

Environmental Performance Index (EPI) and Economic Development: An Inter-Country Analysis

Kuldeep Singh

Department of Post Graduate Studies,
Punjabi University Regional Centre, Bathinda,
Punjab (India)–151001.
Email: kuldeep_dhillon86@yahoo.co.in

ABSTRACT

In this study an effort has been made to analyze and compare the position of different countries by using the different environmental indicators responsible for the diversity in environment for which the Environmental Performance Index (EPI) has been constructed. The study attempts to establish the relationship between economic development and environmental quality as a whole instead of using individual indicators. A composite environmental index which summarizes the environment condition of a region or country or state is more meaningful than individual indicators. Efforts have also been made to find the relationship between environmental performance and economic development. For constructing the EPI, 'Factor Analysis' has been employed to determine the relative weight of the selected indicators. In order to develop the Environmental Performance Index, twelve environmental indicators of 96 countries (maximum number of countries for which the data were available) have been used for the year 1990 and 2005. For year 2014, seventeen environmental indicators of 94 countries have been used.

Keywords: Environmental Performance Index, Economic Development, Environmental Quality.

JEL Classification: O13, O44, Q01, Q55

Mathematics Subject Classification Number: 62P12

INTRODUCTION

The relationship between economic growth and environmental quality remained an issue of great controversy for quite a long time. Economists have not made much progress in describing the impacts of long-term economic growth on environmental quality. This debate was highlighted at the 1992 United Nations Conference on Environment and Development in Rio de Janeiro (Antle and Heidebrink, 1995).

Development which is socially, economically and environmentally sustainable is a challenge. Economic growth is needed, but growth alone is not enough if it does not reduce poverty and increase the equality of opportunity. And failing to safeguard the environment eventually threatens economic and social achievements (World Development Report, 2010).

Economic development is the primary objective of every nation. It is associated with a rising level of income over a long period of time. Development implies change. It is a multidimensional process which involves changes in economic and social structures. Development means the eradication of poverty, acceleration of economic growth, an access to clean drinking water, sanitation, higher standards of health and nutrition, better education and more equality of opportunity. It aims at

an elimination of unemployment, malnutrition, illiteracy and inequality. Development can be distinguished from growth, it is no longer considered identical with growth. Economic development implies growth plus change. An economy may grow but it may not develop because unemployment, illiteracy, poverty and inequalities may continue to persist due to absence of technological and structural changes.

The scarcities of natural resources now threaten the sustained productivity of the economy and economic production and consumption activities. These activities impair environmental quality by over loading natural sinks with wastes and pollutants. The environmental consequence of development tends to offset many benefits that may be accruing to individuals and societies on account of rising incomes. There are direct costs on the health of individuals, their longevity and on quality of life on account of deterioration in environmental quality. More importantly, the environmental damage can also undermine future attainments and productivity, if the factors of productions are adversely affected. (Compendium of Environment Statistics of India, 2008).

In this study an effort has been made to analyze and compare the position of different countries by using the different environmental indicators responsible for the diversity in environment for which the Environmental Performance Index (EPI) has been constructed. The study attempts to establish the relationship between economic development and environmental quality as a whole instead of using individual indicators. A composite environmental index which summarizes the environment condition of a region or country or state is more meaningful than individual indicators. Efforts have also been made to find the relationship between environmental performance and economic development (Singh and Dhillon, 2018).

In order to develop the Environmental Performance Index, twelve environmental indicators of 96 countries (maximum number of countries for which the data were available) have been used for the year 1990 and 2005. For year 2014, seventeen environmental indicators of 94 countries have been used. Countries that have missing observations have been excluded because it becomes difficult to accurately rank a country. Following seventeen environmental indicators have been used for developing Environmental Performance Index (EPI)

- (i) Carbon Dioxide (CO₂) emissions (metric tons per capita)
- (ii) Methane emissions (kt of CO₂ equivalent)
- (iii) Nitrous oxide emissions (thousand metric tons of CO₂ equivalent)
- (iv) Other green house gases emissions, HFC, PFC and SF₆ (thousand metric tons of CO₂ equivalent)
- (v) HFC gas emissions (thousand metric tons of CO₂ equivalent)
- (vi) PFC gas emissions (thousand metric tons of CO₂ equivalent)
- (vii) SF₆ gas emissions (thousand metric tons of CO₂ equivalent)
- (viii) PM 10 - particulates matter less than ten microns in diameter at country level (micrograms per cubic meter)
- (ix) Industrial nitrous oxide emissions (thousand metric tons of CO₂ equivalent)
- (x) Agricultural methane emissions (thousand metric tons of CO₂ equivalent)
- (xi) Agricultural nitrous oxide emissions (thousand metric tons of CO₂ equivalent)

- (xii) Forest area (% of land area)
- (xiii) Annual total freshwater withdrawals (billion cubic meters)
- (xiv) Bird species threatened
- (xv) Fish species threatened
- (xvi) Mammal species threatened
- (xvii) Plant species threatened

On the economic side, GDP per capita of a country expressed in constant US Dollars for the corresponding years has been used as proxy for economic development.

For constructing the EPI, 'Factor Analysis' has been employed to determine the relative weight of the selected indicators. In Factor Analysis, original 'n' number of variables are converted into 'P' number of groups which are called 'Factors' and are less in number than the given variables. The variables within a group (Factor) have same variation related to the phenomenon under study but between groups 'Factors' variables are independent of each other. Thus factors F_i and F_j are orthogonal" (Harman, 1967).

The relative weights to various indicators have been assigned on the basis of all the principal components.

The study has been divided into three sections. Section I describes the Environmental Performance Index (EPI) of different countries for the year 1990, 2005 and 2014. The regression analysis of EPI and income has been discussed in section II. The whole discussion has been concluded in section III.

SECTION – I

In this section, Environmental Performance Index (EPI) has been developed by using the weights obtained from all principal components for the countries. The analysis has been undertaken for the year 1990, 2005 and 2014.

Environmental Performance Index (EPI) for the year 1990 was developed on the basis of the selected indicators, by using the weights calculated from the 'Principal Components' for 96 countries and is presented in table 1 along with ranking of the different countries. Table also shows the GDP per capita of the countries and their ranking.

Table 1 shows that the value of index varies within the range of 0.1281 to 0.991 and it is clear from the ranking of the countries that Honduras is at the top with highest value of index (0.991) among the 96 countries during 1990 followed by Gabon (0.9837), Benin (0.9834), Costa Rica (0.9828), Rep. Congo (0.9824), Panama (0.9818), Guatemala (0.9805), Zimbabwe (0.9804) and Ecuador (0.9803).

Table further shows that United States has the lowest EPI i.e. 0.1281. Except USA all other countries have EPI value above 0.5. Other countries having value of index more than United States were China (0.6804), Japan (0.7486), Canada (0.7966), France (0.7999), India (0.8105), United Kingdom (0.8261), Brazil (0.8434), Australia (0.8592), United Arab Emirates (0.8621), Netherlands (0.8708), Bahrain (0.8764), Norway (0.8917) and Italy (0.8991).

