

Determine the Indicators that Influence for Measuring Development at the Regional Level

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Abstract

Regional development takes into consideration the spatial dimensions along with the sectoral dimensions across the development of plans and strategies that have been drawn at the national, regional and local level. These plans and visions are seeking to strike a relative balance among the different regions. Consequently, that contribute to solve the problems of disparity in regions and governorates. Therefore, the process of setting integrated indicators to measure the regional development is absolutely crucial. The Significance of setting these indicators is embedded in correcting the paths of the regional development and structural imbalances that hinder the process of development programs. The aim of the research is to formulate a set of indicators to determine the extent of the progress to gain the desired results of the regional development, and strike the balance at the national and regional level. The research will discuss the concept of regional development, followed by illustrating the role of indicators and how it is significant in the development. Eventually, the study created a mathematical equation through analysis by a set of indicators using the SPSS program to guide planners and decision makers to achieve the developmental goals at the regional level.

Keywords: Regional development, Measure development, Indicators, Mathematical equation, SPSS.

1. INTRODUCTION

Regional development is the spatial expression for development plans and programs, and it is the envelope that contains the economic, social, environmental dimensions and others. Since the regional development policies deal with specific development issues and problems in specified regions and areas, and the interaction of these issues with sectoral and spatial dimensions to strike a balanced regional development [1].

The world now raises the slogan “Statistics for Development in the 21st Century”, that leads to emerge the requisite need to identify the indicators that measure the regional development at the sectoral and spatial levels. Where Indicators are one of the paramount mechanisms which we are depending on it for measuring the progress towards fulfilling the development outcomes at different levels [2]. These indicators measure

development to provide the decision-maker with comprehensive and integrated information about the current development situation. Hence, the importance of this research, where the study aims to formulate a set of indicators of measuring regional development to set up a mathematical model to measure what has been achieved in regional development, in order to support the development policies and decision-making.

To achieve the aim of this study, the research has been divided into three main parts. The first one is the inductive approach; it represents a rapid review of the theoretical background of the regional development and the significance of indicators in regional development. Moreover, the second part is the analytical approach, it shows the proposed methodology to determine the indicators of measuring development. Finally, the third part is the applied approach, it presents the strength of the regional development indicators according to the analytical study. These indicators are utilized to arrange the regions according to their factor scores and to formulate a mathematical model that can be used for measuring regional development. This is conducted by statistical analysis to 161 indicators measured on 403 regions, using one of the statistical programs (SPSS).

2. DEFINITION OF REGIONAL DEVELOPMENT

Regional planning depends on scientific processes and methods, through which an integrated set of actions are taken into consideration to expedite the regional development to achieve the desired objectives, (national and regional vision of development), through programs, projects, and investments in a specific region and specific periods [3].

3. THE MAIN OBJECTIVES OF REGIONAL DEVELOPMENT

Regional development promotes balanced growth interregional and intraregional, which it uses to reduce regional disparities. Furthermore, it ensures the integration of these regions on the national level. These processes could enhance the country's competitiveness on the international scale, the pre-set goals of regional development could be explored in the following point [4]:

- Achieving the balance between production, quality, and level of the service and the volume of consumption, increasing of population and improving the quality of life.
- Diminishing the gaps of the development among and within territories and establish the optimal use of the available resources in a sustainable way.
- Strengthening the regional specialization, and also providing and developing the infrastructure.
- Providing job opportunities and restricting the internal migration among regions.
- Eventually, the diversifying of the economic structures in the regions and promoting economic cooperation internally and externally, through distributing projects and investments in accordance with the conditions, potentials, and needs of each region, thus avoiding the unequal growth and subsequent problems.

4. THE IMPORTANCE OF INDICATORS IN THE REGIONAL DEVELOPMENT

Due to the complexity of regional development issues, this leads to highlight the urgent need to follow the scientific methods of information and measurement indicators at sectoral and spatial levels in the country. It is, therefore, necessary to set up a model of indicators to monitor and follow-up the different dimensions of development [5]. This part will discuss the importance of measuring development in decision-making and the role of measuring indicators in improving the performance of regional development policies.

