JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Rural Urban Groundwater Draft: A Case Study of Ambala district Block I and Block II, Haryana, India

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Abstract: Urbanization is a process which exhibits itself in the demographic, social, economic, technological and environmental aspects of life through temporal, spatial and sectoral changes in a given society. Urbanization is a progressive concentration of traditional rural economies into modern industrial one (Davis, 1965). The uncontrolled growth of population in several parts of the world has put drastic pressure on natural resources such as groundwater. The manner, in which we use our land, definitely leaves some visible or non-visible impact on all the natural resources including groundwater. Present paper discusses the water consumption pattern between an urban and rural area. An attempt has been made to analyze the groundwater draft in the study area. The results indicate towards more extraction of groundwater in the urban areas caused by more demand.

Keywords: Groundwater draft, Urbanization, Rural, Natural Resources

I. Introduction

With the urbanization there comes a change in land use/ land cover pattern. More Urbanization means more population which puts unreasonable pressure on natural resources of the area. Our study area is Ambala district, Haryana, India. These cities are located near the state capital of Haryana i.e. Chandigarh. The impact of land use change exerts its effect on natural resources, such as air, water and soil. Major natural factors include climate, topography and soil structure, whereas socio-economic factors include economic ability, awareness among farmers, management practices and the development of infrastructure. Unsustainable development coupled with unplanned and unsystematic urbanization has led to environmental pollution. Pollution, once considered a regional problem, has transformed into a global phenomenon now. In the new era of globalization and economic liberalization, it becomes imperative to plan and manage cities. It needs a logical approach and far sightedness to see the future problems while making planning in present. While analyzing global change, the study of land use/land cover (LULC) changes plays an important role. On one side rapid urbanization has bought opportunities in terms of new urban development and suffered losses to arable land, vegetation cover land and water bodies on the other side. There is a direct as well as indirect relation between land use and the

quality as well as quantity of water. Although remotely sensed images have been used to study urban growth pattern the world over, very few studies have employed these methods to examine the growth of Indian cities, particularly Ambala City and Ambala Cantonment in Haryana. To study the continuously changing process of urbanization, remote sensing is very helpful. During last decade, there has been great attention towards urbanization and land use as there is strong effect of anthropogenic activities and the ecosystem as almost half of the world population is living in the cities (Stow and Chen, 2002). With increase in urban population, there is an increased demand of natural resources and hence the increased exploitation, scarcity and contamination.

The role of groundwater is very crucial in the economic and social well being of urban areas. Analyzing water consumption patterns is an important task in the sustainable water supply to the people (P Mousi1 and V Bhuvaneswari, 2021). Although there are no comprehensive statistics on the proportion of urban water supply derived from groundwater, it has been estimated (Foster et al., 1998) that the number of people dependent directly on groundwater is more than 1 billion urban dwellers in Asia and 150 million in Latin America. These include the residents of some of our largest megacities, including Beijing, Jakarta, Bangkok, Manila, Dhaka, Buenos Aires, Mexico City, Delhi, Mumbai and many others. The objective of sustainable development can be achieved only through the proper management of water resources. Determining the behavior of domestic water consumers can facilitate a more proactive approach to water demand management, and serves as the foundation for the development of any intervention strategies that seek to bring about sustained and substantial reductions in domestic water consumption (Narmilan et al, 2020). The present chapter deals with the hydrogeology and groundwater resources of the area under study.

II. Description of Study Area:

Present administrative status of the district (2011) is that there are three tehsils namely, Naraingarh (170 villages, Naraingarh MC and two Census Towns Kakkar Majra and Majra), Ambala (164 villages, Ambala MCL, Ambala Sadar MCL, Ambala Cantt. C.B. and 7 Census Towns (Census, 2011, District Handbook, Ambala). A map showing map of present day Ambala district has been shown in Figure 2.2.

Table 1. Administrative changes in district Ambala 2001- 2011

Name of District/ Tehsil	Number of villages		Number of Towns	
	2001	2011	2001	2011
Ambala	493	470	6	15
Tehsil Naraingarh	172	170	1	3
Tehsil Ambala	229	164	5	10

Tehsil Barara	92	136	-	2

(Source: Census, 2011, District Handbook, Ambala)