Table 1: Environmental Performance Index and GDP per capita for the Year 1990

Countries	EPI	Rank	GDP per capita	Rank
Honduras	0.9910	1	1051	66
Gabon	0.9837	2	4626	35
Benin	0.9834	3	295	87
Costa Rica	0.9828	4	3119	41
Rep. Congo	0.9824	5	1170	64
Panama	0.9818	6	2935	45
Guatemala	0.9805	7	1444	58
Zimbabwe	0.9804	8	537	76
Ecuador	0.9803	9	1299	61
Senegal	0.9799	10	477	78
Nicaragua	0.9796	11	888	70
Dominican Republic	0.9790	12	1851	50
Mozambique	0.9788	13	184	94
Peru	0.9781	14	1664	54
Paraguay	0.9773	15	1397	59
Sri Lanka	0.9772	16	577	75
Nepal	0.9768	17	177	95
Bolivia	0.9766	18	871	71
Tanzania	0.9755	19	305	86
El Salvador	0.9755	20	1570	57
Malaysia	0.9753	21	2593	46
Cote d'Ivoire	0.9750	22	663	73
Ghana	0.9747	23	221	92
Namibia	0.9737	24	1831	52
Togo	0.9735	25	284	88
Colombia	0.9718	26	2325	48
Zambia	0.9716	27	387	82
Morocco	0.9706	28	1172	63
Cameroon	0.9696	29	665	72
Albania	0.9695	30	978	68
Botswana	0.9685	31	2336	47
Angola	0.9678	32	373	83
Philippines	0.9677	33	991	67
Kenya	0.9670	34	450	79
Lebanon	0.9668	35	3067	44
Congo, Dem. Rep.	0.9655	36	210	93
Portugal	0.9652	37	8772	27
Tunisia	0.9643	38	1661	55
Sweden	0.9642	39	23492	8
Chile	0.9641	40	3068	43
Vietnam	0.9634	41	227	91

Cuba	0.9632	42	3339	39
Ethiopia	0.9585	43	128	96
Jordan	0.9577	44	1618	56
Cyprus	0.9575	45	10682	23
Finland	0.9564	46	19921	10
Thailand	0.9545	47	1391	60
Syrian Arab Republic	0.9542	48	955	69
Switzerland	0.9541	49	34208	3
Uruguay	0.9519	50	5254	31
Algeria	0.9519	51	1833	51
Nigeria	0.9509	52	359	84
Oman	0.9482	53	6773	29
Mongolia	0.9481	54	520	77
New Zealand	0.9479	55	11627	21
Bangladesh	0.9467	56	280	89
Austria	0.9464	57	19192	12
Sudan	0.9460	58	264	90
Israel	0.9448	59	15283	19
Ireland	0.9424	60	14074	20
Hungary	0.9421	61	4359	36
Venezuela, RB	0.9416	62	4823	34
Iceland	0.9407	63	26540	6
Korea, Rep.	0.9399	64	6895	28
Denmark	0.9392	65	24098	7
Bulgaria	0.9387	66	1671	53
Turkey	0.9379	67	3448	37
Pakistan	0.9366	68	449	80
Trinidad and Tobago	0.9362	69	4912	32
Greece	0.9348	70	9718	24
Iran, Islamic Rep.	0.9328	71	1281	62
Indonesia	0.9328	72	592	74
Egypt, Arab Rep.	0.9321	73	1154	65
Mexico	0.9276	74	4903	33
South Africa	0.9248	75	3152	40
Romania	0.9209	76	1896	49
Argentina	0.9198	77	5582	30
Brunei Darussalam	0.9187	78	19075	13
Singapore	0.9184	79	15788	18
Poland	0.9179	80	3101	42
Saudi Arabia	0.9085	81	8930	26
Spain	0.9007	82	11336	22
Italy	0.8981	83	16600	17
Norway	0.8917	84	27577	5
Bahrain	0.8764	85	9428	25
Netherlands	0.8708	86	18858	14

United Arab Emirates	0.8621	87	36598	1
Australia	0.8592	88	17553	16
Brazil	0.8434	89	3353	38
United Kingdom	0.8261	90	20087	9
India	0.8105	91	316	85
France	0.7999	92	18732	15
Canada	0.7966	93	19562	11
Japan	0.7486	94	34237	2
China	0.6804	95	392	81
United States	0.1281	96	28298	4

When we compare the EPI of countries with GDP per capita of these countries to find out the relationship between environment and economic development, it has been found that the countries with high environmental performance have low level of GDP per capita and vice-versa as shown by the ranking of the countries in terms of EPI and GDP per capita. Countries which are at the top in terms of EPI ranking like Honduras occupies 66th position in terms of GDP per capita, Gabon at 35th position, Benin at 87th, Costa Rica at 41st, Congo Rep. at 64th, Panama at 45th, Guatemala at 58th, Zimbabwe at 76th, Ecuador at 61st, Senegal at 78th, Nicaragua at 70th and so on. This shows that the countries with high environmental performance are the less developed countries with low level of GDP per capita.

On the other hand, countries with low environmental performance have high level of GDP per capita. Countries which are at the bottom in terms of EPI ranking have high GDP per capita ranking except China and India. China and India being developing countries have low level of per capita GDP and also have low environmental performance because these are highly populated countries in the world. United States which has lowest ranking in EPI occupies 4th position in terms of GDP per capita. Then countries like Japan (2nd), Canada (11th), France (15th), United Kingdom (9th), Brazil (38th), Australia (16th), United Arab Emirates (1st), Netherlands (14th), Bahrain (25th), Norway (5th), Italy (7th) and so on have high ranking in terms of GDP per capita. Thus the high income countries except USA have medium environmental performance index.

It emerges from the analysis that the relationship between environmental performance and economic development is negative, meaning there by that countries with high economic development have low environmental performance and vice-versa. This relationship points to the fact that the process of economic development leads to more exploitation of resources both natural as well as economic, which results in environmental degradation, thus low value of EPI.

Table 2 presents the profile of environmental performance based on the EPI for the year 1990. All the countries were divided into high, medium, low and lowest categories based on their environmental performance as depicted in the Environmental Performance Index (EPI) given in the table 1. The table also shows the average EPI scores and average GDP per capita of the countries for each of these categories.

Table 2: Profile of Environmental Performance for the year 1990

	High	Medium	Low	Lowest
	Honduras	Cameroon	Oman	Mexico
	Gabon	Albania	Mongolia	South Africa
	Benin	Botswana	New Zealand	Romania
	Costa Rica	Angola	Bangladesh	Argentina
	Congo, Rep.	Philippines	Austria	Brunei Darussalam
	Panama	Kenya	Sudan	Singapore
	Guatemala	Lebanon	Israel	Poland
	Zimbabwe	Congo, Dem. Rep.	Ireland	Saudi Arabia
	Ecuador	Portugal	Hungary	Spain
	Senegal	Tunisia	Venezuela, RB	Italy
	Nicaragua	Sweden	Iceland	Norway
	Dominican Republic	Chile	Korea, Rep.	Bahrain
	Mozambique	Vietnam	Denmark	Netherlands
	Peru	Cuba	Bulgaria	United Arab Emirates
	Paraguay	Ethiopia	Turkey	Australia
	Sri Lanka	Jordan	Pakistan	Brazil
	Nepal	Cyprus	Trinidad and Tobago	United Kingdom
	Bolivia	Finland	Greece	India
	Tanzania	Thailand	Iran, Islamic Rep.	France
	El Salvador	Syrian Arab Republic	Indonesia	Canada
	Malaysia	Switzerland	Egypt, Arab Rep.	Japan
	Cote d'Ivoire	Uruguay		China
	Ghana	Algeria		United States
	Namibia	Nigeria		
	Togo			
	Colombia			
	Zambia			
	Morocco			
Average EPI	0.9780	0.9614	0.9407	0.8325
Average GDP per capita	1282.778	5249.061	7521.6401	14145.7587

Average EPI score is declining from high (0.9780) to medium (0.9614), low (0.9407) and lowest (0.8325) categories. But when we see the average GDP per capita, it increases as we move from high EPI to lowest EPI group. Average GDP per capita is highest for lowest category followed by low, medium and highest categories. In other words, countries with highest average environmental performance have lowest average GDP per capita. It is high for medium performance countries, higher for low performance countries and highest for lowest performing countries in terms of environment.

