviewed some aspects affecting the quality of life such as the spread of epidemics, malnutrition, illiteracy, school dropout and others, then addressed the policies implemented in Algeria in response to this.

What distinguishes this study from its predecessor is its attempt to reach more comprehensive concepts in light of previous concepts, and to link the two variables in their theoretical framework by addressing the same elements in both variables to facilitate the extrapolation of theoretical interactions. On the analytical side, we relied on the figures of the Human Development Index modified by adding the environmental dimension to be at the core of sustainability in its full dimensions, and we adopted specific figures for quality of life even though some data were missing, and tried to discover the correlation between them statistically.

1.6. Methodology and Methods

Our study revolves around two quantitative variables, so we had to follow the descriptive approach to familiarize ourselves with the theoretical aspects of both variables, and the analytical approach to study the relationship between the two variables by adopting statistical methods such as graphs and correlation metrics, This is based on the outputs of: Excel and Python.

1.7. Structure of study

The structure of the study is simply splited to three parts: two parts surrounding the conceptual and theoretical framework of both of Quality of Life and Sustainable human development, and the last part try to uncover the theoretical and practical framework of the relationship between them.

2. The conceptual and theoretical framework of Quality of life

2.1. The concept of Quality of life

The World Health Organisation [WHO] defines it as: « an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. » (WHOQOL, 2012) This definition makes quality of life a mental and subjective process at the same time that is influenced by the surrounding environment, and perhaps this is what made the World Health Organisation establish a questionnaire about it - which can be downloaded from its official website - which includes mostly psychological questions and its answers are purely subjective, which is not strange for it due to its specialisation, which is the reason that prevents us from saying that this definition is incomplete, and therefore we can only say that it is concerned with the psychological aspect perceived by the individual himself about himself: Health and Satisfaction, and assesses the subjective judgement of the quality of life or lack thereof. On this concept, most definitions are formulated in their psychological framework, although they are correct in that they do not take into account the material aspect because happiness and satisfaction are not always associated with it, and it is known from this why the concept of quality of life is associated with subjectivity above all as its main determinant.

However, this does not prevent the material aspect, such as good living conditions and decent surroundings, from being a factor in the quality of life, if not mostly because it affects the self in one way or another, which makes satisfaction vary according to the degree of satisfaction of various material and moral needs. On this basis, we can say that quality of life is the interaction between individuals and their surroundings in the context of the resulting gap between their expectations and their reality.

2.2. The dimensions of Quality of life

There are different opinions about the dimensions of quality of life, some of them make it four, some of them make it five, some of them make it less or more than that, and it mostly reflects their intellectual and theoretical orientations, as we find Rosen's quartet: Perceived Psychological Stress, Emotion, Psychological Unity and Satisfaction, and Widaral's quadrilateral of: The physical, functional, social and psychological dimension, and the Felce-Perry quintet: Physical well-being, material and social well-being: Physical and Social, Emotional Strength, Growth and Activity, and many opinions fall into the dichotomy of two dimensions: This is the classification that Schalock criticizes on the grounds that it lacks the flexibility that makes it include all the variables that can be included in the quality of life, as these variables, according to him, may fall outside that binary, although some fields need them in their studies and research, and Schalock did not stop at the limit of criticism but reinforced his view by finding eight dimensions, which are: Emotional, material and physical quality of life, interpersonal relationships, personal advancement, self-determinants, social inclusion and rights (محمد ,

2015), and it seems that Schalock's view is deficient in some aspects and lacks comprehensiveness, as it is clearly noticeable that he created three dimensions, all of which start with one expression, namely: Quality of life, which could have been a single dimension under which the three are subdivided or elaborated, personal advancement and self-determination are two dimensions related to the self itself, and relationships with individuals, social inclusion and rights only reflect the extent to which this self exists and is affected by and influenced by its surroundings, and its impact on this surroundings and its impact on it.

An interesting division is the Craig-Jackson trilogy: Being, Belonging, and Becoming, each of which has three other dimensions. Being or existence is physical, psychological, and spiritual, and is thus specific to the self and the consideration of its conditions; belonging is spatial, meaning housing and neighborhood, social, meaning relationships with other selves, and community, meaning various opportunities to obtain social services, and thus this dimension with its branches is specific to the surroundings; and becoming: Practical, recreational and uplifting, and includes all the activities that the self performs in its surroundings (حكيم, 2019), and we deduce from this thesis that it was based on three basic elements, namely the self, the surroundings and the interaction between them: The self, the environment, and the interaction between them through activities, and there are other divisions for the follower, but we will be satisfied with this amount.