4.1 The Importance of the Measuring Development

The decision-making and development policies are considered to be one of the most fundamental steps to achieve growth, whether those decisions are related to solve problems and exploit the potentials at the regional level. In addition, the decisions based on statistics, indicators and clear perception of the development process are the main and active means of making development decisions properly.

Therefore, the measurement systems and indicators are continued in all stages from planning and implementing to evaluate and follow-up. That's to guarantee the optimal exploitation of the available resources and to identify the faults in diverse aspects of growth, so that they can be dealt with and upscaling to an appropriate development level [5].

4.2 The Role of Indicators in Improving the Performance of Regional Development

Regional indicator systems are often complicated, due to related to the vertical level for development at the national, regional and local level and the horizontal level for the main development sectors (industrial/agricultural/tourism/trade).

Therefore, the need for coordination and cooperation have been emerged at all levels through the follow-up of the higher levels of government to achieve results at the lower level, (formulate the vision at the national scale and implementing this vision at regional level), according to the potential of each region at a sectoral and spatial level. Thus, the information and indicators that arise in this context have a direct and effective impact on the performance of regional development policies [6].

5. METHODOLOGY

This part of the research study will determine the most crucial factors and variables of measuring the level of development in the regions, Fig.1. illustrates the steps of methodology for the analytical and applied study. This is done through:

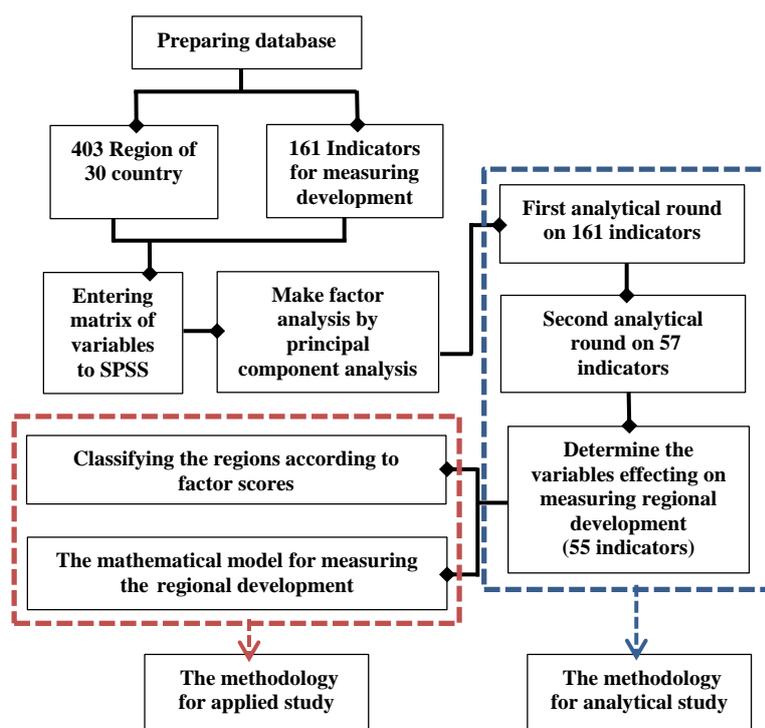


Fig. 1. The methodology steps for analytical and applied study

1- Preparing the matrix of variables for the case study, it consists of 161 indicators that are measuring on 403 regions which representing 30 countries, as shown in Table 1,2.

2- By entering the matrix of variables into the SPSS in preparation for conducting statistical analysis (factor analysis) of its data, in order to create links among the variables and defining their directions and impact, so that it's accessible to get the primary variables (after the second analytical round in factor analysis) that affect on measurement of development. Where these indicators give developmental weight (factor scores) to each region, then a mathematical equation is formulated to measure the development at the level of regions.

Table 1. The country and region used in SPSS for analytical study

Country	Region NO.	Country	Region NO.	Country	Region NO.
1-Germany	16	11-Serbia	4	21-Ukraine	25
2-China	31	12-Moldova	5	22-Russia	8
3-Malaysia	18	13-Romania	8	23-Philippines	17
4-Indonesia	34	14-Bulgaria	6	24-Japan	47
5-Slovakia	8	15-Lithuania	10	25-Poland	16
6-Macedonia	8	16- Czech	14	26-Denmark	5
7-Greece	13	17-Albania	3	27-Belarus	7
8-Slovenia	12	18-Georgia	8	28-Latvia	6
9-Ireland	8	19-Hungary	7	29-Egypt	27
10-S. Korea	17	20-Estonia	5	30-Zambia	10