The comparison of average EPI score and average GDP per capita clearly shows a inverse relationship between environment and economic development. Analysis reveals that the environmental degradation is the result of economic development.

Environmental Performance Index (EPI) for the year 2005 has been developed on the basis of the above mentioned indicators by using the weights calculated from the 'Principal Components' for 96 countries. The EPI and the resulting ranks of countries are presented in the table 3. Table also shows the GDP per capita of the countries for the year 2005 and their ranking.

Table 3: Environmental Performance Index and GDP per capita for the Year 2005

Countries	EPI	Rank	GDP per capita	Rank
Gabon	0.9982	1	4029	43
Costa Rica	0.9884	2	4521	41
Congo, Rep.	0.9879	3	1112	70
Panama	0.9871	4	4431	42
Benin	0.9866	5	357	90
Dominican Republic	0.9864	6	3080	48
Honduras	0.9864	7	1297	68
Albania	0.9834	8	1526	64
Nicaragua	0.9834	9	1100	71
Zimbabwe	0.9830	10	363	88
Cote d'Ivoire	0.9828	11	578	78
Ecuador	0.9827	12	1562	62
Brunei Darussalam	0.9826	13	18312	20
Mozambique	0.9823	14	312	91
Ghana	0.9820	15	294	92
El Salvador	0.9819	16	2438	51
Togo	0.9811	17	253	93
Senegal	0.9804	18	541	81
Lebanon	0.9802	19	5129	37
Peru	0.9802	20	2374	53
Hungary	0.9800	21	5639	35
Finland	0.9797	22	26435	12
Guatemala	0.9796	23	1761	60
Cyprus	0.9791	24	14411	24
Switzerland	0.9784	25	36737	4
Sri Lanka	0.9783	26	1010	73
Cuba	0.9781	27	3470	46
Sweden	0.9780	28	31271	8
Botswana	0.9779	29	3880	45
Tunisia	0.9778	30	2654	50
Morocco	0.9776	31	1531	63
Namibia	0.9776	32	2391	52
Nepal	0.9775	33	237	94
Portugal	0.9769	34	11587	27
Jordan	0.9768	35	2130	57
Iceland	0.9764	36	36129	5
Paraguay	0.9762	37	1331	66
Tanzania	0.9762	38	380	87
Bolivia	0.9757	39	1069	72
Austria	0.9750	40	25370	14

Cameroon	0.9747	41	635	75
Zambia	0.9738	42	359	89
Bulgaria	0.9731	43	2178	56
Greece	0.9718	44	13658	26
Israel	0.9717	45	19968	18
Kenya	0.9713	46	427	85
Chile	0.9706	47	5979	34
Malaysia	0.9704	48	4530	40
Denmark	0.9702	49	31439	7
Mongolia	0.9701	50	611	76
Syrian Arab Republic	0.9684	51	1330	67
Trinidad and Tobago	0.9679	52	9102	30
Philippines	0.9666	53	1185	69
Ireland	0.9662	54	29826	9
Venezuela, RB	0.9657	55	5000	38
Angola	0.9656	56	404	86
New Zealand	0.9653	57	15172	22
Congo, Dem. Rep.	0.9652	58	92	96
Colombia	0.9649	59	2772	49
Oman	0.9647	60	9723	28
Algeria	0.9641	61	2115	58
Singapore	0.9613	62	28389	10
Uruguay	0.9611	63	6967	32
Romania	0.9608	64	2260	55
Bahrain	0.9586	65	14776	23
Vietnam	0.9547	66	543	80
Nigeria	0.9508	67	443	82
Ethiopia	0.9502	68	149	95
Saudi Arabia	0.9500	69	9440	29
United Arab Emirates	0.9492	70	33288	6
Thailand	0.9473	71	2360	54
South Africa	0.9454	72	3398	47
Bangladesh	0.9396	73	437	83
Iran, Islamic Rep.	0.9366	74	1907	59
Egypt, Arab Rep.	0.9341	75	1600	61
Netherlands	0.9339	76	25194	15
Mexico	0.9297	77	5983	33
Norway	0.9283	78	40584	1
Spain	0.9279	79	15701	21
Korea, Rep.	0.9278	80	13802	25
Turkey	0.9277	81	4887	39
Poland	0.9276	82	5224	36
Sudan	0.9267	83	427	84

Pakistan	0.9237	84	595	77
Argentina	0.9209	85	8108	31
United Kingdom	0.9198	86	28354	11
Italy	0.9151	87	19782	19
Australia	0.8934	88	23929	16
France	0.8904	89	22734	17
Indonesia	0.8787	90	915	74
Canada	0.8565	91	25438	13
Japan	0.8292	92	39295	2
India	0.7057	93	578	79
Brazil	0.6973	94	3977	44
United States	0.2801	95	37718	3
China	0.1737	96	1464	65

Table shows that the EPI varies within the range of 0.1737 to 0.9982. Gabon occupies the top position with highest value of index (0.9982) followed by Costa Rica (0.9884), Rep. Congo (0.9879), Panama (0.9871), Benin (0.9866), Dominican Republic (0.9864), Honduras (0.9864), Albania (0.9834), Nicaragua (0.9834), Zimbabwe (0.9830) and so on.

When we look at other extreme, table further shows that China was at the bottom with lowest value of EPI (0.1734). The country having low value of EPI, but slightly better than China was United States (0.2801). Brazil (0.6973), India (0.7057), Japan (0.8292), Canada (0.8565), Indonesia (0.8787), France (0.8904), Australia (0.8934) had EPI more than 0.5 but were placed at the bottom of the table as compared to other countries with better EPI.

When the EPI of the countries is compared with GDP per capita to find out the relationship between environment and economic development, again it has been found that countries having good performance in EPI, have not shown satisfactory performance at GDP per capita level. On the other hand countries who have achieved high economic development, failed to maintain their environment well.

It has been found that despite showing a best performance in EPI, Gabon secured lower place 43 in terms of GDP per capita. Similarly other topper countries like Costa Rica occupied position 41 in terms of GDP per capita, Rep. Congo at 70, Panama at 42, Benin at 90, Dominican Republic at 48, Honduras at 68, Albania at 64, Nicaragua at 71, Zimbabwe at 88 and so on.

Further, out of top eighteen countries in terms of EPI, seventeen countries have ranks more than 40 in terms of GDP per capita, twelve countries have more than 60, six countries have more or equal to 80 and four countries have more or equal to 90.

On the other hand, countries that are placed at the bottom in terms of EPI ranking, performed better in terms of GDP per capita. From the group of nineteen lowest performed countries in terms of EPI, three countries namely Norway, Japan and United States had secured top three positions in terms of GDP per capita but they secured a lower place on the EPI scale. Out of these nineteen countries, thirteen countries have rank less than 40 in terms of GDP per capita, eight have less than 20 and three have less than 10.