Those who scrutinize the different opinions included in this research find that they do not deviate from two basic dimensions that fall under one of them, which are closely related to each other until they are inseparable, and these two dimensions are:

- **The moral dimension:** It includes all that is perceptible, intangible, unmeasurable, and not measurable, but is known by identification, such as the relationship of man with himself and others, and his knowledge of himself, his emotions, what he wants, and what he is. Hence, we find that all of Rosen's quartet falls under this dimension, and some elements from other disciplines can be included, such as being from the psychological and spiritual side of Craig-Jackson.
- **The material dimension:** It includes everything that is perceptible and tangible, and is measurable and does not need to be known by identification, such as physical, mental and financial status, and the aforementioned jurisprudence does not deviate in some of its elements from this dimension, such as the dimensions of quality of life: Schalock's physical and material existence, and Craig-Jackson's physical existence.

And you can classify the rest of the elements mentioned previously in various dimensions in the correct position of the two dimensions, and do not forget to refer to the mutual impact between the two dimensions: positive and negative, and that is a fact, the bad psychological state, for example, has an impact on the physical condition to varying degrees, and vice versa is often true, whether this effect is positive or negative.

2.3. The Quality-of-life Index

2.3.1. Definition of the Quality-of-Life Index:

Because the concept of quality of life is still new and judged subjectively by many, its measurement has also differed, and this difference does not go beyond being global, general or specific, and this division is found among psychologists and thus we know its trends (محمد, 2015), and what we are concerned with in our study is the global scale that includes the countries of the world, and gives figures on quality of life that can be used in different contexts, especially in development and sustainable development, and in this regard we find two interesting indices that we will adopt one of them in our study on the basis of familiarity with them:

- **The numbeo indice:** which allows through its interactive website to view, share and compare data related to the quality of life, and provides an important feature which is to include those data according to the region in which individuals live from different countries of the world and calculate the quality-of-life index based on it, although there are reservations about this method in its reliability, as it may include data with preconceptions about its results for its owners.
- **US News indice:** The US News website is particularly interested in monitoring the performance of countries in various fields in which quality of life is one of its main components, and it ranks and ranks these countries annually through this as the best, and some countries may leave the list if they do not achieve certain criteria on which the classification is based, and new countries are included in the list that have achieved the same criteria.

Components of the Quality-of-Life Index: The previous two indices are based on a set of components as discussed below:

- **Components of the numbeo indice:** It includes eight indicators with different weights in its final formula, four of which are better when the value of their indicators is the highest possible value for their positive connotation, namely: Purchasing Power Index, Safety Index, Health Care Index, and Climate Index, and the remaining four are best when they have the lowest possible value for their negative connotation, namely: The pollution index, house price to income ratio, cost of living index, and traffic commute time Index, and the higher value resulting from the final formula expresses a better quality of life (About Quality of Life Indexes, n.d.).
- **Components of the US News indice:** The weight given to the partial quality of life indicator among the other indicators that rank the best countries in the US News indicates its importance and position among them, which is estimated at 14.12% in 2023, and thus a country is in the balance of preference in quality of life if it has a good job market, affordable, economically stable, family friendly, income equality, politically stable, safe, well-developed public education system, well-developed public health system (U.S.News, 2023).

2.3.2. Quality of life index levels:

There is no explicit identification of levels from numbeo except what we can deduce from the distribution map defined on the domain: 72 and 208, with a colour gradient from red for the Lowest Value to green for the Highest Value, which can be more or less than the two values through the values of the countries listed on the same map, but in this case it takes the same two colours for the highest and lowest value (Quality of Life Index by Country 2024, n.d.), while the US News Index does not have specific levels because it is originally part of a whole as mentioned earlier.

2.3.4. Classification of countries according to quality-of-life index:

Referring back to the previous distribution map from numbeo, it can be clearly seen that the colours divide the world into the two sections that already exist: Developed and underdeveloped countries or what is complementarily called developing countries, and from this we know where the two colours are concentrated: This includes, of course, the countries whose numbers were available because the map shows that there are countries whose numbers are not available, including Algeria, and if the distribution of the two colours raises doubts about the bias of this indicator, except for Oman and Saudi Arabia with high values, and the low value of Russia, and here we exclude the U S News Index from talking about the classification of countries because it is its subject in its original research into preference.

3. The conceptual and theoretical framework of Sustainable Human Development

3.1. The concept of Sustainable Human Development

Human development was defined in 1990 in the UN's first report on development under its development programme as: « a process aimed at maximizing the choices available to people, and in principle these choices are infinite and change over time. At all levels of development, these choices are centred on three key things: People should live long and healthy lives, acquire knowledge, and have access to the resources needed for a decent standard of living. Unless these basic choices are guaranteed, many other opportunities will remain out of reach, and not only that, but other choices are highly valued by many people, from political, economic and social freedom to opportunities for creativity, production, personal self-respect and guaranteed human rights. » (UNDP, 1990, P. 10).