Table 2. The indicators at country and region level used in SPSS

Indicators at Country Level	
1-Country Area (KM2)	50-% of Employment (K, L, M, N)
2-Quality of Land use Administration (Score)	51-% of Employment (O, P, Q, R, S, T)
3-Population (Person)	52-Employment in Primary Activity (person)
4-Density (Person/KM2)	53-Employment in Secondary Activity (Person)
5-GDP in Country (\$)	54-Employment in Tertiary Activity (person)
6-GDP per Capita in Country (\$)	55-Capacity of Innovation (Score)
7-GAV in Country (\$)	56-Quality of Scientific Research Institution (Score)
8-GAV per Capita in Country (\$)	57-Company Spending R&D (Score)
9-Economic Activity (A) (\$)	58-University & Industry Collaboration R&D (Score)
10-Economic Activity (B, C, D, E) (\$)	59-Availability of Scientists & Engineers (Score)
11-Economic Activity (F) (\$)	60- Total of Economic Zones in Country (Number)
12-Economic Activity (G, H, I, J) (\$)	61- Logistics Areas in Country (Number)
13-Economic Activity (K, L, M, N) (\$)	62- Special Economic Zones in Country (Number)
14-Economic Activity (O, P, Q, R, S, T) (\$)	63- Free Zones in Country (Number)
15-% of Economic Activity (A)	64- Industrial Zone in Country (Number)
16-% of Economic Activity (B, C, D, E)	65- Total of Agriculture Area in Country (KM2)
17-% of Economic Activity (F)	66- Percentage of Agriculture Area in Country to Total Land Area in Country (%)
18-% of Economic Activity (G, H, I, J)	67- Accommodation (Number)
19-% of Economic Activity (K, L, M, N)	68- Visitors (Number)
20-% of Economic Activity (O, P, Q, R, S, T)	69- World Heritage Natural Sites (Score)
21-Primary Economic Activity (\$)	70- World Heritage Cultural Sites (Score)
22-Secondary Economic Activity (\$)	71- Total Protected Areas (% total territorial area)
23-Tertiary Economic Activity (\$)	72- Road Length in Country (KM)
24-Government Budget Balance (%GDP)	73- Railway Length in Country (KM)
25-Gross National Saving (%GDP)	74- Airport in Country (Number)
26-Inflation (Annual % Change)	75- Seaport in Country (Number)
27-Government Debt (%GDP)	76- Quality of Overall Infrastructure (Score)
28-Ease of Access to Loans (Score)	77- Quality of Roads (Score)
29-Strength of Investor Protection (Score)	78- Quality of Railways (Score)
30-Export (% GDP)	79- Quality of Seaports (Score)
31-Import (%GDP)	80- Quality of Airports (Score)
32-FDI Inward Stock (Million Dollar)	81- Quality of Electricity Supply (Score)
33-FDI Outward stock (Million Dollar)	82- Mobiles Subscription (/100 pop) (Score)
34-Starting Business (Days)	83- Fixed Telephones Line (/100 pop) (Score)
35-Total of Labor Force in Country (Person)	84- Network Readiness (Score)
36-Total of Employment in Country (Person)	85- Got Construction Permits (Day)
37-% of Employment in Country	86- Getting Electricity (Day)
38-Total of Unemployment in Country (Person)	87- Efficiency and transparency of border administration (Score)
39-% of Unemployment in Country (Person)	88- Time to import: Documentary compliance (Hour)

