Linkages between Women's Education and Environmental Quality : Evidence from India

Dr. Anup Sinha
Dr. Ritumani Haloi
Dr. Pratiti Singha

Abstract

Presently the perception of environmental sustainability is the major concern of the world. The continuous growth of population and developmental activities severely decrease the quality of environment and act as a key source of environmental degradation. Loss of environmental quality on the one hand directly affects health status and on the other hand acts as a major threat to quality of life. Under such condition, women's education gains topmost priority. This is because educated women not only play significant role in economic development and controlling population but also help in managing and preserving natural resources. This ultimately plays major role in environmental sustainability. In this paper we have investigated the impact of women's education on environmental quality in India using secondary data. Environmental quality is measured by Environmental Quality Index, developed by 'Planning Commission'. Higher value of the index implies higher quality of environment and more sustainability and vice versa. On the other hand, women's education is measured by Girls' Gross Enrolment Ratio in higher education. The regression result revealed girls' gross enrolment in higher education significantly affects the quality of environment in India. Therefore, as an act of the deeper understanding of the connection between women's knowledge and environmental sustainability, emphasis should be placed on increasing girls' enrolment in higher education in India by providing affordable quality education.

Keywords: *Women's Education, Environmental Quality Index, Sustainable Development, Regression Analysis, and India.*

1. Introduction

During the last few decades the world has experienced drastic loss in environmental quality due to the destruction of environment on a comprehensive scale. The continuous growth of population and developmental activities are the major causes of environmental degradation. Among other factors, global warming caused by rise of CO_2 in atmosphere and massive deforestation is pointed out as another main cause of degradation (Lim et al., 2022). Apart from this, other major factors responsible for environmental degradation include poverty, urbanization, agricultural and various institutional factors etc. (Chopra, 2016; Lim et al., 2022). Immense environmental impairment has numerous negative consequences on ecosystem and human life. Loss of environmental quality on the one hand directly affects health status and on the other hand acts as a major threat to quality of life.

India is recognized as one of most severely affected nations in the world due to environmental damage. Degradation of environment directly affects the health of millions of population while indirectly it causes death in India. Apart from health concerns, it has economic consequences as well. According to World Bank the cost of environmental damage is estimated to be about $80 billion in a year (Financial Times, 2013). The figure accounts approximately 6 per cent of India's GDP. Several researchers put forward many causes for environmental damage in India. But the most important reason for the poor state of environment is India's enormous size of population along with massive poverty (Nagdeve, 2007; Jha, 2018). Thus, present state ofthe environmental health along with its social and economic consequences become the key concern in India.

In the face of rigorous efforts by government and other development agencies, the quest for environmental sustainability is the major concern of the world including India. In fact, there is growing commitment and consensus among the policy makers regarding environmental sustainability at local, regional and international level which has been recognized as one of the core discussions in development studies in the recent past. The extraordinary changes in the environmental patterns symbolize a threat to human beings and life on this earth. Precisely, the essence of understanding environmental degradation and deteriorating health status and quality of life in a gender perspective is very much crucial due to differences in the socio-economic roles and rights between men and women. However, even today, while assessing the linkage between human beings and nature in environmental perspectives, women's knowledge, perspectives and needs are being overlooked by the Environmental Education research and theory (Martin, 2016). Against this backdrop and in the context of growing interest in understanding the role of women in environmental sustainability.

Objectives : The objectives of the present study are twofold.

Firstly, the study aims to understand the state-wise scenario of environmental performance index in India.

Secondly, the primary aim of this paper is to investigate the impact of women's education on environmental quality in India using secondary data sources.

2. Linkage between women and environment

Although the linkage between women and environment in the development process is a recent one but in reality its journey started in 1985 at the World Conference held in Nairobi where the action plan was drawn to strengthen the leadership of women in environmental management and administration and to provide information, education and training to women on environmental issues (Rico, 1998). Similarly, it is difficult to have a consensus regarding the notion of environmental sustainability which is universally acceptable as its quality or intensity is not the same across space and time. Broadly speaking, it can be said that environmental sustainability is a situation of interaction with the environment to stay away from the depletion or the degradation of natural resources so as to generate a long term environmental quality.