It is clear from this definition that human development is a transition from the materialistic view that talks about income and wealth as the basis for economic development without considering its impact on people's lives, to concern for the human being as such, who is the maker, initiator and goal of development, which goes beyond the concept of a decent life and good education to giving an opportunity to activate productive and creative capabilities by participating in political, social and economic life, by encouraging various freedoms and focusing on ensuring that human rights are guaranteed for all without exception in all societies, In doing so, he

overlooks a very important matter, which is the disparity between human beings in their abilities, interests and effectiveness depending on the field.

Not all people have the ability to participate in political, economic or even social life effectively, and it is very rare to find people with that ability, just as it is very rare to find people with that ability, just as it is very rare to find people with interest in various fields. It is very rare to find people who have an interest in various fields, and if so, it is also rare to find that this category of people find their creativity and interesting imprint in all the fields in which they are active, and thus, if participation is to be for everyone in every field without exception, we are not talking about development, but rather the opposite, therefore, it is necessary to study and elaborate on this point and explain how to make it a reality.

The term sustainable human development appeared after the emergence of the concept of sustainable development, which was first raised at the Stockholm Conference in 1982, and officially emerged in the report of the World Commission on Environment and Development in 1987 as the: « development that meets the needs of the present without compromising the ability of future generations to meet their own needs. » (The World Commission on Environment and Development, 1978, P. 37), and therefore sustainable development is human essence like human development, which led to the addition of sustainability to the latter and formed the term: Sustainable human development. The latter also means: « providing mechanisms, means and methods for each individual to have equal opportunities to create a better society that achieves a fair distribution of resources and wealth among different groups of society. » (حميدة, 2016, P. 03) and between different generations.

3.2. The dimensions of Sustainable Human Development

Referring to the United Nations Human Development Reports, we find that they make it three basic dimensions, which are the same basic pillars referred to in the previous definition of human development (UNDP, 2024, P. 30), but in fact they are only two dimensions, the economic dimension concerned with a decent standard of living determined by per capita income, and the social dimension concerned with education and health: The economic dimension concerned with a decent standard of living defined by per capita income, and the social dimension concerned with education and health, and the points included in the two dimensions are on the side of ability and complement each other, and if good health is a basic pillar on which the rest is built. good health creates the ability to learn as a key factor, and good learning develops abilities that provide opportunities to occupy decent jobs with good salaries that raise the standard of living, which is an increase in the ability to live a decent life, so the aim of the selected elements is to develop abilities by increasing people's choices. In addition to these options, the same definition referred at the end to other options, which are freedom and empowerment, which requires equity and participation, and here lies the confusion of classification.

If these two options are actually social demands, we are facing the completion of the social dimension, but if they are imposed by state institutions through laws and legislation, we may be facing an institutional dimension, although the first is closer due to the societal nature of humans and the ideas spread among them, and thus we are facing two dimensions of human development.

When sustainability is added to the latter, we only have to return to the basic dimensions of sustainable development itself, which have traditionally been limited to three basic dimensions: The social, economic and environmental dimensions, and we will limit ourselves to these dimensions outside of the two dimensions that were added to the 2030 Agenda, to make it complete: People, Prosperity, Planet, Partnership and Peace, which known as the 5P's (UNSSC, n.d). Accordingly, we deduce the missing dimension from the previous analysis, which is the environmental dimension, which is of great importance as there is no human sustainability without environmental sustainability, which explains the preservation of the environment to preserve the human being and the continuity of his generations, but this dimension can only be achieved with a degree of awareness. This dimension can only be achieved with a high degree of awareness of the importance of this dimension among humans, and perhaps this is what added the two subsequent dimensions, the participation of nations in achieving the SDGs away from wars and conflicts, which will undoubtedly destroy what has been achieved and prevent the realisation of the rest, all of which reflects the spirit of sustainable human development.

Despite the specific visions about the dimensions of sustainable human development and their relationship with sustainable development and the existence of overlap between them, a closer look at them reveals that they do not go beyond two basic dimensions, one of which is closely related to the human being, and this connection makes us start from the human being himself in defining these two dimensions, which are as follows:

- **Endogenous dimension:** It is the dimension that relates to the ability of the human being himself to do things from the standpoint of the human self itself, which is mainly concerned with the development of capabilities, and is controlled by the human being himself, and is influenced by purely subjective factors such as physical, mental, psychological and even spiritual aptitudes and potentials, and their great impact on the previous aspects, as spiritual instability leads to psychological instability and the rest of the aspects in the search for stability. Spiritual instability leads to psychological instability and the rest of the aspects in the search for stability, and this is where many people may go astray by following incorrect paths, such as drug addiction, and this dimension is neglected in the literature on human development.
- **Exogenous dimension:** It is the dimension that relates to the alignment between everything that surrounds the human being, whether material, such as society and the environment, or moral, such as policies and systems, which is not controlled by the human being and has a direct impact on his abilities: Both positively

and negatively, hence we understand the overlap between the two dimensions, and the mentioned dimensions can be categorised as elements of this dimension.