40-Employment (A) (Person)	89- Time to import: Border compliance (Hour)
41-Employment (B, C, D, E) (Person)	90- Time to export: Documentary compliance (Hour)
42-Employment (F) (Person)	91- Time to export: Border compliance (Hour)
43-Employment (G, H, I, J) (Person)	92- Cost to export: Documentary compliance (\$)
44-Employment (K, L, M, N) (Person)	93- Cost to export: Border compliance (\$)
45-Employment (O, P, Q, R, S, T) (Person)	94- Human Development Index (Score)
46-% of Employment (A)	95- Comprehensive Index (Score)
47-% of Employment (B, C, D, E)	96- Logistics Performance Index (Score)
48-% of Employment (F)	97- Doing Business Index (Score)
49-% of Employment (G, H, I, J)	
Indicators at Region Level	
98- Region Area (KM2)	130-Employment (B, C, D, E) (Person)
99-Percentage of the total region to total country (%)	131-Employment (F) (Person)
100-Population (Person)	132-Employment (G, H, I, J) (Person)
101-Percentage of the total population in the region to total in population country	133- Employment (K, L, M, N) (Person)
102-Density (Person/KM2)	134- Employment (O, P, Q, R, S, T) (Person)
103-GDP in Region (\$)	135- % of Employment (A)
104-Percentage of Regional GDP to Total Country GDP (%)	136- % of Employment (B, C, D, E)
105-GDP per Capita in Region (\$)	137- % of Employment (F)
106-GAV in Region (\$)	138- % of Employment (G, H, I, J)
107-% of Regional GAV to Total Country GAV	139- % of Employment (K, L, M, N)
108-GAV per Capita in Region (\$)	140- % of Employment (O, P, Q, R, S, T)
109-Economic Activity (A) (\$)	141-Employment in Primary Activity (person)
110-Economic Activity (B, C, D, E) (\$)	142-Employment in Secondary Activity (Person)
111-Economic Activity (F) (\$)	143- Employment in Tertiary Activity (person)
112-Economic Activity (G, H, I, J) (\$)	144- Total of Economic Zones in Region (Number)
113-Economic Activity (K, L, M, N) (\$)	145- Logistics Areas in Region (Number)
114-Economic Activity (O, P, Q, R, S, T) (\$)	146- Special Economic Zones in Region (Number)
115-% of Economic Activity (A)	147- Free Zones in Region (Number)
116-% of Economic Activity (B, C, D, E)	148- Industrial Zone in Region (Number)
117-% of Economic Activity (F)	149- Total of Agriculture Area in Region (KM2)
118-% of Economic Activity (G, H, I, J)	150- Percentage of Agriculture Area in Region to Total Agriculture area in Country (%)
119-% of Economic Activity (K, L, M, N)	151- Accommodation in Region (Number)
120-% of Economic Activity (O, P, Q, R, S, T)	152- Visitors in Region (Number)
121-Primary Economic Activity (\$)	153- Road Length in Region (KM)
122-Secondary Economic Activity (\$)	154- Railway Length in Region (KM)
123-Tertiary Economic Activity (\$)	155- Airport in Region (Number)
124-Total of Labor Force in Region (Person)	156- Seaport in Region (Number)
125-Total of Employment in Region (Person)	157-Region have Land and Sea Permeability (2), or Region have Land or Sea Permeability (1), or Region haven't Permeability (0)
126- % of Employment in Region	158- Regional Common Project (1 or 0)
127-Total of Unemployment in Region (Person)	159- Connection with Roads (1or 0)
128-% of Unemployment in Region (Person)	160- Connection with Railways (1 or 0)
129-Employment (A) (Person)	161- Human Development Index (Score)

6. PRINCIPAL COMPONENT ANALYSIS

Principal component analysis (PCA) is a variable lowering technique that shares many semblances to obtain factor analysis. It aims to minimize a large group of variables into a small group of variables (principal components matrix), which represent most of the variance in the original variables [7].

6.1 First Analytical Round

The Factor analysis has been performed to 161 indicators. It generated 22 components having the most significant influence to explain the change occurred in the variables out of the total 161 components used in factor analysis, thus the total that 22 components can refer is about 91.695%. As a result, the first component that explains the most significant

percentage of variance is 28.091% to obtain the best indicators, as shown in Table 3.

Based on the 22 essential components derived from Table 3., the SPSS is creating a component matrix of factors that shows the degree of effect in each variable for each element in the matrix. As shown in Table 4., the matrix demonstrates the strength of the effect of the variables in creating a change in measuring the growth at the regional level. This is conducted by eliminating the values that have a saturation value less than 0.5 whether are positive or negative from the first component to obtain the best variables, that can be used in the next analytical round.

