CSIBER INTERNATIONAL JOURNAL OF ENVIRONMENT (CIJE)

Vol. 1, Issue No. 2, October 2024

Published By :
CSIBER Press, Central Library Building,
CSIBER Campus, University Road,
Kolhapur, Maharashtra, 416004, INDIA.

Find the Journal online at
https://www.siberindia.edu.in/journals
E-mail :editorcije@siberindia.edu.in

CSIBER International Journal of Environment – CIJE

A Bi-Annual Double-Blind Peer Reviewed (Refereed/Juried)
Open Access International e-Journal - Included in the International Serial Directories

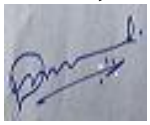
Published By:
CSIBER Press, Central Library Building
Chhatrapati Shahu Institute of Business Education & Research (CSIBER)
University Road, Kolhapur – 416004, Maharashtra, India

Editorial Note

CSIBER International Journal of Environment (CIJE) offers a venue where relevant interdisciplinary research, practice and case studies are recognized and evaluated. Increasingly, environmental sciences and management integrate many different scientific and professional disciplines. Thus the journal seeks to set a rigorous, credible standard for specifically interdisciplinary environmental research. CIJE is a multidisciplinary journal, publishing research on the pollution taking place in the world due to anthropogenic activities. CIJE welcomes submissions that explore environmental changes and their cause across the following disciplines like atmosphere and climate, biogeochemical dynamics, ecosystem restoration, environmental science, environmental economics & management, environmental informatics, remote sensing, environmental policy & governance, environmental systems engineering, freshwater science, interdisciplinary climate studies, land use dynamics, social-ecological urban systems, soil processes, toxicology, pollution and the environment, water and wastewater management, etc.

We invite authors to contribute original high-quality research on recent advancements and practices in Environment Management. We encourage theoretical, experimental (in the field or in the lab), and empirical contributions. The journal will continue to promote knowledge and publish outstanding quality of research so that everyone can benefit from it.

Er. D. S. Mali
Editor, CIJE



CSIBER International Journal of Environment (CIJE)

Contents

Sr No.	Title of Paper	Page No.
1.	**Aquaponics as an Ecofriendly Method, to Study the Growth Parameters of Different Vegetables** **Aishwarya D Mohite** Krishna Institute of Allied Sciences, Krishna Vishwa Vidyapeeth, Deemed to be university, Karad (Formerly known as Krishna Institute of Medical Sciences, Deemed to be university) Maharashtra, India – 415539 **Aishwarya D Mohite** Rajiv Gandhi Institute of Information Technology and Biotechnology, Pune (Bharti Deemed to be University) Katraj, Pune-411043 **Snehal Masurkar** Krishna Institute of Allied Sciences, Krishna Vishwa Vidyapeeth, Deemed to be university, Karad (Formerly known as Krishna Institute of Medical Sciences, Deemed to be university) Maharashtra, India – 415539	**1 to 6**
2.	**A Review on Control Measures for Various Gerbera Diseases** **Anagha A. Raut** Krishna Institute of Allied Sciences, Krishna Vishwa Vidyapeeth, Deemed to be university, Karad (Formerly known as Krishna Institute of Medical Sciences, Deemed to be university) Maharashtra, India – 415539 **A.G. Pathade** Krishna Institute of Allied Sciences, Krishna Vishwa Vidyapeeth, Deemed to be university, Karad (Formerly known as Krishna Institute of Medical Sciences, Deemed to be university) Maharashtra, India – 415539 **G.R. Pathade** Krishna Institute of Allied Sciences, Krishna Vishwa Vidyapeeth, Deemed to be university, Karad (Formerly known as Krishna Institute of Medical Sciences, Deemed to be university) Maharashtra, India - 415539	**7 to 12**
3.	**Removal of Hexavalent Chromium from Industrial Waste by using Iron Nanoparticles** **Rahul M. Sonavale** Krishna Institute of Allied Sciences, Krishna Vishwa Vidyapeeth (Deemed to be University) Karad, 415539, Maharashtra, India **Sayali Jadhav** Krishna Institute of Allied Sciences, Krishna Vishwa Vidyapeeth (Deemed to be University) Karad, 415539, Maharashtra, India **Girish Pathade** Krishna Institute of Allied Sciences, Krishna Vishwa Vidyapeeth (Deemed to be University) Karad, 415539, Maharashtra, India	**13 to 18**
4.	**Employee Engagement Enhancement by Pride Award- A Case Study** **Dr. Mamata Mahapatra** Professor & PhD Supervisor, Amity Institute of Psychology and Social Sciences, Amity University, Noida, UP **Miss Surbhi Jain** PhD Scholar (2021-2024), Amity Institute of Psychology and Social Sciences, Amity University, Noida, UP	**19 to 25**