3.3. The Sustainable Human Development Index

3.3.1. Definition of the Sustainable Human Development Index:

An average known as the Human Development Index [HDI] is used to measure human development internationally, which has been issued annually by the United Nations Development Programme [UNDP] since the first report in 1990, which includes 193 countries for comparison until 2023 (UNDP, 2024, P. 30), and this index is defined as a summary measure of achievements in three key dimensions of human development: a long and healthy life, access to knowledge and a decent standard of living. For ease of comparison, the average value of achievements in the three dimensions is summed using the geometric mean on a scale between 0 and 1, where a higher value means better performance (UNDP, 2020, P. 02), It is noted that the dimensions of sustainability, including the environmental dimension, are not included in this index. To solve this issue, the Sustainable Development Index, which was originally created to measure the environmental efficiency of human development, was created, noting that it was not added by the United Nations, but its initiative started from an article by Hickel Jason (Sustainable Development Index, n.d), It would be better to call it the Sustainable Human Development Index [SHDI] and we will treat it as such.

3.3.2. Components of the Sustainable Human Development Index:

The above-mentioned Human Development Index is based on four indicators corresponding to the three dimensions mentioned in its definition:

- **Long and Healthy Life:** Measured by life expectancy at birth, the extracted value is called the Life Expectancy Index, with the highest value set at: 85 and the lowest value: 20, and these values represent the number of years.
- **Knowledge Acquisition:** Its average is measured from the sum of the ratio of expected years of schooling to the average years of schooling, and is called the value extracted from the education index, by setting the lowest and highest value of the expected years of schooling index in the range: 0-18, and the lowest and highest value of the Average Years of Schooling Index in the range: 0-15, with both ranges representing the number of years.
- **Decent standard of living:** Measured by GDP per capita in US dollars, the extracted value is called the GDP index, which falls in the range: 100-75000. (UNDP, 2020, P. 02)

In addition to these components, we find the environmental component of sustainability frameworks, proposed by Hickel's structure as mentioned above, which is the complement that gives the general outline of the SHDI:

- **d. Environmental impact:** It is measured by a special equation that adopts Euler's value, the most important exponent of which is the mean exceedance, which is calculated by dividing both the physical footprint and emission values by the planetary boundaries for each individual, then calculating the geometric mean of the two values derives the Environmental Impact Index [EII] (Methodology And Data, n.d).

3.3.3. Sustainable Human Development Index levels:

The index includes four levels of human development that the country can be categorized in:

- **Very high:** the index value falls in the range of 0.800 and above.
- **High:** the index value falls in the range of 0.700 to 0.799.
- **Medium:** the index value falls in the range 0.699-0.550.
- **Low:** the index value is less than 0.550. (UNDP, 2020, P. 04)

The proposed proof is through a world map showing the distribution of values with a heptagonal scale, maintaining levels A and B, and then decreasing by 0.001 each time along the estimated range of: 0.099, with four levels, ending with the range: 0-0.299 (Sustainable Development Index, n.d), but these levels are not named.

3.3.4. Classification of countries according to the Sustainable Human Development Index:

Countries where the HDI is very high are classified as developed countries, and the rest of the countries are classified from the remaining three levels regardless of the level in developing countries, and for caution, this classification is specific to human development in particular (UNDP, 2010, P. 26) and is only an aid to compare countries that are close in terms of values and potential, while the SHDI trend focuses on the extracted values and ranks countries from the highest value to the lowest out of the ranking.

4. Between Quality of life and Sustainable Human Development

4.1. The relationship theoretically

4.1.1. The Concepts:

The first thing that distinguishes the definitions of quality of life and human development is that they are issued by the same authority, as the World Health Organisation is included in the United Nations system, and we find that they intersect on two main points: Human beings and their surroundings, The practical intention behind these two points is to improve them, and there is no doubt that the centre and goal of this process is the human being himself, and if sustainability is added to human development, we are not facing a third element, but rather a feature added to it, and this feature is not isolated from quality of life because most of the sustainable development goals were created for its sake.

4.1.2. The Dimensions:

We have noted the clear difference between thinkers in the dimensions of both quality of life and sustainable human development, and we have shown that the difference is nothing more than perspectives and divisions that lack comprehensiveness in most of them. We have reached a general idea that the dimensions of quality of life are built on three main pillars: the self, the environment, and the interaction between them, These are the same conclusions of looking at the two definitions by increasing the interaction, This is the holistic view from which human development emerges, as the development of the human self and the environment in all its aspects necessarily leads to the development of the interaction between them in a positive way, and this development with its continuity constitutes sustainability, which is the modern perspective of development in general.

