International Journal of Computational Intelligence Research
ISSN 0973-1873 Volume 13, Number 5 (2017), pp. 825-832

http://www.ripublication.com

Nature of Water Shortage Issue in Marathwada
Case Study of Upper Manar Sub-basin

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Abstract

Water is a precious natural resource which is essential for life on the earth. It is becoming scarce and valuable resource as population and water consumption rise and other side water resource management is being poor. Water shortage is root of other problems. Hence in this study, water shortage analysis has been done in upper Manar sub-basin of the Deccan trap, it is part of Marathwada. Here Falkenmark's indicators of water shortage are used to define water shortage level. Water shortage has been classified in three categories first is physical water shortage, second is economical water shortage and third is manmade water shortage to define nature of water shortage.

Entire region physical water shortage index value is 0. There economical water shortage index value is 14.82. Overall study region manmade water shortage is found because per person 632.02 cubic meters water is delivered out of total 1448 cubic meters developed water. Entire region manmade water shortage index value is 56.35 and it is very higher than physical and economical water shortage index value. Generally we blame to nature but in this study it has found that nature is not major cause of water shortage in Marathwada. This study shows that not only nature but also government policy and people also play main role in water shortage issue. It can be rectify through the proper water conservation and management technique. In this region underground, small scale and base location water storage such as farm dam, artificial riverbed, dug well etc. are more effective than large scale water storage because its water use efficiency is grater compare to other sources.

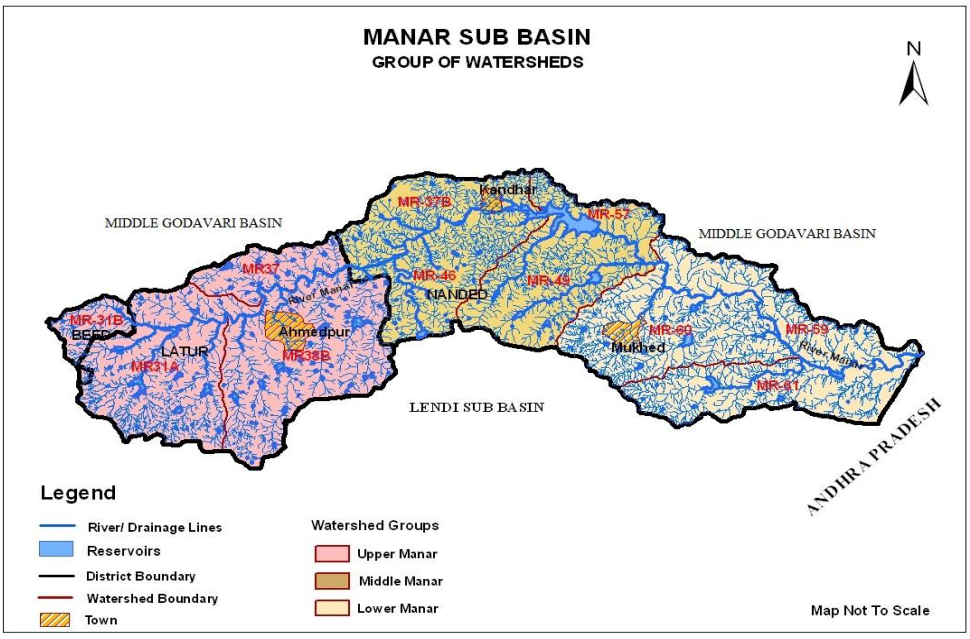
Keywords: Water Resource Management, Water Shortage Issue.

INTRODUCTION

Water is essential for socio-economic development and maintaining healthy ecosystems. It is becoming more and more scarce and valuable resource as population and water consumption rise. Other side water resource management is poor. A properly managed water resource is critical due to its complex nature and its association with other natural element. Water resources management aims at optimizing the available natural water flows, including surface water and groundwater to satisfy these competing needs. Hence in this study, geographical analysis of water demand and shortage has been done to provide fundamental information for water resources management. Considering the ever-growing population and its requirement of water, the present pattern of water extraction is certainly unsustainable e.g. the rate of water pumping from aquifers is greater than its recharge. If same trend is continued then we have to face water shortage problem in coming decade. As we know freshwater supply sources are limited and its demand is constantly increasing therefore to avoid gap between demand and supply there is need to proper water resource analysis and management of this vital resource. Water shortage is root of other problems. Hence in this study water shortage analysis has been done in upper Manar sub-basin.

