

Measurement of Environmental Performance Index: A Case Study of Calicut City

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Abstract-Environment means the surrounding in which the organisms live. Due to different reasons the quality of environment is decreased. Quality of the environment can be determined by measuring the environmental performance index. A study was conducted on Calicut city. Different environmental indicators are selected for calculating the environmental performance index, such as water quality, air quality, sewerage and sanitation and solid waste management etc. Pyramidal four level indicator framework method was used for finding the EPI. The frame work consists of data variables, preliminary indicators, thematic indicator and environmental performance index. Weightages were provided for thematic indicators according to their importance on environmental performance. The thematic indicators were selected as growth of cities, state of natural resources, state of urban services and initiatives for improving city environment. The environmental performance index of Calicut city was found to be 55.8. The Environmental performance index of Calicut city obtained from the study is considered as moderate. Average water quality index of Calicut City was found to be 44.8. By comparing the standard values of water quality index, water quality status of Calicut city was found to be marginal.

Keywords-Environment; Environmental quality; Water Quality Index; Air Quality; Four level indicator; Environmental Performance Index

I. INTRODUCTION

The term environment has been derived from a French word “Environia” means to surround. It refers to both abiotic (physical or non-living) and biotic (living) environment. The word environment means surroundings, in which organisms live. Environment and the organisms are two dynamic and complex component of nature. Environment regulates the life of the organisms including human beings. Human beings interact with the environment more vigorously than other living beings.

The adverse impact felt is due to natural resources depletion and the health consequences of air, soil and water pollution and inadequate waste management. It is well

recognized that environmental degradation leads to additional economic hardships to the vulnerable sections of the population. Environmental problems therefore should no longer be viewed by the states as a consequence of development alone, but there should be continued focus on pollution abatement, promotion of adherence to environmental standards, natural resources conservation and adopting the 3Rs (reuse, recycle, recover)/4Rs (reuse, recycle, recover and remanufacture). Considering the influence of natural resources depletion and unabated pollution on many sectors of the economy and well-being of the citizens, it was considered necessary to evolve an environmental performance index (EPI).

II. MATERIALS AND METHODS

2.1 Study Area

Kozhikode Corporation forms part of Kozhikode Taluk of Kozhikode District. The city situated on the West Coast of Indian sub-continent and on the North West of Kerala state, at latitudes between 110 12’ N to 110 23’ N and longitudes between 750 39’E to 750 49’E and has Korappuzha as its North boundary, Thalakkulathur, Kakkodi, Kunnamangalam, Peruvial and Perumanna panchayats on the East, Kadalundippuzha on the South and Lakshadweep Sea on the West. Kozhikode City had a population of 614366 (2011 Census). [1]

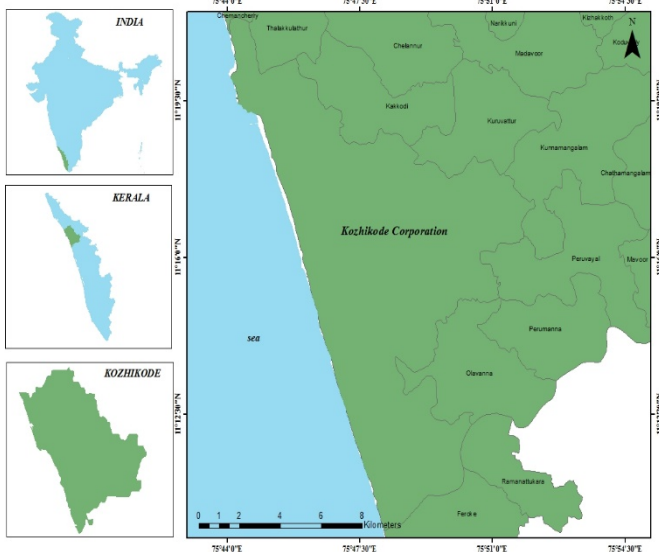


Fig 1: Map of Calicut City [1]

2.2 Environmental Performance Index

Environmental indicators and performance indices are emerging as powerful tools for decision makers to navigate the uncertain information landscape. They distil complex information, allowing decision makers and key audiences to efficiently spot critical areas of concern, support policy development and target setting, and measure impacts of policy responses. The EPI ranks countries as well as cities on performance indicators tracked across policy categories that include both environmental public health and ecosystem vitality. These indicators, aimed at the national government scale, provide a gauge of a country’s performance toward policy goals. The EPI stands out from other quantitative environmental efforts.

Sl No	EPI Score	Classification
1	0 -25	Poor
2	25 – 50	Marginal
3	50 – 75	Moderate
4	75 – 100	Good

Table 1: Classification of Environmental Performance Index

2.3 Four level indicator framework

Four level indicator framework method was adopted for the determination of environmental performance index. At the base of the indicator pyramid are the data variables. The data variables are translated to preliminary indicators under various thematic groups. All the preliminary indicators under same theme add up to give scores of thematic indicators.

Adding up score of thematic indicators finally give the apex score, that is the Environmental Performance Index (EPI).