With regard to the proposed dimensions, the two dimensions proposed in sustainable human development are the most comprehensive, as they are based on the three basic pillars mentioned above, and because these pillars were revealed in the dimensions of quality of life, it is not far the endogenous and exogenous dimensions being two dimensions of quality of life as well, thus unifying the dimensions between them and sustainable human development, and the proposed moral and material dimensions in their dimensions are merely a division within the details of both the endogenous and exogenous dimensions, which can be considered part of a whole.

4.1.3. The Index:

The global quality of life index between numbeo and U.S. News does not differ significantly, except for the addition and subtraction of some parts, which are generally based on social, economic, political and environmental aspects, as numbeo index is unique to the environmental aspects represented in climate and pollution, and the U.S. News index is unique to the quality of education, and they agree in their expression on decent standard of living and health, the latter three of which are the focus of the Human Development Index [HDI], and through the various parts of the index, it becomes clear that it is more comprehensive than the HDI and SHD index due to its interest in its components and the components of the HDI. Through the various constituent parts of the Quality-of-Life Index, it is clear that it is more comprehensive than the Human Development and Sustainable Human Development Index because it is concerned with its components and other components that are not from it. However, whatever these partial details are, they are in favour of human welfare and development, thus unifying the goals of quality of life and sustainable human development.

4.2. The relationship analytically

4.2.1. The evolution of quality-of-life figures in Algeria:

The US News Index numbers were chosen for two main reasons: Firstly, Algeria's numbers are not available from numbeo, and if they were, we would have chosen the same index due to our reservations about the method of data collection as mentioned earlier, , and secondly, its general agreement with the Human Development Index in its three pillars as we have shown; US News Quality of Life Index data is available since 2016 as shown in Table N°1, we note that Algeria's best ranking among the best countries was in 2016 with the lowest value of the quality of life index across the years of study, estimated at 59, which is certainly due to the values of other indicators, but in the following year it witnessed a rise that the other subsequent values did not reach, with the second best ranking in preference and somewhat maintained that level in 2018, followed by an exit from the ranking for three consecutive years from 2019 to 2020, which is due to the inability to submit the values to the competent authority in the US news, most likely, or there is an actual unacceptable decline in the values, all due to the Corona pandemic which swept the world and affected all its aspects, including development, and not to forget that Algeria was going through a phase of political instability that disrupted several interests starting in 2019; it returned in 2022 with the last preference ranking with a significant decline in the value of the quality of life index, and almost maintained the same position and value in the last year.

Table N°1: Evolution of Algeria's quality of life numbers

Index \ Years	2016	2017	2018	2019	2020	2021	2022	2023
Value	59	79	78	-	-	-	69	70
Rank	60	78	80	-	-	-	80	79

Source: Prepared by the researchers based on U.S. News reports.

The average value of quality of life is estimated at 71, with the furthest value of 59 in the first year with a negative difference of 12, and the closest value with a negative difference in the last year estimated at 1. Positive differences are only found in two consecutive years starting from 2017, with positive differences respectively: 8 and 7, which are the best values between years.

4.2.2. The evolution of sustainable human development figures in Algeria:

The United Nations Development Programme [UNDP] provides Algeria's numbers since 1990, but we will limit our study to the same years of the quality-of-life index, we will start with the evolution of the human development numbers by analysing the numbers in Table N°2, where we notice that the values of the first two years are equal but the ranking is different by decreasing by 24 places, which indicates the need to increase each year at least to maintain the same rank. This is what we clearly observe in the third year, where a small increase in the index led to a rise of three places, but this small amount of increase could not maintain the rise in ranking,

as in the fourth year it witnessed a drop to 9 places, and this may be due to the political circumstances that Algeria went through in 2019, as we mentioned earlier, then 2020 recorded a free fall in the value of the index, which is the worst ever across the years of the study, and it is not surprising that the ranking dropped by only 5 places due to the bad conditions the world was going through in this year, which affected all aspects, especially the social and economic ones cause of Corona pandemic. It recovered in 2021, as it rose in the ranking from the previous year by 5 points and returned to stabilise within the average it used to achieve normally, until it achieved the best value across the years of the study in 2022 with a slight progress, but this did not prevent its ranking from dropping by two places.

Table N°2: Evolution of Algeria's human development numbers

Index \ Years	2016	2017	2018	2019	2020	2021	2022	2023
Value	0.738	0.738	0.740	0.742	0.730	0.740	0.745	-
Rank	61	85	82	91	96	91	93	-

Source: Prepared by the researchers based on the Human Development Index reports.