STUDY AREA

The present study upper Manar sub-basin has been selected. The upper Manarsub basin is placed between longitude 76° 43' 17" to 77° 05' 34" East and between latitude 18° 32' 28" to 18° 50' 18" North. The entire reach is in Deccan trap of Maharashtra. In this study mostly Ahmadpur tahsil area is covered. It's covered an area of 783.15 Sq. km. It is situated between 402 to 648 meters above MSL.



Objective: To evaluate nature of water shortage.

Material and Methodology: Upper manar sub-basin has divided into sixteen watersheds for study convenience. Watershed delineation has done based on DEM and major stream using GIS software. In this study watershed code has given such as AH-1 to AH-16 to symbolize its name in map, table and description. Water demand of area has estimated on following formula. As per **Falkenmark** standard annually per person 1700 cubic meters water is required. In this study additional agriculture potential factor has considered for annual water demand calculation.

Water shortage has calculated using following procedure.

Water demand = Population × 1700 cubic meters × **K**

Where: K = Agriculture Potential Factor

$$\textbf{Agriculture Potential Factor } (K) = \frac{\text{Total Area under Agriculture}}{\text{Total Geographical Area}}$$

Water Shortage = Water demand – (Absolute available water for use)

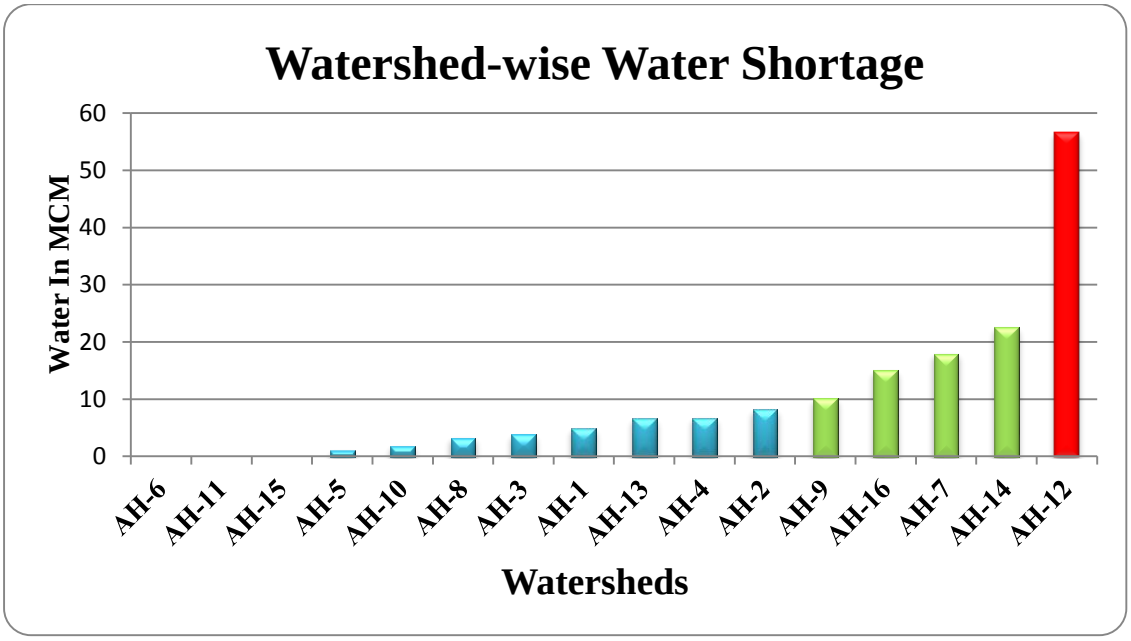
Present study, following data is used to perform study.