5.	**Water Resource Management** **Anuradha Gaikwad** Chhatrapati Shahu Institute of Business Education and Research, Kolhapur, India **Madhura K Mane** Chhatrapati Shahu Institute of Business Education and Research, Kolhapur, India **Dr. Bindu Menon** Chhatrapati Shahu Institute of Business Education and Research, Kolhapur, India	**26 to 32**
6.	**Industry-Academia collaboration modelsfor the medical device development** **Amitkumar Dave[1]** [1]Doctoral Student, School of Doctoral Research and Innovation, GLS University, Ahmedabad, Gujarat, INDIA [1]helloamitdave@hotmail.com, **Dr. Deepa Vyas[2]** [2]Assistant Professor, School of Doctoral Research and Innovation, GLS University, Ahmedabad, Gujarat, INDIA [2]deepa.vyas@glsuniversity.ac.in	**33 to 42**

Water Resource Management

Anuradha Gaikwad
Chhatrapati Shahu Institute of Business Education and Research, Kolhapur, India

Madhura K Mane
Chhatrapati Shahu Institute of Business Education and Research, Kolhapur, India

Dr. Bindu Menon
Chhatrapati Shahu Institute of Business Education and Research, Kolhapur, India

Abstract
Water resource management is a critical component of addressing global environmental and socioeconomic challenges. The growing demand for freshwater, coupled with the impacts of climate change, and has made the sustainable management of water resources an urgent priority. This abstract provides a literature review of the key issues and strategies in water resource management. The article delves into issues like water resource management, integrated water resource management, water footprint, environmental flows and importance of water for the economic growth of the country. It gives an overview of the conceptual aspects of the above mentioned elements of water resource management.

Key Words: Water Resource Management, Environmental Flows, Integrated Water Resource Management.

Introduction:
Water resource management has been defined by a variety of researchers, agricultural organisations and Governmental agencies. Water resource management is the activity of planning, developing and distribution system for managing the optimum use of water resources. Basically it comprises of water cycle management. Ideally, water resource management planning has to do with the competing demands for water and seeks to allocate water on an equitable basis to satisfy all uses and demands. Water has always been an important commodity for the human civilisation. We know that all civilisations were initiated, grew and developed in the vicinity of water and hence most of the ancient civilisations are also known as river valley civilisations for e.g. the Nile Valley civilisation, The Indus Civilisation, etc. As man expanded his knowledge of science civilisations moved away from water bodies and then were established across the length and breadth of the available land. Increasing population and growth of modern day industries than began competing for available water and management of available resources of water became extremely important.

Objective
The following article attempts to answer the questions

What is Water Resource Management?

What is Integrated Water Resource Management?

What is water footprint and its relation to water management?

What are environmental flows?

Research Methodology
The paper is based on reviews of various articles published in research journals as well on various websites, blogs, etc.

An attempt has been made to understand the literature available on various aspects of water resource management, integrated water resource management, its linkages with water footprints and environmental flows.

Water Resource Management and Integrated Water Resource Management
World Bank (WB) has defined water resources management. According to WB water resource management includes the development of surface and groundwater resources for urban, rural, agriculture, energy, mining, and industrial uses, as well as the protection of surface and groundwater sources, pollution control, watershed management, control of water weeds, and restoration of degraded ecosystems such as lakes and wetlands—is an important element of our lending, supporting one of the essential building blocks for sustaining livelihoods and for social and economic development in general, (**World Bank, Technical Note, 2003**). Another **WB** document says that Integrated Water Resource Management as **Integrated River Basin Management (IRBM) aims to establish a framework for coordination whereby all administrations and stakeholders involved in river basin planning and management can come together to develop an agreed set of policies and strategies such**

that a balanced and acceptable approach to land, water, and natural resource management can be achieved (World Bank, 2006).