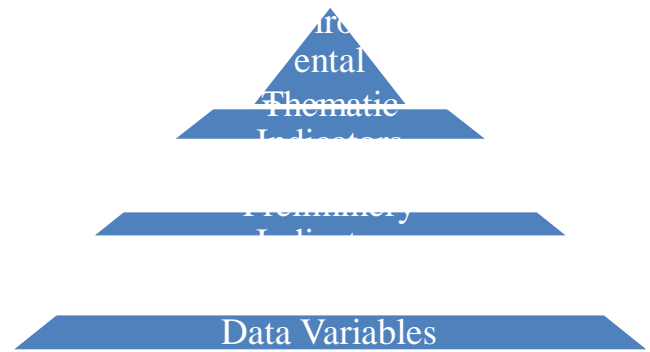


Fig 2: Four level Indicators

2.4 Thematic Indicators

In this study the thematic indicators used in the four level indicator frame work were growth of cities, state of natural resources, state of urban services and initiatives for improving city environment. The scoring was proposed in such a way that maximum of the score will show the best environmental performance of the city. Weights were defined as per the contribution of that theme into city environment. Different preliminary indicators were considered under each thematic indicator. A number of data variables were considered under each preliminary indicator. There were total 64 data variables in this present study. The preliminary indicators under growth of cities theme include: demographic, economic, industrial and spatial growth; state of natural resources theme include: land, air, water, energy and humans; urban services theme include: water supply, sanitation, transport and solid waste management and the initiatives for improving city environment theme includes: Environment education, waste management, and traffic and slum improvement. In this study water quality index was a data variable, which was calculated by CCME water quality index method. Provide scores for the data variables like 0, 0.2, 0.4, 0.6, 0.8 and 1 according to the obtained values and its desirable value.

III. RESULTS AND DISCUSSION

The environmental performance of Calicut city was found out by using the pyramidal four level indicator method. Four thematic indicators are used in this method. They are growth of cities, State of Natural Resources, State of urban services and Initiatives for improving city environment. Under these thematic indicators eleven preliminary indicators are selected. Sixty four data variables are evaluated for

calculating the environmental performance of Calicut city. The data are collected from Kozhikode Corporation, Kerala water authority, Census 2011, Kerala pollution control board and water quality index was calculated by conducting the laboratory tests for determining the physico – chemical parameters by taking samples across Kozhikode Corporation.

Sl. No	Thematic Indicators	Weight
1	Growth of Cities	25
2	State of Natural Resources	30
3	State of Urban services	25
4	Initiatives for improving city environment	20
	Total	100

Table 2 : Initial Weights for Thematic Indicators

In the thematic indicator growth of cities considered the preliminary indicators as Demographic growth, Economic growth, Industrial growth, Spatial growth. Under state of natural resources land, air, water, energy and humans were considered as preliminary indicators. Under state of urban services water supply, sewerage and sanitation, solid waste management and sanitation were considered as preliminary indicators. Environmental education, waste management, slum improvement and traffic were considered as preliminary indicators in the study of Initiatives for improving city environment.

Sl No	Thematic Indicator	Thematic Weightage	Weighted Score
1	Growth of cities	25	14.074
2	State of Natural Resources	30	17.976
3	State of Urban Services	25	12.75
4	Initiatives for improving city environment	20	11

Table 3: Weighted scores of thematic indicators

Environmental performance index is the apex score got by sum up the score of thematic indicators. After conducting the study the thematic indicators growth of cities, state of natural resources, state of urban services and initiatives for improving city environment got the EPI value of 14.074, 17.976, 12.75 and 11 respectively. The required data were collected from Kozhikode Corporation, Kerala Water Authority, Kerala Pollution control Board etc. Water Quality Index for Calicut city was found by taking water samples from different station points. The average WQI was found to be 44.8. By comparing the standard values of water quality index, water quality status of Calicut city was found to be marginal.

Environmental Performance Index = Score of Growth of cities + Score for State of Natural Resources + Score for Urban Services + Score of Initiative improving city Environment = 14.074 + 17.976 + 12.75 + 11 = 55.8

The obtained environmental performance index indicates the moderate performance of Calicut city. This indicates that further city improvement programs are necessary to develop the city properly.

IV. CONCLUSION

The environmental performance index of Calicut city was determined by four level indicator frame work method. Four thematic indicators considered in the frame work. The environmental performance index of Calicut city was assessed to be 55.8. This indicates moderate performance of city. The water quality index of Calicut city was calculated by CCME (Canadian Council of Ministers of the Environment) water quality index method. Average water quality index of Calicut City was found to be 44.8. By comparing the standard values of water quality index, water quality status of Calicut city was found to be marginal category.

ACKNOWLEDGEMENT

Words cannot heartfelt gratitude towards my dearest family Mr. Akhil K, Mr. A K Gopi, Mrs. Lathika Gopi, and Mr. Alan V G for their ceaseless motivation and encouragement during the progress of thesis and journal publication.

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International Research Journal of Engineering and Technology, volume 04, issue 05/ May 2017

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