Previous research works have analyzed and established that women play an ample role in natural resource management and contribute a lot to environmental conservation. In this context, (Moser 1991) states that the role played by women in environment can be examined as managers or maintainers of the natural environment, as rehabilitators of the natural environment in the sense of sustainable development, and as innovators in the use of appropriate technology in the creation of new environments. Besides, women play an important role in managing the natural resources available to them and is profound in adopting different mechanisms to deal with the kinds of environmental crisis they face (Dankelman et.al., 1997). The fact is that even today more than 70 percent Indian women are directly dependent on the natural resources such as fuel, food and fodder, forest, water and land chiefly in rural areas. Thus, being the daughter of nature, women also act as farmers, as collectors of water and firewood and most importantly have a close connection with their local environment and often suffer most directly from environmental harms (Aditya,2016). Moreover, women are more attached to the natural environment than men as they are basically accountable for household management. As a result, this section of people living in the society are more likely to suffer from a ruined home, locality, and city environment and to bear more of the burden that goes with living in poor housing and communities with inadequate residential and health infrastructure; they suffer the most since they spend more time at home and its immediate surrounding area (Etta, 1999). Factors like use of resources at unsustainable levels, inefficient

technologies, improper administrative practices, poor economic development policies, growing population pressure on natural resources, unscientific development practices, ignorance about the laws and regulation of environment protection, poor education, are related to the critical threats to the environment such as the deterioration of human health (Ibanez et.al.2018).Therefore, under such circumstances, protection of environment is the utmost priority. In this regard the initiative like- the 1992 UN Earth Summit, Chipko Movement in India, Kenya's Green Belt Movement, Appiko movement, Save Silent Valley Movement, and Narmada Bachao Andolan, the ongoing movement of Medha Patekar (Indian social worker), Menaka Gandhi (an Indian environmentalist and politician) reflects the trend that most of the participants are women, Adivasis, and poor people (Shiva, 1988).

In this way, although women have done all this, their contributions towards environment have generally been undervalued which strongly advocates for empowering women through education. In fact, a systematic approach is very much essential to link the environmental issues with the women's education in the development process. This is because environmental dimensions of development and women's education are inseparable, and that this link is a result of the aggregate effect of social relationships and actions as they influence the natural ecology on the one hand and the impact of women education on environmental changes on society on the other hand (Gallopín,1986). Moreover, earlier researches have also affirmed that people's commitment and involvement in public debates about environmental problems vary according to their levels of education and understanding of the issue (Salehi et al. 2015). Besides, women's education has been considered as an essential tool for women empowerment for long time but the relationships between women's education and environmental quality have not been deeply explored in the field of environmental education research (Sakellari et.al. 2013). In this way, the extent of literature outlined here has served to underscore various aspects of environmental sustainability in the context of developmental perspectives. Understanding the linkage between gender especially of women and the environment and sustainability has emerged as an important segment of environmental discussion because loss of environmental quality on the one hand directly affects health status and on the other hand acts as a major threat to quality of life. So, the proposal of women's education gains top most primacy. This is because educated women not only plays significant role in controlling population but also helps in managing and preserving natural resources. Under such circumstances, understanding whether women's education improves environmental quality is the need of the hour from developmental perspective and against this backdrop the researcher has found a gap and showed interest to make a study to fulfill the gap.