Table 3. Total variance explained of 22 components

Component	Initial Eigenvalues			Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %		Total	% of Variance	Cumulative %
1	45.22	28.091	28.091	12	2.653	1.648	81.725
2	22.06	13.703	41.794	13	2.437	1.514	83.238
3	18.52	11.508	53.302	14	2.135	1.326	84.564
4	9.181	5.703	59.005	15	2.028	1.260	85.824
5	6.799	4.223	63.228	16	1.962	1.218	87.042
6	5.521	3.429	66.657	17	1.492	.927	87.969
7	5.178	3.216	69.873	18	1.345	.835	88.804
8	4.892	3.038	72.912	19	1.309	.813	89.618
9	4.423	2.747	75.659	20	1.217	.756	90.374
10	3.857	2.396	78.055	21	1.118	.694	91.068
11	3.256	2.022	80.077	22	1.011	.628	91.696

Table 4. Part of variables scores in component matrix

Component Matrix							
Variables	1	2	3	4	5	6	7
Country Area	.713	-.343	.088	-.014	.220	.051	.059
Quality of Land use Administration	-.004	.456	.430	-.277	.296	-.131	-.108
Country Population	.898	-.271	-.001	-.173	.131	-.072	.197
GDP in Country	.934	.094	-.015	-.210	-.085	-.132	.176
GAV in Country	.938	.057	-.002	-.220	-.058	-.122	.182
Total of Labor Force in Country	.916	-.260	-.067	-.076	.131	-.093	.176
Region Population	.820	-.313	.267	.038	-.009	.100	-.161
GDP in Region	.774	-.012	.389	.056	-.242	.150	-.314
GAV in Region	.784	-.030	.386	.052	-.230	.155	-.309
Total of Labor Force in Region	.747	-.300	.320	.198	-.077	.151	-.311

6.2 Second Analytical Round

Factor analysis has been performed to 57 indicators extracted from 161 indicators. It is clear in this respect that 5 components out of factors 57 used in factor analysis were accepted, the first component can be relied upon which explains the largest rate of the variance of 70.020% as the largest among the 5 components.

According to the 5 basic components derived from Table 5., the SPSS prepares the matrix of component that shows the strength degree of the impact of variables in creating the change in measuring the growth at the regional level. As shown in Table 6., this is conducted by removing the values that have a saturation value less than 0.5 whether are positive

or negative from the first component to obtain the final indicators, that can be used to obtain factor scores for each region and formulating a mathematical equation by multiple linear regression.

Table 5. Total variance explained of 5 components

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	39.911	70.020	70.020
2	6.404	11.235	81.255
3	3.349	5.875	87.130
4	1.574	2.761	89.891
5	1.121	1.967	91.858

Table 6. Part of variables scores in component matrix

Component Matrix					
Variables	1	2	3	4	5
Country Area	.748	-.093	-.388	.334	-.333
Country Population	.929	-.264	-.176	-.147	.018
GDP in Country	.914	-.294	.238	-.072	.000
GAV in Country	.926	-.292	.196	-.092	-.002
Total of Labor Force in Country	.929	-.273	-.174	-.031	.044
Region Population	.882	.288	-.220	-.092	.114
GDP in Region	.813	.493	.254	-.062	-.070
GAV in Region	.825	.489	.227	-.057	-.069
Total of Labor Force in Region	.806	.493	-.204	.105	.116
Road Length in Region	.764	.015	-.201	.044	-.108

7. THE STRENGTH OF THE REGIONAL DEVELOPMENT INDICATORS ACCORDING TO THE ANALYTICAL STUDY

After conducting the factor analysis, the most significant and accurate of 55 indicators have been recognized, that are being

used in evaluating the development at the regional level. As shown in the following Table 7., a point for each indicator. The outcomes can be stated as follows:

Table 7. The final indicators and their score

The indicator at country level (Variable)	Score	The indicator at country level (Variable)	Score
Country Area	0.748	Total of employment	0.931
Population	0.929	Total of unemployment	0.741
GDP	0.914	Employment (B, C, D, E)	0.938
GAV	0.926	Employment (F)	0.935
Economic activity (A)	0.919	Employment (G, H, I, J)	0.937
Economic activity (B, C, D, E)	0.942	Employment (K, L, M, N)	0.951
Economic activity (F)	0.940	Employment (O, P, Q, R, S, T)	0.943
Economic activity (G, H, I, J)	0.860	Employment in secondary activity	0.938
Economic activity (K, L, M, N)	0.791	Employment in tertiary activity	0.947
Economic activity (O, P, Q, R, S, T)	0.914	Total of agriculture area in country	0.747
Primary economic activity	0.919	World Heritage Natural Sites	0.913
Secondary economic activity	0.942	World Heritage Cultural Sites	0.784
Tertiary activity	0.870	Road length	0.942
Gross national saving (GDP%)	0.668	Railway length	0.922
FDI inward stock	0.878	Airport	0.829
FDI outward stock	0.672	Cost to export: border compliance	0.619
Total of labor force	0.929		
The Indicator at region level (Variable)	Score	The Indicator at region level (Variable)	Score
Population	0.882	Tertiary activity	0.738
GDP	0.813	Total of labor force	0.806
GAV	0.825	Total of employment	0.809
Economic activity (A)	0.852	Employment (B, C, D, E)	0.753
Economic activity (B, C, D, E)	0.837	Employment (F)	0.770
Economic activity (F)	0.878	Employment (G, H, I, J)	0.817
Economic activity (G, H, I, J)	0.739	Employment (K, L, M, N)	0.808
Economic activity (K, L, M, N)	0.627	Employment (O, P, Q, R, S, T)	0.787
Economic activity (O, P, Q, R, S, T)	0.726	Employment in secondary activity	0.774
Primary economic activity	0.852	Employment in tertiary activity	0.841
Secondary economic activity	0.849	Road length	0.764

7.1 The First Outcome

The indicators mentioned in Table 7. are used to give a point for each case; this is obtained through factor scores, as shown in Table 8., regions were classified into five categories by factor scores.

Table 8. Regions classification according to factor scores

Country	Total region NO.	Classification of Factor Scores				
		Region No. with Factor Scores (Highest of + 1)	Region No. with Factor Scores (+ .5 and Higher)	Region No. with Factor Scores (Less than + .5)	Region No. with Factor Scores (less than - .5)	Region No. with Factor Scores (Higher than - .5)
Countries with a high level of development regions						
China	31	31	0	0	0	0
Russia	8	2	5	1	0	0
Germany	16	2	3	11	0	0
Japan	47	1	3	43	0	0
Countries with a medium level of development regions						
Indonesia	34	0	3	11	12	8
S. Korea	17	0	0	2	15	0
Malaysia	18	0	0	1	17	0
Countries with a low level of development regions						
Egypt	27	0	0	0	27	0
Philippines	17	0	0	0	17	0
Poland	16	0	0	0	16	0
Ukraine	25	0	0	0	13	12
Czech	14	0	0	0	10	4
Romania	8	0	0	0	8	0
Ireland	8	0	0	0	8	0
Denmark	5	0	0	0	5	0
Greece	13	0	0	0	2	11
Zambia	10	0	0	0	2	8
Hungary	7	0	0	0	1	6
Slovenia	12	0	0	0	0	12
Lithuania	10	0	0	0	0	10
Slovakia	8	0	0	0	0	8
Macedonia	8	0	0	0	0	8
Georgia	8	0	0	0	0	8
Belarus	7	0	0	0	0	7
Latvia	6	0	0	0	0	6
Serbia	4	0	0	0	0	4
Moldova	5	0	0	0	0	5
Bulgaria	6	0	0	0	1	5
Estonia	5	0	0	0	0	5
Albania	3	0	0	0	0	3

From Table 8., we can explore the development level of the regions of the countries, where the table shows that there is a variance in the levels of development. Accordingly, we find that there are three levels of development in the regions:

1- There are countries that have high-level development regions such as (China, Germany, Russia, and Japan). These countries have performed regional development policies and programs to obtain comprehensive and balanced regional development, for example, these countries own their visions and policies for development like China “National plan on new urbanization 2014-2020” [8], and Germany “ Concepts and strategies for spatial development” [9], and Russia “Russia national plan” [10], and Japan “New national spatial strategy” [11], all of them were well-prepared according to the availability of potential and resources at the spatial and sectoral level.

2- There are countries having regions with a medium level of development, such as (Indonesia, South Korea, and Malaysia). These countries have developed their visions and development plans in order to raise and improve their development levels. For example, Indonesia has a vision for a development addressed “Acceleration and expansion of Indonesia economic development” [12], and South Korea vision “Comprehensive national territorial and development plan 2011-2020” [13], and Malaysia vision “National physical plan 2006-2020” [14].