According to the Policy document (2012) on water of Government of India -Water resources development and management will have to be planned for a hydrological unit such as drainage basin as a whole or for a sub-basin, multi-sectoral, taking into account surface and ground water for sustainable use incorporating quantity and quality aspects as well as environmental considerations. All individual developmental projects and proposals should be formulated and considered within the framework of such an overall plan keeping in view the existing agreements / awards for a basin or a sub-basin so that the best possible combination of options can be selected and sustained (**National Water Policy, 2002**).

Integrated Water Resource Management is another important issue which has to be addressed while considering water management. It is a concept where all aspects and all stakeholders, their needs, environmental concerns are to be addressed. Water especially in form of rivers is an extremely complex commodity to be managed. Purely technical solutions as were initially designed and implemented by technocrats can't alone address all the concerns raised their in. One has to factor in various competing stakeholders and activities each of which is equally important for the country. Environmental and ecological concerns are equally important and have to be addressed while managing water resources.

Egemen and Aras (2009) have stated in their paper that as the demand of the society with respect to both ecological and chemical quality of specific River reaches, its use and protection increases, it leads to new views and strategies towards policy for river basin management. **Akpabio** (2007) has reported that integrated water resources management involves the co-coordinated development, allocations, use and management of water, and related natural resources in order to meet present and future human needs whilst maintaining the functioning of vital ecological systems. Integrated Water Resources Management (IWRM) has been defined by the Global Water Partnership (GWP) as "a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems" Over the last decade's river basin management has become increasingly complex.

Gupta (2001) states in his article on Integrated Water Management that till very recently the Planning Process was dominated more by considerations of economic development. There was very little attention paid to the effect on social and cultural systems and the natural environment which today is not the case. Even today economic considerations are at the forefront while planning for water management. However, one can find alternatives to the problems being faced due to the current system of water management.

The Sydney Catchment Authority - Catchment Management Report 2007-2008 basically talks about practices for catchment management. Information about following aspects is collected: extent of gully and soil erosion, extent, type and condition of land cover and use, condition of native vegetation, condition of riparian vegetation, extent and severity of wildfires and hazard reduction burns, biomass of potential fire fuel loads, extent of priority weed species. In the past no such system or procedure is found in India to manage either water or land resources. Thus it becomes very difficult to scientifically evaluate the efficiency of water management in India.

Environmental Flows

Environmental flows are the quantity, timing, and quality of water flows required to sustain freshwater and estuarine ecosystems. They are also known as instream flows or instream flow needs. Environmental flows are managed changes in a river's flow pattern that aim to mimic the natural flow pattern. They are intended to maintain or improve river health.

Environmental flows are important because:

1. They sustain freshwater, estuarine, and near shore ecosystems.
2. They sustain the human livelihoods and wellbeing that depend on these ecosystems.
3. They provide locations for religious ceremonies, recreation, and aesthetic value.
4. They generate income and food, and provide a safe place to live.

As such Environmental Flows is an aspect that requires attention while planning for integrated river basin management is the requirement of environmental flows or e flows of a river basin. In their paper on altered river flows, **Bunn & Arthington (2002),** have explained impact of altered flows on river ecology. Their paper basically discusses the impact of altered flows on aquatic life. Fish are one of the major species in any water body that are directly associated with livelihood concerns. According to a report by **Kelkar and Kelkar** carried out in **1956** there were 71 species of fish in the Panchaganga river but as of now as per the fishery department statistics only

29 species are found out of which 5 species are exotic. Decrease in number and variety of fish would have a direct impact on livelihood of the fishing community and this aspect will be brought out in the study. It is also essential to understand that livelihood of people residing in river basins is more directly dependent on the river water (both in terms of quantity and quality) as compared to residents of towns and cities. Specifically, it is essential to understand whether there exists any relationship between the socio-economic development of an area and its proximity to water.