3. Methodology

3.1 Data

The study is conducted by collecting data from many secondary sources. The data related to Environmental Performance Index (EPI) are collected from the paper of (Chandrasekharan, et al., 2020). It is used as a proxy of environmental quality (Mukherjee and Chakraborty, 2009). On the other hand, the data for Girls Gross Enrolment Ratio (GGER) and NSDP per capita (NSDP) are compiled from Handbook of Statistics on Indian Economy, published by RBI. The variable GGER is used to measure the extent of women's education. Per Capita Energy Consumption (PCEC), and Emission Intensity data are collected from State Energy & Climate Index Round-I. Other variables such as Urbanisation (URB), and Population (POPU), are collected from Census 2011, and https://uidai.gov.in/images/state-wise-aadhaar-saturation.pdf, respectively. For this study, we have collected data (for all the variables) for the year 2020, covering 28 states and 3 UTs of India. The variables description are shown in Table-1.

Table 1 : Description of the variables

Variable	Definition	Type of Variables	Source
Environmental Performance Index (EPI)	Represents the quantitative measure of environmental wellbeing.	Dependent Variable	Chandrasekharan, et al., (2020)
Girls Gross Enrolment Ratio (GGER)	Displays the share of girls enrolled in higher secondary studies	Independent Variable	RBI
Urbanisation (URB)	Refers to the share of population lives in urban areas	Control	Census 2011
Population (POPU)	Shows total number of population in millions	Control	https://uidai.gov.in/images/state-wise-aadhaar-saturation.pdf
NSDP per capita (NSDP)	Shows per capita Net state domestic product (in Rs.) at 2011–2012 (constant) prices	Control	RBI

Variable	Definition	Type of Variables	Source
Per Capita Energy Consumption (PCEC)	Shows energy consumption in kg of oil equivalent per capita	Control	State Energy & Climate Index Round-I
Emission intensity	Emission intensity referstothe extent of emissions in terms of GDP.	Control	State Energy & Climate Index Round-I

Source: Researchers' own specification

3.2 Methods

In this section we have discussed the appropriate method used in the study to analyse the objective concerned. As the variable Environmental Quality Index (dependent variable) ranges from 0 to 1, we have identified our model as non-linear model. The rationale for deciding such specification is to avoid the problem of unboundedness. The logistic (non-linear) regression equation to investigate the impact of girl's gross enrolment on environment quality is shown as:

$$EPI_i = \frac{1}{1 + e^{-[\alpha_i + \beta_i GGER_i + Z' + u_i]}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

$$EPI_i = \frac{e^{[\alpha_i + \beta_i GGER_i + Z' + u_i]}}{1 + e^{[\alpha_i + \beta_i GGER_i + Z' + u_i]}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

$$1 - EPI_i = \frac{1}{1 + e^{-[\alpha_i + \beta_i GGER_i + Z' + u_i]}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

$$\frac{EPI_i}{1 - EPI_i} = e^{\alpha_i + \beta_i GGER_i + Z' + u_i} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

Interestingly it is observed that, although we have started with the selection of non-linear model, our final model becomes linear model. Now, if we take natural log on the both sides of the equation (4) then

$$\ln\left[\frac{EPI_i}{1 - EPI_i}\right] = \alpha_i + \beta_i lnGGER_i + lnS' + u_i$$

Or,

$$Z_i = \alpha_i + \beta_i lnGGER_i + lnS' + u_i$$

Where, Z_i shows for log of odds ratio of environmental quality index and GGER represents girls' gross enrolment ration in higher education, a_i and u_i are the intercept and error term respectively. S' is set of all possible control variables.

4. Analysis of the Results

4.1 State-wise scenario of environmental performance index

Degradation of environment is one of the most serious causes of concern in the world including India (The Economic Times, 2019). Expanding the growth of population along with the practice of pesticides and insecticides in agricultural activities severely affects the quality of environment. The latest report provided by the 'World Economic Forum' claims that among the 180 countries,India ranks168thin relation to environmental performance in 2021. The rank further decreases and hits the bottom as India languishes at 180thin 2022. These figures show the extent of ill health of environment and severity of the concern in India. Therefore, for deeper understanding of the fact, we have analysedstate-wise scenario of India's environmental performance index in figure - 1 :