Thus the comparison of EPI and GDP per capita reveals a clear cut negative relation between environmental degradation and economic development.

Table 4: Profile of Environmental Performance for the year 2005

	High	Medium	Low	Lowest
	Gabon	Finland	Syrian Arab Republic	Mexico
	Costa Rica	Guatemala	Trinidad and Tobago	Norway
	Congo, Rep.	Cyprus	Philippines	Spain
	Panama	Switzerland	Ireland	Korea, Rep.
	Benin	Sri Lanka	Venezuela, RB	Turkey
	Dominican Republic	Cuba	Angola	Poland
	Honduras	Sweden	New Zealand	Sudan
	Albania	Botswana	Congo, Dem. Rep.	Pakistan
	Nicaragua	Tunisia	Colombia	Argentina
	Zimbabwe	Morocco	Oman	United Kingdom
	Cote d'Ivoire	Namibia	Algeria	Italy
	Ecuador	Nepal	Singapore	Australia
	Brunei Darussalam	Portugal	Uruguay	France
	Mozambique	Jordan	Romania	Indonesia
	Ghana	Iceland	Bahrain	Canada
	El Salvador	Paraguay	Vietnam	Japan
	Togo	Tanzania	Nigeria	India
	Senegal	Bolivia	Ethiopia	Brazil
	Lebanon	Austria	Saudi Arabia	United States
	Peru	Cameroon	United Arab Emirates	China
	Hungary	Zambia	Thailand	
		Bulgaria	South Africa	
		Greece	Bangladesh	
		Israel	Iran, Islamic Rep.	
		Kenya	Egypt, Arab Rep.	
		Chile	Netherlands	
		Malaysia		
		Denmark		
		Mongolia		
Average EPI	0.9842	0.9755	0.956	0.819
Average GDP per capita	2821.395	9778.1729	7995.1273	14974.6921

The profile of environmental performance based on the EPI for the year 2005 is presented in table 4. The table shows the high performance countries, medium performance countries, low performance countries and lowest performance countries according to the EPI along with their respective average EPI scores and average GDP per capita.

The average EPI score for the high performance category is 0.9842. Average GDP per capita for this category is \$ 2821 which is lowest than all other categories. This reveals that countries with highest performance in environment according to the EPI have the lowest average GDP per capita. For medium performance category, the average EPI score is 0.9755. The average GDP per capita of this category is \$ 9778. This category has low environmental performance than high performance category but average GDP per capita is higher. Next low performance category has lesser EPI score i.e. 0.95 than high performance category but more average GDP per capita which is \$ 7995. The average EPI score for lowest category is 0.8190 which shows the lowest level of environmental performance of this category, but this category has highest average GDP per capita i.e. \$ 14974 than all other categories.

So, the study found that higher GDP per capita is associated with lower environmental performance of the countries. The relationship between environment and income is negative. The environment deteriorates with increasing level of income.

Comparative analysis of Environmental Performance Index (EPI) and GDP per capita has been shown in table 5. Table reveals that countries in the group of top 20 positions during the year 1990 in terms of EPI, remained in this group for the year 2005 as well except for the countries Guatemala, Paraguay, Sri Lanka, Nepal, Bolivia and Tanzania which occupied 23rd, 37th, 26th, 33rd, 39th and 38th respectively during the year 2005. The environmental performance of these six countries has declined in 2005 as compared to 1990. These countries were out placed by other six countries (namely Albania, Cote d'Ivoire, Brunei Darussalam, Ghana, Togo and Lebanon) which performed better in terms of environment and entered into top 20 countries list by the year 2005. Out of these six countries, Brunei Darussalam had significantly improved its position i.e. from 78 to 13.

Table 5: Environmental Performance Index and GDP per capita for the Years 1990 and 2005

Countries	1990				2005			
	EPI	Rank	GDP per capita	Rank	EPI	Rank	GDP per capita	Rank
Honduras	0.9910	1	1051	66	0.9864	7	1297	68
Gabon	0.9837	2	4626	35	0.9982	1	4029	43
Benin	0.9834	3	295	87	0.9866	5	357	90
Costa Rica	0.9828	4	3119	41	0.9884	2	4521	41
Congo, Rep.	0.9824	5	1170	64	0.9879	3	1112	70
Panama	0.9818	6	2935	45	0.9871	4	4431	42
Guatemala	0.9805	7	1444	58	0.9796	23	1761	60
Zimbabwe	0.9804	8	537	76	0.9830	10	363	88
Ecuador	0.9803	9	1299	61	0.9827	12	1562	62
Senegal	0.9799	10	477	78	0.9804	18	541	81
Nicaragua	0.9796	11	888	70	0.9834	9	1100	71
Dominican Republic	0.9790	12	1851	50	0.9864	6	3080	48
Mozambique	0.9788	13	184	94	0.9823	14	312	91
Peru	0.9781	14	1664	54	0.9802	20	2374	53
Paraguay	0.9773	15	1397	59	0.9762	37	1331	66
Sri Lanka	0.9772	16	577	75	0.9783	26	1010	73
Nepal	0.9768	17	177	95	0.9775	33	237	94
Bolivia	0.9766	18	871	71	0.9757	39	1069	72
Tanzania	0.9755	19	305	86	0.9762	38	380	87
El Salvador	0.9755	20	1570	57	0.9819	16	2438	51
Malaysia	0.9753	21	2593	46	0.9704	48	4530	40
Cote d'Ivoire	0.9750	22	663	73	0.9828	11	578	78

Ghana	0.9747	23	221	92	0.9820	15	294	92
Namibia	0.9737	24	1831	52	0.9776	32	2391	52
Togo	0.9735	25	284	88	0.9811	17	253	93
Colombia	0.9718	26	2325	48	0.9649	59	2772	49
Zambia	0.9716	27	387	82	0.9738	42	359	89
Morocco	0.9706	28	1172	63	0.9776	31	1531	63
Cameroon	0.9696	29	665	72	0.9747	41	635	75
Albania	0.9695	30	978	68	0.9834	8	1526	64
Botswana	0.9685	31	2336	47	0.9779	29	3880	45
Angola	0.9678	32	373	83	0.9656	56	404	86
Philippines	0.9677	33	991	67	0.9666	53	1185	69
Kenya	0.9670	34	450	79	0.9713	46	427	85
Lebanon	0.9668	35	3067	44	0.9802	19	5129	37
Congo, Dem. Rep.	0.9655	36	210	93	0.9652	58	92	96
Portugal	0.9652	37	8772	27	0.9769	34	11587	27
Tunisia	0.9643	38	1661	55	0.9778	30	2654	50
Sweden	0.9642	39	23492	8	0.9780	28	31271	8
Chile	0.9641	40	3068	43	0.9706	47	5979	34
Vietnam	0.9634	41	227	91	0.9547	66	543	80
Cuba	0.9632	42	3339	39	0.9781	27	3470	46
Ethiopia	0.9585	43	128	96	0.9502	68	149	95
Jordan	0.9577	44	1618	56	0.9768	35	2130	57
Cyprus	0.9575	45	10682	23	0.9791	24	14411	24
Finland	0.9564	46	19921	10	0.9797	22	26435	12
Thailand	0.9545	47	1391	60	0.9473	71	2360	54
Syrian Arab Republic	0.9542	48	955	69	0.9684	51	1330	67
Switzerland	0.9541	49	34208	3	0.9784	25	36737	4