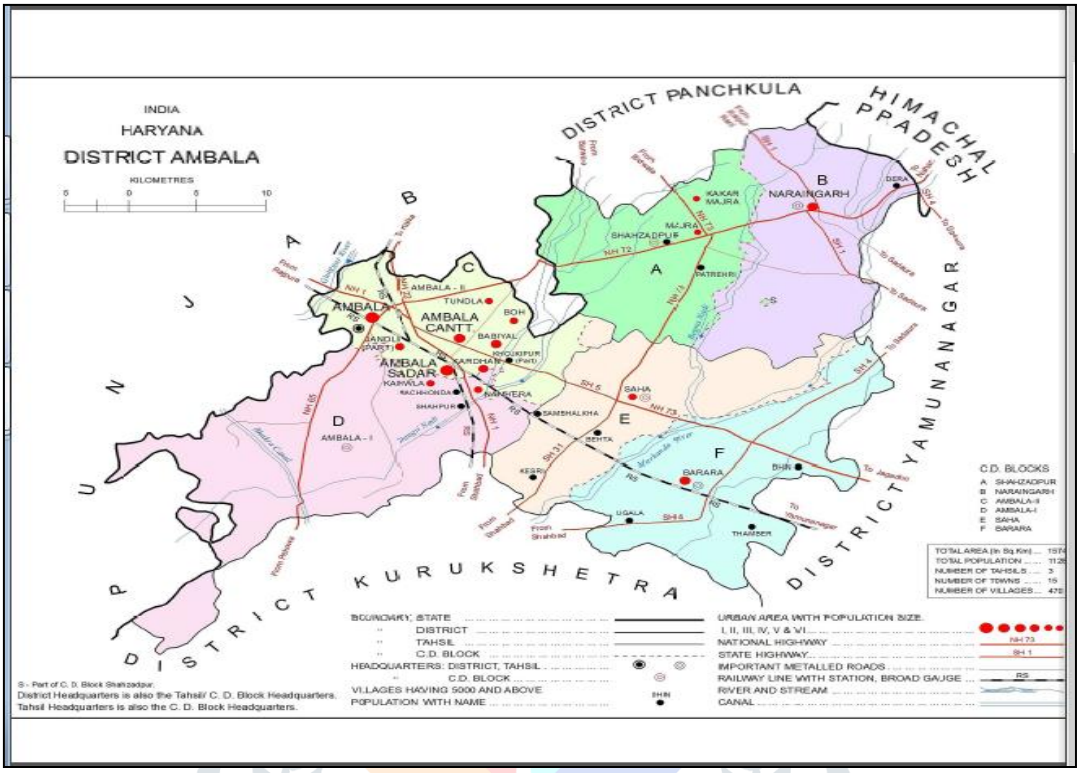

Figure 1: Map of study area

III. Methodology

Secondary data was collected from Central Ground Water Board and Groundwater Estimation Committee (GEC), 2011. Calculations were done by using the data from census 2011 and CGWB and GEC.

IV. CATEGORIZATION OF BLOCKS FOR GROUNDWATER DEVELOPMENT

The units of assessment are categorized for groundwater development based on two criteria- (a) Stages of groundwater development and (b) Long term pre and post monsoon water levels.

The area can be classified into different utilization categories as per norms given in Table 1:

1. **Safe areas** which have groundwater potential for development
2. **Semi critical areas** where cautious development is recommended
3. **Critical areas and Over exploited areas** where there should be intensive monitoring and evaluation and future groundwater development be linked with water conservation measures

The stage of groundwater development is defined by:

Stage of groundwater development (%) = (Existing gross groundwater draft for all users /Net groundwater availability)*100

Table 2. Criteria for categorization of Blocks

S. No.	Stage of Ground water Development	Significant Long term Decline		Categorization
		Pre-monsoon	Post-monsoon	
1.	<= 70%	No	No	Safe
2.	>70% and <=90%	No	No	Safe
		Yes/No	No/Yes	Semi-critical
3.	>90% and <=100%	Yes/No	No/ Yes	Semi-critical
		Yes	Yes	Critical
4.	>100%	Yes/No	No/Yes	Over-Exploited
		Yes	Yes	Over-Exploited

(Source: www.cgwb.gov.in)

From the perusal of Table 2, it has become clear that Ambala Block I and Block II fell in the safe category, Shahzadpur, Barara, Naraingarh and Saha blocks are under critical and over exploited category. Whereas GEC report of 2011 (Table 1) put Ambala Block I and Block II in semi critical and critical category respectively. This clearly indicates towards the conditions of water resources that is deteriorating with time in the study area.