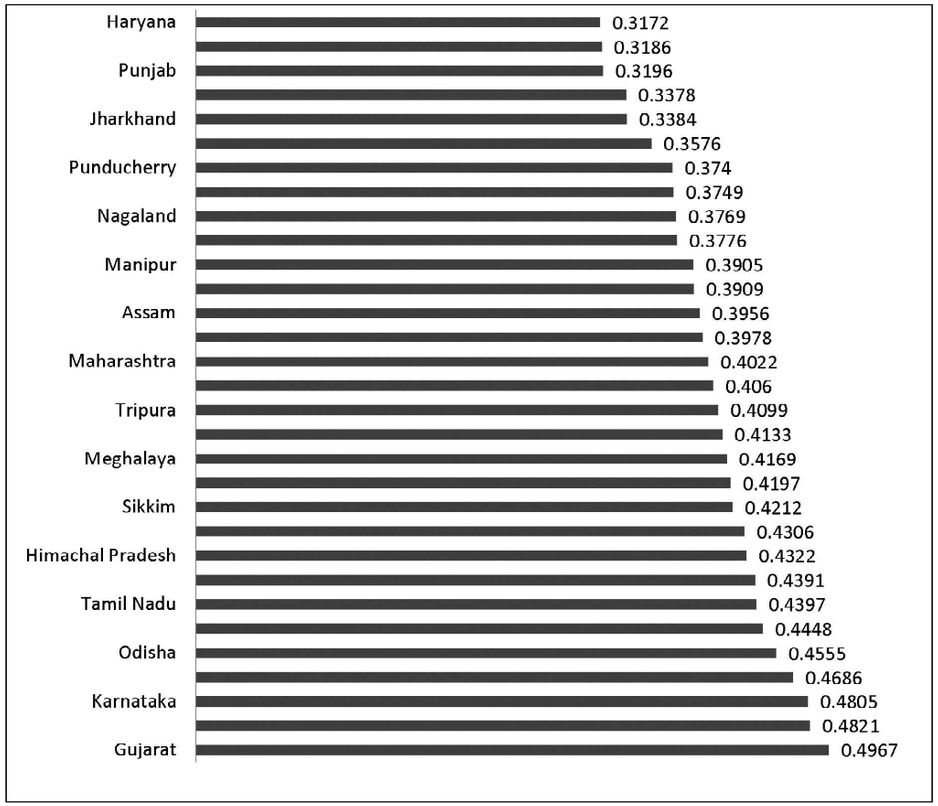


Figure 1: Snapshot of Environmental Performance Index across Indian states

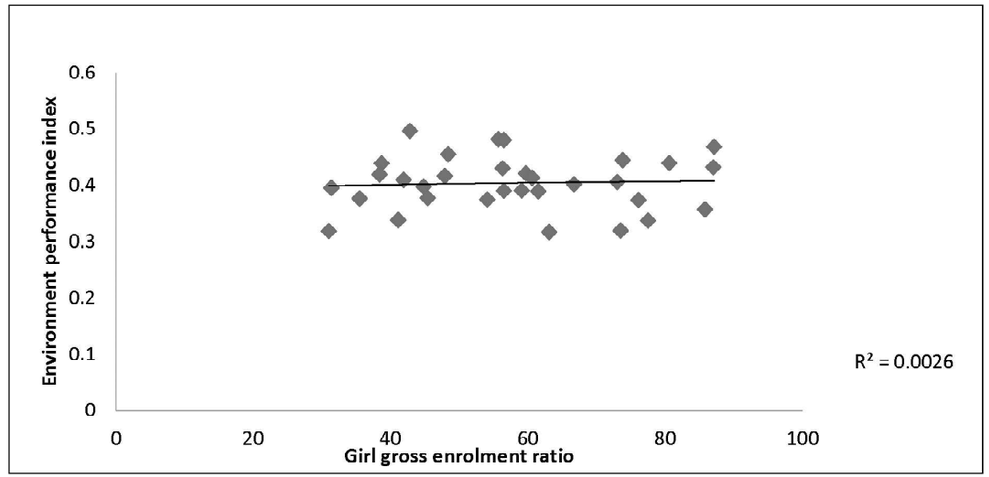
Source: Researchers' own drawing

The figure-1 reveals that, there is huge dis-similarity in the performance of environmental quality index among the states. The highest value of the index is recorded for Gujarat followed by Andhra Pradesh, and Karnataka. On the contrary, the lowest value is observed for Haryana. The disparity in the performance of environmental quality index is may be due to dissimilar environmental laws and regulations in Indian states (Priyadarshini and Gupta, 2003). In fact, dissimilar socio-cultural background and respect towards nature are also another cause for such disparity (Dwivedi, 2006).

4.2. Impact of women's education on environmental performance

In this segment, we have analysed the impact of women's education on environmental performance. Here we begin with examination of scatter diagram analysis to cognize the relation between the concerned variables. The diagram shown in figure-2 reveals that there is positive association between girl's education and environmental performance (hence environmental quality) in India. But the relation is found to be weak as the recorded value of R square is very low. The probable reason for such weak relation is due to non inclusionof other variables that may affect the association.

Figure 2: Scatter analysis for Association between Environmental Performance Index and Girls Gross Enrolment Ratio



Source: Researchers' own drawing

Consequently, we have included number of control variable in the regression model that may affect the association. Thus the final regression equation (see methodology for details) to investigate the impact of women's education on environmental performance is given as:

$$Z_i = \alpha_i + \beta_i lnGGER_i + lnS' + u_i$$

Where, Z_i shows for log of odds ratio of environmental performance index and GGER represents girls' gross enrolment ration in higher education. The S/ is the set of control

variables that include Urbanisation (URB), Population (POPU), Per Capita Energy Consumption (PCEC), NSDP per capita (NSDP), Emission intensity, and Deforestation (DF). Summary statistics of variables are presented in Appendix Section (Table-A1). The result of logistic regression model is shown in Table-4:

Table 4: Result of regression analysis (Logistic)

Varables	Coef.	Std. Err.	t Stat.	Pro. Value
ln GGER	0.10463	0.06613	1.58*	0.100
lnURB	-2.75553	0.532179	-5.18***	0.000
lnPOPU	-0.018724	0.01315	-1.42*	0.100
lnEC	0.064799	0.071317	0.91	0.373
lnSDP	0.138623	0.071108	1.95*	0.064
lnEI	-0.00937	0.025845	-0.36	0.720
lnDF	-0.0302	0.007754	-3.89***	0.001
Cons	-0.0159871	0.0493427	-0.32	0.749
		Model Summary		
F(7, 23)			3.12**	
R-square			0.58	
Adj. R-square			0.49	

Source: Researchers' own calculation

Note: ***, **, and * shows 1 percent, 5 percent, and 10 percent level of significance respectively.

In the above table, let us first discuss the appropriateness of the model used in our analysis. This can be understood from F statistics. It is seen that the F statistic (3.12) is statistically significant at 5 percent level. This implies that our overall model is significant. This result is further supported by adjusted R square (0.49) and claimed better fit model.

Since our model is statistically sound and free from statistical errors, we will now focus on regression results.In Table-4 we found that the coefficient of girls' gross enrolment in higher education (0.10) is positive and statistically significant. This implies that girls' education positively impact environmental quality. Further, value of the coefficient implies that, if girls' gross enrolment in higher education increases by 1 percent environmental quality will improve by 10 percent. In general women are more concerned and careful about environmental

issues compared to male due to their caring behavior (Stern et al., 1993). Thereforeeducated women are not only more aware about environmental illness but also able to make more sustainable choices that helps in managing and preserving natural resources (Imran et al., 2021). Besides, beingthe first teacher of their children, educated women teachfuture generation the importance of environment and make them more concerned about environment (Sola, 2014). All these aspects ultimately improve the quality of environment and make it more sustainable.