The mean value of human development is estimated at 0.739, with the furthest value of 0.730 in 2020 with a negative difference of 0.009, the closest value with a negative difference in 2016 and 2017 estimated at 0.001, and the closest positive differences to the average with the same value in two years: 2018 and 2021, and the best positive differences in the last year estimated at 0.006, and it is noticeable that the positive difference in 2019 estimated at 0.003 was the best positive difference before the coronavirus pandemic.

Looking at the sustainable human development numbers represented in Table N°3, the first thing that stands out is the differences between them and the human development numbers for each of the two years, respectively: 0.021, 0.016, 0.018, and the last year had a difference of 0.013, perhaps this pattern would have an explanation in the context of a longer time series; unlike the previous index, the best values across the study years were in the first two years, then decreased slightly, estimated at 0.003, to return to a single level of 0.002, maintaining the same value until the last year, except for 2020, which decreased unprecedentedly as before.

Table N°3: Evolution of Algeria's Sustainable Human Development numbers

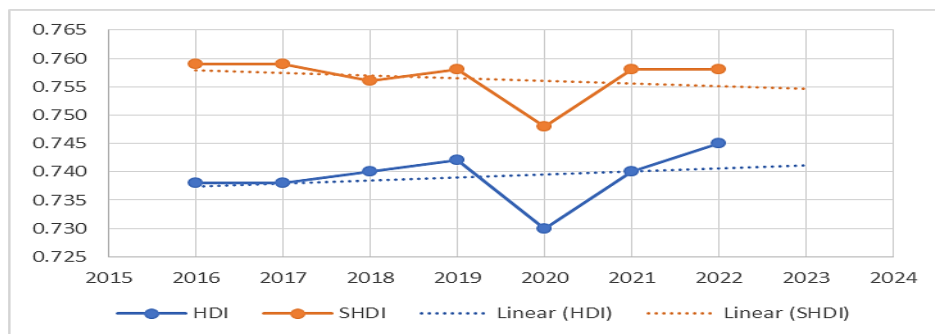
Index \ Years	2016	2017	2018	2019	2020	2021	2022	2023
Value	0.759	0.759	0.756	0.758	0.748	0.758	0.758	-

Source: Prepared by the researchers based on the calculations of the Sustainable Development Index website.

The average values for sustainable human development are estimated at 0.756, equivalent to the value of 2018, and this indicator is characterised by more positive differences between it and the average with close values of 0.002 and 0.003, for five separate years, and there was only one negative difference in 2020, estimated at 0.008, the same year of the pandemic.

We notice from Fig N°1 that the addition of environmental indicators to the previous HDI did not change the equality of the values of the first two years, which means equality in environmental indicators between the two years, and the third year was lower than the previous two years, unlike the HDI, and this was the majority of the rest of the values, which shows that the addition of environmental indicators had an impact on the values of the previous HDI, as almost all values reversed between an increase and decrease, and it is very important to note that the linear trend of all values moved from a decreasing trend to an increasing trend, which proves as a preliminary vision the urgency of including environmental indicators in the HDI in the official accounts of the United Nations Development Programme [UNDP], not only because it is one of the dimensions of sustainable development, but because it reflects human behaviour towards the environment and awareness of the need to preserve it, which makes it closely related to human development in itself but within the framework of environmental sustainability.

Fig N°1: Evolution curve of HDI and SHDI for Algeria

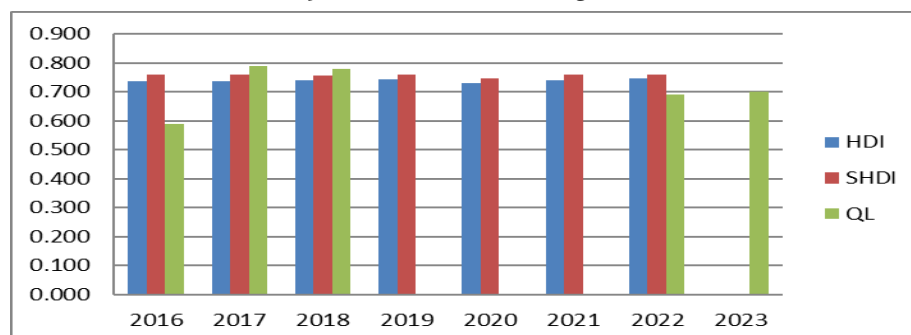


Source: Prepared by the researchers based on the numbers of tables N°2 and N°3 using Excel.