Uruguay	0.9519	50	5254	31	0.9611	63	6967	32
Algeria	0.9519	51	1833	51	0.9641	61	2115	58
Nigeria	0.9509	52	359	84	0.9508	67	443	82
Oman	0.9482	53	6773	29	0.9647	60	9723	28
Mongolia	0.9481	54	520	77	0.9701	50	611	76
New Zealand	0.9479	55	11627	21	0.9653	57	15172	22
Bangladesh	0.9467	56	280	89	0.9396	73	437	83
Austria	0.9464	57	19192	12	0.9750	40	25370	14
Sudan	0.9460	58	264	90	0.9267	83	427	84
Israel	0.9448	59	15283	19	0.9717	45	19968	18
Ireland	0.9424	60	14074	20	0.9662	54	29826	9
Hungary	0.9421	61	4359	36	0.9800	21	5639	35
Venezuela, RB	0.9416	62	4823	34	0.9657	55	5000	38
Iceland	0.9407	63	26540	6	0.9764	36	36129	5
Korea, Rep.	0.9399	64	6895	28	0.9278	80	13802	25
Denmark	0.9392	65	24098	7	0.9702	49	31439	7
Bulgaria	0.9387	66	1671	53	0.9731	43	2178	56
Turkey	0.9379	67	3448	37	0.9277	81	4887	39
Pakistan	0.9366	68	449	80	0.9237	84	595	77
Trinidad and Tobago	0.9362	69	4912	32	0.9679	52	9102	30
Greece	0.9348	70	9718	24	0.9718	44	13658	26
Iran, Islamic Rep.	0.9328	71	1281	62	0.9366	74	1907	59
Indonesia	0.9328	72	592	74	0.8787	90	915	74
Egypt, Arab Rep.	0.9321	73	1154	65	0.9341	75	1600	61
Mexico	0.9276	74	4903	33	0.9297	77	5983	33
South Africa	0.9248	75	3152	40	0.9454	72	3398	47
Romania	0.9209	76	1896	49	0.9608	64	2260	55

Argentina	0.9198	77	5582	30	0.9209	85	8108	31
Brunei Darussalam	0.9187	78	19075	13	0.9826	13	18312	20
Singapore	0.9184	79	15788	18	0.9613	62	28389	10
Poland	0.9179	80	3101	42	0.9276	82	5224	36
Saudi Arabia	0.9085	81	8930	26	0.9500	69	9440	29
Spain	0.9007	82	11336	22	0.9279	79	15701	21
Italy	0.8981	83	16600	17	0.9151	87	19782	19
Norway	0.8917	84	27577	5	0.9283	78	40584	1
Bahrain	0.8764	85	9428	25	0.9586	65	14776	23
Netherlands	0.8708	86	18858	14	0.9339	76	25194	15
United Arab Emirates	0.8621	87	36598	1	0.9492	70	33288	6
Australia	0.8592	88	17553	16	0.8934	88	23929	16
Brazil	0.8434	89	3353	38	0.6973	94	3977	44
United Kingdom	0.8261	90	20087	9	0.9198	86	28354	11
India	0.8105	91	316	85	0.7057	93	578	79
France	0.7999	92	18732	15	0.8904	89	22734	17
Canada	0.7966	93	19562	11	0.8565	91	25438	13
Japan	0.7486	94	34237	2	0.8292	92	39295	2
China	0.6804	95	392	81	0.1737	96	1464	65
United States	0.1281	96	28298	4	0.2801	95	37718	3

Now when we look at the other extreme i.e. 20 worst performing countries in 1990, these countries remained in the bottom 20 places except the countries like Brunei Darussalam, Singapore, Saudi Arabia, Bahrain, Netherlands and United Arab Emirates. These six countries performed better in 2005 than 1990 and occupied 13, 62, 69, 65, 76 and 70 ranks respectively during the year 2005.

New countries that were added in the 20 worst performer list during the year 2005 were Indonesia, Pakistan, Sudan, Turkey, Rep. Korea and Mexico. The ranks of these countries during the year 1990 were 72, 68, 58, 67, 64 and 74 respectively. So the environmental performance of these countries deteriorated during the study period.

Further, the study found that the ranks of almost all the countries changed in terms of EPI and GDP per capita in 2005 as compared to 1990. But in 37 countries, change in EPI ranks in the study period is more than or equal to 15 places. In these 37 countries, major changes (more or equal to 5 ranks) in GDP per capita ranking have occurred in 12 countries. Of these 12 countries, in eight countries the change in positions in terms of GDP per capita was in the opposite direction as change in their EPI rankings. In these eight countries, Malaysia is the country in which environmental performance declined by 27 ranks and increase in GDP per capita position by 6 places. However Vietnam is the one, where EPI position decreased by 25 ranks but in GDP per capita shifted up by 11 ranks. The position of Cuba in EPI enhanced by 15 places, however performance in terms of GDP per capita level declined by 7 places. In case of Thailand, EPI position lowered by 24 positions and GDP per capita increased by 6 places. Similarly, the environmental performance of Bangladesh went down by 17 places but GDP improved by 6 places. Sudan shifted down by 25 ranks in terms of environmental performance and shifted up by 6 ranks in terms of GDP. The environmental performance of Brunei Darussalam and United Arab Emirates enhanced by 65 and 17 ranks and declined by 7 and 5 positions in terms of GDP respectively. So these countries reveal the negative relationship between environmental performance and GDP per capita. In other words, increase in GDP per capita relates to decline in environmental performance and vice-versa.

The positions of remaining four countries in terms of GDP per capita moved in the same direction as change in the EPI ranking. The environmental quality and GDP per capita of Paraguay shifted down by 22 and 7 positions respectively. Whereas in case of Zambia, the ranks of EPI and GDP per capita lowered by 15 and 7 places respectively. However, in case of Lebanon, positions went up by 16 and 7 ranks in terms of EPI and GDP per capita respectively. Another is the case of Singapore where EPI improved by 17 places and GDP per capita by 8 ranks. The trend of these countries depicts the positive relation between environmental quality and income level.

Environmental Performance Index (EPI) for the year 2014 was developed on the basis of above mentioned indicators by using the weights calculated from the 'Principal Components' for 94 countries and is presented in table 6 along with ranking of the different countries. Table also shows the GDP per capita of the countries and their ranking.

Table 6 shows that EPI for the year 2014 varies within the range of 0.1724 to 0.9928. For the year 2014, Congo Rep. is at the top position with highest value of index (0.9928) followed by Albania (0.9919), Cyprus (0.9917), Botswana (0.9915), Benin (0.9909), Costa Rica (0.9884), Denmark (0.9879), Angola (0.9871), Austria (0.9868), Brunei Darussalam (0.9867), Bulgaria (0.9866), Bahrain (0.9848), Cote d'Ivoire (0.9846), Bolivia (0.9829) and so on.

On the other hand, Sudan was at the bottom place with lowest value of EPI (0.1724). Other countries having low value of EPI, but slightly better than Sudan were Dominican Republic (0.181), China (0.1911) and United states (0.3433). Other countries like India (0.5752), Brazil (0.7464), Japan (0.7685), Indonesia (0.7819), Mexico (0.8243), Egypt (0.8295) were having EPI more than 0.5.