- **Survey of India (SOI**): (56: B/10, B/13, B/14 and 56: F/1, F/2) Topographic maps of 1:50000 scale.
- **National Remote Sensing Centre (NRSC) / Indian Space Research Organisation (ISRO):** thematic Services, Bhuvan's land use land cover map of 1:50000 scale.
- **Shuttle Radar Topography Mission (SRTM) and Advanced Space borne Thermal Emission and Reflection Radiometer (ASTER):**
- **Nation Information Center (NIC) and Hydrology Project Water Resources Dept. Gov. of Maharashtra (India):** Temporal distribution data of rainfall.
- **Groundwater Surveys and Development Agency, Latur (GSDA):** Groundwater level, groundwater recharge and groundwater yield capacity data.
- **Irrigation Department of Maharashtra**: Minor, medium and major irrigation projects information.
- **Indian Meteorological Department (IMD**): Daily rainfall data for various time periods form the rain gage stations of the region.
- **Central Ground Water Board (CGWB):** Geological and Hydrological map of Ahmadpur tahsil.

- **National Bureau of Soil Survey and Land Use Planning (NBSS and LUP):** Soil map with attribute data.
- **Census of India:**

RESULTS & DISCUSSION

Whole region annual watershortage is about 155.58 MCM. Low watershortage is observed in AH-6, AH-11, AH-15, AH-5, AH-10, AH-8, AH-3, AH-1, AH-13, AH-4 and AH-2 watersheds; there annual watershortage is below 10 MCM. Moderate watershortage is observed in AH-9, AH-16, AH-7 and AH-14 watersheds; there annual watershortage is between 10 to 40 MCM. High watershortage is observed in only in AH-12 watershed. There watershortage is above 40 MCM.



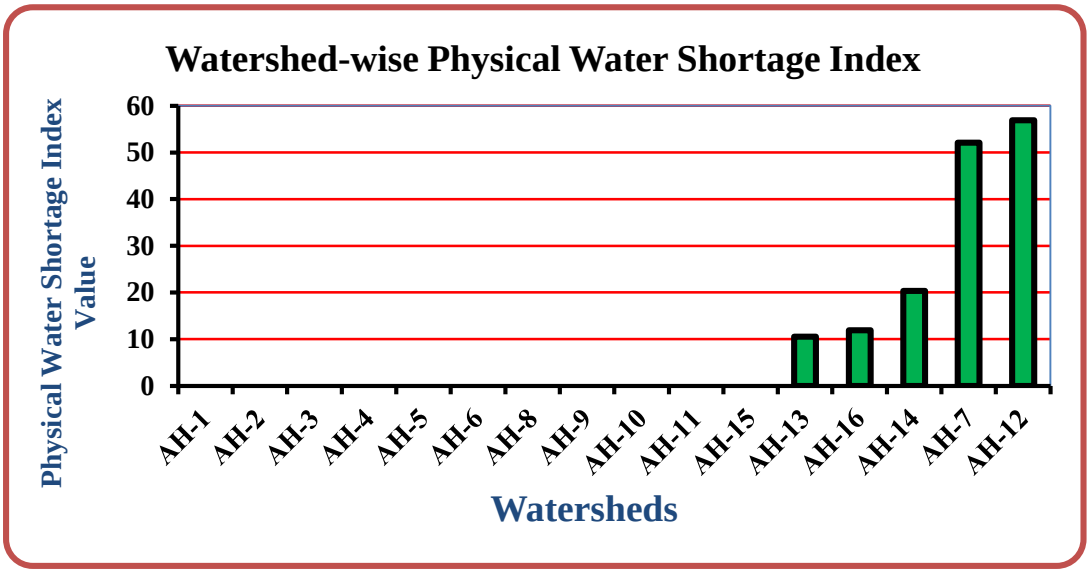
Water shortage is relative concept. In this study Nature, Money and people elements are used to find out nature of water shortage**.** Water shortage has classified in three categories based on physical, economical and manmade elements. First is physical water shortage, second is economical water shortage and third is manmade water shortage.