Revisiting frameworks such as IWRM to resonate with these new complexities of water usage are important. Moreover, stronger, better and more efficient interlinked institutions will be required to handle the increased level of complexity (**UN Jobs and Water 2016).**

The United Nations Department of Economic and social Affairs came out with Status Report on 'The Application of Integrated Approaches to Water Resources Management' on the issue of water management and this is what they have to say: 54% of Very High Human Development Index (HDI) countries, 44% of medium and high HDI countries and 24% of low HDI countries reported high economic impacts from integrated approaches to water resources management **(2002).** The **'**Status Report on The Application of Integrated Approaches to Water Resources Management' **2012** further gives findings from analysis of 180 countries on application of Integrated Approach to Water Resources Management in those countries. One of the findings specifies that legal frame work is available in 79% of countries with changes in their water policies. The change however is not translated into actual implementation at ground level. India falls into the medium HDI country as per the 2012 UN report. The progress of implementation has been slow or has even regressed in low as well as medium HDI countries. So when we look at ground level at India we still find that there is a lot that needs to be done to implement approach of Integrated Water Resource Management.

Gupta (2001) states in his article on Integrated Water Management that till very recently the Planning Process was dominated more by considerations of economic development. There was very little attention paid to the effect on social and cultural systems and the natural environment which today is not the case. Even today economic considerations are at the forefront while planning for water management. However, one can find alternatives to the problems being faced due to the current system of water management. It would be interesting to find out the impact of water availability on the economic growth and development of the country.

Thus one can see that Water Management basically talks about a holistic approach involving social, economic and environmental concerns. The concerns of all stakeholders are to be addressed so that their needs can be addressed. At the same time the needs of environment and sustainability are also to be taken into account so that a balance can be sought between the human needs and environmental needs of water. However, when we look at present systems of water distribution and management in India we find an absence of any such approach. Though the Indian Water Policy 2012 of Government of India mentions various uses of water and its allocation we don't find it being implemented at the ground level. The earlier approach to management of natural resources was more economically oriented with the assumption that all resources on the earth are meant to be exploited for human and human needs only.

The researcher has not been able to find any literature in India which shows the implementation of a holistic approach water resource management in its true sense. An attempt will be made to show relation between land management, cropping practises and rise in socio-economic indicators. In economics, the Dutch disease is the apparent relationship between the increase in exploitation of natural resources and a decline in the manufacturing sector (agriculture). The mechanism is that an increase in revenues from natural resources (inflows of foreign aid) will make a given nation's currency stronger compared to that of other nations (manifest in an exchange rate), resulting in the nation's other exports becoming more expensive for other countries to buy, making the manufacturing sector less competitive. While it most often refers to natural resource discovery, it can also refer to "any development that results in a large inflow of foreign currency, including a sharp surge in natural resource prices, foreign assistance, and foreign direct investment". Water as a natural resource does not come under this category as there is no question of exporting water like other commodities.

Environmental Sustainability

The study of water management started from early 1990's. The concept of sustainability was introduced by the Brutland report in 1987. The term was used by the Brundtland Commission which coined what has become the most often-quoted definition of sustainable development as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs (**Report: Our Common Future, 1987**). Sustainable development ties together concern for the carrying capacity of natural systems with the social challenges facing humanity. As early as the 1970s "sustainability" was employed to describe an economy "in

equilibrium with basic ecological support systems (**Zuo Qi Ting, et, al. 2007).** In **1996, the Working Group of the International Hydrological Program (IHP) of UNESCO** defined sustainable management of water resources as "The management and use of water that supports society and its well-being into the indefinite future without degrading the integrity of the hydrological cycle or the ecological systems that depend on it".

The perceptions of what is required for sustainable water resources management and sustainability science in general have undergone major changes over the past decade. Initially, water resources management followed an instrumental "prediction and control" approach, dominated by technical end-of-pipe solutions (**Pahl – Wosti, 2008**). The author basically explains how the learning through trials has brought about the present understanding of the concept of sustainable management. The **European Water Framework** that came into existence in **2000** also set up innovative measures in the European Society. These are:

- An integrated approach expanding the scope of water protection to all waters, surface waters, and groundwater;
- The hydrological principle where water management is based on river basins;
- The obligation to achieve a "good status" by 2015;
- A "combined approach" of emission limit values and quality standards;
- Getting the prices right by introducing the principle of cost recovery;
- Getting citizens involved more closely by prescribing public participation in the development and implementation of the WFD.