Table 6: Environmental Performance Index and GDP per capita for the Year 2014

Countries	EPI	Rank	GDP per capita	Rank
Congo, Rep.	0.9928	1	1961	65
Albania	0.9919	2	3916	53
Cyprus	0.9917	3	20517	24
Botswana	0.9915	4	7027	39
Benin	0.9909	5	583	86
Costa Rica	0.9884	6	5839	45
Denmark	0.9879	7	47220	5
Angola	0.9871	8	2738	61
Austria	0.9868	9	41217	9
Brunei Darussalam	0.9867	10	24185	22
Bulgaria	0.9866	11	4808	48
Bahrain	0.9848	12	17502	28
Cote d'Ivoire	0.9846	13	1079	76
Bolivia	0.9829	14	1323	74
Algeria	0.9765	15	3244	57
Chile	0.9754	16	9728	33
Cameroon	0.9704	17	989	79
Congo, Dem. Rep.	0.9635	18	288	94
Bangladesh	0.9563	19	621	85
Colombia	0.9523	20	4394	50
Australia	0.9192	21	37492	14
Canada	0.9015	22	37529	13
Gabon	0.8959	23	6938	41
Finland	0.8953	24	39090	11
El Salvador	0.8941	25	3063	59
Iceland	0.8935	26	59061	2
Zimbabwe	0.8934	27	475	88
Lebanon	0.8933	28	7241	38
Jordan	0.8931	29	2855	60
Zambia	0.8928	30	1054	77
Switzerland	0.8928	31	59009	3
Honduras	0.8928	32	1577	71
Togo	0.8925	33	424	90

Hungary	0.8922	34	11434	31
Nicaragua	0.8917	35	1367	73
Mongolia	0.8913	36	1796	68
Senegal	0.8905	37	796	80
Guatemala	0.8905	38	2341	63
Panama	0.8903	39	7740	37
Tunisia	0.8901	40	3981	52
Trinidad and Tobago	0.8900	41	14370	29
Sweden	0.8900	42	45551	7
Paraguay	0.8895	43	1929	66
Namibia	0.8893	44	4565	49
Mozambique	0.8889	45	433	89
Ireland	0.8884	46	47257	4
Oman	0.8882	47	13307	30
Morocco	0.8872	48	2531	62
Portugal	0.8869	49	18215	26
Israel	0.8866	50	24340	21
Sri Lanka	0.8849	51	2004	64
Syrian Arab Republic	0.8847	52	1700	69
Nepal	0.8846	53	409	91
Uruguay	0.8845	54	7809	36
Greece	0.8842	55	18229	25
United Arab Emirates	0.8834	56	25141	20
Ghana	0.8828	57	769	83
Romania	0.8822	58	6067	44
Norway	0.8796	59	65240	1
Saudi Arabia	0.8776	60	18060	27
Netherlands	0.8770	61	42893	8
Kenya	0.8768	62	632	84
New Zealand	0.8750	63	29334	17
Singapore	0.8726	64	36898	15
Venezuela, RB	0.8709	65	6402	42
Poland	0.8708	66	10786	32
Peru	0.8681	67	4110	51
Tanzania	0.8677	68	487	87
Ethiopia	0.8660	69	295	92
Nigeria	0.8638	70	291	93
Italy	0.8638	71	29212	18
United Kingdom	0.8617	72	40225	10

Malaysia	0.8600	73	6998	40
South Africa	0.8599	74	6090	43
Ecuador	0.8578	75	3701	54
Philippines	0.8565	76	1581	70
Spain	0.8556	77	25150	19
Iran, Islamic Rep.	0.8517	78	3132	58
Korea, Rep.	0.8503	79	23893	23
France	0.8480	80	35668	16
Vietnam	0.8472	81	1029	78
Thailand	0.8451	82	3438	56
Turkey	0.8443	83	8723	34
Pakistan	0.8329	84	790	81
Egypt, Arab Rep.	0.8295	85	1567	72
Mexico	0.8243	86	8519	35
Indonesia	0.7819	87	1810	67
Japan	0.7685	88	37573	12
Brazil	0.7464	89	5823	46
India	0.5752	90	1190	75
United States	0.3433	91	45710	6
China	0.1911	92	3583	55
Dominican Republic	0.1810	93	4884	47
Sudan	0.1724	94	771	82

Table 7: Profile of Environmental Performance for the year 2014

	High	Upper Medium	Low Medium	Low	Lowest
	Congo, Rep.	Australia	Sweden	Peru	United States
	Albania	Canada	Paraguay	Tanzania	China
	Cyprus	Gabon	Namibia	Ethiopia	Dominican Republic
	Botswana	Finland	Mozambique	Nigeria	Sudan
	Benin	El Salvador	Ireland	Italy	
	Costa Rica	Iceland	Oman	United Kingdom	
	Denmark	Zimbabwe	Morocco	Malaysia	
	Angola	Lebanon	Portugal	South Africa	
	Austria	Jordan	Israel	Ecuador	
	Brunei Darussalam	Zambia	Sri Lanka	Philippines	
	Bulgaria	Switzerland	Syrian Arab Republic	Spain	
	Bahrain	Honduras	Nepal	Iran, Islamic Rep.	
	Cote d'Ivoire	Togo	Uruguay	Korea, Rep.	

	Bolivia	Hungary	Greece	France	
	Algeria	Nicaragua	United Arab Emirates	Vietnam	
	Chile	Mongolia	Ghana	Thailand	
	Cameroon	Senegal	Romania	Turkey	
	Congo, Dem. Rep.	Guatemala	Norway	Pakistan	
	Bangladesh	Panama	Saudi Arabia	Egypt, Arab Rep.	
	Colombia	Tunisia	Netherlands	Mexico	
		Trinidad and Tobago	Kenya	Indonesia	
			New Zealand	Japan	
			Singapore	Brazil	
			Venezuela, RB	India	
			Poland		
Average EPI	0.9814	0.8941	0.8826	0.8303	0.222
Average GDP per capita	9958.9945	14268.1315	17220.1089	10470.542	13737.193

Further, when the EPI of the countries has been compared with GDP per capita, study found that countries which are at the top in terms of EPI ranking have low level of GDP per capita except Denmark and Austria. Congo Rep. with best environmental performance remained at 65th position in terms of GDP per capita, Albania at 53, Cyprus at 24, Botswana at 39, Benin at 86, Costa Rica at 45, Angola at 61, Brunei Darussalam at 22, Bulgaria 48 and so on.

Table shows that out of top twenty countries in terms of EPI, fifteen countries have ranks more than 30 in terms of GDP per capita, eleven countries have more than or equal to 50 and six countries have more than 70. So the countries with low level of GDP per capita have high environmental performance.

When we look at the other extreme i.e. at the bottom of the countries in terms of EPI, no clear relationship has been found between EPI and GDP per capita.

Table 7 presents the profile of environmental performance based on the EPI for the year 2014. All the countries were divided into high, upper medium, low medium, low and lowest categories based on their environmental performance as shown in the EPI given in table 6. The table also shows the average EPI scores and GDP per capita of the countries according to these categories.