PHYSICAL WATER SHORTAGE

Physical water shortage means limited physical water access. When the demand outstrips the lands ability to provide the needed water than it is physical shortage. Overall study region there is no physical water shortage because per person 1808

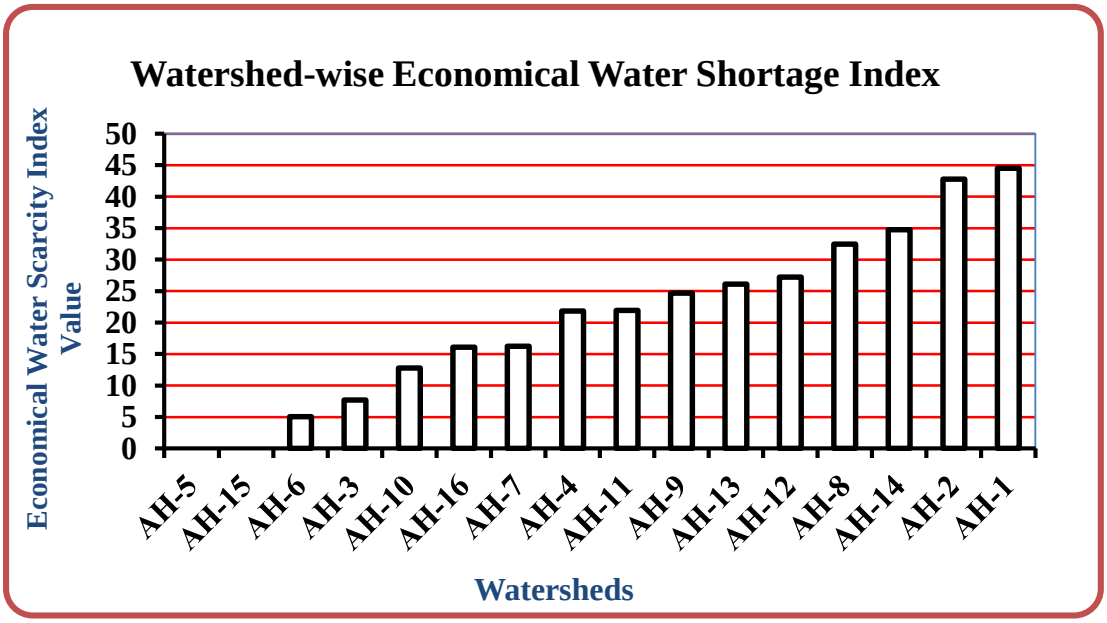
cubic meters water is available and it is greater than 1700 cubic meters. Entire region physical water shortage index value is 0; so overall there is no physical water shortage. But watershed-wise, physical water shortage is found in AH-12, AH-7, AH-14, AH-16 and AH-13 watersheds because in these watersheds per person available water is 732.48, 813.87, 1353.75, 1497.52 and 1521.35 cubic meters respectively.

Physical water shortage index values of AH-12, AH-7, AH-14, AH-16 and AH-13 are 56.91, 52.13, 20.31, 11.91 and 10.51 respectively. Watershed-wise high intensity of physical water shortage is found in AH-12 and AH-7 watersheds.



ECONOMICAL WATER SHORTAGE

Economical water shortage is most disturbing form of water shortage because economical water shortage exists when government or people do not have the necessary monetary means to utilize an adequate source of water. Overall study region economical water shortage is found because in this region per person more than 1700 cubic meters physical water is available but out of that per person only 1448 cubic meters water has developed till 2011 due to deficiency of budget. Maximum money has been spent to develop water resource but still water resources are not developed as per water demand and also water supply system has failed to proper water supply as per demand. Entire region economical water shortage index value is 14.82. It is more than physical water shortage index value hence in Ahmadpur economical water shortage is higher than physical water shortage.



