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An analysis of spatial variation of environmental condition of Bangladesh on the basis of accessibility to improved drinking water source and improved sanitation facility

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Abstract

The study attempts to analyze the spatial variation of environmental condition of Bangladesh on the basis of access to improved source of drinking water and sanitation facility. Data on the percentage of people having accessibility to improved drinking water source and sanitation facility for each district has been collected from Multiple Indicator Cluster Survey Report 2009 of Bangladesh. Using cluster analysis method districts have been classified into six groups in a scatter plot classifying districts on the basis of different level access to improved drinking water source and sanitation facility. The findings of the study can help the government to take pragmatic policy to achieve sustainable access to improved drinking water source and sanitation, particularly for the improvement of lagging districts.

INTRODUCTION

Environmental sustainability is a precondition for ensuring a sustainable development and progress of a country. For this reason, one of the goals of Millennium Development Goal (MDG) was to ensure environmental sustainability worldwide. Under this goal one objective was to ensure sustainable access to improved drinking water sources and sanitation facility [1]. To determine the environmental sustainability of Bangladesh to access the achievement of MDG, four indicators have been considered. These factors depict the environmental situation of the country. In commensuration of the targets of MDGs, access to improved drinking water and improved sanitation are two indicators that have been considered to judge the environmental situation for Bangladesh [2].

Access to safe drinking is necessary for healthy life. Water contaminated with harmful materials or chemicals or containing high level of arsenic is likely to cause various diseases [2,3]. Besides, lack of hygienic sanitation or disposal of human excreta in open space causes water pollution which ultimately accelerates the spread of diseases like cholera, diarrhea, polio etc [2,4]. Every year these diseases cause morbidity and mortality of millions of children as well as adults in Bangladesh [2]. So, it is necessary to identify the regions which are lagging in terms of access to improved drinking water source and sanitation facility to prioritize the regions to take appropriate measure to ensure better access to drinking water and sanitation.

This study focuses on the spatial variation of environmental conditions all the 64 districts of Bangladesh in terms of access to improved drinking water sources and sanitation facility. The findings of the study can be applied to take required policy measures and allocation of resources for the improvement of lagging districts and achieve MDG of environment sustainability for Bangladesh.

MATERIALS AND METHODS

Four indicators were considered for the judgment of environmental condition in Multiple Indicator Cluster Survey Report 2009 of Bangladesh. These were access to improved drinking water source, improved sanitation facility, level of arsenic contamination and awareness of arsenic contamination. In order to analyze environmental condition of Bangladesh, two important environmental aspects: access to drinking water and sanitary facility was considered because inadequate access to safe water and sanitation services with poor hygiene practices contribute to the mortality and morbidity of the thousands of children's everyday and diminishing their future opportunities [2]. Spatial variation of the environmental condition of districts of Bangladesh was analyzed on the basis of two factors. Data on percentage of people having to the improved drinking water

and sanitation of the 64 districts of Bangladesh have been from the report of Bangladesh Here the data of access to safe drinking water adjusted for the arsenic contamination less than 50 micrograms per litre (According to Bangladesh Government) is used as contamination of arsenic is a major concern in Bangladesh. For access to sanitation facility there are two types of data. Improved sanitation is defined by UNICEF, World health Organizations (WHO) Joint Monitoring Program (JMP) and Government of Bangladesh (GoB) in different way. The JMP definition is strict in the sharing aspect of latrines while GoB definition is quite liberal in the aspect of sharing of latrines [2]. However, the GoB definition can be much more appropriate in the context of Bangladesh. So the data related to the government definition of sanitation access is used for the analysis.

Among different tools for determining spatial variation, clustering method has been used in this study because this method considers the relationship among entire data sets and generates groups on the basis of homogeneity of data. Among different methods of cluster analysis in this study Hierarchical Cluster Analysis Method has been used in SPSS 16 platfrom [5].

RESULTS AND DISCUSSION

From the cluster analysis in SPSS software districts of Bangladesh have been classified into six groups on the basis of access to drinking water and sanitary facility. Six clusters namely A, B, C, D, E, F have been shown in the Fig. 1.
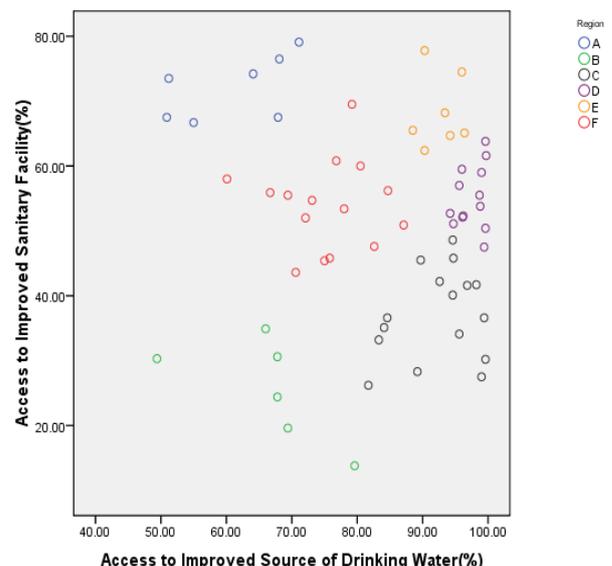