In India most of the systems of water management seem to be based on the Tennessee Valley Authority (TVA) approach of United States where the focus was more on compounding and distribution of water rather than sustainable water management **(Tortajada, 2001).**

Water Footprint

Traditionally the terms ground water and surface water have been used to denote water present in aquifers and rivers (also rivulets, streams, ponds) respectively. Of late two new concepts the green water and blue water have come into existence. Both surface water and ground water are denoted as blue water while water present in evapotranspiration cycle (water present in trees, crops and other vegetation) has been termed as green water (Taiekan Oki, et al, 2006). The water foot print of various nations has been calculated using data from 1997 – 2001 for all nations. The global average water footprint is 1240 m^3 / cap / yr. the water footprint of India is 987 m^3 / cap / yr ie. 14 % of the world water usage. In fact India forms a group of select eight countries (China, USA, the Russian Federation, Indonesia, Nigeria, Brazil and Pakistan) that consume 50 % of the world's water supplies. A break up of the water footprint in terms of consumption of water shows that highly developed countries use more water for production of industrial goods while in a country like India 92 % of water is used for consumption of agricultural goods (Hoekstra, Chapagain, 2007). One of the objectives is to study water consumption of the people for irrigation in the study area. Hence an understanding the concept of water footprint is essential to understand and analyse water consumption patterns of irrigation. Another fact is that increased water usage leads to increased economic growth (Hoekstra, 2004) and impacts the water footprint of a nation. Calculation of water footprint at a district level would be difficult but the researcher intends to try to understand the water consumption in terms of the water footprint concept.

Traditionally the terms ground water and surface water have been used to denote water present in aquifers and rivers (also rivulets, streams, ponds) respectively. Of late two new concepts the green water and blue water have come into existence. Both surface water and ground water are denoted as blue water while water present in evapotranspiration cycle (water present in trees, crops and other vegetation) has been termed as green water (Taiekan Oki, et al, 2006). The water foot print of various nations has been calculated using data from 1997 – 2001 for all nations. The global average water footprint is 1240 m^3 / cap / yr. the water footprint of India is 987 m^3 / cap / yr ie. 14 % of the world water usage. In fact India forms a group of select eight countries (China, USA, the Russian Federation, Indonesia, Nigeria, Brazil and Pakistan) that consume 50 % of the world's water supplies. A break up of the water footprint in terms of consumption of water shows that highly developed countries use more water for production of industrial goods while in a country like India 92 % of water is used for consumption of agricultural goods (Hoekstra, Chapagain, 2007). One of the objectives is to study water consumption of the people for irrigation in the study area. Hence an understanding the concept of water footprint is essential to

understand and analyse water consumption patterns of irrigation. Another fact is that increased water usage leads to increased economic growth (Hoekstra, 2004) and impacts the water footprint of a nation.

Water and Economic Growth

A document prepared for the HSBC by Frontier Economics explores the relationship between water and economic growth. It says that that an investment of 3.06 million US dollars in access to water and sanitation would give an annual potential economic gain of 5.2 % in terms of percentage of GDP. The cost benefit ratio is 3.2 and the payback period would be 7.0 yrs. It further states that while calculating the World GDP of top ten most populated river basins two: The Ganga and Krishna are from India. The Krishna Basin (of which Panchaganga is a major tributary) has 1.3 % of the world population and the GDP from this basin is 0.2 % of the World GDP at 2010 figures. The blue water footprint as a percentage of natural runoff in the Krishna Basin is 17, 59,152 cubic meters per month. Agriculture is responsible for 92 % of the total water footprint in the world while drinking water and industrial usage accounts for the remaining 8 % (Hoekstra et el, 2012). It is quite obvious that productivity of agriculture is dependent on water resources and an attempt has been made to find the relationship if any between the availability of water and the increase in economic indicators.

A **UN report titled 'Water and Jobs'** states that water is an enabler of economic activity. As such effective management of water supply is a key element that should be incorporated into national employment Policy.