Economical water shortage index values of AH-1, AH-2, AH-14, AH-8, AH-12, AH-13, AH-9, AH-11, AH-4, AH-7, AH-16, AH-10, AH-3 and AH-6 watersheds are 44.53, 42.77, 34.75, 32.45, 27.25, 26.10, 24.69, 21.96, 21.85, 16.22, 16.11, 12.80, 7.70 and 5.04 respectively. Watershed-wise high intensity of economic water shortage is found in AH-1 and AH-2 watersheds.

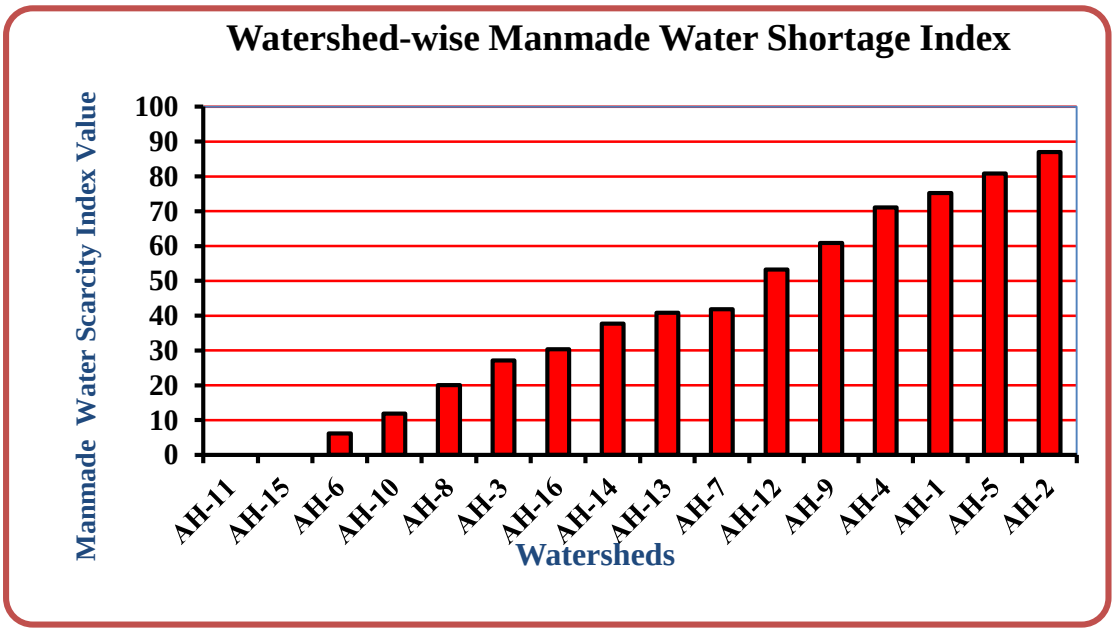
Watershed-wise Physical, Economical and Manmade Water Shortage Index

Watersheds	Physical Water Availability Per Person in Cubic Meter	Developed Water Availability per Person in Cubic Meter	Delivered Water Availability Water per Person in Cubic Meter	Physical Water Shortage Index = 100 - (A / 1700 X 100)	Economical Water Shortage Index = 100 - (B / A X 100)	Manmade Water Shortage Index =100 - (C / B X 100)
AH-1	1901.84*	**943.03**	**233.30**	0.00	44.53	75.26
AH-2	2062.1*	**972.97**	**126.16**	0.00	42.77	87.03
AH-3	2184.41*	**1569.03**	**1143.76**	0.00	7.70	27.10
AH-4	2245.67*	**1328.54**	**383.71**	0.00	21.85	71.12
AH-5	2033.19*	18286.96*	**325.85**	0.00	0.00	80.83
AH-6	6997.24*	**1614.37**	**1515.20**	0.00	5.04	6.14
AH-7	**813.87**	**681.87**	**396.53**	52.13	16.22	41.85
AH-8	2125.13*	**1148.34**	**918.47**	0.00	32.45	20.02
AH-9	1880.93*	**1280.28**	**500.72**	0.00	24.69	60.89
AH-10	4555.49*	**1482.46**	**1306.50**	0.00	12.80	11.87
AH-11	2706.52*	**1326.71**	1402.08	0.00	21.96	0.00
AH-12	**732.48**	**532.89**	**249.08**	56.91	27.25	53.26