Fig. 1. Scatter plots of clusters with district wise variation of environmental condition of Bangladesh

Cluster A: People of districts in this cluster have moderately good access to improved drinking water source and good access to sanitary facility. There are 7 districts within this cluster: Bagerhat, Chandpur, Comilla, Feni, Faridpur, Gopalgang and Madaripur,

Cluster B: Districts belonging to cluster B have moderately good access to improved drinking water source but poor access to sanitary facility. There are 6 districts in Cluster B: Bandarban, Khagrachari, Kishoreganj, Netrokona, Rangamati and Sunamganj.

Cluster C: In this cluster, people of districts have good access to improved drinking water source but access to sanitation facility is moderately poor. This cluster includes 16 districts Barguna, Bhola, Chuadanga, Gaibandha, Jamalpur, Meherpur, Mymensingh, Naogan, Narayanganj, Narsindhi, Nawabganj, Nilphamari, Patuakhali, Rajshahi, Rangpur and Sherpur.

Cluster D: In this clusters districts are in very good condition in terms of access to improved drinking water source. Access to sanitation facility for people is moderately good for these districts. This cluster has 13 districts: Barishal, Coxs Bazar, Dhaka, Gazipur, Dinajpur, Joupurhat, Kurigram, Kushtia, Lalmonirhat, Natore, Panchaghar, Tangail, and Thakurgaon.

Cluster E: People of the belonging districts in this cluster seem to have a good access to both improved drinking water source and sanitation facility. Degree of accessibility to drinking water is highly satisfactory (almost 100%). 7 districts belong to this cluster are Bogra, Chittagong, Jhalkhati, Rajbari, Pabna, Shariatpur and Shirajganj.

Cluster F: Access to drinking water and sanitation is moderately good in the districts of this cluster. There are 15 districts in this cluster are Brahmanbaria, Habiganj, Jessore, Jhenaidha, Khulna, Laxmipur, Magura, Manikganj, Maulavibazar, Munshiganj, Narail, Noakhali, Pirojpur, Satkhira and Sylhet.

Table 1. Cluster wise variation of environmental condition of districts of Bangladesh

Cluster	Environmental condition	No. of District	Percentage of districts
A	Moderately good access to improved drinking water source and good access to improved sanitary facility	7	10.93
B	Moderately Good access to improved drinking water source. poor access to improved sanitary facility	6	9.38
C	Good access to improved drinking water source, moderately poor improved sanitation facility	16	25
D	Very good access to improved drinking water source, moderately good access to improved sanitation facility	13	20.31
E	Very good access to improved drinking water source, Good access to improved sanitation facility	7	10.93
F	Moderately good access improved drinking water source and improved sanitation facility	15	23.43

Fig. 1 shows that none of districts have achieved accessibility of improved water supply and sanitation facility for all. As shown in Table 1, Cluster E has the best condition in terms of accessibility to improved drinking water and sanitation. Within this cluster highest 25% of districts are located. Cluster E contains districts with relatively better environmental condition. 23.43% districts are located within Cluster F and A which has moderately good condition of the environmental aspects considered. These two clusters encompass districts with moderately good environmental condition. Cluster C is greatly lagging in accessing improved sanitation. It can be interpreted for cluster C that poor or lack of sanitation facility contributing more in the deterioration of environmental condition than unsafe water supply. Referring to Fig 1, it can be stated that districts within the Cluster B has relatively backward condition than other clusters in terms of both indicators of environmental condition (Fig. 1). Districts within this cluster are of worst environmental condition.

CONCLUSION

In order to achieve environmental sustainability, government must focus on the improvement of environmental conditions. For this it is necessary to take appropriate policy measure and allocate resource for increasing the accessibility of improved drinking water sources and sanitation facility. But for a developing country like Bangladesh it is not possible to allocate resources for the development of water supply and sanitation facility at a time [6]. This study identifies the clusters and districts which are lagging most and which are in a better condition in accessing improved drinking water source and sanitation facility. The government should give priority to the lagged clusters and districts while allocating resources. According to this study it can be recommended Cluster B must be in first priority of allocating resources for developing environmental condition of Bangladesh while policy making. All the Clusters do not show the similar level of accessibility to both improved water source for drinking and improved sanitation. The sector which is lagging more must receive priority for allocating resources for improvement of regional environmental condition. In Cluster C, accessibility to improved drinking water is good condition but sanitation facility is very poor. So, while allocating resources for development of regional environment, more resources is to be allocated for sanitation facility improvement rather than water supply for Cluster C.

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