The average EPI score for the high performance category is 0.9814. Average GDP per capita for this category is \$ 9958 which is lowest than all other categories. This reveals that countries with highest performance in environment according to the EPI have the lowest average GDP per capita. For upper medium category, the average EPI score is 0.8941. The average GDP per capita for this category is \$ 14268. This category has low environmental performance than high performance category, but average GDP per capita is higher. Next low medium performance category has lesser EPI score i.e. 0.8826 than high and upper medium performance categories but more average GDP

per capita which is \$ 17220. The average EPI score for low category is 0.8303 which is lower than high, upper medium, and low medium categories but average GDP per capita (\$ 10470) is more than high performance category and less than upper medium and low medium categories. The average EPI score for lowest category is 0.222 which is lowest than other categories but average GDP per capita (\$ 13737) is more than high and low performance categories and less than upper medium and low medium categories. The analysis reveals that there is no clear relationship found between environmental performance and GDP per capita for the year 2014.

SECTION - II

In this section, an effort has been made to analyze the relationship between Environmental Performance Index (EPI) and income per capita with the help of regression analysis. The EPI is taken as dependent variable and GDP per capita as an independent variable in regression model. The linear and non-linear regression equations are used to test the possible relationship between the EPI and income.

The result of regression analysis of the relationship between EPI and GDP per capita for the year 1990, 2005 and 2014 are shown in table 8. Table shows that there is significant quadratic relationship between EPI and GDP per capita for the year 1990 i.e. the existence of inverted U type relationship ($\beta_1 > 0$ & $\beta_2 < 0$). In this type of relationship, environmental performance first increases with income and then after reaching maximum point, starts declining. Table further shows that with one unit increase in per capita income, there is 0.383 units increase in environmental performance initially, but after turning point i.e. per capita income level of \$ 1097, environmental performance is going to decrease by 0.063 units with one unit increase in per capita income. The same is depicted by figure 1 also as initially the environmental performance starts increasing and thereafter declining with further increase in per capita income.

Table 8: Regression results of EPI and GDP per capita.

Dependent Variable	Constant	GDP	GDP ²	GDP ³	R ²	F-value	N	Turning Point
EPI (1990)	0.390 (1.593)	0.383** (2.593)	-0.063*** (-2.937)		0.188	10.758***	96	1097.6769
EPI (2005)	0.955*** (64.855)	-0.000001748* (-1.709)			0.03	2.922*	96	
EPI (2014)	0.845*** (29.781)	6.099E-6 (0.878)	-2.409E-10 (-0.802)	2.407E-15 (0.715)	0.009	0.264	94	

Significant at the 1% (***), 5% (**) and 10% (*) levels of significance.

The result of the regression analysis for the relationship between EPI and income per capita for the year 2005 shows that the relationship of EPI (2005) with GDP per capita turns out to be negative (linear) and significant as $\beta < 0$. The negative value of coefficient describes that one unit increase in per capita income leads to 0.000001748 units decline in environmental performance. Thus highlighting the fact that higher level of development leads to lower level of environmental

performance. The same has been shown by downward slopping curve in figure 2, indicating that as per capita income increases, there is decline in environmental performance resulting in loss of environmental quality. The relationship between EPI (2014) and GDP per capita turns out to be cubic but insignificant.

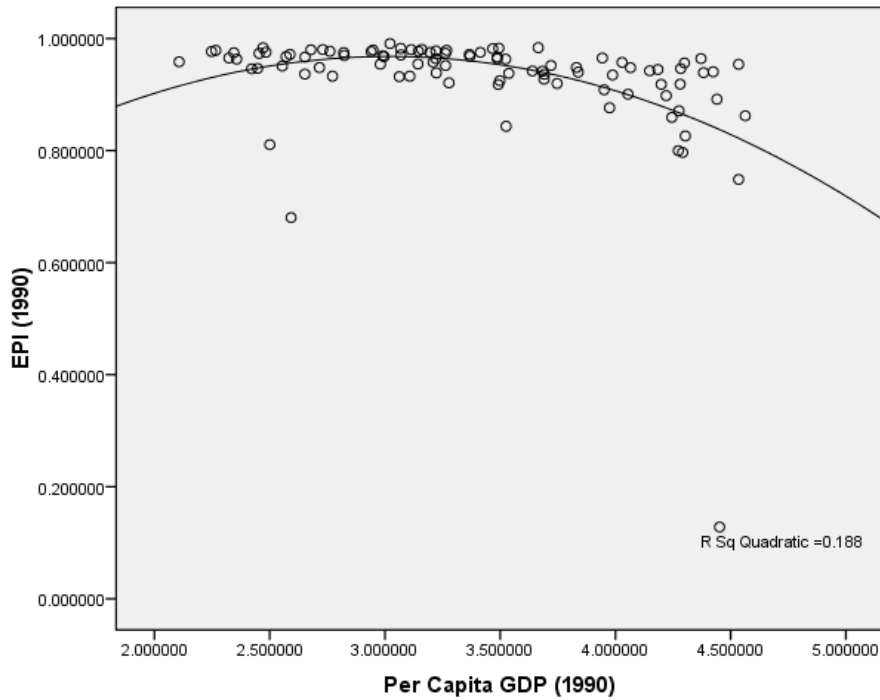


Figure 1: EPI (1990) vs. GDP Per capita – cross-country analysis.

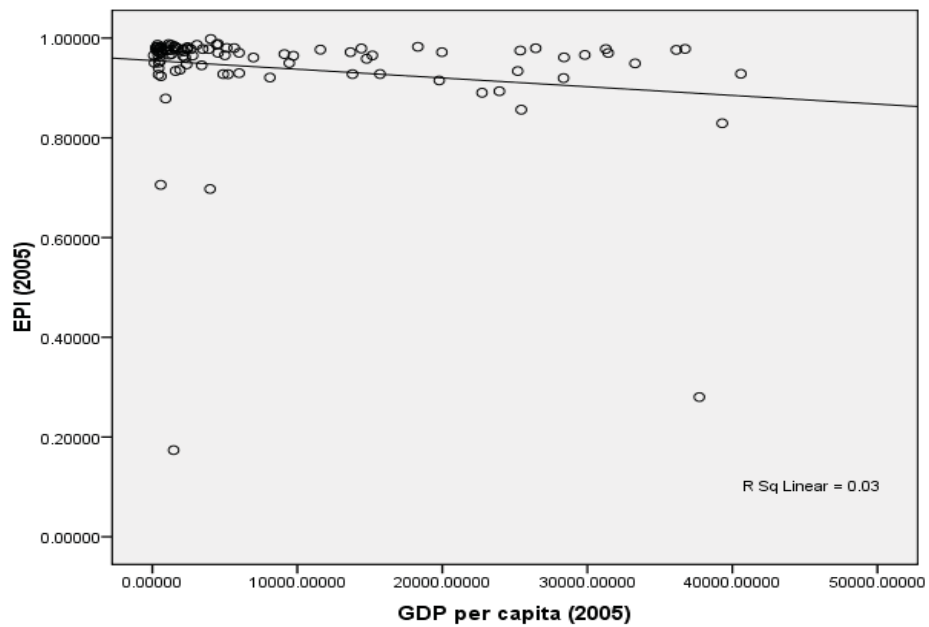


Figure 2: EPI (2005) vs. GDP Per capita – cross-country analysis.