AH-13	**1521.35**	**1256.27**	**742.83**	20.31	26.10	40.87
AH-14	**1354.75**	**883.94**	**550.44**	20.31	34.75	37.73
AH-15	400000*	400000*	400000	0.00	0.00	0.00
AH-16	**1497.52**	**1256.21**	**874.99**	11.91	16.11	30.35
Tahsil	1808*	**1448.06**	**632.02**	**0.00**	**14.82**	**56.35**

Condition : * *If per person available water is greater than 1700 cubic meters then for calculation 1700 cubic meters water is considered as base.*
Minus (-) Index value is considered as no water scarcity

Manmade Water Shortage: When particular area physical water as well as money available as per need but still people face water shortage problem then this water shortage problem is considers as manmade water shortage. Manmade water shortage occurs due to mismanagement of water resource. Overall study region manmade water shortage is found because per person 632.02 cubic meters water is delivered out of total 1448 cubic meters developed water. Entire region manmade water shortage index value is 56.35 and it is very higher than physical water and economical water shortage index value. Hence study region maximum water shortage problem is manmade.



Manmade water shortage index values of AH-2, AH-5, AH-1, AH-4, AH-9, AH-12, AH-7, AH-13, AH-14, AH-16, AH-3, AH-8, AH-10 and AH-6 watersheds are 87.03, 80.83, 75.26, 71.12, 60.89, 53.26, 41.85, 40.87, 37.73, 30.35, 27.10, 20.02, 11.87, and 6.14 respectively. Manmade water shortage high intensity is found in AH-2, AH-5, AH-1, AH-4, AH-9, AH-12, and AH-7 and AH-13 watersheds.

CONCLUSION

This study shows that not only nature and money but also people play major role in water shortage. Physical availability of water is about 1808 cubic meter per person but local water sources and water supply system unable to store and supply it as it is. Only 632.02 cubic meter water delivered per person out of 1808 through present system. This study point out that lack of water management is main reason of water shortage in Marathwada region. It can be rectify through the proper water conservation and management techniques. Underground, small scale and base location water storage such as farm dam, artificial riverbed, dug-well etc. are more effective than large scale water storage in this region. Underground, small scale and base location water storage projects water use efficiency is fine comparative to surface and large scale water storage project. This study would be helpful for researcher and decision maker in the water resources development & management. Some nice efforts are going on thoughts "Jaltukt Shivar Yojana" to overcome water shortage.

REFERENCES

[1] **Amber, Brown (2011): "**A Review of Water Scarcity Indices and Methodologies", the Sustainability Consortium, April 2011.

[2] **Brouwer, C, Hoevenaars, J. P. M. and Van Bosch, B. E. (1992):** "Irrigation Water Management: Training Manual No. 6 – Scheme Irrigation Water Needs and Supply", FAO.

[3] **Falkenmark, M., Lundquist, J. and Widstrand, C. (1989):** "Macro-Scale Water Scarcity Requires Micro-Scale Approaches: Aspects of Vulnerability in Semi-Arid Development", Nat. Resour. Forum 13, pp. 258–267.

[4] **FAO Staff (1993):** "The State of Food and Agriculture 1993", FAO Agriculture Series no. 26, Rome.

[5] **Murty, J. V. S.(1995):** "Watershed Management in India", Wiley Eastern, Limited.

[6] **Poul, P. V. (2015):** "Geographical Analysis Water Resources and Management in Ahmadpur Tahsil", unpublished thesis submitted to SRTMU Nanded.

[7] **USGA:** "Domestic Water Use". Website: http://water.usgs.gov/edu /wudo.html"