4.2.3. Analysing the relationship between quality of life and human development in Algeria

4.2.3.1. The Data between QoL and SHDI: From the histogram represented in Fig N°2, we notice the significant convergence between the numbers of HDI and SHDI in all years, so comparing only one of them with the available quality of life index is enough. By looking at all years, we can see that the Quality of Life Index decreased below the Sustainable Human Development Index [SHDI] twice in the years: 2016 and 2022, and increased twice in 2017 and 2018.

Fig N°2: Histogram of the evolution of quality of life, human development and sustainable human development numbers for Algeria

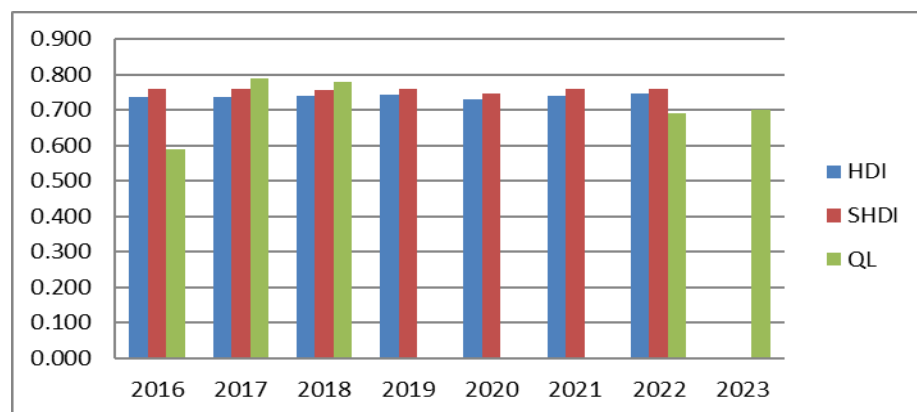


Source: Prepared by the researchers based on the numbers of Tables N°1, N°2, N°3 using Excel.

Taking into account the chronology, we find that the first year was lower in quality of life than sustainable human development, which may be due to the novelty of the indicator and the incompleteness of its parameters or that Algeria was not surrounding what must be considered to raise the value of the indicator. What reinforces this view is that the following year increased significantly higher than sustainable human development, although it witnessed a decrease in its value in 2018, but it maintained that rise, however, this did not last long. In 2019, Algeria dropped out of the ranking of the best countries for the reason we mentioned earlier, namely the political situation at the time, which was followed by a deteriorating health situation on a global level in 2020, represented by the Corona pandemic, and Algeria only recovered in 2022. However, its return to the best countries ranking was not with high quality of life values as last time, but rather a decrease in the sustainable human development index, which was stable in 2021 and 2022, and this decrease will most likely remain in 2023.

The previous graph implies a disturbance in the quality of life values in contrast to the SHD values, which appear to be very stable, and this disturbance did not allow to determine whether the relationship between them is direct or inverse, suggesting that there is no relationship at all, contrary to what the theory proves, however, we can't say for sure due to the lack of data and missing data, Only four out of eight years were compared, which made it difficult to judge the nature of the relationship, however, we thought to look at the linearity of the relationship through Fig N°3.

Fig N°3: Evolution of Algeria's Quality of Life and Sustainable Human Development numbers

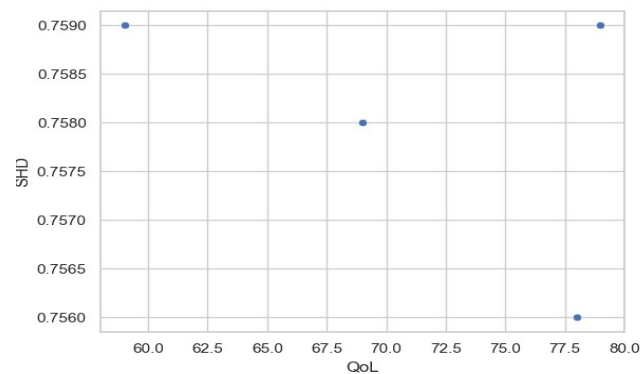


Source: Prepared by the researchers based on the numbers of tables N°1 and N°3 using Excel.

We can see from Fig N°3 that the SHD linearity rises and runs parallel to the quality-of-life linearity, which seems more logical, although due to the size of the samples and the value of the coefficient of determination in both of them is statistically unacceptable.

4.2.3.2. The spread of data between QoL and SHD: According to the way the representative data points in Fig N° 4 are spread out, there is no correlation between quality of life and sustainable human development.

Fig N°4: The spread of data between QoL and SHD



Source: Prepared by the researchers based on the numbers of tables N°1 and N°3 using python.