Among other determinants, urbanization negatively and significantly influences environmental quality. This is becauseindustrial activities associated with the rise in urbanization produceseveral types of pollution (such as water, air and soil pollution) which decreases the quality of environment (Uttara et al., 2012). Similarly, growing population has negative and significant impact on environmental quality. With growing population, the extraction of resources from environment also increases to satisfy growing needs (Pimentel et al., 1997). And rise in resource extraction along with other negative consequences of growing population decreases the quality of environment(Weber, and Sciubba, 2019). At the same time, the variable deforestation also negatively influences environmental quality in India. This is because, deforestation adversely affects climate and biodiversity which results in loss of environmental quality (Vajpeyi, 2001). However, the coefficient of SDP is found to be positive and significant. This indicates that, per capita SDP positively influences environmental quality.

5. Conclusion and policy formulation

In the present day, loss of environmental quality is the most serious concern in the world. The continuous growth of population and developmental activities severely decrease the quality of environment. It acts as a key source of environmental degradation. Loss of environmental quality on the one hand directly affects health status and on the other hand acts as a major threat to quality of life. India being the second largest populous country with massive poverty and illiteracy, is under serious environmental threat. This is becausethe illiterate and poor people make more environmental damage by over exploitation ofnatural resources compared to the rich and literate people. The severity of the concern can be traced from India's lowest rank (180th rank) in terms of Environmental Performance Index. In this paper, we have investigated the impact of women's education on environmental quality (environmental performance index) in India. The study shows that, there is huge dis-similarity in the performance of environmental performance index among the states. Almost in all the states the value of environmental index is less than 0.5 which is very negligible compared to the developed countries. These outcomesvisiblypoint outthe severity of thefact and the crucialrequirement for sustainable policy measure.Further, the regression resultshows that

girls' education positively impact environmental quality in India. This may be because educated women make more sustainable choices for environmental wellbeing than less educated women.This result empirically establishes the well-acclaimed fact of women's knowledge-environment relationship.

Therefore, in order to understand the connection between women's knowledge and environmental sustainability, emphasis should be laid on increasing girls' enrolment in higher education in India by providing affordable quality education. Additionally, since India witnessed gender discrimination in the access of education, govt. should adopt appropriate policies to remove such inequalities for increasing girl's enrolment (Tippa, and Mane, 2018). Apart from this,looking at the negative impact of growing population and deforestation, govt. should adopt strict policies to control population as well as deforestation in India.As expected, urbanization adversely affects environmental quality in India.But as urbanization reflects country's growth, we can't resist urbanization. In such case policies need to be adopted to encourage the use of CNGs and the plantation of trees in urban areas in order to reduce the negative impact onenvironment.

Works Cited:

Aditya, S.K. (2016). Role of Women in Environmental Conservation. *International Journal of Political Science and Development*, 4(4),140-145.

Chopra, R. (2016). Environmental degradation in India: causes and consequences. *International Journal of Applied Environmental Sciences*, *11*(6), 1593- 1601.

Dankelman. I & Davidson, J. (1997). Women and Environment in the Third World. Landon; Earthscan publication.

Etta, F.E. (1999). Maroko low- income settlement in Lagos, Nigeria; Gender and Urban Natural resources management in D. L. smith women managing resources Mazigira institute, Nairobi.

Gallopín, G. (1986). Ecología y ambiente. *Los problemasdelconocimiento y la perspectivaambiental del desarrollo*, Enrique Leff (ed.), Mexico City, SigloVeintiunoEditores.

Ibanez, M.E & Munoz, L.V.A. (2018). The role of women in environmental education, *MedCrave-Open Access Journal of Science*, 2(5).

Imran, M., Akhtar, S., Chen, Y., & Ahmad, S. (2021). Environmental Education and Women: Voices From Pakistan. *SAGE Open*, *11*(2), 21582440211009469.

Jha, P. (2018). Poverty and Environmental Degradation in India. Supremo Amicus, 8, 168.