3- There are countries have regions with low levels of development such as (Egypt, Slovakia, Slovenia, Greece, Ireland, Serbia, Moldova, Romania, Bulgaria, Albania, Georgia, Hungary, Estonia, Ukraine, Lithuania, Philippines, Belarus, Poland, Latvia, and Zambia). These countries need to formulate policies and development strategies to remedy regional disparities and improve the management of resources at the spatial level. For example, Egypt has two visions for the development called “Sustainable development strategy: Egypt vision 2030” [15] and “National strategy for urban development: Egypt 2052” [16].

7.2 The Second Outcome

A mathematical equation has been formulated to be used to measure the level of development in the regions; this is done by multiple linear regression in SPSS. Multiple linear regression is used when we needed to foresee the value of a variable according to the value of two or more other variables. The variable we need to foresee is named the dependent variable. The variables used to foresee the value of the dependent variable are named the independent variables [17].

Table 9. shows the point for each variable that is used to obtain the mathematical equation. Table 10. shows the abbreviation for each indicator used in the equation.

Table 9. Indicators that used in a mathematical equation

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	-.662	.000		-6472.735	.000
V1	6.314E-9	.000	.021	59.454	.000
V12	1.422E-13	.000	.080	69.975	.000
V13	1.578E-13	.000	.071	44.339	.000
V14	1.370E-14	.000	.008	4.611	.000
V21	5.443E-13	.000	.140	84.205	.000
V25	.002	.000	.017	351.106	.000
V32	9.610E-8	.000	.039	75.766	.000
V33	-1.102E-8	.000	-.007	-8.285	.000
V38	9.102E-9	.000	.023	92.497	.000
V41	3.054E-9	.000	.068	54.987	.000
V44	5.143E-9	.000	.054	41.251	.000
V45	5.624E-9	.000	.086	99.048	.000
V65	2.052E-8	.000	.012	22.766	.000
V69	.007	.000	.023	193.551	.000
V70	.001	.000	.015	122.610	.000
V72	2.674E-8	.000	.032	36.017	.000
V73	4.180E-7	.000	.014	38.069	.000
V74	.000	.000	.019	132.266	.000
V93	8.861E-5	.000	.016	314.503	.000
V100	1.568E-9	.000	.022	166.388	.000
V103	1.405E-13	.000	.020	29.759	.000
V106	1.461E-13	.000	.021	14.112	.000
V110	7.611E-13	.000	.040	87.734	.000
V111	3.077E-12	.000	.025	164.500	.000
V112	9.089E-13	.000	.025	82.912	.000
V113	8.706E-13	.000	.022	93.773	.000
V114	9.600E-13	.000	.027	98.458	.000
V121	4.192E-12	.000	.043	310.429	.000
V124	4.415E-9	.000	.020	14.633	.000
V125	4.670E-9	.000	.021	14.743	.000
V130	2.759E-8	.000	.033	206.059	.000
V131	5.272E-8	.000	.025	261.796	.000
V132	2.049E-8	.000	.033	190.038	.000
V133	4.826E-8	.000	.024	242.797	.000
V134	3.417E-8	.000	.026	226.732	.000
V153	3.750E-7	.000	.019	447.707	.000