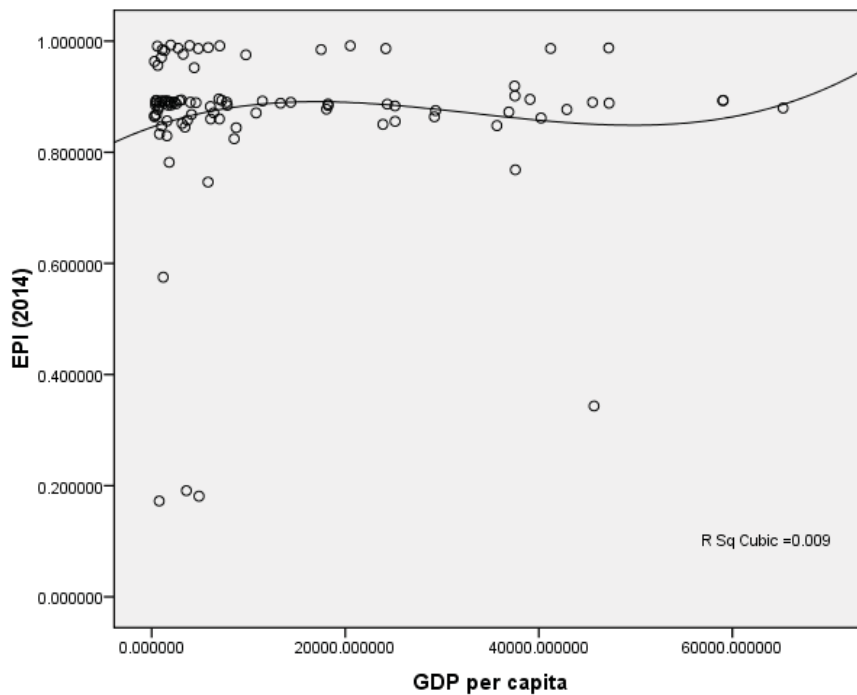


Figure 3: EPI (2014) vs. GDP Per capita – cross-country analysis.

SECTION– III CONCLUSION

The study found that there are large variations in environmental performance of the different countries. The analysis revealed that in the year 1990, Honduras is at the top with highest value of Environmental Performance Index (EPI) among the 96 countries followed by Gabon, Benin, Costa Rica, Rep. Congo, Panama, Guatemala, Zimbabwe and Ecuador. Further, United States has the lowest EPI. Except USA all other countries have EPI value above 0.5. Other countries having value of index more than United States were China, Japan, Canada, France, India, United Kingdom, Brazil, Australia, United Arab Emirates, Netherlands, Bahrain, Norway and Italy.

Further, it has been found that countries with high environmental performance have low level of GDP per capita as shown by the ranking of the countries in terms of EPI and GDP per capita. This indicates that the countries with high environmental performance are the less developed countries with low level of GDP per capita. On the other hand, countries with low environmental performance have high level of GDP per capita. Countries which are at the bottom in terms of EPI ranking have high GDP per capita ranking except for two countries China and India.

It emerges from the analysis that the relationship between environmental performance and economic development is negative, meaning there by that countries with high economic development have low environmental performance and vice-versa. This relationship points to the fact that the process of economic development leads to more exploitation of resources both natural as well as economic, which results in environmental degradation, thus low value of EPI.

In the year 2005, Gabon occupies the top position with highest value of EPI followed by Costa Rica, Rep. Congo, Panama, Benin, Dominican Republic, Honduras, Albania, Nicaragua, Zimbabwe and so on. When we look at other extreme, China was at the bottom place with lowest value of EPI. The country having low value of EPI, but slightly better than China was United States. Brazil, India, Japan, Canada, Indonesia, France, Australia had EPI more than 0.5 but were placed at the bottom of the table as compared to other countries with better EPI. The study further reveals that countries having good performance in EPI, have not shown satisfactory performance at GDP per capita level. On the other hand countries which have achieved high economic development, failed to maintain their environment well.

The study also made comparative analysis of Environmental Performance Index (EPI) and GDP per capita for both the periods i.e. 1990 and 2005. The analysis revealed that countries in the group of top 20 positions during the year 1990 in terms of EPI, remained in this group for the year 2005 as well except for the countries Guatemala, Paraguay, Sri Lanka, Nepal, Bolivia and Tanzania. These countries were out placed by other six countries (namely Albania, Cote d'Ivoire, Brunei Darussalam, Ghana, Togo and Lebanon) which performed better in terms of environment and entered into top 20 countries list by the year 2005. Out of these six countries, Brunei Darussalam had significantly improved its position i.e. from 78 to 13. Now when we look at the other extreme i.e. 20 worst performing countries in 1990, these countries remained in the bottom 20 places except the countries like Brunei Darussalam, Singapore, Saudi Arabia, Bahrain, Netherlands and United Arab

Emirates. New countries that were added in the 20 worst performer list during the year 2005 were Indonesia, Pakistan, Sudan, Turkey, Rep. Korea and Mexico.

Further, the study found that the ranks of almost all the countries changed in terms of EPI and GDP per capita in 2005 as compared to 1990. But in 37 countries, change in EPI ranks in the study period is more than or equal to 15 places. In these 37 countries, major changes (more or equal to 5 ranks) in GDP per capita ranking have occurred in 12 countries. Of these 12 countries, in eight countries the change in positions in terms of GDP per capita was in the opposite direction as change in their EPI rankings.

In year 2014, Congo Rep. is at the top position with highest value of index followed by Albania, Cyprus, Botswana, Benin, Costa Rica, Denmark, Angola, Austria, Brunei Darussalam, Bulgaria, Bahrain, Cote d'Ivoire, Bolivia and so on. On the other hand country Sudan was at the bottom place with lowest value of EPI. Other countries having low value of EPI, but slightly better than Sudan were Dominican Republic, China and United states. Other countries like India, Brazil, Japan, Indonesia, Mexico and Egypt were having EPI more than 0.5. The analysis reveals no clear relationship between environmental performance and GDP per capita for the year 2014.

The analysis revealed that for the year 1990, there was significant quadratic relationship between EPI and GDP per capita i.e. the existence of inverted U type relationship ($\beta_1 > 0$ & $\beta_2 < 0$). In this type of relationship, environmental performance first increases with income and then after reaching maximum point, starts declining. Further, the relationship of EPI with GDP per capita for the year 2005 turns out to be negative (linear) and significant as $\beta < 0$. Thus highlighting the fact that higher level of development leads to lower level of environmental performance. In year 2014, the relationship between EPI and GDP turns out to be insignificant.

The present analysis clearly revealed the negative relationship between environmental performance and income per capita that means increase in income has unfavourable effect on environmental quality.

REFERENCES

- Antle, John M. and Gregg Heidebrink (1995), *Environment and Development: Theory and International Evidence*, Economic Development and Cultural Change, 43 (3), 603-625.
- Central Statistical Organisation, *Compendium of Environment Statistics of India, 2008*, Ministry of Statistics and Programme Implementation, Government of India.
- Commission on Environmental Accounting (1991), *Taking Nature into Account: Proposed Scheme of Resource and Environmental Accounting*, Stockholm: Ministry of Finance.
- Singh, Kuldeep and Sharanjit Singh Dhillon (2018), *Economic Development and Environment: The Indian Experience*, International Journal of Ecology and Development, 33 (1), 67-93.
- World Commission on Environment and Development (1987), *Our Common Future*, Oxford University Press, New York.
- World Bank (1992), *World Development Report 1992: Development and the Environment*, Washington DC.
- _____(2010), *World Development Report 2010: Development and Climate Change*, Washington DC.
- _____, *World Development Indicators*, Washington DC, Various Issues.