Lim, C. H., Lim, B. S., Kim, A.R., Kim, D. U., Seol, J. W., Pi, J.H., ... & Lee, C.S. (2022). Climate change adaptation through ecological restoration. In *Natural Resources Conservation and Advances for Sustainability* (pp. 151-172). Elsevier.

Martins, A.N. (2016). Environment,Communication and Politics. Masters Dissertation-15ECTS, Sodertorn University.

Moser, C.O.N. (1991).Gender Planning In the Third World: Meeting Practical and Strategic Needs. In R. Grant and K. Newland (eds) Gender and International Relations, (83-121).Buckingham: Open University Press.

Mukherjee, S., &Chakraborty, D. (2009). Is there any relationship between Environmental Quality Index, Human Development Index and Economic Growth? Evidences from Indian States.

Nagdeve, D. A. (2007). Population growth and environmental degradation in India. *International Institute for Population Sciences. http://paa2007. princeton. edu/papers/7192. Department of fertility studies, Govandi station road, Deonar, Mumbai*, *400*, 088.

Pimentel, D., Huang, X., Cordova, A., & Pimentel, M. (1997). Impact of population growth on food supplies and environment. *Population and environment*, 9-14.

Priyadarshini, K., & Gupta, O. K. (2003). Compliance to environmental regulations: The Indian context. *International Journal of Business and Economics*, *2*(1), 9.Rico, M.N. (1998). Gender, the environment and the sustainability of development, UN, Santiago, Chile.

Sakellari, M & Skanavis, C. (2013). Environmental Behavior and Gender: An Emerging Area of Concern for Environmental Education Research, *Applied Environmental Education & Communication*, 12(2), 77-87, DOI: 10.1080/1533015X.2013.820633.

Salehi, S., Pazuki N. Z., Mahmoudi, H and Knierim, A. (2015). Gender, responsible citizen and global climate change. *Women's StudiesInternational Forum*,50,30-36.

Shiva, V. (1988). Staying Alive: Women, Ecology and Survival in India. New Delhi: Kali for India.

Sola, A. O.(2014). Environmental education and public awareness. *Journal of Educational and Social Research*, *4*(3), 333.

Stern, P. C., Dietz, T., &Kalof, L. (1993). Value orientations, gender, and environmental concern. *Environment and behavior*, *25*(5), 322-348.

Tippa, N. G., & Mane, S. R. (2018). Gender Inequality in India: A Reflection and Review. *Mahila Pratishtha*, 81.

Uttara, S., Bhuvandas, N., &Aggarwal, V. (2012). Impacts of urbanization on environment. *International Journal of Research in Engineering and Applied Sciences*, *2*(2), 1637-1645.

Vajpeyi, D. K. (Ed.). (2001). *Deforestation, environment, and sustainable development: a comparative analysis*. Greenwood Publishing Group.

Weber, H., &Sciubba, J. D. (2019). The effect of population growth on the environment: Evidence from European regions. *European Journal of Population*, *35*(2), 379-402.

https://www.ft.com/content/0a89f3a8-eeca-11e2-98dd-00144feabdc0 (Accessed on 23/03/2022).

https://energy.economictimes.indiatimes.com/energy-speak/how-is-india-dealing-with-environmental-risks-and-climate-change/3824(Accessed on 24/03/2022).

Appendix

Table-A1: Summary Statistics

Variables	Mean	Standard Deviation	Min	Max	Count
Environment Performance Index	0.40	0.04	0.317	0.49	31
Girl Gross Enrolment Ratio	57.74	16.86	31.00	87.10	31
Urbanisation	36.18	21.32	10.03	97.50	31
Population	42.92	52.00	0.69	237.88	31
NSDP per capita (constant)	123736.9	76377.57	310	374055	31
Percapita Energy Consumption	234.37	102.62	71.80	471.70	31
Emissionintensity	0.012	49.54	0.02	0.077	31
Deforestation	64684.35	94615.07	12	287000	31

Source: Researchers' own calculation