4.2.3.3. Correlation between QoL and SHDI: Before we start measuring the correlation scores between the two variables, we note that we will replace the missing data with the average values for both time series with their average, as the average values for quality of life are: 71, and the average values for sustainable human development are: 0.757, and that we will use different metrics using python to measure the correlation between them as follows:

Pearson's Correlation: it can be used to summarize the strength of the linear relationship between two data samples and returns a value between -1 and 1, symbolizing the full spectrum of correlation: from a complete negative correlation to a total positive correlation. A value of 0 means no correlation (Jason, 2023). The Pearson coefficient in our case is equal to -0.005418, which indicates a very weak negative correlation very close to zero, and the corresponding probability value of 0.989840 is greater than the 0.05 significance level, so we reject the null hypothesis that there is a relationship and accept the alternative hypothesis that there is no relationship between the two study variables.

Spearman's Correlation: This test is not assumed a linear relationship between the variables, although a monotonic relationship is assumed, like the previous test it returns a value between -1 and 1 with same explanations (Jason, 2023). The Spearman value in our study equals to -0.135812, which is very close to zero like the test before, and the corresponding probability value of 0.748464 is greater than the 0.05 significance level, so we reject the null hypothesis that there is a relationship and accept the alternative hypothesis that there is no relationship between the two study variables.

Distance Correlation: it can be applied to both linear and non-linear data, his results range from 0 to 2, where 0 means perfect correlation and 2 means perfect negative correlation (Hristov, 2023). The result of applying this metric to the two variables of our study is 1.005418, which is extremely close to the middle that means no relationship between the two variables of the study.

Mutual Information: This metric gives non-negative value from 0 to $+\infty$, Results around 0 means the variables are independent, and the higher value means that the variables are more interdependent (Hristov, 2023). The value of metric in our study equals to 0, which means there are no relationship between the two variables of our study.

Maximal Information Coefficient: it can be applied to both linear and non-linear data, and it ranges between 0 and 1 (Hristov, 2023). The value for this metric in our study is 0.2, which points to an extremely weak correlation between SHD and QoL.

Kendall's Tau: it is used to measure the dependence between two ordinal values, and it has the same range of Spearman with the same explanations (Hristov, 2023). While our variables are not ordinal, we can still use Kendall's coefficient like we used Spearman's to measure linear dependence. Kendall's value in our study is very close to zero with the value -0.117669, and the corresponding probability value of 0.698250 is greater than the 0.05 significance level, so we reject the null hypothesis that there is a relationship and accept the alternative hypothesis that there is no relationship between QoL and SHD.

5. Results and discussion

We have concluded in the theoretical aspect that the concepts of quality of life and sustainable human development meet at one point, namely: The human being. The first aims to make his life better and the second aims to make him sustainably better in himself, and because the human being is not isolated from interacting with what surrounds him because of the positive or negative impact of this surroundings on him, it was necessary to address his improvement to overcome the positive impact on him, thus achieving quality of life and human development simultaneously; and the dimensions of both are not far from each other, as we concluded from a holistic view that it is only two dimensions: An endogenous dimension related to the human himself and an exogenous dimension related to what surrounds him, and that what we mentioned in the quality of life of two dimensions: Moral and material, are only an extension or elaboration of the previous two dimensions.

As for the measurement indicators of quality of life, we found two measurement models that differ in some parts, and one of them is closer to the HDI than the other in its components from the other, and we did not neglect to criticise the HDI for neglecting the environmental dimension in sustainable development, which is the concern of today, and this criticism was not only in our minds, it created an indicator that modifies the HDI by taking the environmental dimension into account, and has already changed its values, and we treated it in our study as a sustainable human development index.

As for the relationship between quality of life and sustainable human development, we concluded theoretically that it does exist, from the concept to the dimensions to the indicators, all of which are based on three main pillars: The human being, the environment, and the interaction between them. As for the relationship

in its analytical aspect, given the small sample of study years and the missing data, the graphical analysis led to the absence of a relationship, unlike the linear paths that showed the two running in parallel with the superiority of sustainable human development over quality of life, although this was accompanied by statistical unacceptability.

However, this linearity is very logical because quality of life is meant to be higher than SHD, The shape of the spread of data between the two variables and the outputs of the correlation measures led to the absence of a relationship, although some of them showed a very weak relationship, and therefore we can say that the two hypotheses on which the study was based between the theoretical and analytical aspects are contradictory, as the relationship proves itself and is very logical theoretically, but statistically it does not exist, whether linear or non-linear, perhaps due to the small sample size, however, we cannot but deny both hypotheses, which leads to the answer to the study's issue that there is no relationship between quality of life and sustainable human development based on the data used in this study.

6. Conclusion :

There is definitely a relationship between quality of life and sustainable human development theoretically, but this has not been proven by the analytical side with the same level of certainty, and although its statistical results are weak, its linear trajectories reflect the reality and intent of the relationship, but the tests of correlation proved that there is no relationship at all.

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