Scarcity of water could negatively affect growth (Barbier, 2004). This is of paramount importance in agro-based economies like India. Proper utilisation of water can take place only through proper, holistic and sustainable management of water resources. The quantity of land available for agriculture is limited. It can be reduces if agricultural land is used for other purposes or it can increase if forest land or other barren land is brought under cultivation. One way of increasing agricultural with the same amount of land is to go for multiple crops on the same land. Obviously this would require stored water in rain fed areas for irrigation. **Brown 2006** says that countries with a higher Seasonal Storage index (SSI) have higher GDP. India has a SSI of 356.6 and GDP of 555 US dollars (Year 2003)

In all industrial countries, the flows of almost all major rivers are regulated and managed, storing water for multiple uses, reducing peak flows, increasing low flows and protecting water quality, thus reducing the risk of water-related shocks and damage, increasing the reliability of water services for production, and reducing other negative impacts, such as disease (**Gray 2006**).

Water and economic growth are linked to each other and as such scarcity of water would lead to lack of growth and development. It obviously would then lead to lowering of the values of social indices of socio – economic development. The relation between water scarcity and has been well established (**Grey, Sadoff, 2007**). The water management and water utilisation therefore needs to be studied. Water is a finite resource and one can only improve efficiency of yield using various techniques of irrigation but one can't per say increase the quantum of water. The supremacy of drip irrigation with respect to water efficiency and productivity has been well established (**Narayanmurthy, 1997**). One of the objectives therefore relates to whether the farmers in the study area use this method and if they don't their reasons for not using drip irrigation.

Conclusion

Thus in order to understand water resource management in a holistic perspective it is essential to incorporate all aspects while designing and maintain systems and processes that manage water as resource. Need of water for human development is essential and one can't imagine life (no matter how advanced or modern) without adequate requirement of water. Trying to manage water without understanding various ecological, geographical, economic and hydrological perspectives would be disastrous to environment and the human life dependent on that very resource for its survival.

References

Behera, D. K. (2016). Measuring Socio-Economic Progress in India: Issues And Challenges. Revista Galega de Economia, 25(2).

Brown, C., & Lall, U. (2006). Water and economic development: The role of variability and a framework for resilience. Natural Resources Forum, 306–317. [DOI: 10.1111/j.1477-8947.2006.00118.x]

Brown, C., Meeks, R., Ghile, Y., & Hunu, K. (2013). Phil. Trans. R. Soc. A 2013 371 20120416. [DOI: 10.1098/rsta.2012.0416]

Brundtland Commission. (1987). Our Common Future.

Chaturvedi, M. C. (1987). Water Resource Systems Planning and Management: Chapter 1 Introduction. Tata McGraw-Hill Publishing Company Ltd: New Delhi.

Davis, R., & Hirji, R. (2003). Environmental Flows: Concepts and Methods. Series Water Resources and Environment: Technical Note C.1.

Egemen, T., Togan, V., & Berkun, M. (2007). River water quality management model using genetic algorithm. Environ Fluid Mech, 439-50.

Emmanuel, M. A., Watson, N. M., Ite, U. E., & Ukpong, I. E. (2007). Integrated Water Resources Management in the Cross River Basin, Nigeria. Water Resources Development, 23(4), 691–708.

EPW Research Foundation. (1994). Special Statistics-7: Social Indicators of Development for India: I. Economic and Political Weekly, 29(20), 1227-1240.

EPW Research Foundation. (1994). Special Statistics-8: Social Indicators of Development for India-II. Economic and Political Weekly, 29(21), 1300-1308.

Fallenmark, M. (2013). Growing water scarcity in agriculture: a future challenge to global water security. Phil. Trans. R. Soc. A, 371, 20120410. [DOI: 10.1098/rsta.2012.0410]

Government of India. (10th Five-Year Plan).

Government of India. (11th Five-Year Plan).

Government of India. (12th Five-Year Plan).

Government of India. (2007). Five-Year Plan Report of the Working Group on Water Resources for the XI Five-Year Plan (2007-12).

Gupta, R. K. (2001). River Basin Management: A Case Study of Narmada Valley Development with Special Reference to the Sardar Sarovar Project in Gujarat, India. International Journal of Water Resources Development, 17(1), 55–78.

Gupta, R., & Sharma. (2010). Dynamics of Land Utilisation, Land degradation and factors determining Land Utilisation in HP. Indian Journal of Agriculture Economics, 65(2), April–June 2010.