Table 10. The abbreviation for indicators that used in the equation

Indicator at country level (Variable)	Indicator at country level (Variable)
V ₁ - Country Area	V ₄₄ -Employment (K, L, M, N)
V ₁₂ - Economic activity (G, H, I, J)	V ₄₅ -Employment (O, P, Q, R, S, T)
V ₁₃ -Economic activity (K, L, M, N)	V ₆₅ -Total of agriculture area in country
V ₁₄ -Economic activity (O, P, Q, R, S, T)	V ₆₉ -World Heritage Natural Sites
V ₂₁ - Primary economic activity	V ₇₀ -World Heritage Cultural Sites
V ₂₅ -Gross national saving (% GDP)	V ₇₂ -Road length
V ₃₂ -FDI inward stock	V ₇₃ -Railway length
V ₃₃ -FDI outward stock	V ₇₄ -Airport
V ₃₈ -Total of unemployment	V ₉₃ -Cost to export: border compliance
V ₄₁ - Employment (B, C, D, E)	
Indicator at region level (Variable)	Indicator at region level (Variable)
V ₁₀₀ -Population	V ₁₂₄ -Total of labor force
V ₁₀₃ -GDP	V ₁₂₅ -Total of employment
V ₁₀₆ -GAV	V ₁₃₀ -Employment (B, C, D, E)
V ₁₁₀ -Economic activity (B, C, D, E)	V ₁₃₁ -Employment (F)
V ₁₁₁ -Economic activity (F)	V ₁₃₂ -Employment (G, H, I, J)
V ₁₁₂ -Economic activity (G, H, I, J)	V ₁₃₃ -Employment (K, L, M, N)
V ₁₁₃ -Economic activity (K, L, M, N)	V ₁₃₄ -Employment (O, P, Q, R, S, T)
V ₁₁₄ -Economic activity (O, P, Q, R, S, T)	V ₁₅₃ -Road length
V ₁₂₁ .Primary economic activity	

A mathematical equation for measuring development at the regional level:

$$Score = 6.314E-9V_1 + 1.422E-13V_{12} + 1.578E-13V_{13} + 1.370E-14V_{14} + 5.443E-13V_{21} + 0.002V_{25} + 9.610E-8V_{32} - 1.102E-8V_{33} + 9.102E-9V_{38} + 3.054E-9V_{41} + 5.143E-9V_{44} + 5.624E-9V_{45} + 2.052E-8V_{65} + 0.007V_{69} + 0.001V_{70} + 2.674E-8V_{72} + 4.180E-7V_{73} + 0.000V_{74} + 8.861E-5V_{93} + 1.568E-9V_{100} + 1.405E-13V_{103} + 1.461E-13V_{106} + 7.611E-13V_{110} + 3.077E-12V_{111} + 9.089E-13V_{112} + 8.706E-13V_{113} + 9.600E-13V_{114} + 4.192E-12V_{121} + 4.415E-9V_{124} + 4.670E-9V_{125} + 2.759E-8V_{130} + 5.272E-8V_{131} + 2.049E-8V_{132} + 4.826E-8V_{133} + 3.417E-8V_{134} + 3.750E-7V_{153} - 0.662$$

8. CONCLUSION

- The research highlighted the importance of having a set of indicators to measure what has been achieved concerning with different developmental objectives at the regional level. The research concluded the indicators that were derived from Table 7. can be used as useful means within the regionally balanced development. In this context, the indicators analyzed and extracted from the research can be used as active means through three steps:

- 1- Determining the defects and weaknesses by defining the indicators with the highest percentage of disparities.
- 2- Adopting the procedures and projects that can address this imbalance in the different developmental sectors, and arrange their priorities according to the gap volume in each sector and its importance, and impact on the other developmental sectors and national and regional priorities.
- 3- Following-up the impacts that come from the plans and strategies at the development levels by measuring the change in these indicators at specific periods of time.

- The paramount issue of measuring indicators systems is to achieve effective performance by narrowing information

gaps between horizontal and vertical levels. Where, the measurement indicators systems do not automatically produce benefits, but that are important and effective means in improving the performance of regional development policies.

- The socio-economic indicators are the fundamentals for any development worldwide, so the region should be developed firstly in order to be balanced and sustainable.
- According to the factor scores, the Egyptian governorates are located in the fourth classification (regions with factor scores less than -0.5). Consequently, Egypt can benefit from the experiences of countries with high regional development levels in the preparation of their development plans and strategies, while not neglecting integration at the spatial and sectoral level for the sustainable regional development.
- The research has drastically developed a mathematical equation through a set of indicators in which the countries can measure the level of growth in their regions or governorates or provinces at the spatial and sectoral level, and thus determines the strengths and weaknesses, to get benefit in setting their plans and strategies in order to decrease the weaknesses and augment the strengths.

9. RECOMMENDATION

The research study recommends using the proposed methods of indicators and mathematical equation for planners and decision-makers in countries, that represents information in a dynamic way to measure and identify the level of development in the regions. In order to promote balanced regional development and improve the competitiveness at the national level, and also the ability of countries to add several indicators accordance with their potential and the developmentally level.

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