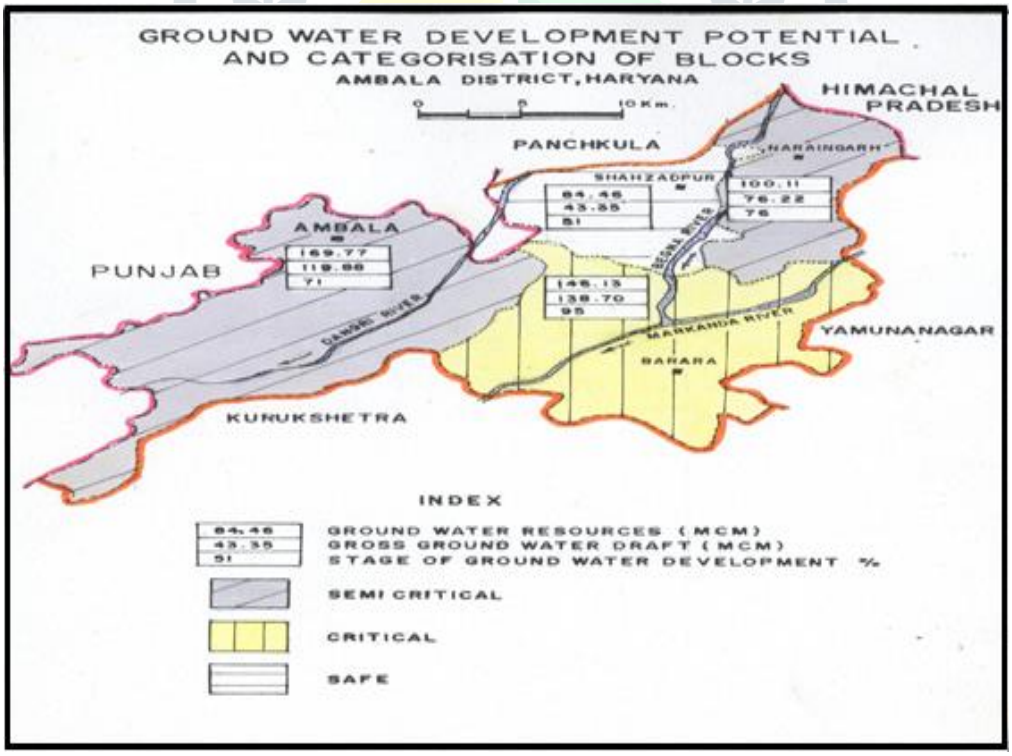

Figure 2: Stage of ground water development and categorization of the blocks in Ambala District

(Source: CGWB, 2007)

Table 3. Groundwater draft of Ambala Block I and Block II

Assessment Unit/ Block	Net Annual Ground Water Availability	Existing Gross Ground Water Draft for irrigation	Existing Gross Ground Water Draft for domestic and industrial water supply	Existing Gross Ground Water Draft for All uses	Stage of Ground Water Development {(13/10) * 100} (%)
Ambala I	13996	7803	1305	9108	65
Ambala II	7275	4438	1170	5608	77

(Source: GEC, CGWB, 2011)

V. GROUNDWATER DRAFT IN THE STUDY AREA

Analysis of Table 1 and 2 shows that the groundwater draft in Ambala City and Ambala Cantonment for drinking and domestic purpose has been found at much higher side than their respective rural areas of Block I and Block II. The total groundwater draft for drinking purpose has been calculated on the basis of actual demand draft of 140 LPCD (Litre Capita per Day). The perusal of Table 1 indicates that in Ambala Cantonment, the existing groundwater draft for industry and domestic purpose is 1089.35 ham whereas in Ambala City, which falls in Ambala Block I, the groundwater draft for drinking and domestic purpose is 997.23 ham (Hectare meter). The above groundwater draft values for drinking and domestic purpose based on actual demand is quiet matching with that of drinking water requirement as per GEC, 2011 norms.

Table 4. Groundwater draft of Ambala Cantonment and Ambala City

Assessment Unit/ Block	Population	Existing Gross Ground Water Draft for domestic	Existing Gross Ground Water Draft for Industrial supply	Existing Gross Ground Water Draft for All uses
Ambala Cantt.(Block II)	160344	819.35	270	1089.35
Ambala City (Block I)	195153	997.23	0	997.23

The groundwater draft for drinking and domestic purpose in rural area has been calculated based on actual water demand of 70 LPCD. Despite of accommodating comparable size of population in rural and urban areas, the groundwater draft in urban areas is on much higher side than the rural areas of both the blocks.

Table 5. Groundwater draft of Ambala Block I and Ambala Block II

Assessment Unit/ Block	Population	Existing Gross Ground Water Draft for domestic water supply	Existing Gross Ground Water Draft for irrigation	Existing Gross Ground Water Draft for Industrial supply
Ambala (Block II)	153455	392	7803	Nil
Ambala (Block I)	144454	369	4438	Nil

After the comparison of above tables, the groundwater draft in Ambala City and Ambala Cantonment for drinking and domestic purpose has been found at much higher side than their respective rural areas of Block I and Block II. The total groundwater draft for drinking purpose has been calculated on the basis of actual demand draft of 140 LPCD (Litre/ Capita per Day). The perusal of Table 4 indicates that in Ambala Cantonment, the existing groundwater draft for industry and domestic purpose is 1089.35 ham whereas in Ambala City, which falls in Ambala Block I, the groundwater draft for drinking and domestic purpose is 997.23 ham. The above groundwater draft values for drinking and domestic purpose based on actual demand is quiet matching with that of drinking water requirement as per GEC, 2011 norms.

In Table 5 the groundwater draft for drinking and domestic purpose in rural area has been calculated based on actual water demand of 70 LPCD. Despite of accommodating comparable size of population in rural and urban areas, the groundwater draft in urban areas is on much higher side than the rural areas of both the blocks.

V. Conclusion

From the results it is clear that there is a significant difference between rural and urban water consumption despite accommodating almost equal size of population. The reasons might include for domestic use like using washing machine, dishwasher, kitchen garden and car washing etc. Changes in lifestyle are responsible for the increase in consumption of water. The use of water has also gone higher due to global warming leading to rising temperatures particularly in cities where there is more built up area which may cause an increase in consumption of water for drinking, bathing and use of equipments such as coolers, more number of taps in commercial areas, educational institutions, railway stations, bus stands, airports and malls etc.

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