Hardin, G. (1968). The Tragedy of the Commons. Science, 162(3859), 1243-1248. [DOI: 10.1126/science.162.3859.1243]

Hoekstra, A. Y., Mekonnen, M. M., Chapagain, A. K., Mathews, R. E., & Richter, B. D. (2012). Global Monthly Water Scarcity: Blue Water Footprints versus Blue Water Availability. PLOS ONE, 7(2), e32688. [DOI: 10.1371/journal.pone.0032688]

HSBC – Frontier Economics. (2012). Exploring the links between water and economic growth: Executive Summary.

Please note that the remaining references follow a similar format with author names, publication years, titles, and source details.

Bunn, S. E., Arthington, A. H. (2001). Basic Principles and Ecological Consequences of Altered Flow Regimes for Aquatic Biodiversity. Cooperative Research Centre for Freshwater Ecology, Centre for Catchment and In-Stream Research, Faculty of Environmental Sciences, Griffith University.

Government of India. (2002). National Water Policy.

Hoekstra, A. Y. and Mekonnen, M. M. (2011) "Global water scarcity: monthly blue water footprint compared to blue water availability for the world's major river basins," UNESCO-IHE, 53.

International Bank for Reconstruction and Development/ The World Bank. (1995). Social Indicators of Development.

Kumar, R., Singh, R. D., & Sharma, K. D. (2010). Water resources of India. Current Science, 89(5), 10 September 2005. Retrieved from the internet on 5th September 2010.

Lado, C. (1997). Socio-economic factors influencing sustainable water supply in Botswana. GeoJournal, 41(1), 43-53. [Stable URL: http://www.jstor.org/stable/41147024]. Accessed on 13th March 2014.

Maharashtra Government. (1989). Chapter 4, Maharashtra State Gazetteer Kolhapur District. Published by Maharashtra Government.

Maharashtra Pollution Control Board. (2004 – 2005). Chapter 9, Environmental Status Report Kolhapur Region. Published by MPCB, pg 88.

Maharashtra Pollution Control Board. (2006). Chapter 6, White Paper on Pollution of River – Causes and Remedies. Published by MPCB, pg 305.

Narayanmurthy, A. (1997). Economic Viability of Drip Irrigation: An Empirical Analysis from Maharashtra. Indian Journal of Agricultural Economics; Bombay, 52(4).

Organisation for Economic Co-operation and Development. (2009). Society at a Glance. M2PressWIRE, April 26, 2010.

Pahl-Wostl, M., Mostert, E., & Tabara, D. (2008). The growing importance of social learning in water resources management and sustainability science. Ecology and Society, 13(1), 24. [Online] URL: http://www.ecologyandsociety.org/vol13/iss1/art24/

Rodriguez Martín, J. A., Holgado Molina, M. D. M., Salinas Fernández, J. A. (2012). An Index of Social and Economic Development in the Community's Objective-1 Regions of Countries in Southern Europe. European Planning Studies, 20(6), 1059-1074. DOI: 10.1080/09654313.2012.673571.

Rohani, M. (2013). Freshwater Values Framework: A Review of Water Valuation Methods Utilized Within Total Economic Valuation. Working Report 2013/001.

Shatanawi, M., Naber, S. (2011). Dialogues on Mediterranean Water Challenges: Rational Water use, water price, water price versus value and lessons learned from the European Water Framework Directive. In Valuing Water from Social, Economic, and Environmental Perspective (pp. 109-117).

Shinde, R. V. (1992). Studies on Hydrobiology of Panchaganga River System. In Division of Environmental Biology, Department of Zoology, Shivaji University.

Singh, P. K., Bhakat, D., Singh, G. (2011). Assessment of Groundwater Resources of Panandhro Lignite Mining Region, Gujarat State, India. International Journal of Environmental Sciences, 1(7).

Singh, S. (2000). Economic and Political Weekly, 35(23), 1886-1889. [Stable URL: http://www.jstor.org/stable/4409348]. Accessed on 6th September 2010.

Skovlin, J. M., Jain, R. K. (1990). Range Management. Rangelands, 12(5), 275-277. [Stable URL: http://www.jstor.org/stable/4000481].

South Asia Network on Dams, Rivers, and People. (1999). River Basins Organisations in India – Institutional Frameworks and Management Options: A Case for Fundamental Review. November 99 issue.